

MARINE BIODIVERSITY OBSERVATION NETWORK

SANTA BARBARA CHANNEL

***Marine Science Institute
University of California Santa Barbara***



Who we are

Principal/Associate Investigators

UCSB

Robert Miller, David Siegel, Craig Carlson, Daniel Reed, BS Manjunath, Deborah Iglesias-Rodriguez, Doug McCauley, Milton Love



Florida State University
Andrew Rassweiler

USGS
Kevin Lafferty

UCSD - SIO

John Hildebrand

NOAA – NMFS SWFSC

Andrew Thompson





Partners

Plumes and Blooms (NASA)

BOEM Pacific Region

Santa Barbara Coastal LTER (NSF)

Channel Islands National Marine Sanctuary

Southern California Coastal Water Research Project

Southern California Coastal Ocean Observing System (SCCOOS)

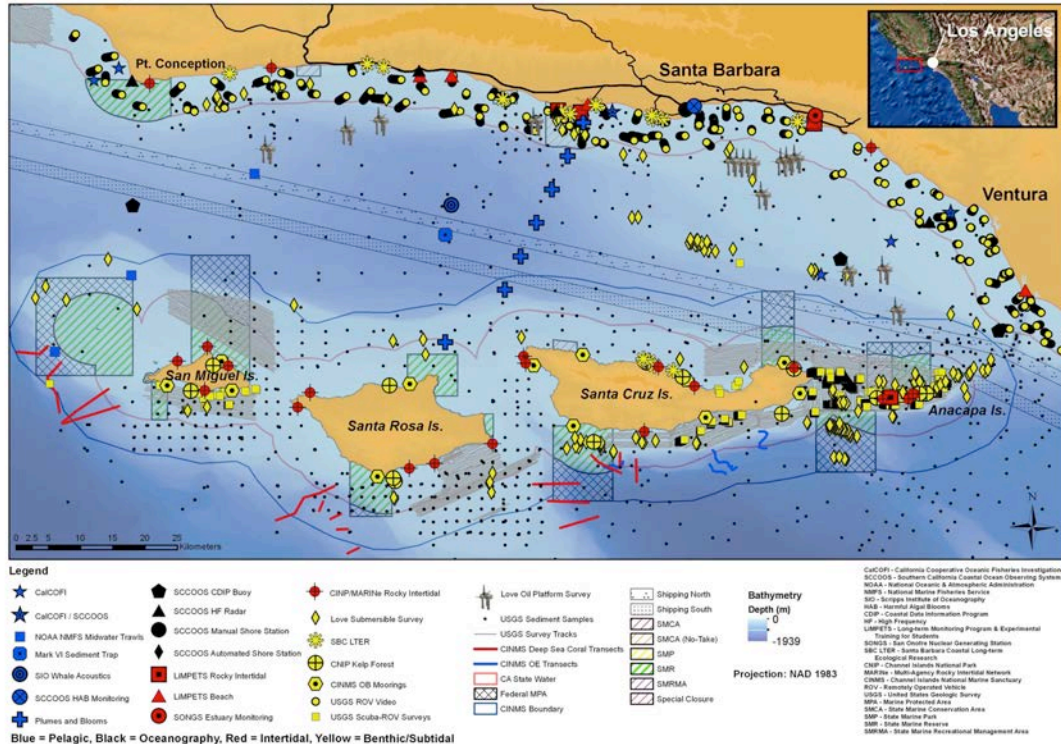
Channel Islands National Park

Gray Whales Count
CalCOFI



Existing Monitoring Partners

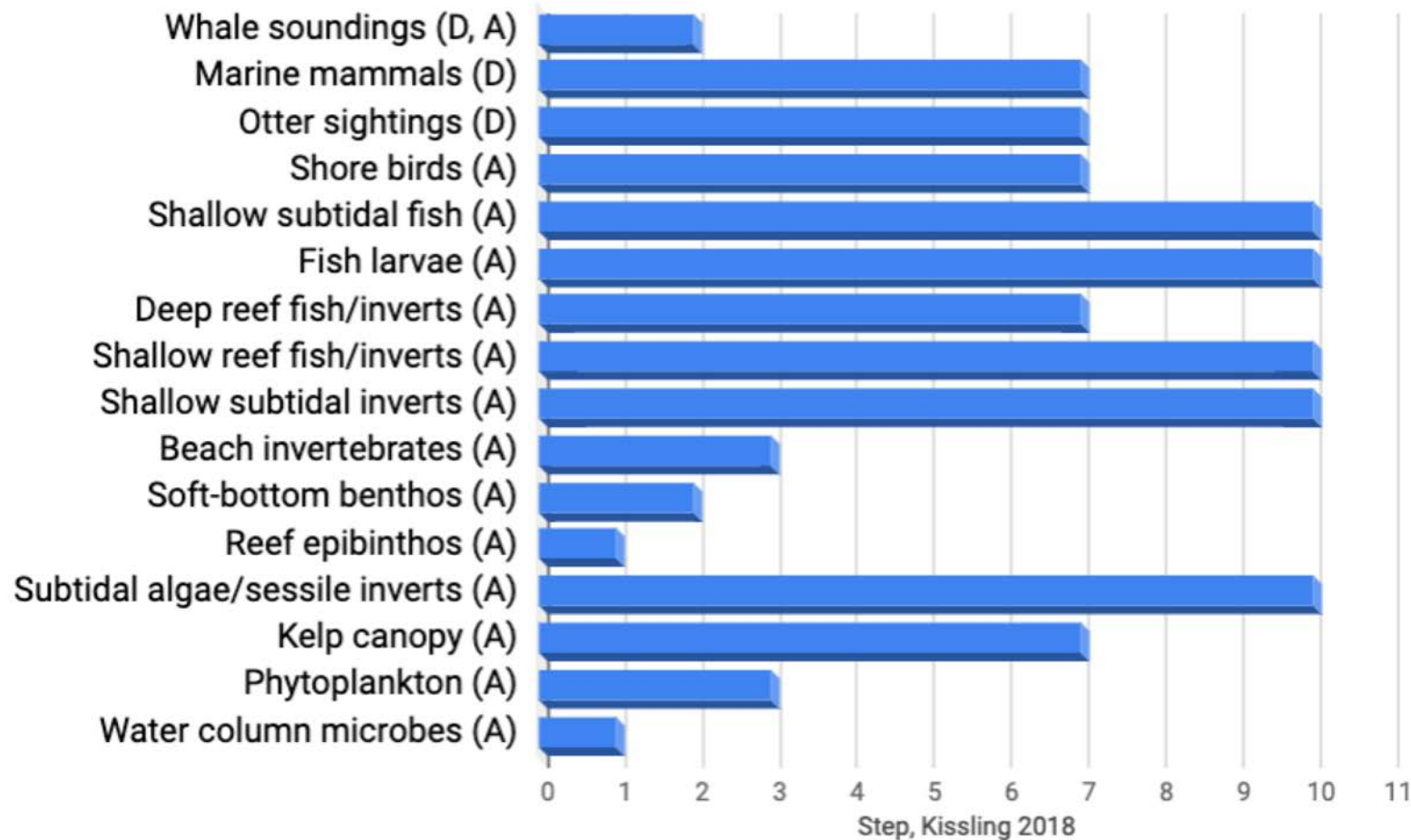
Santa Barbara Channel, California



MBON Prototype:

1. Provide data to inform managers and society about patterns of biodiversity across taxa, space, and time
 - *Integrate existing data*
 - *Develop new methods & products*
2. Build a framework to facilitate MBON development under diverse circumstances

Progress, by Taxonomic Group



Focus on time series

oldest: 35 yrs

youngest: 18 yrs

**14 Data packages
published**

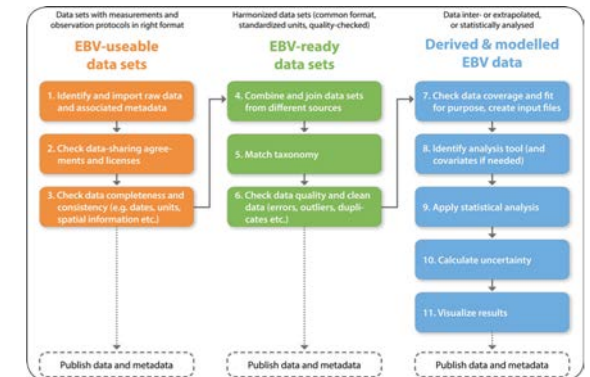
*stable, immutable
with DOI*

**Spanning taxa from
microbes to whales**

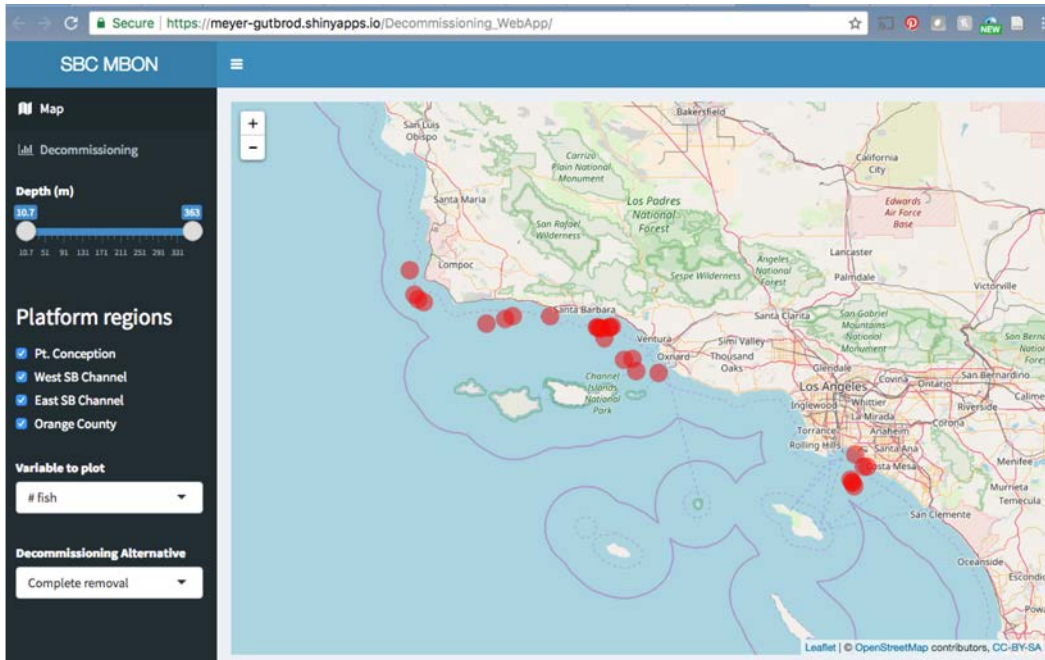
Measurement Class:

D: Occurrence (EBV “distribution”)

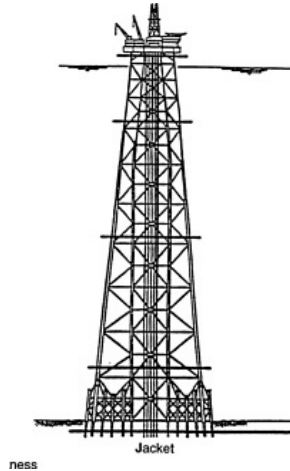
A: abundance or density (EBV “abundance”)



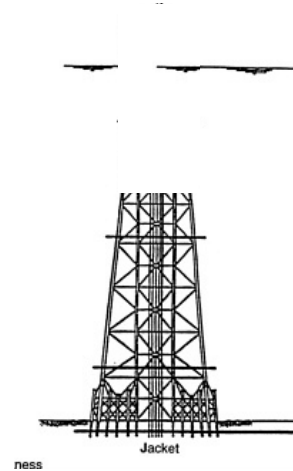
Net Environmental Benefit Analysis of offshore platform decommissioning alternatives



**Leave in
place**



**Partial
Removal**



**Total
Removal**

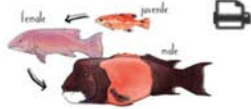


Users:

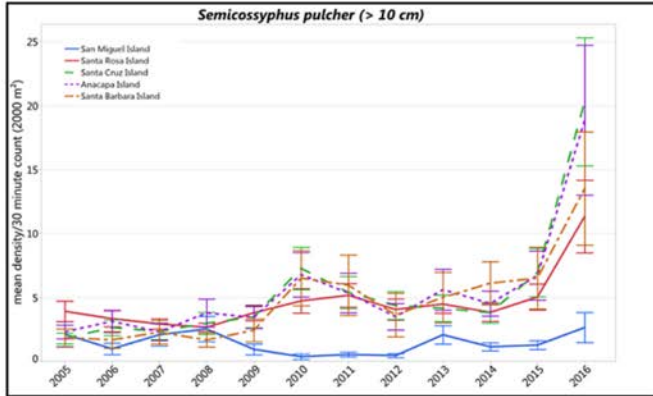
- US Bureau of Ocean Energy Management
- CA State Lands Commission
- Petroleum industry (e.g. Exxon, Chevron, Venoco)

California Sheephead Abundance in CINMS

The California sheephead (*Semicossyphus pulcher*) is a large and beautiful fish that plays an important role in the food web of kelp forests and rocky reefs in southern California. Sheephead are also a popular sport fish for recreational and commercial fishing and a draw for SCUBA divers.

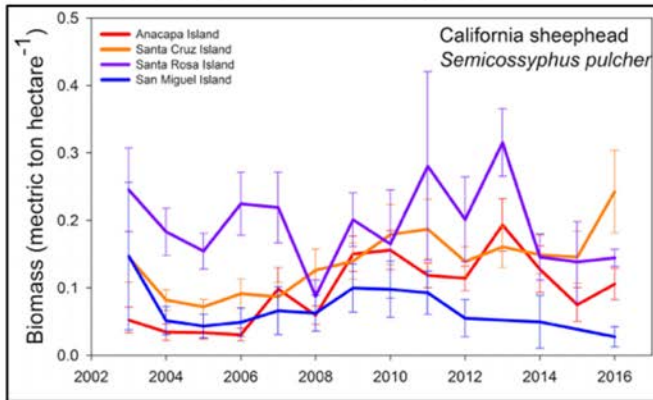


Abundance of California Sheephead



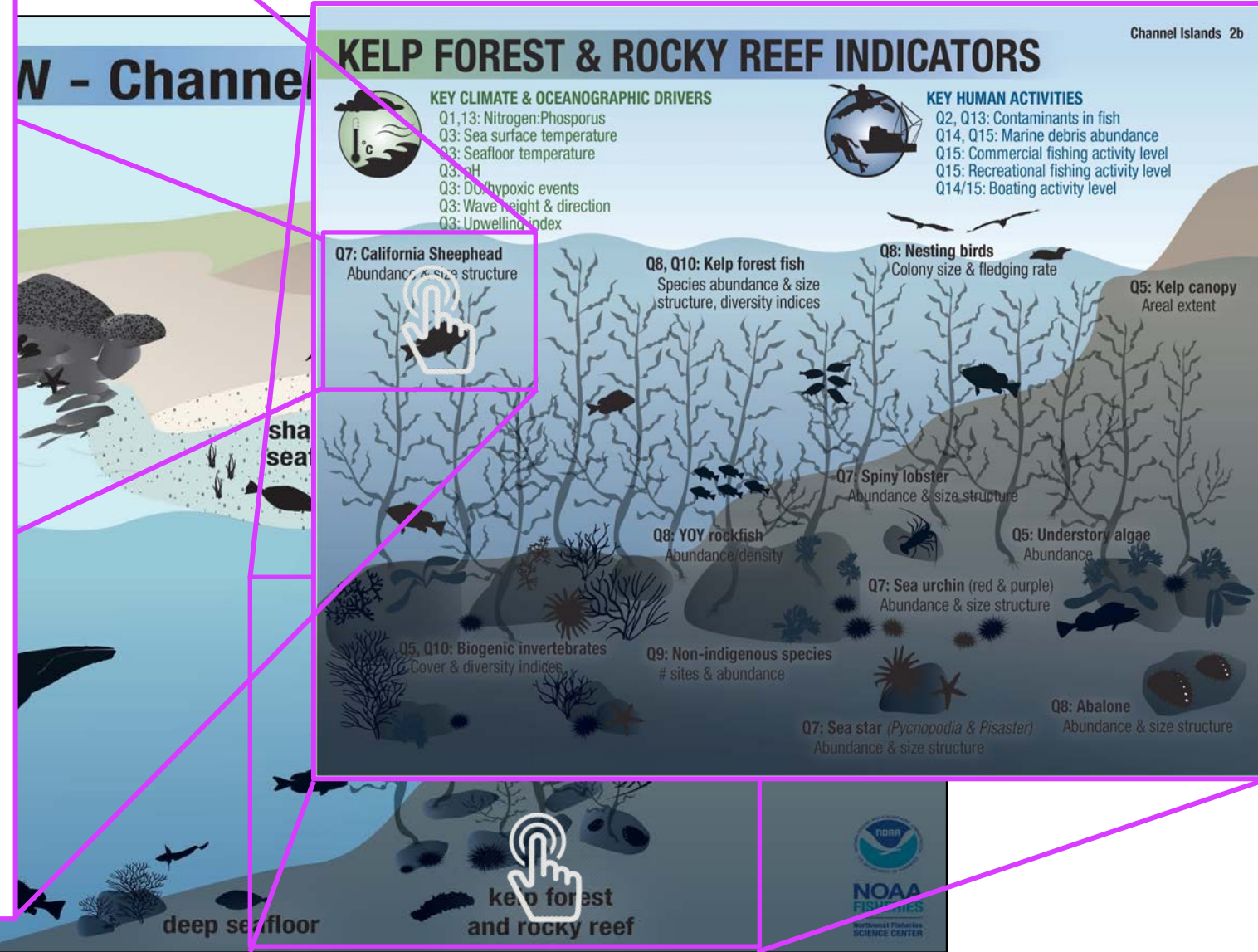
Average density of California sheephead at Channel Island National Park kelp forest monitoring sites at the five islands in CINMS. Sheephead density was averaged across all monitoring sites at each island to examine overall sanctuary trends. Note that juveniles (< 10 cm) were excluded from analysis.

Abundance of California Sheephead



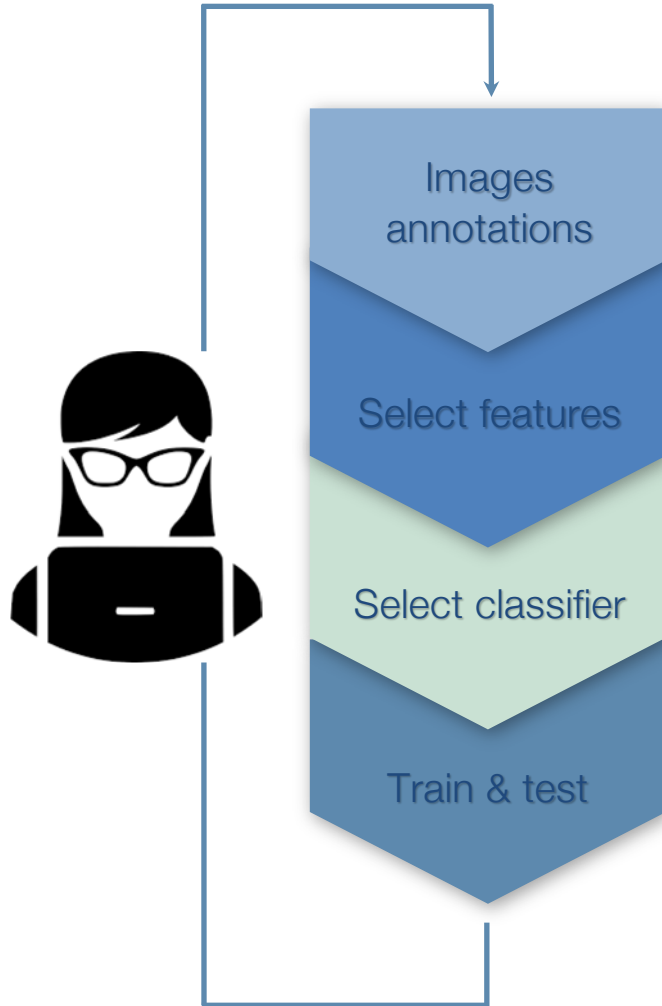
Average density of California sheephead observed by SCUBA divers at 14 sites across four islands in CINMS monitored by the PISCO kelp forest monitoring program. Observed density was averaged across all monitoring sites at each island to examine overall sanctuary trends.

n of Condition Reports



New Products: Deep learning for image analysis

Typical machine learning



**Engineer required
throughout**

**Time consuming
(months)**

**Only works on
specific type of
data**

Deep learning

Benefits

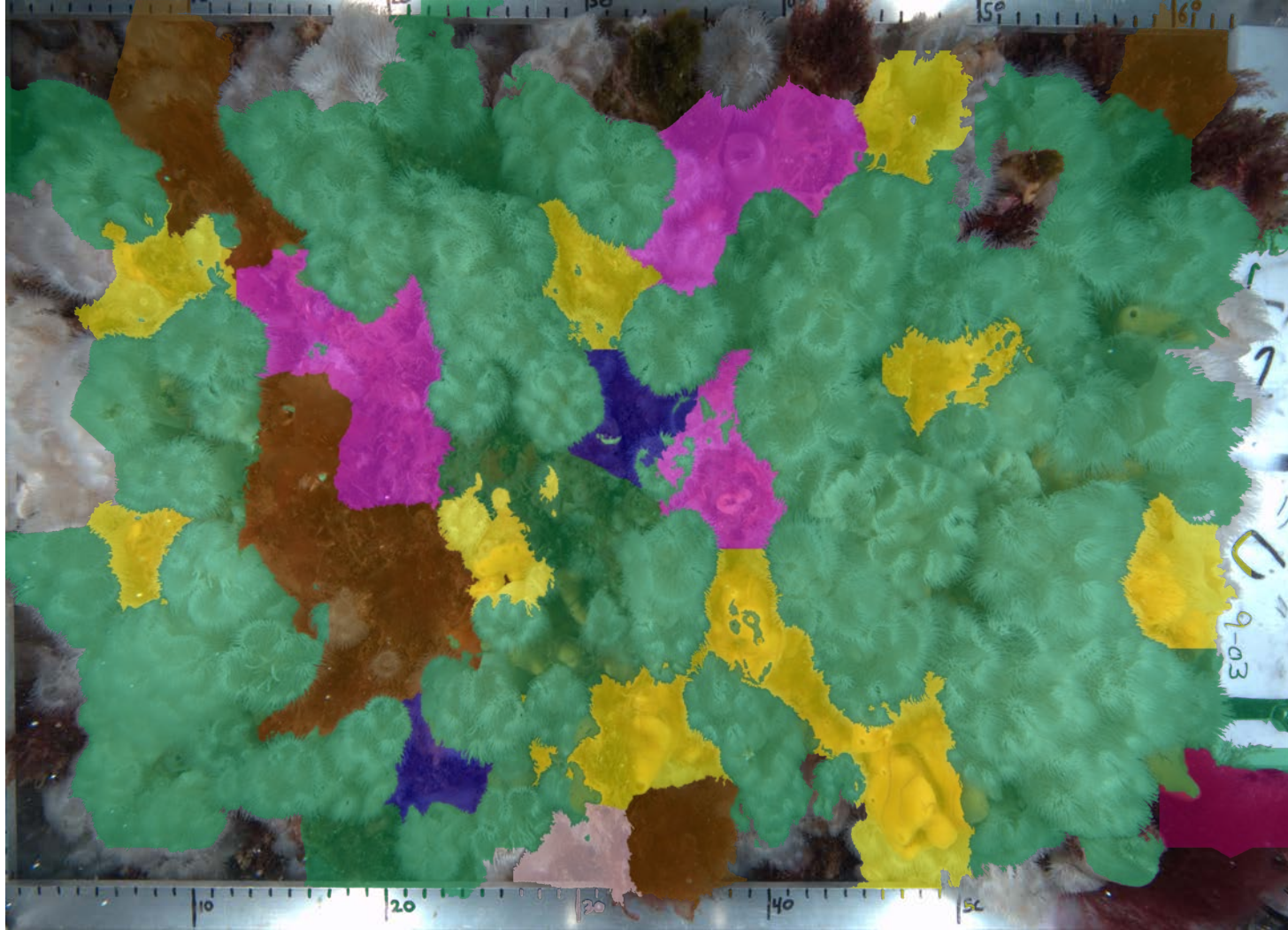
- Generalizes to your data
- Fully automated - no feature selection
- High accuracy

Leverages

- Scalable services
- Annotation system
- Cluster processing
- Fast classification on GPUs

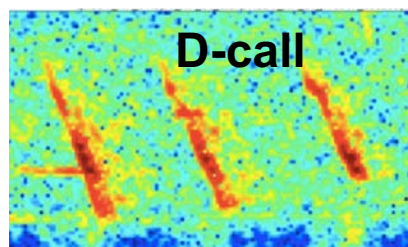
BisQue | ViQi

Identification & segmentation

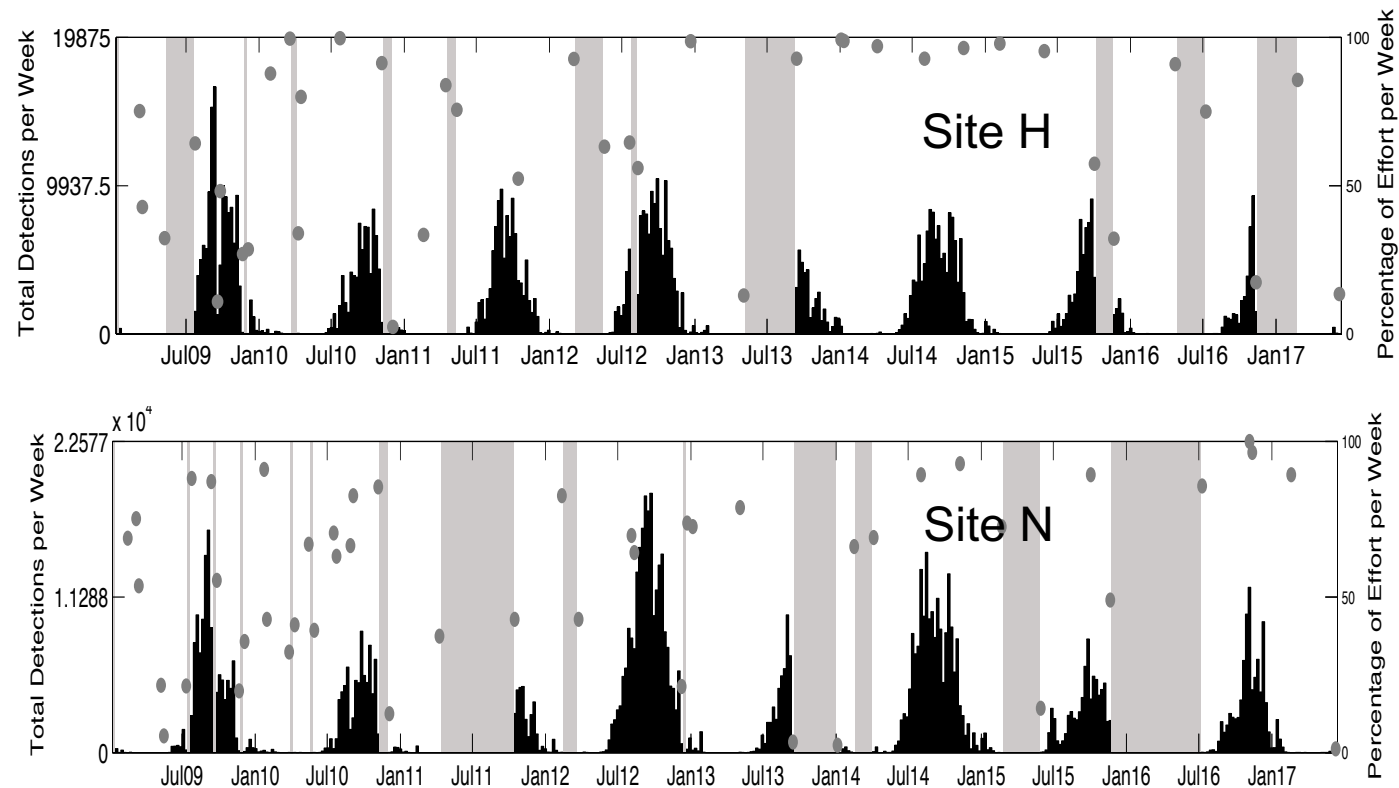


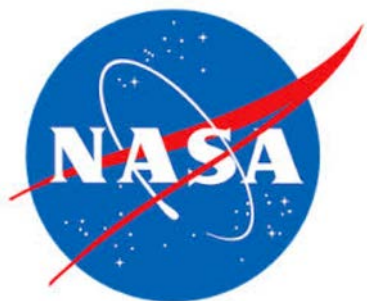
New Products: Acoustics

Acoustic Detection of Marine Mammals



Seasonal patterns of blue whale song



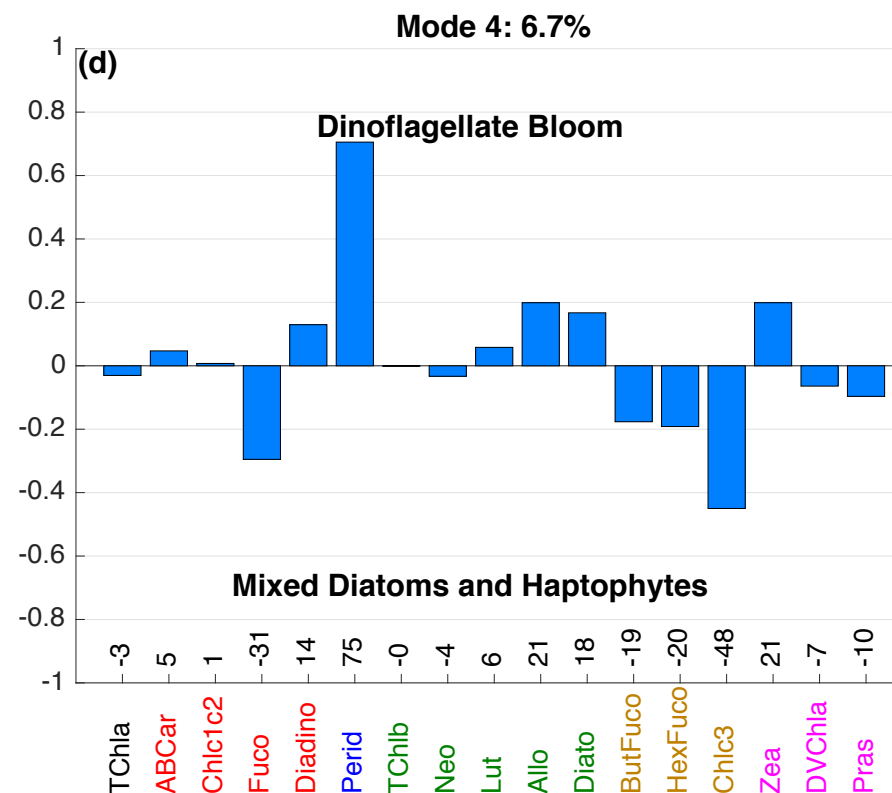
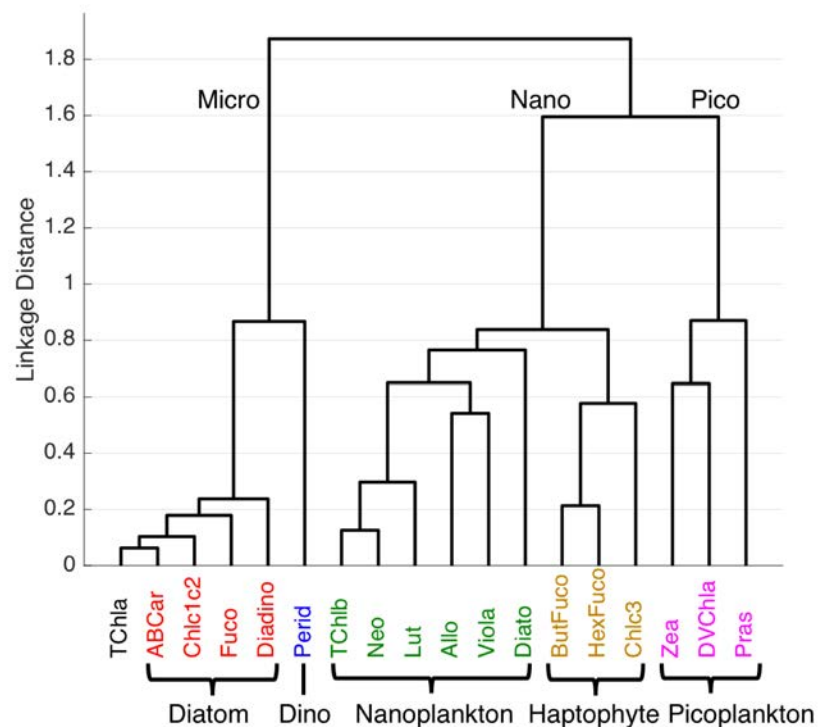


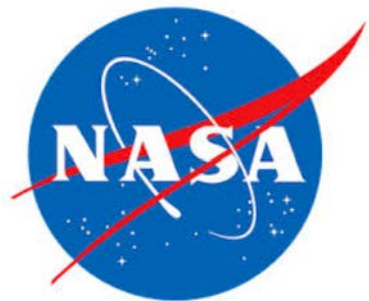
New Products: Remote Sensing

Phytoplankton functional diversity

Phytoplankton Pigment “Communities”

Goal is to model pigment communities from optical data to link to PACE/ESBG





New Products: Remote Sensing

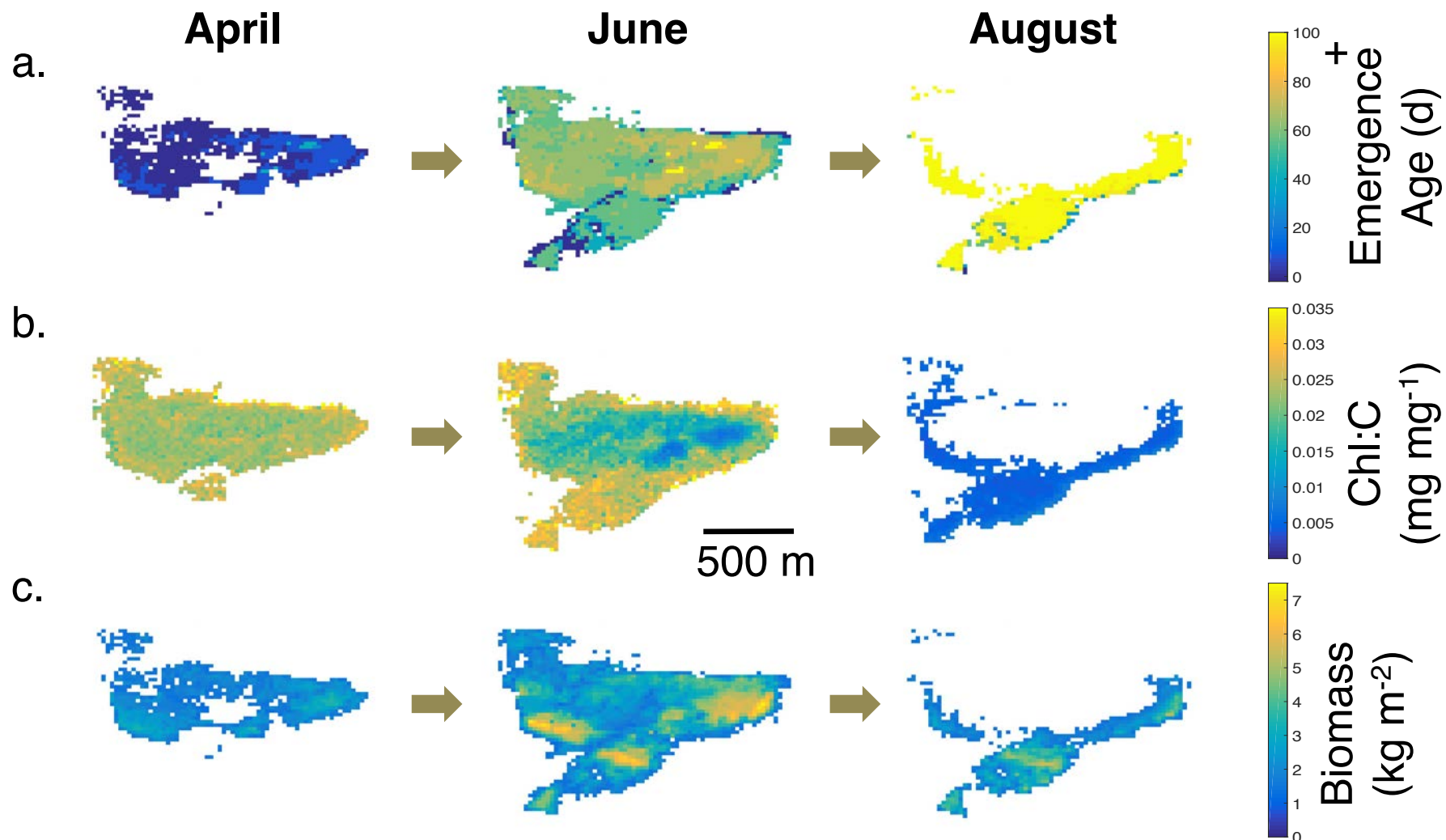
Kelp condition, age, and forest extent



AVIRIS
Airborne Visible / Infrared Imaging Spectrometer



Bell & Siegel in prep
Bell et al. L&O 2018



New Products: Genomics

Microbial diversity & community structure

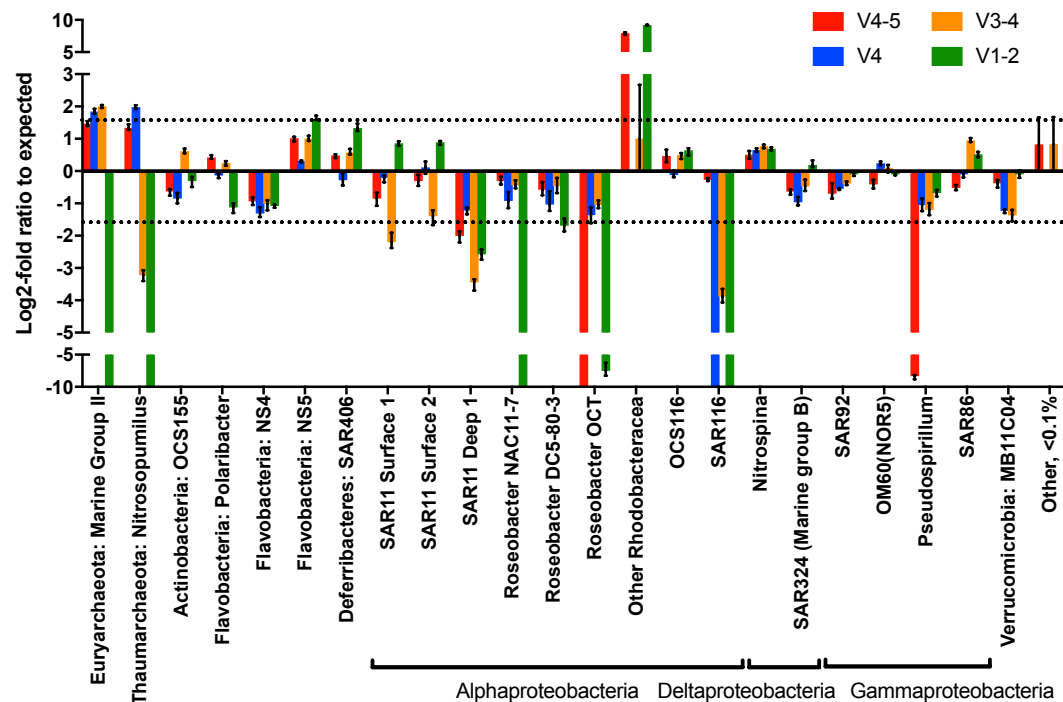
environmental
microbiology



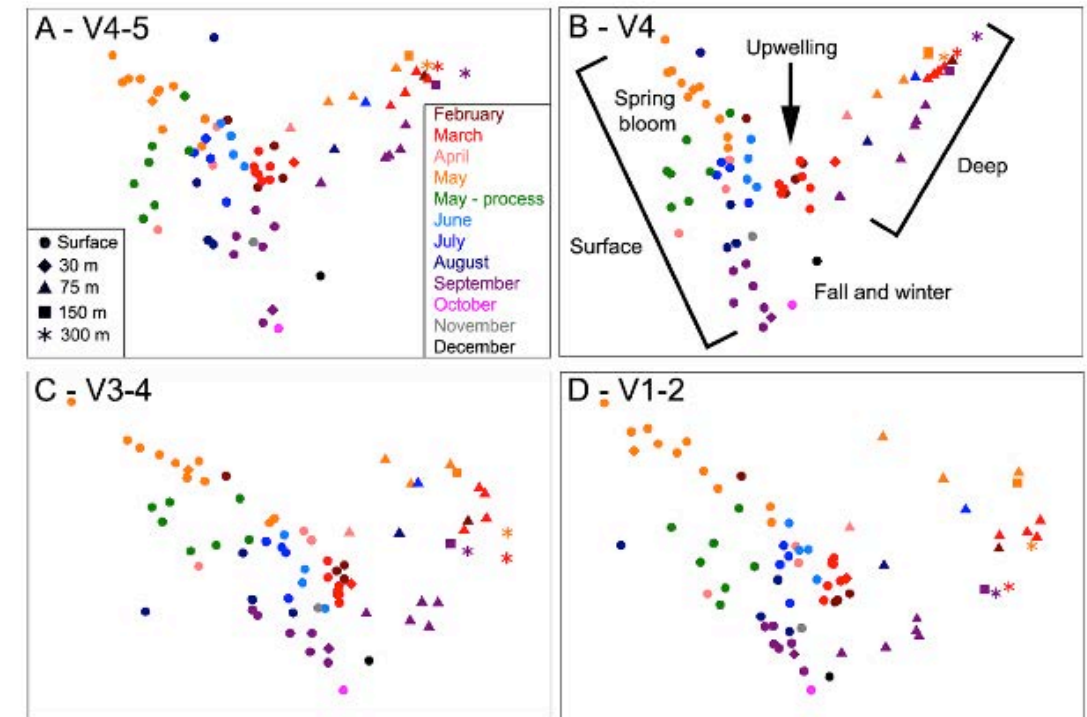
Environmental Microbiology (2018) 00(00), 00–00

doi:10.1111/1462-2920.14091

Mock community deviation from expected abundance with four different primer sets:

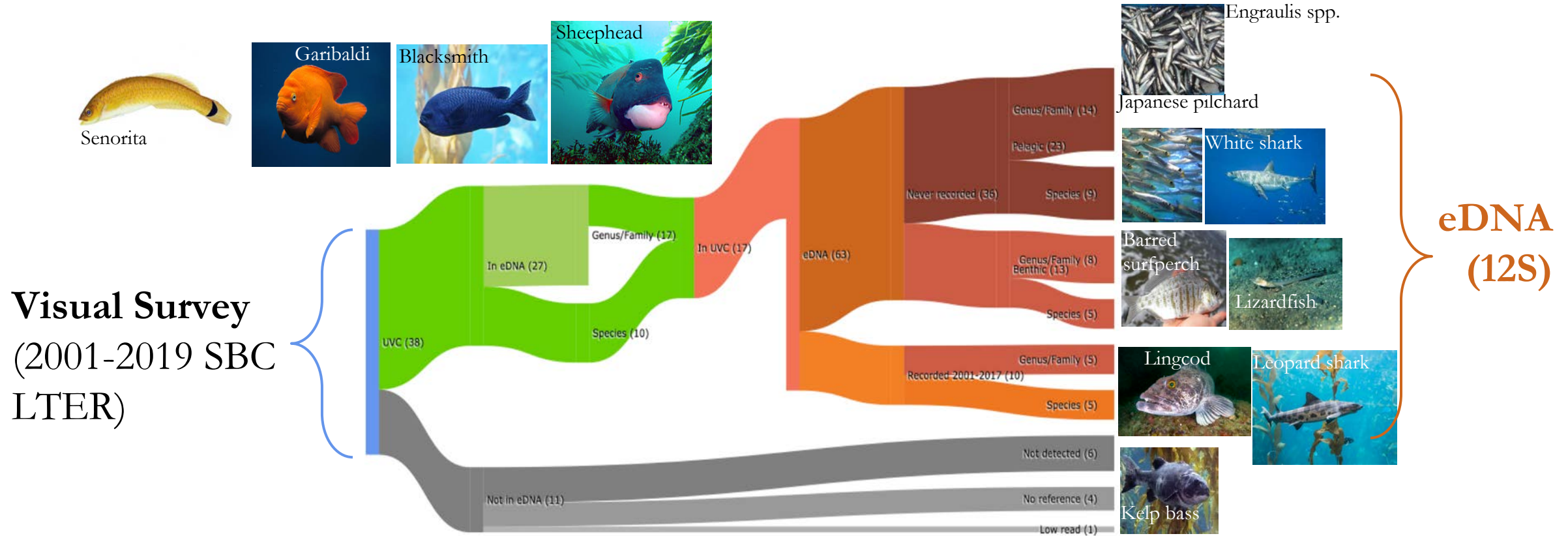


Ordination plots of the same marine time-series samples sequenced with four primer sets



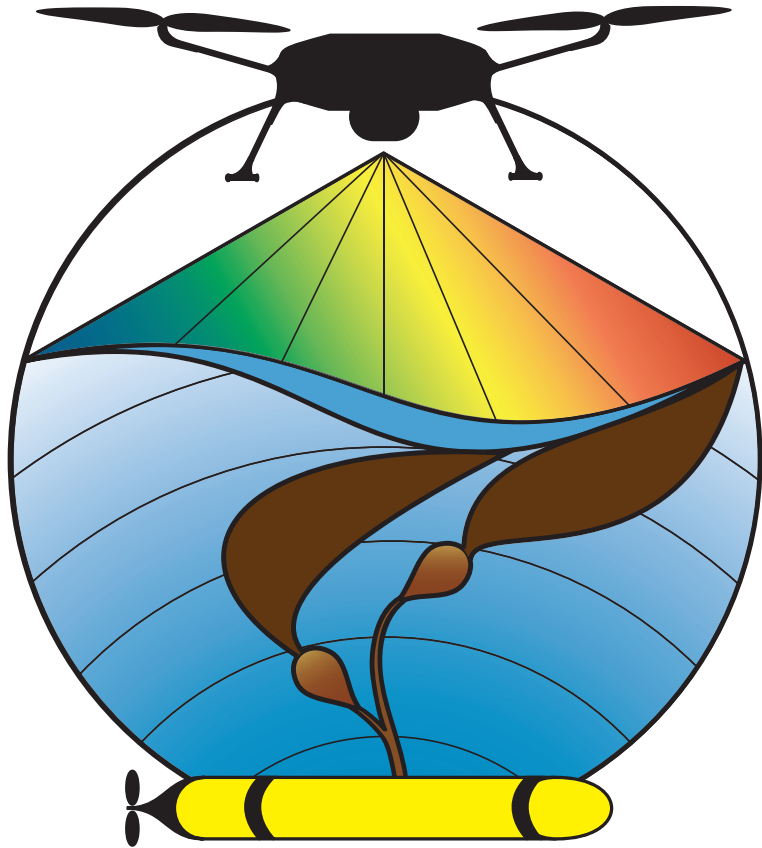
Wear et al. 2018

Environmental DNA captures the fine scale and hierarchical spatial structure of kelp forest fish communities



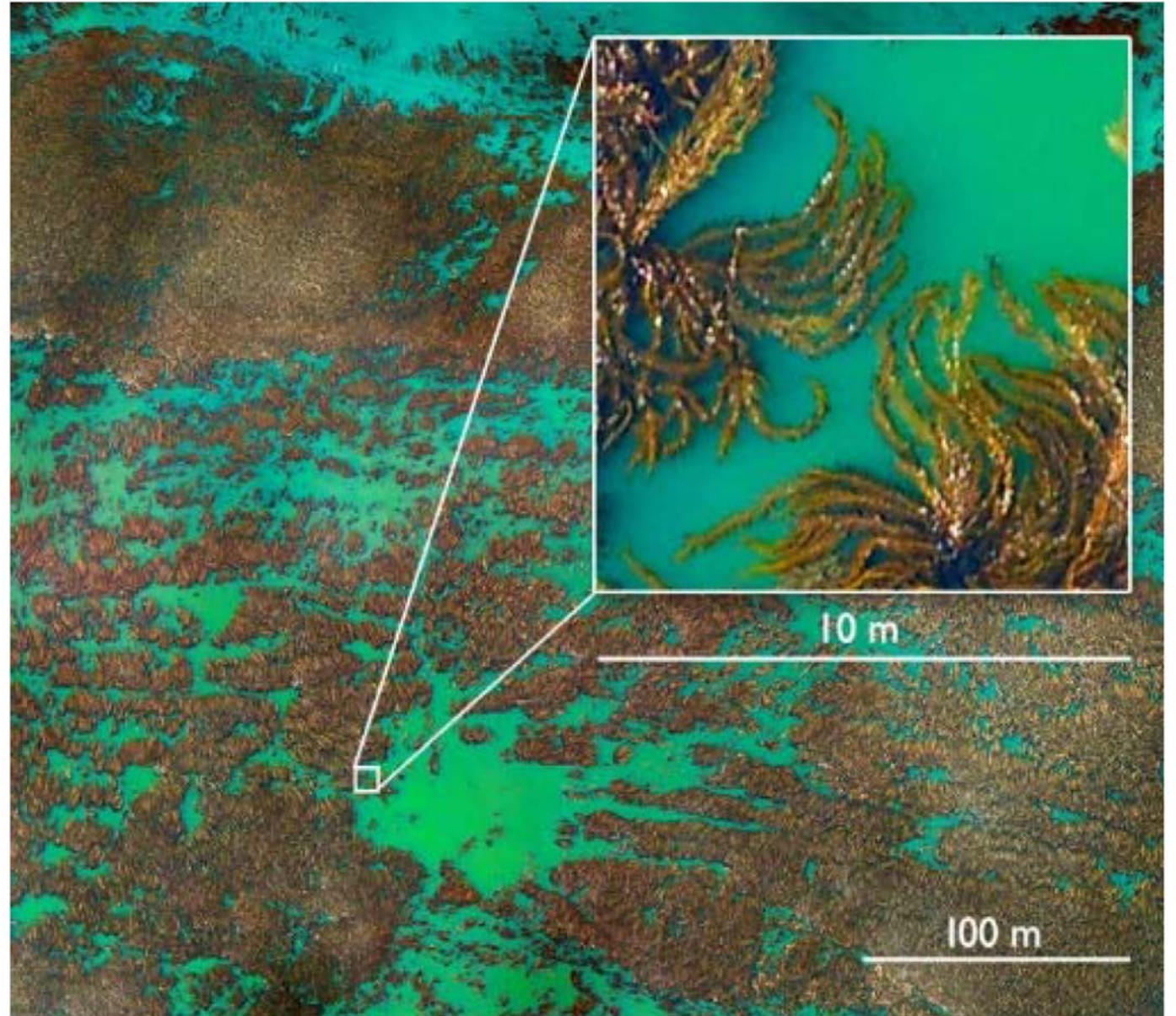
Spatially stratified sampling of 49 water samples on 27 transects across 11 rocky reefs

SAMS



Scalable **A**quaculture **M**onitoring **S**ystem

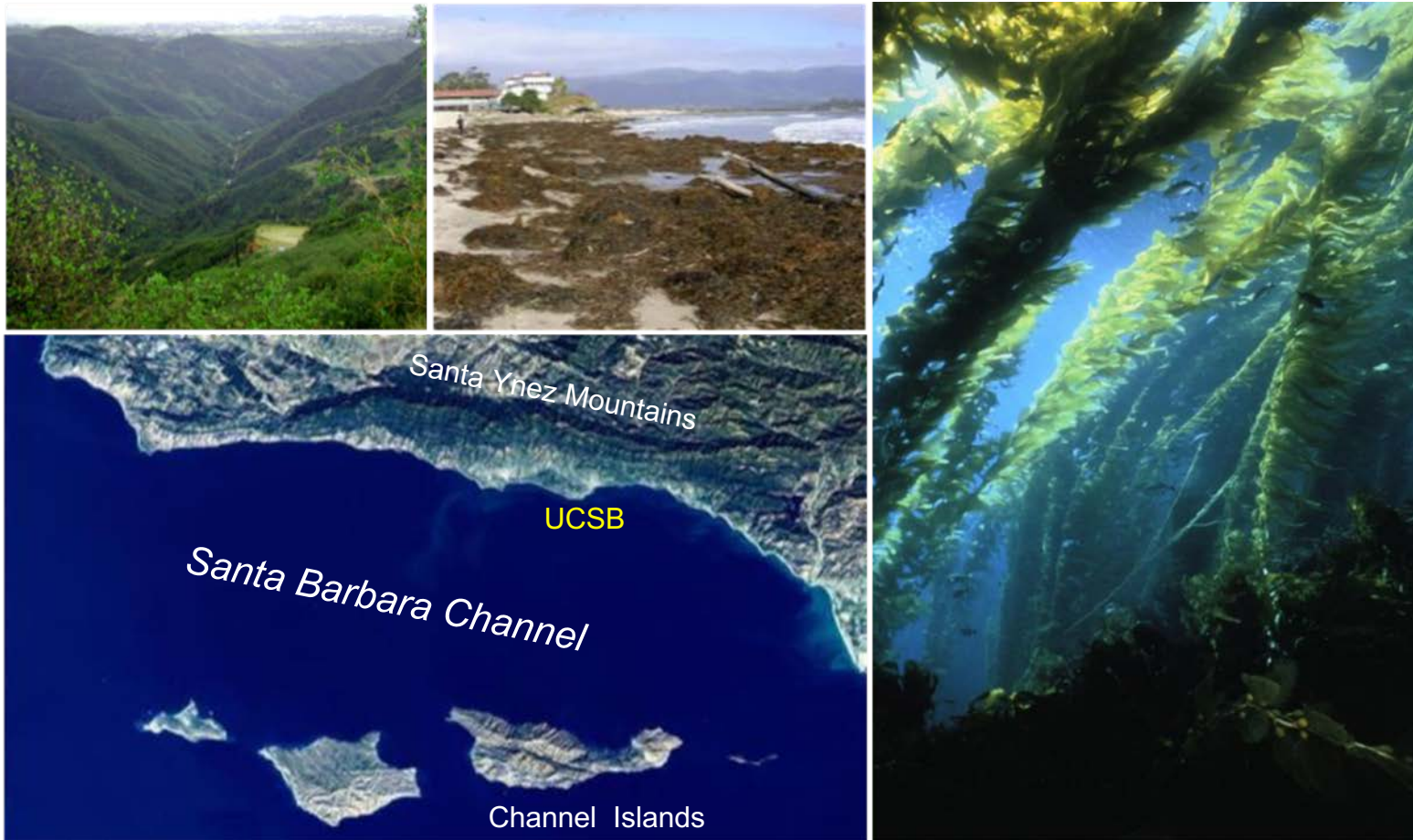
PIs: Siegel, Bell, Cavanaugh, Miller, Nidzieko, Nelson, Reed





Santa Barbara Coastal LTER

Established 2000



Research Focus: Role of material exchange on the structure, function and dynamics of coastal marine ecosystems