

Modeling White Abalone Habitat in the Southern California Bight to inform Future Outplanting Efforts



©Cabrillo Marine Aquarium

**Jordan DiNardo, Brice Semmens
Scripps Institution of Oceanography
PSAWII Conference, February 14, 2019**

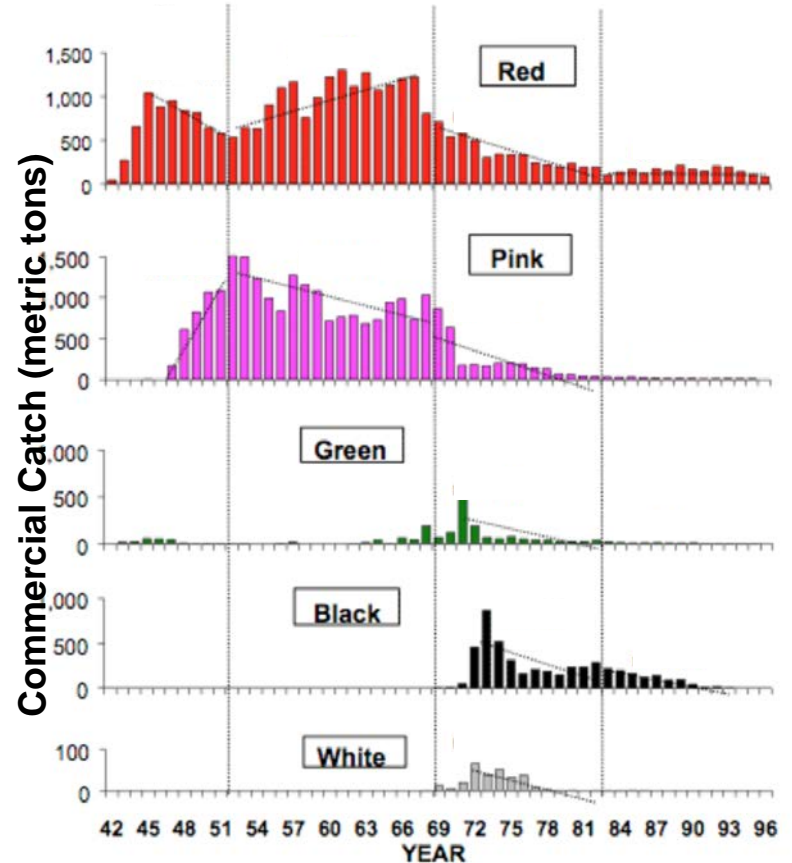
Where were White Abalone found?



History of Fishery and Management



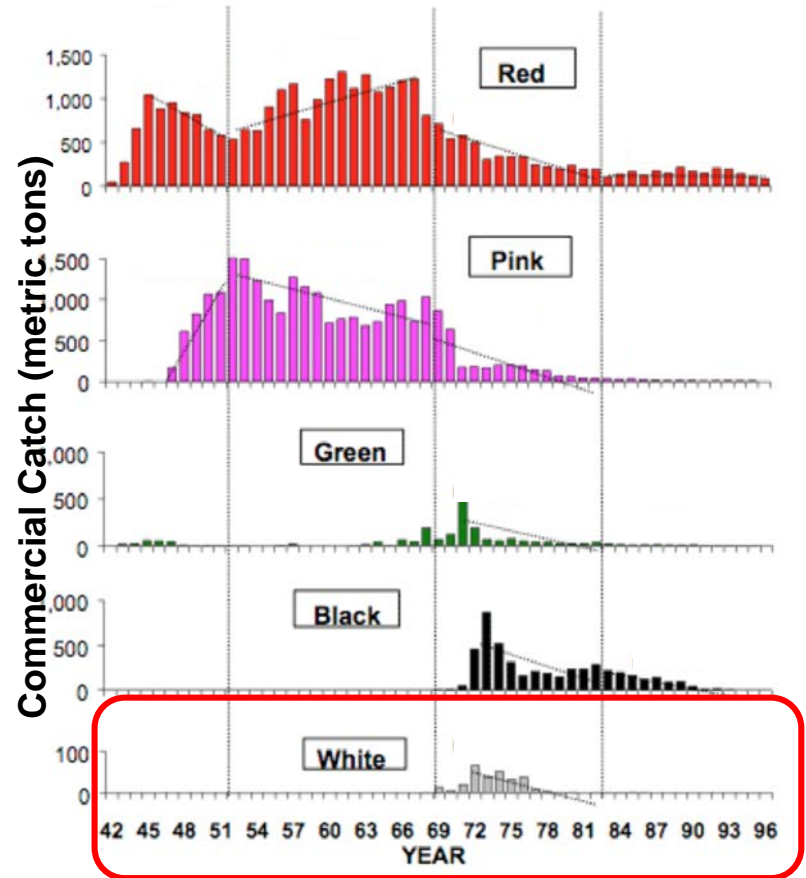
- 1996 Closure of the fishery
- 2001 Listing under the ESA
- 2016 Identification as a “Species in the Spotlight”



History of Fishery and Management



- 1996 Closure of the fishery
- 2001 Listing under the ESA
- 2016 Identification as a “Species in the Spotlight”



Methods: Broadscale Modeling

Historical Model (Fishery-dependent)

Species Data

CDFW White Abalone Commercial Catch
(1955-1996)

Modeling Platform

Random Forest

Environmental data

Depth (CDFW)
Slope (derived from CDFW)
Length of Coastline (derived from CDFW)
Mean Sea Surface Temperature (CalCOFI)

Contemporary Model (Fishery-independent)

Species Data

Fishery-independent surveys (scuba,
submersible, ROV) (1993-present)

Modeling Platform

Maximum Entropy (Maxent)

Environmental data

Depth (CDFW)
Slope (derived from CDFW)
Length of Coastline (derived from CDFW)
Mean Sea Surface Temperature (CalCOFI)

Methods: Finescale Modeling

Species Data

Fishery-independent surveys (scuba, submersible, ROV)
(1993-present)

Modeling Platform

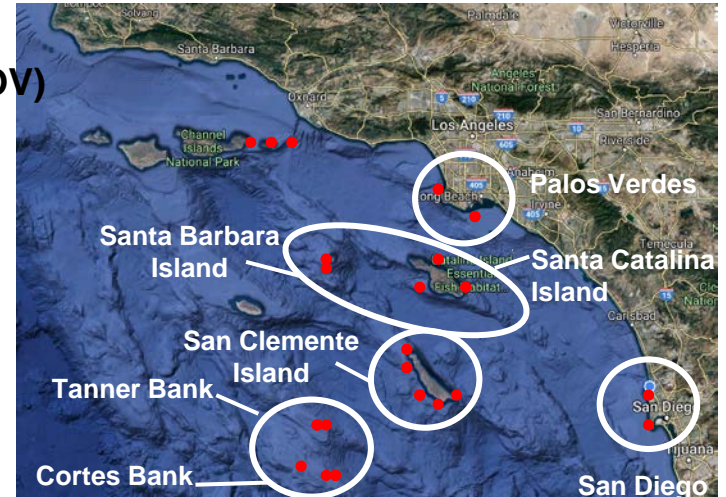
Maxent

Environmental Data

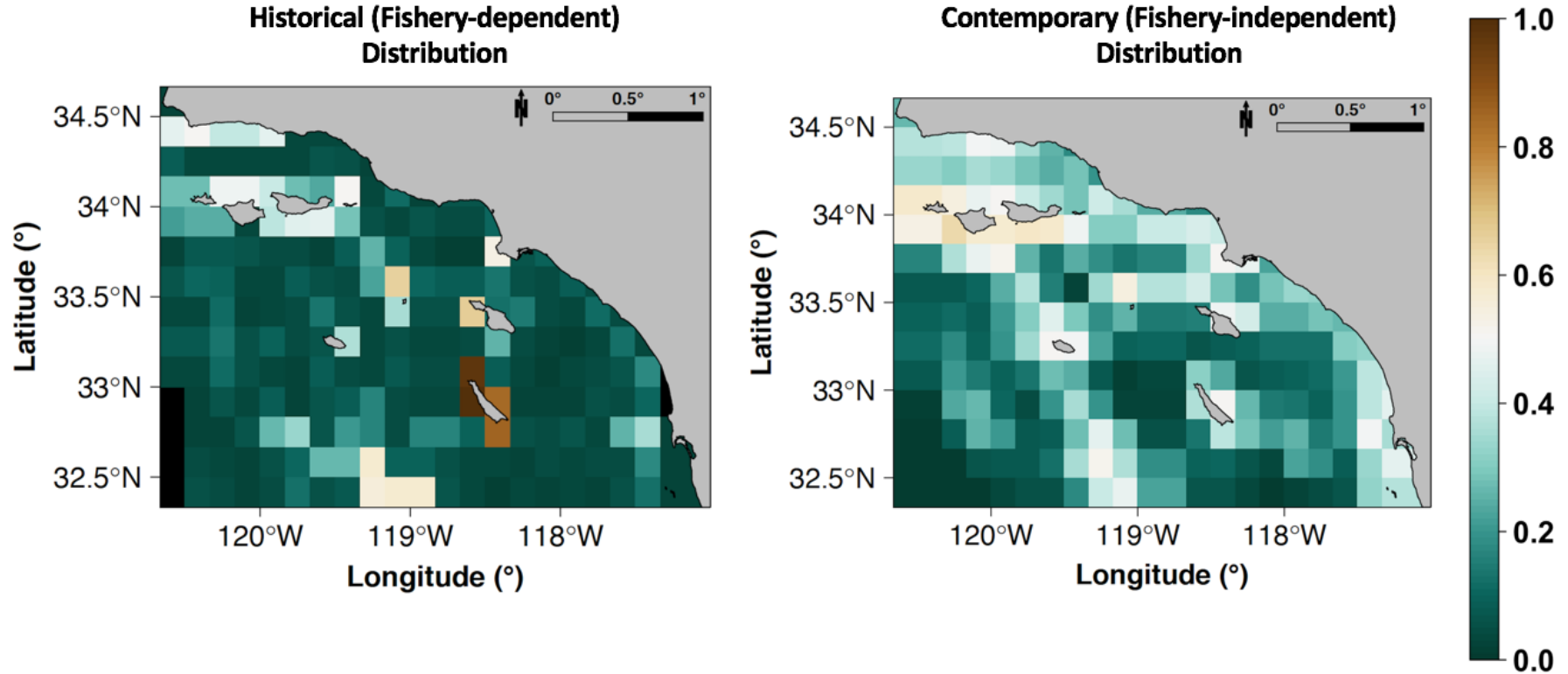
Depth, Slope, Vector Ruggedness Measure (VRM) (CSUMB
SFML)

Kelp Persistence (SBC-LTER)

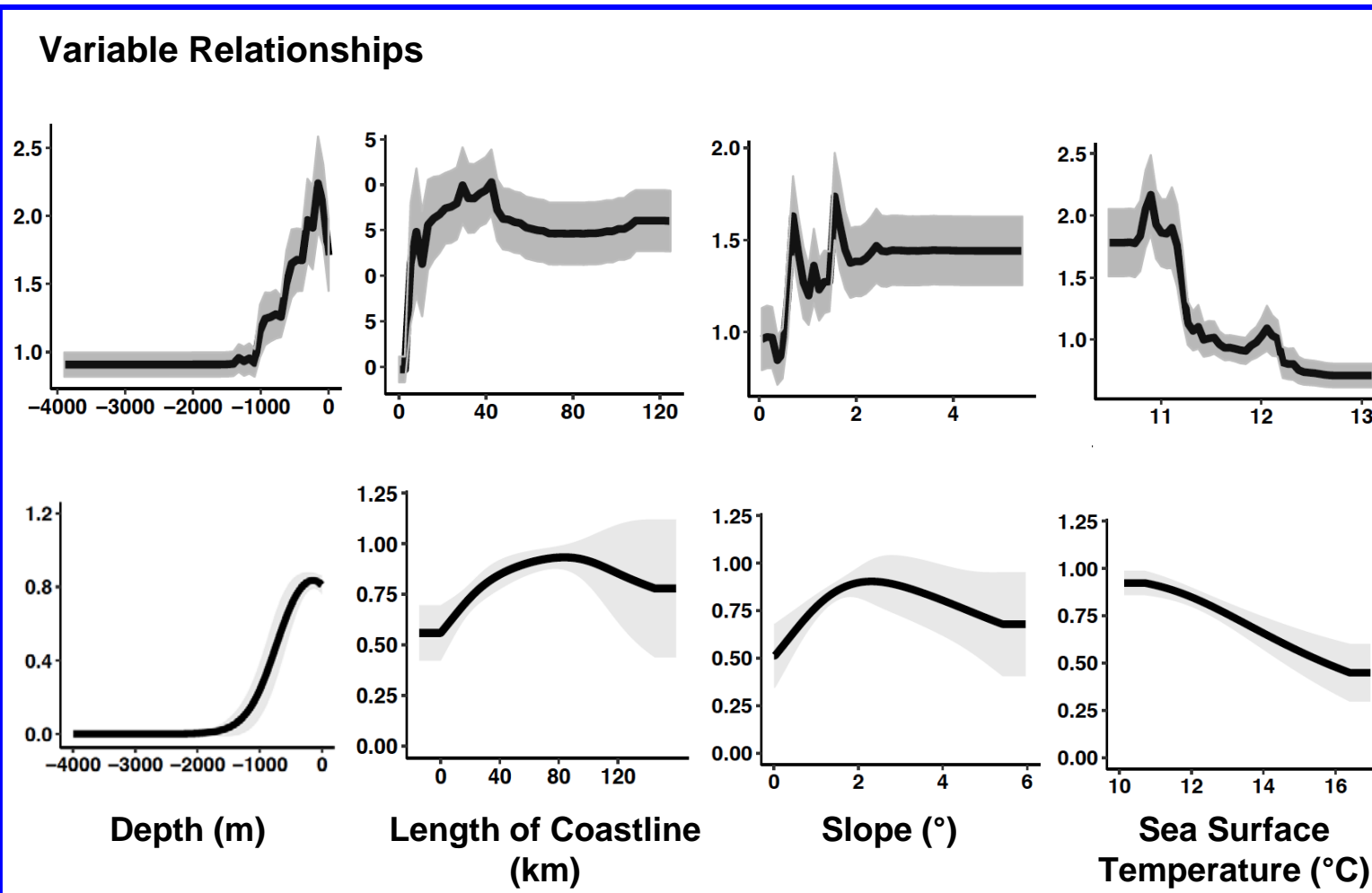
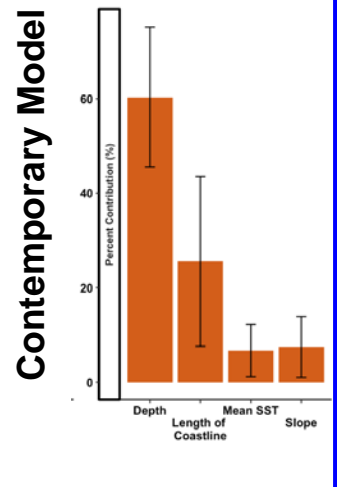
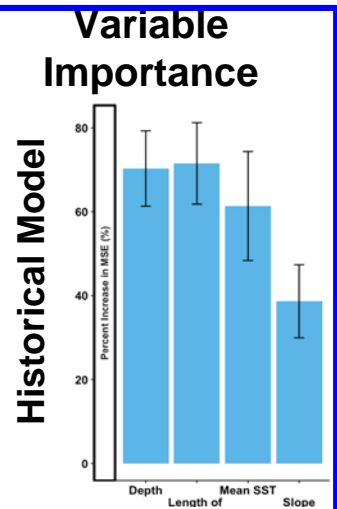
Predator Diversity Index, Two-spot Octopus Abundance
Score, Urchin Abundance Score (REEF)



Broadscale Results: Relative Mean Habitat Suitability



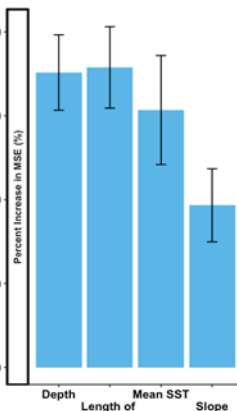
Broadscale Results



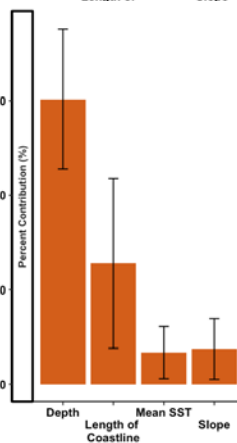
Broadscale Results

Variable Importance

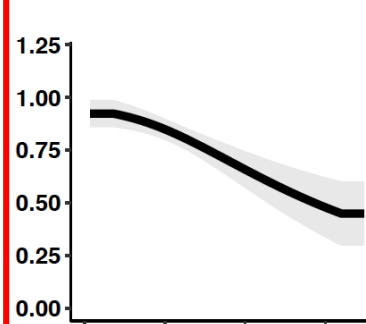
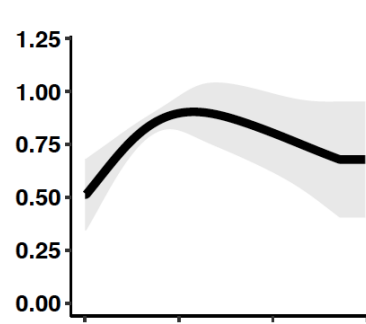
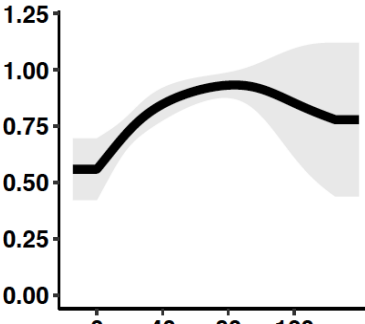
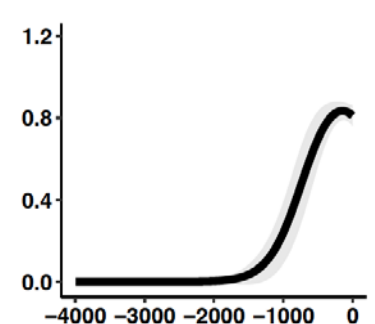
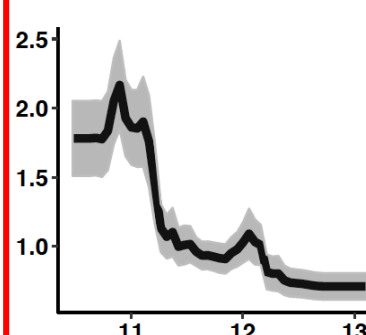
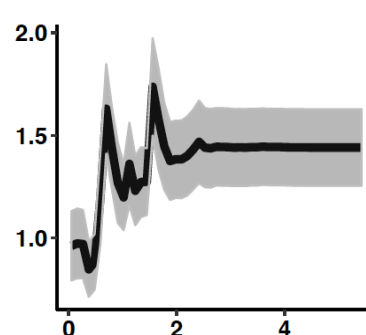
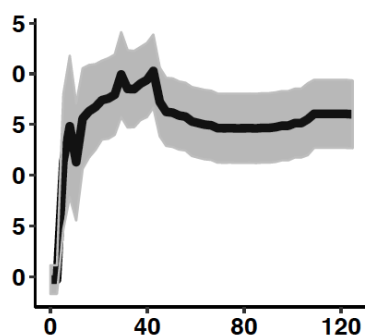
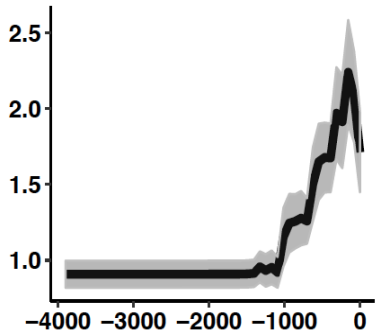
Historical Model



Contemporary Model



Variable Relationships

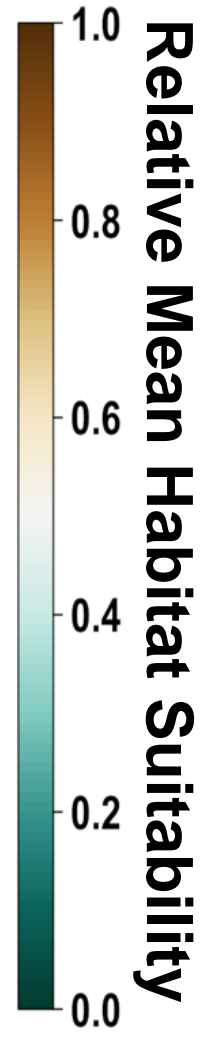
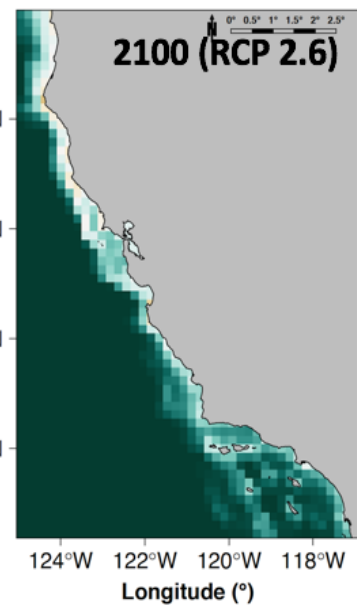
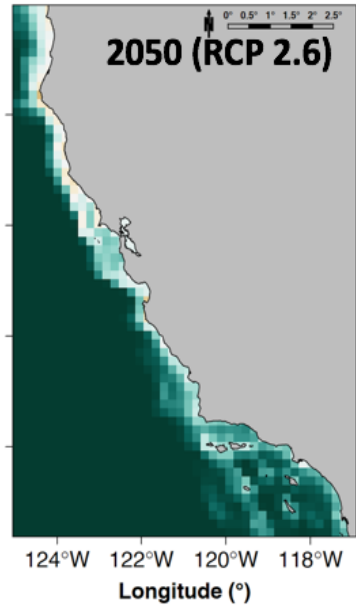
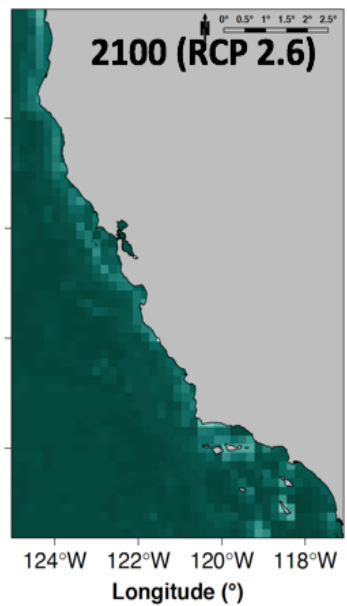
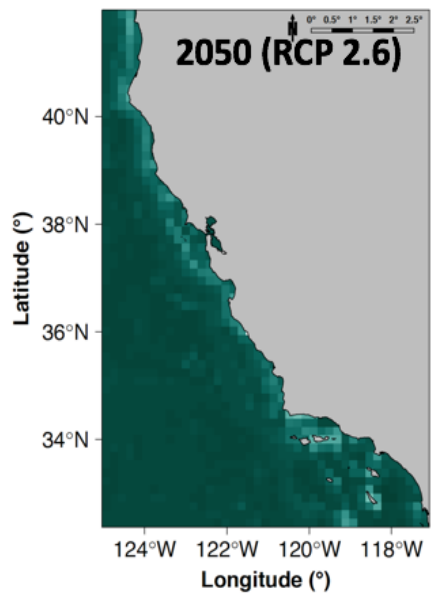
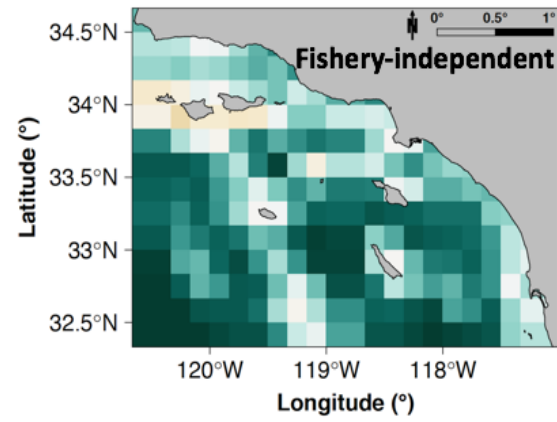
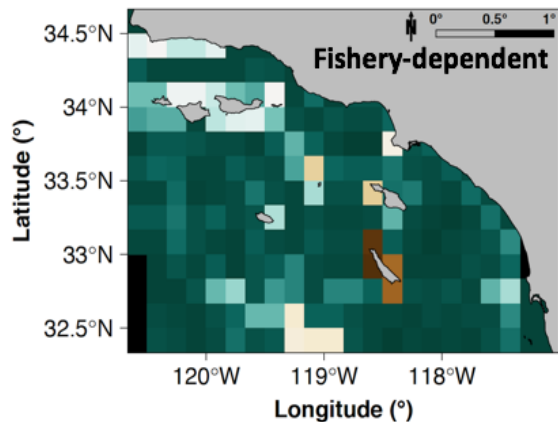


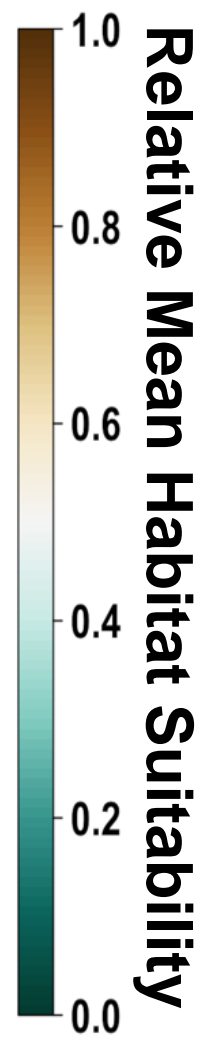
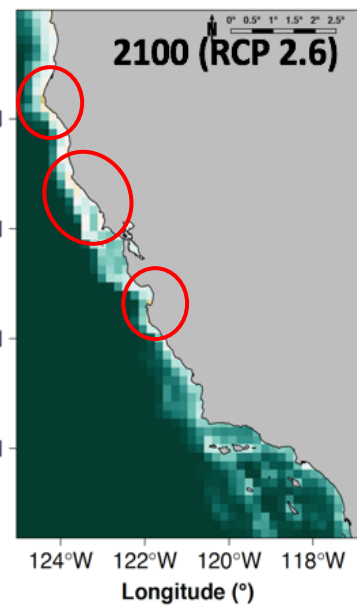
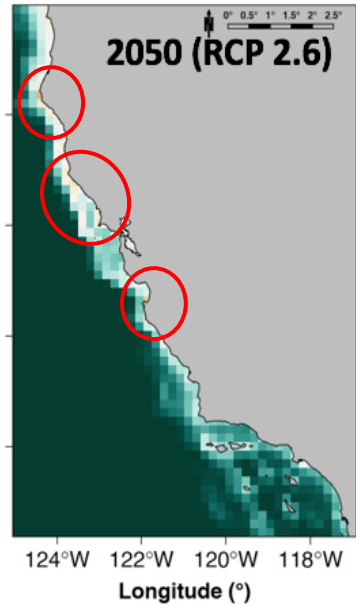
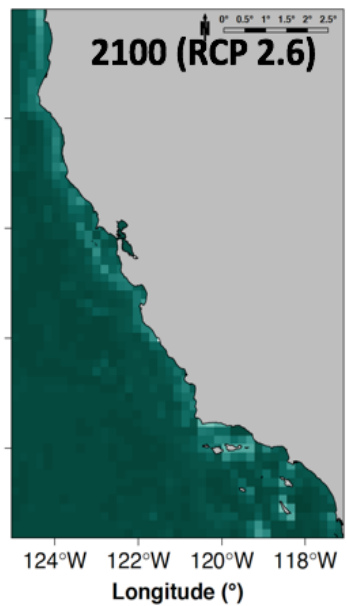
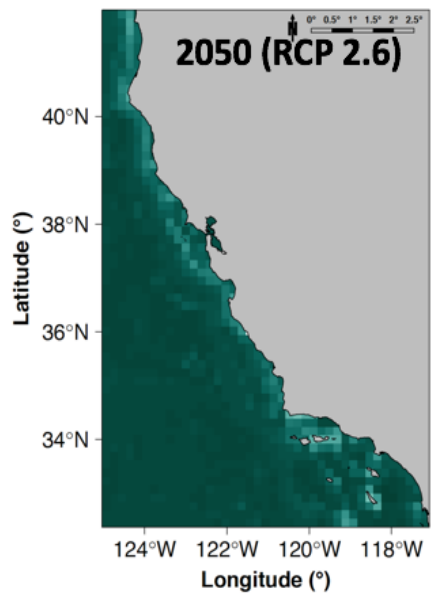
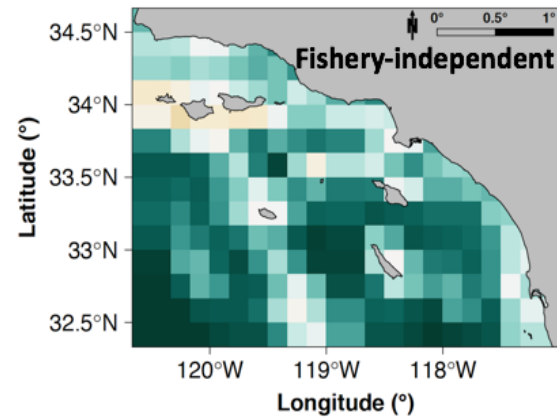
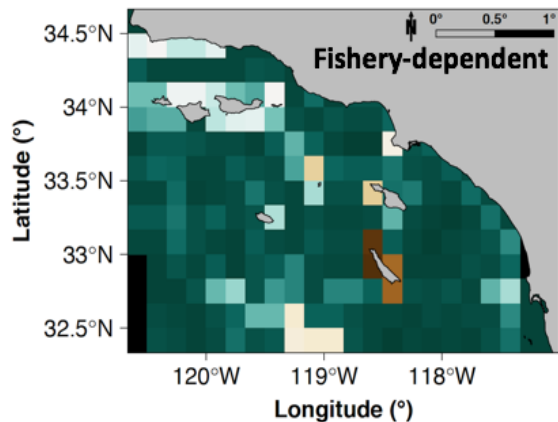
Depth (m)

Length of Coastline (km)

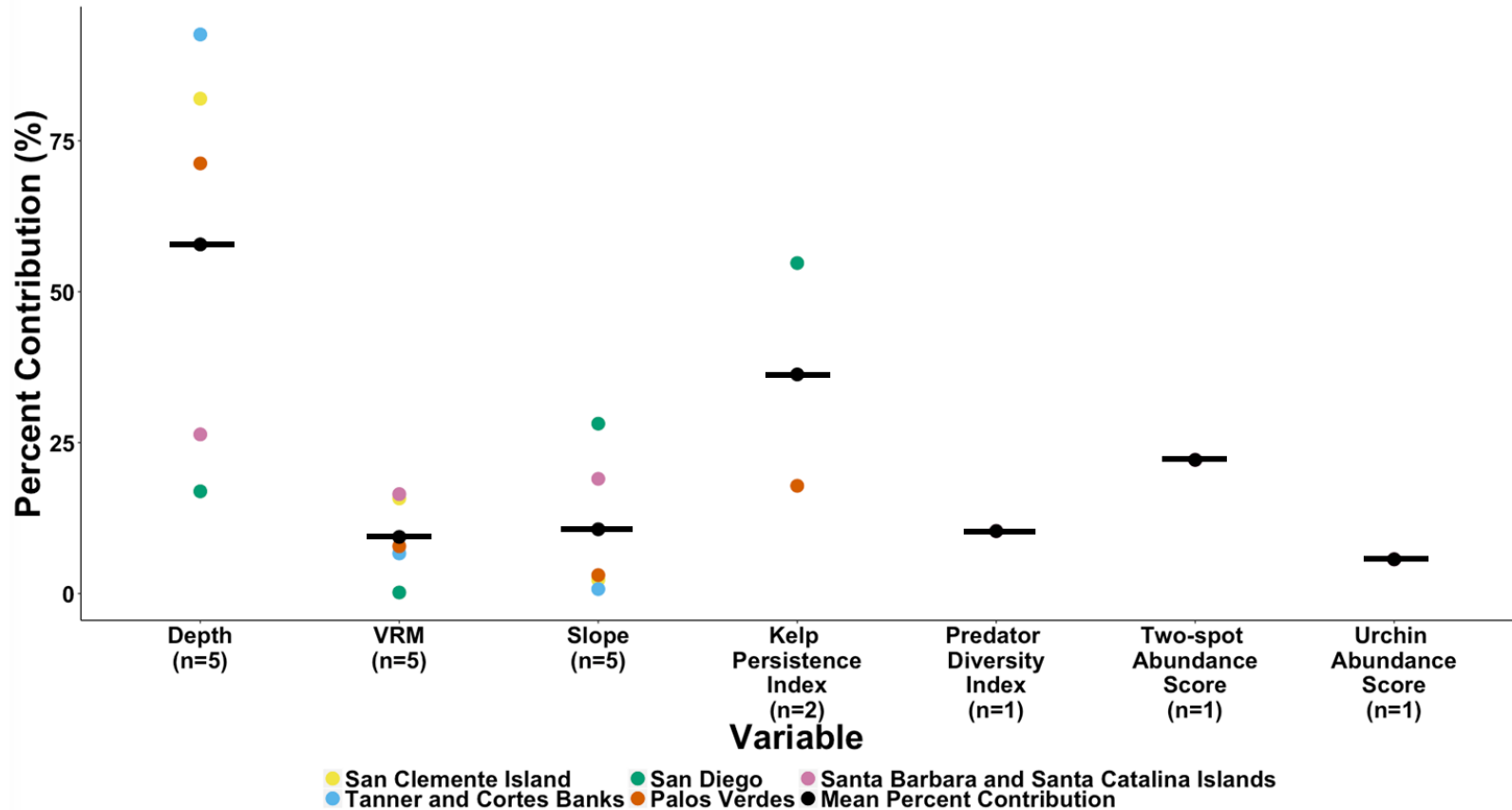
Slope (°)

Sea Surface Temperature (°C)

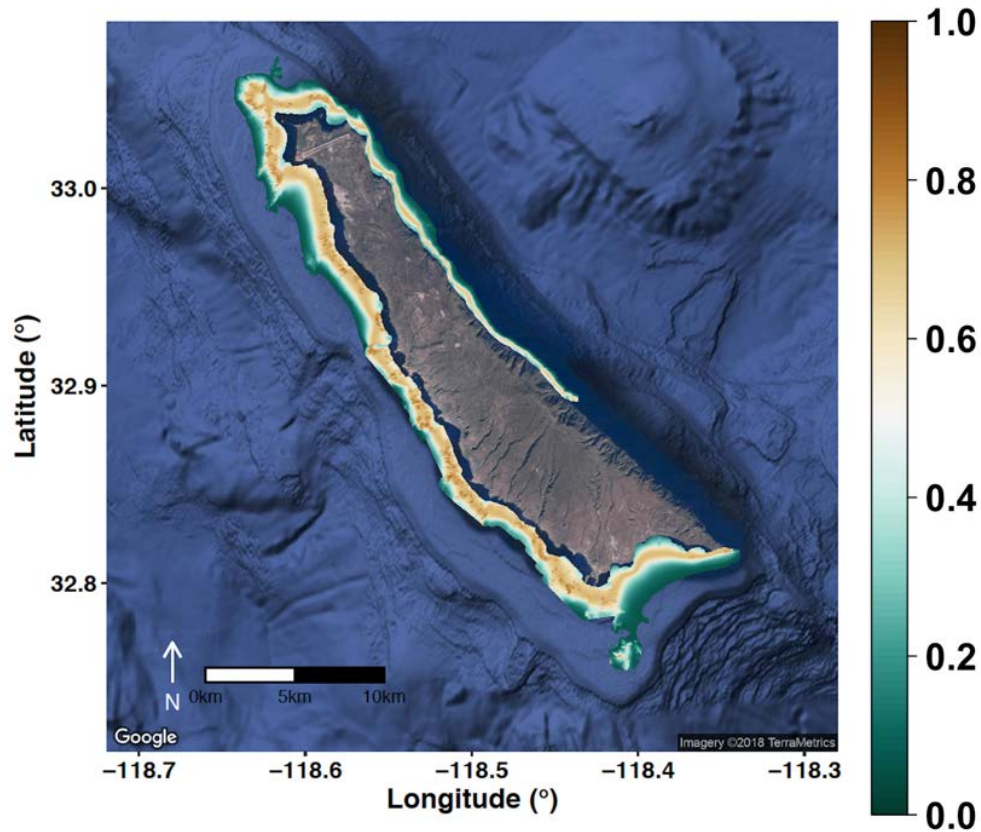




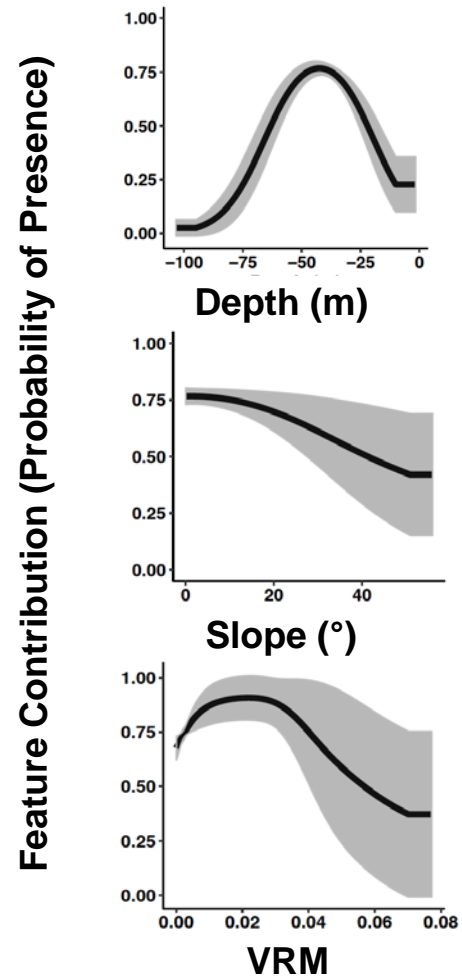
Finescale Results: Variable Importance



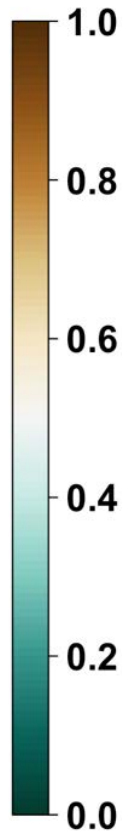
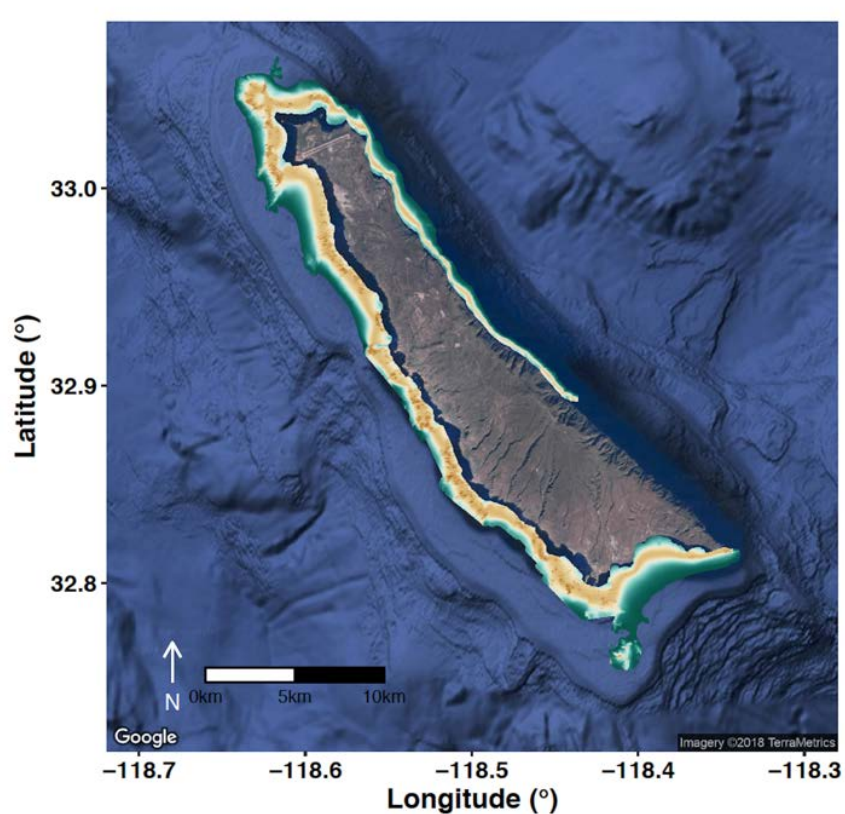
Relative Mean Habitat Suitability at San Clemente Island



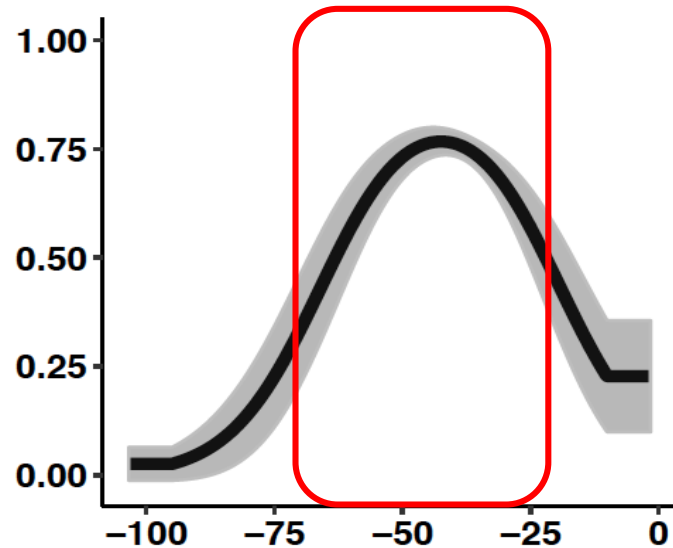
Variable Relationship



Relative Mean Habitat Suitability at San Clemente Island

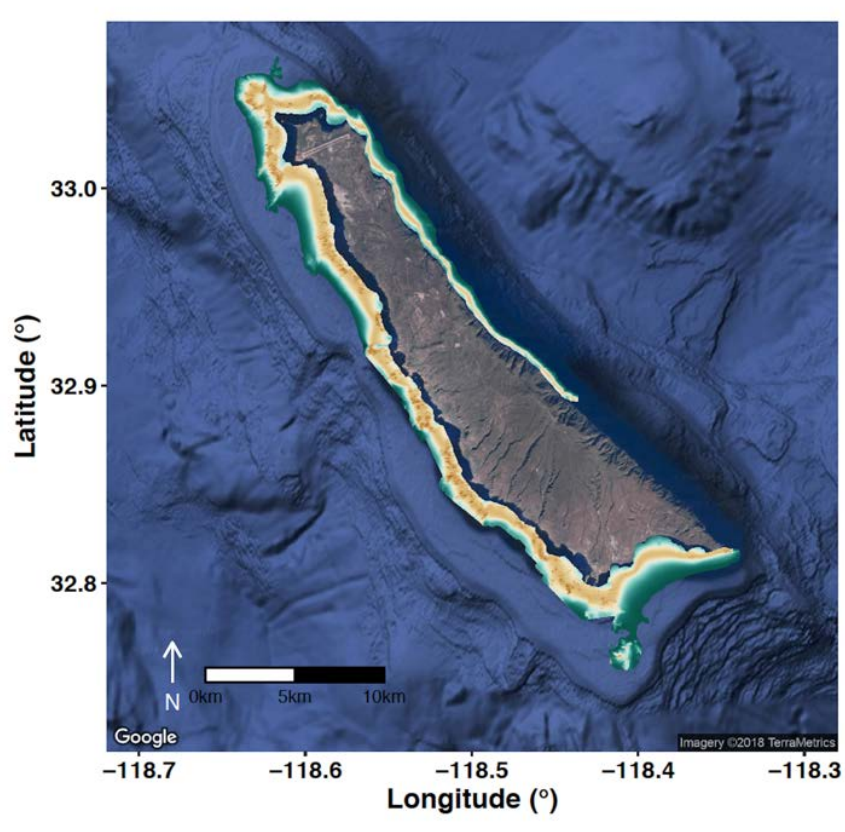


Variable Relationship

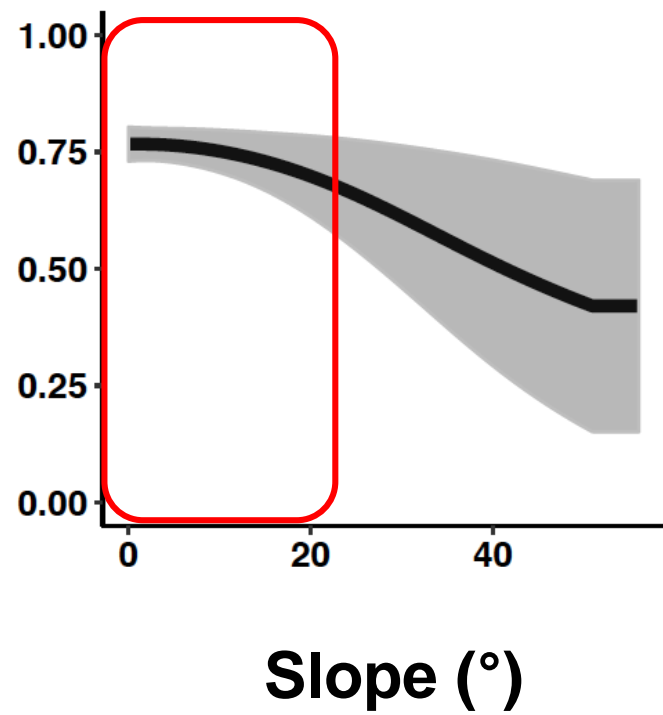


Depth (m)

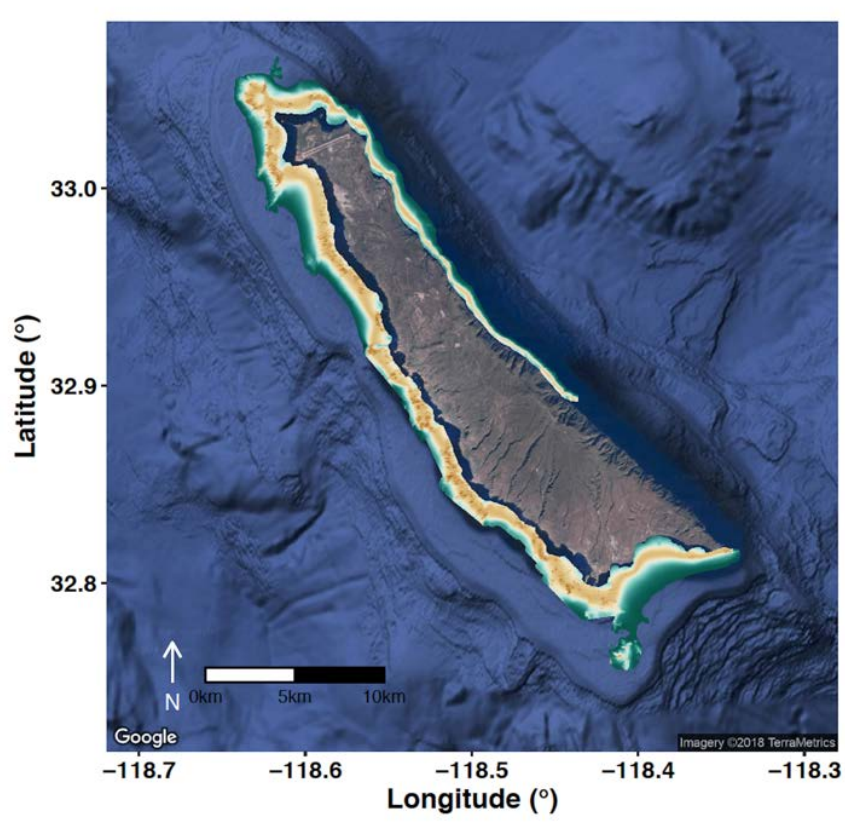
Relative Mean Habitat Suitability at San Clemente Island



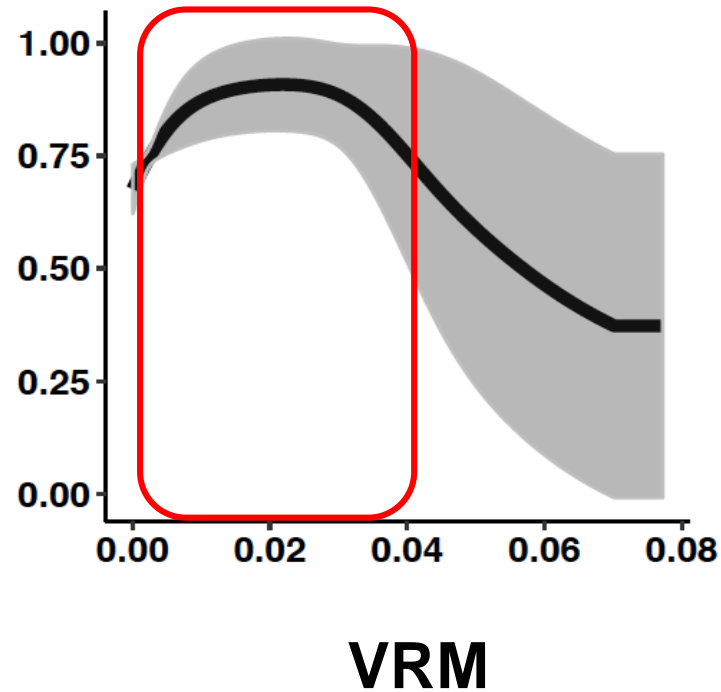
Variable Relationship



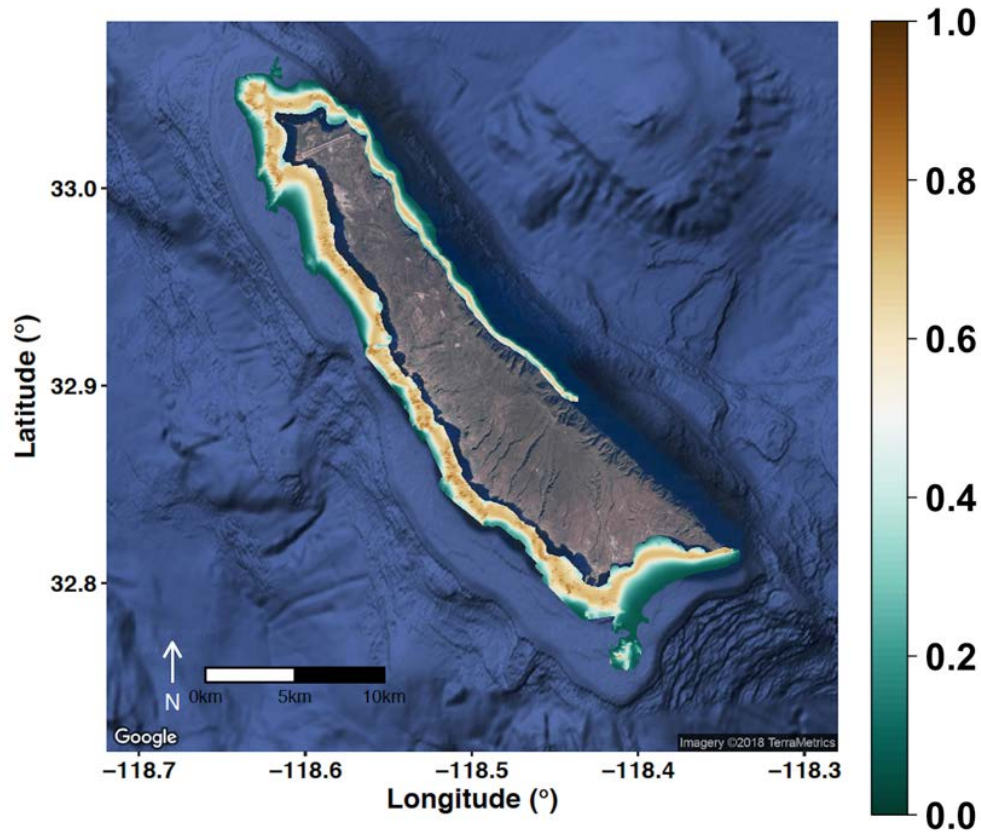
Relative Mean Habitat Suitability at San Clemente Island



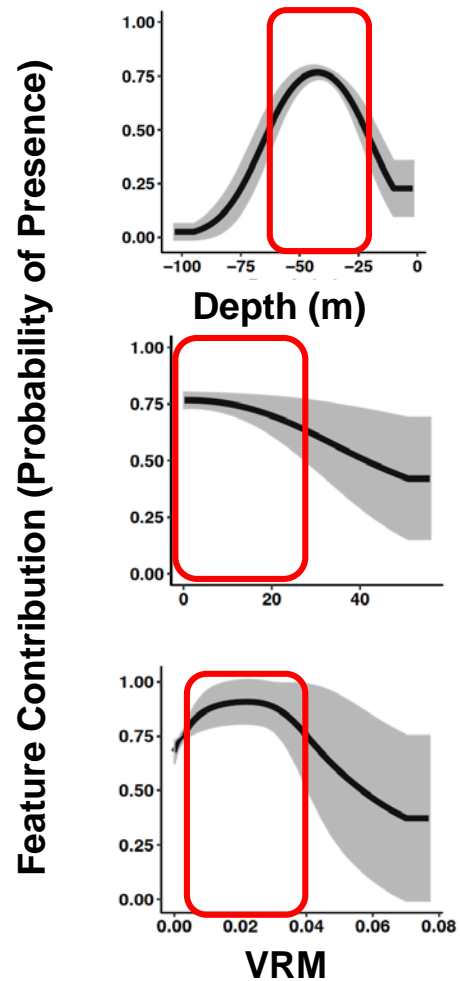
Variable Relationship

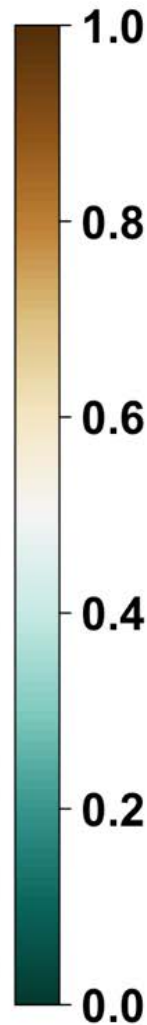
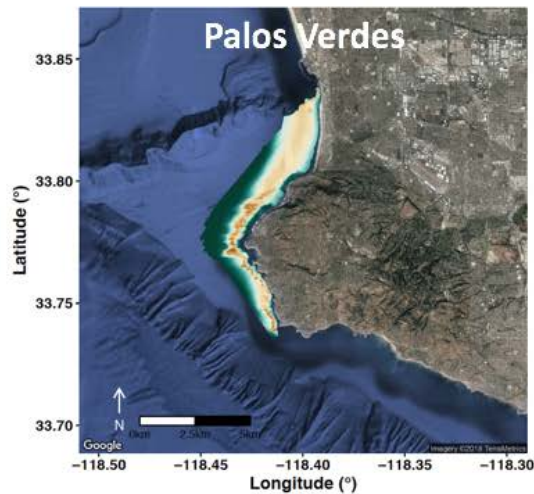
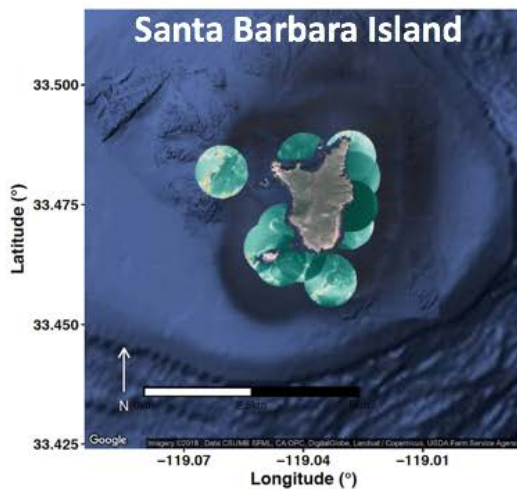
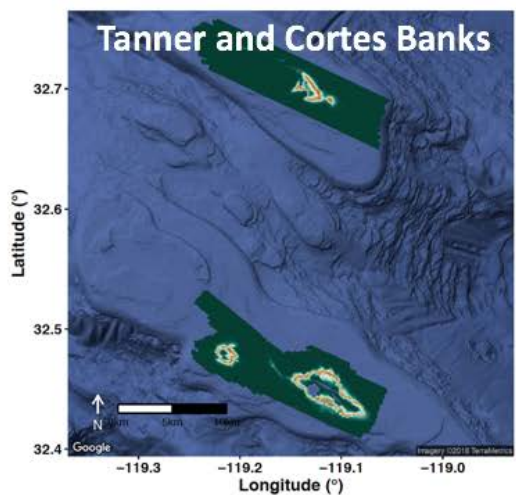
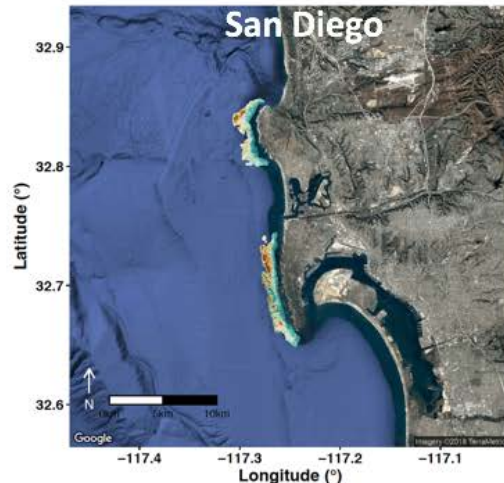
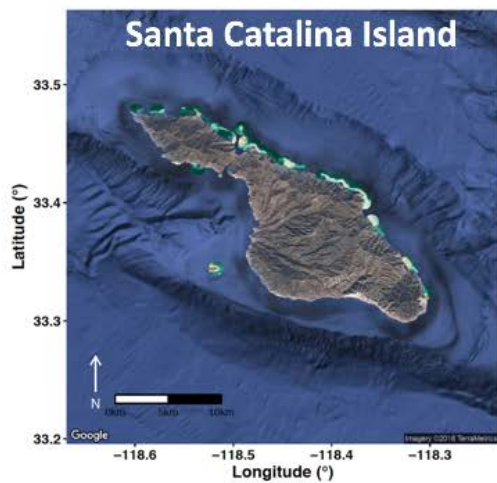
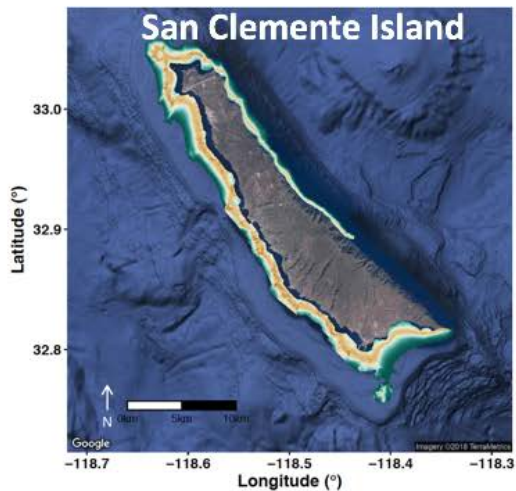


Relative Mean Habitat Suitability at San Clemente Island



Variable Relationship

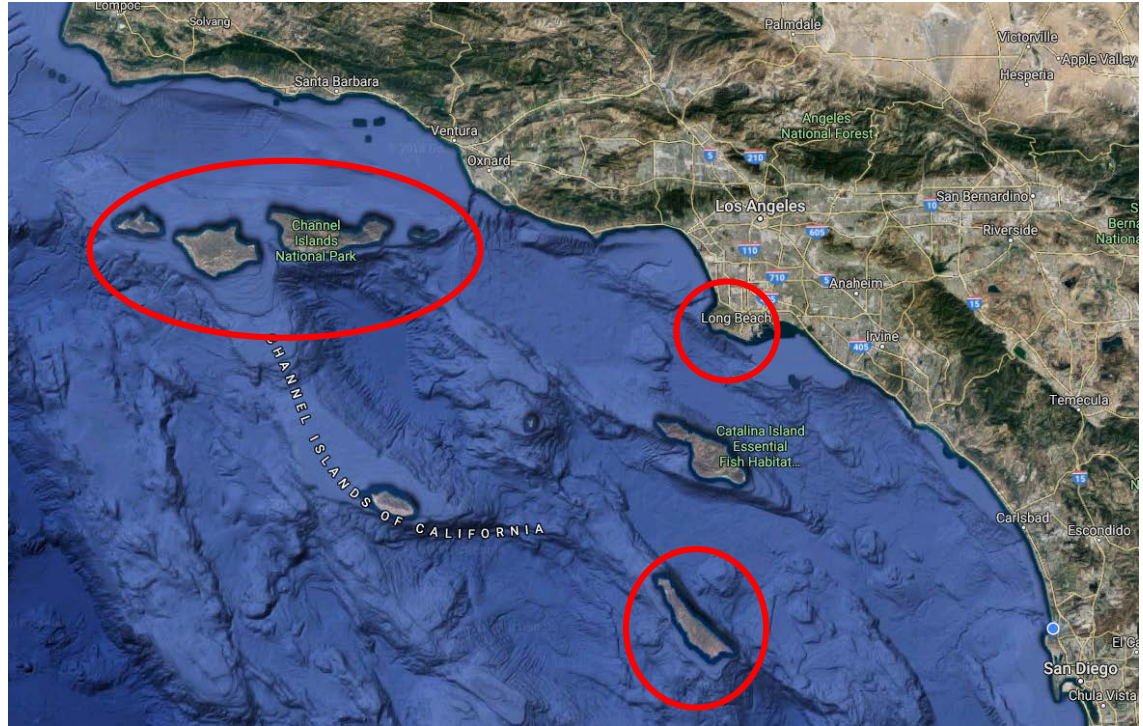




Relative Mean Habitat Suitability

Summary and Next Steps

- **Model historical and contemporary distributions of white abalone at varying scales using multiple datasets**
- **Identify potential outplanting locations within the Southern California Bight and northern California**
- **Propose experimental outplanting using finescale model results**
- **Update data and modeling platforms**



Acknowledgements

SIO

Brice Semmens
Ed Parnell
Octavio Aburto

NOAA

Kevin Stierhoff
Melissa Neuman
Dave Witting
Amanda Bird

Fishermen

Bruce Steele
Jim Dexter
Mary Stein
Mike Curtis
Peter Halmay
Randy Brannock
Russ Armstrong
Shane Anderson
Skip Miser