



NOAA
FISHERIES

SWFSC

Fisheries Ecology Division

Santa Cruz, CA

2.4 CCLME

Demersal fishes, structure-forming invertebrates, and essential fish habitat: *Ecosystem data from visual surveys*

MARY YOKLAVICH, Habitat Ecology Team



Questions to be Addressed:

Q1. Are there clear goals and objectives to assist with an ecosystem science program?

Q2. Does the information address priority needs of Regional Office, Council, partners?

Q4. What is status of habitat data required to address ecosystem science needs?

Q5. Are ecosystem-level processes being analyzed and modeled?

Q6. Is habitat information sufficiently included in advice to management?

Q8. Are research results and needs communicated to managers, partners, stakeholders, public?

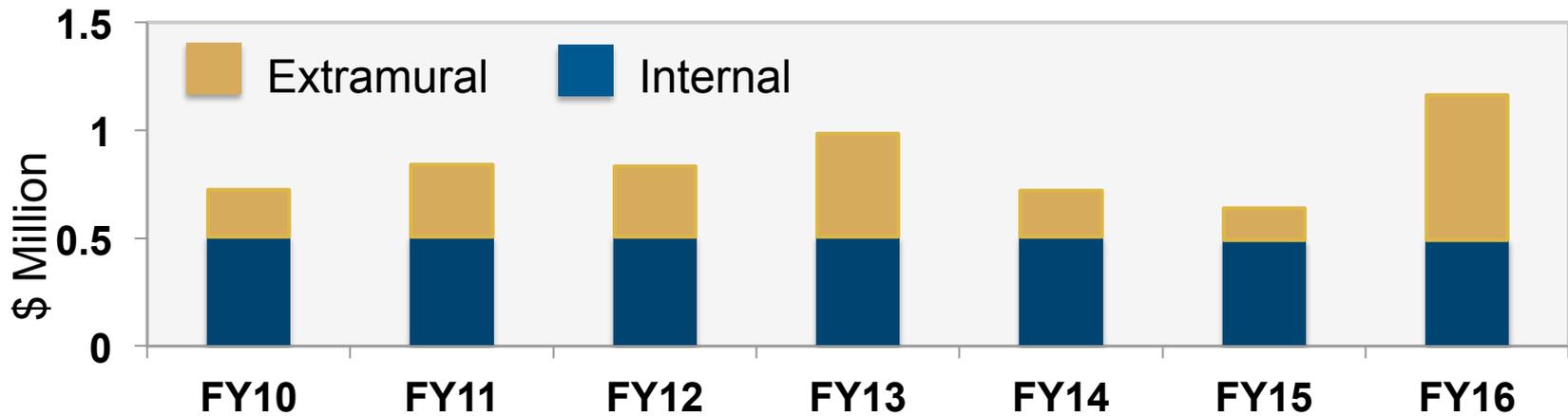
Mandates of the Magnuson-Stevens Fishery Conservation and Management Act

- *Identify and describe EFH and minimize adverse effects of fishing*
 - *Special protections for deep-sea coral habitats*
-

Our Research Objectives are Focused on Deep-Water California Demersals

- Characterize rockfish and habitat associations
- Understand the significance of deep-sea coral habitats
- Improve stock assessments of West Coast rockfishes in untrawlable habitats
- Advise federal and state management processes
 - NOAAs Deep-sea Coral Program
 - Pacific Council Essential Fish Habitat designations
 - Implementation of California's Marine Life Protection Act





Funding Sources:

NMFS:

- Untrawlable Habitat Strategic Initiative
- Habitat Assessment Improvement
- Essential Fish Habitat

NOAA Deep-sea Coral Research
and Technology Program

California Ocean Protection Council

Collaborators:

University of CA Santa Cruz

University of CA Santa Barbara

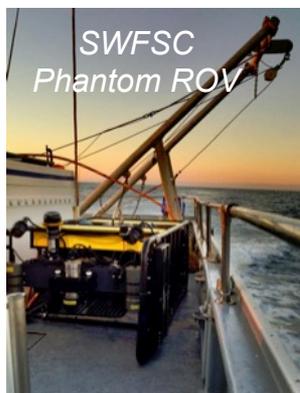
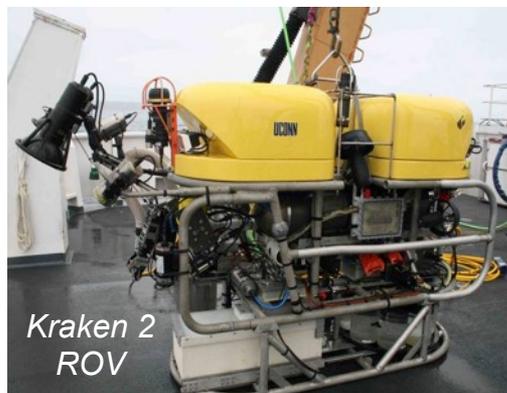
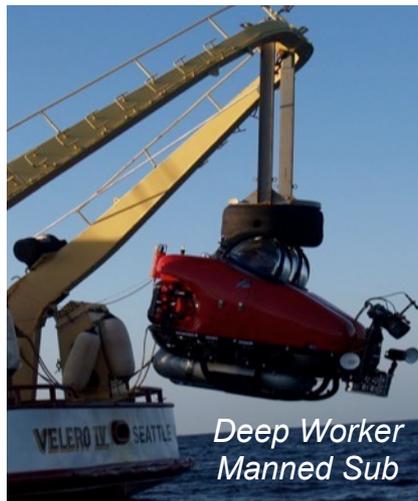
NMFS NWFSC

NMFS West Coast Region

Oregon State University

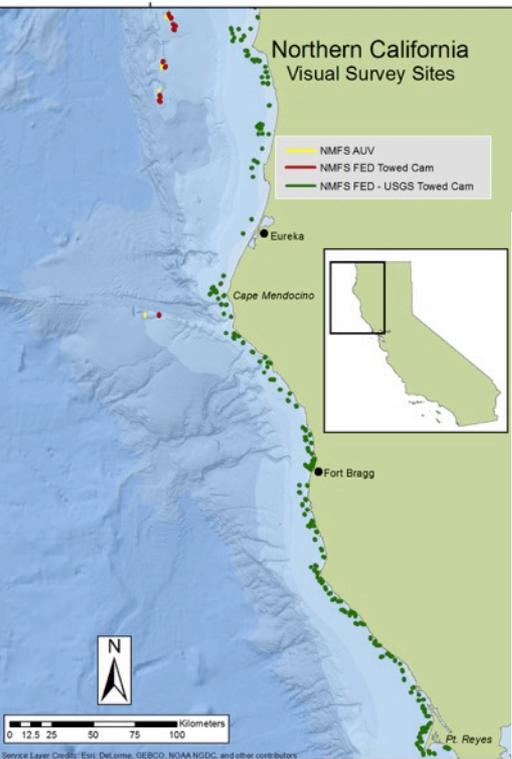
US Geological Survey

Visual Survey Tools We Use to Characterize Demersal Communities



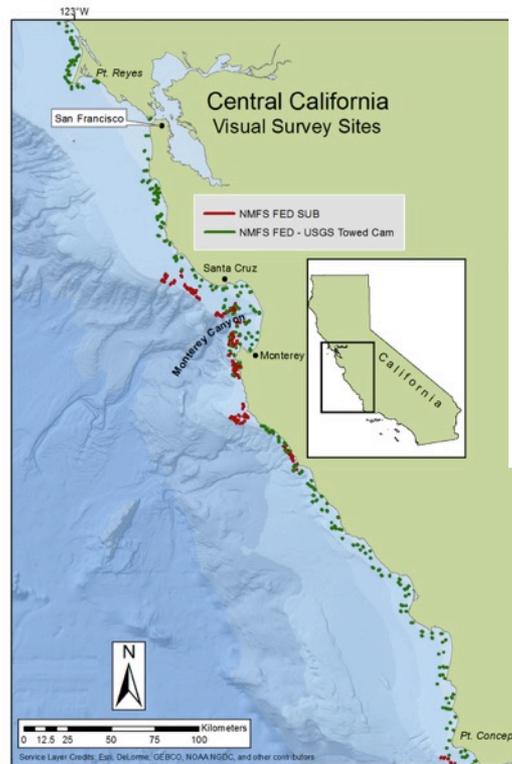
Northern California Visual Survey Sites

- NMFS AUV
- NMFS FED Towed Cam
- NMFS FED - USGS Towed Cam



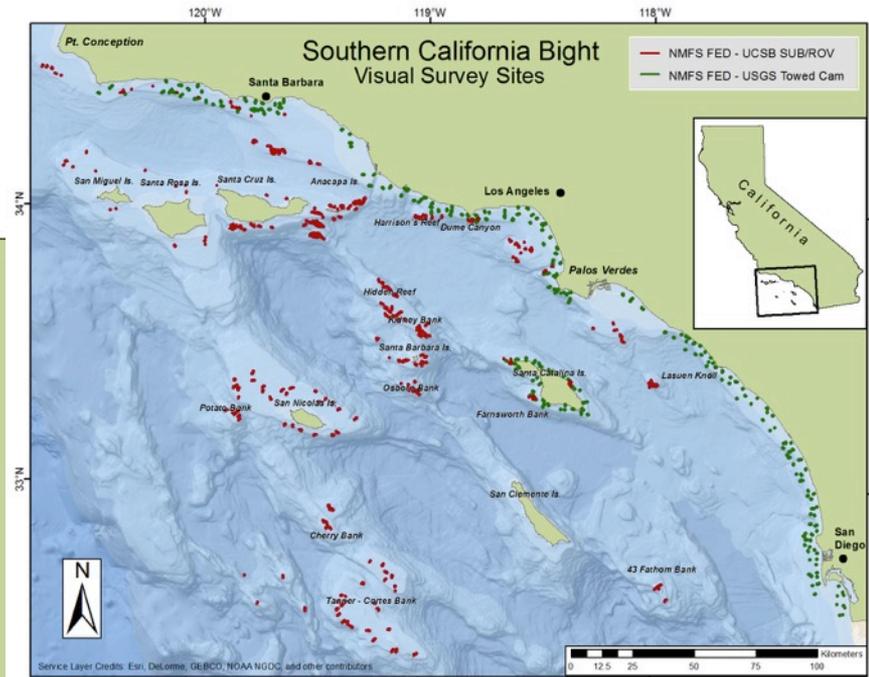
Central California Visual Survey Sites

- NMFS FED SUB
- NMFS FED - USGS Towed Cam



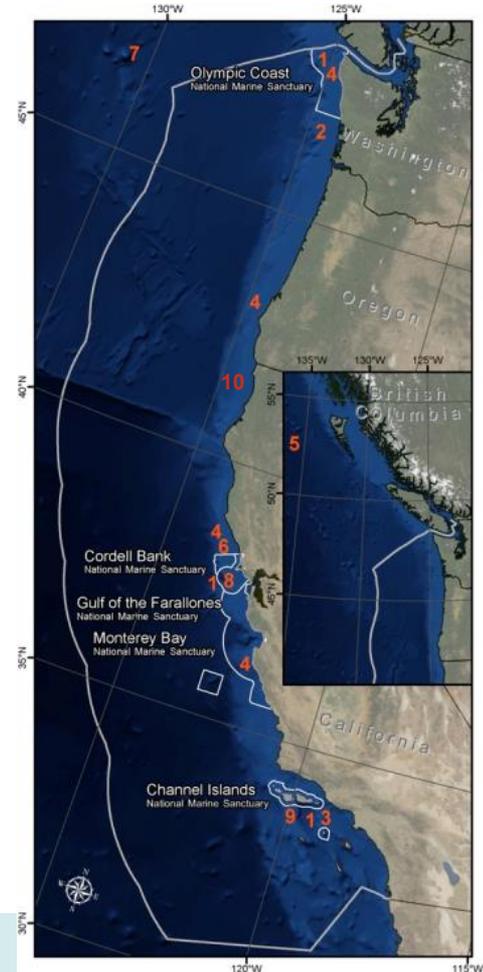
Southern California Bight Visual Survey Sites

- NMFS FED - UCSB SUB/ROV
- NMFS FED - USGS Towed Cam



NOAA's Deep Sea Coral Program - West Coast

- 2010-2014
- Priority EFH sites associated with national marine sanctuaries
- Developed in consultation with Pacific Council
- Inform proposed changes to EFH and Sanctuary boundaries
- Research Objectives
 - Provide information for conservation of DSC habitats
 - Understand factors that influence DSC distribution
 - Evaluate function of DSC as fish habitat
- Diverse investigators and participants:
 - NOAA Fisheries, Sanctuaries, NCCOS
 - Academia & Research Institutes
 - USGS
 - Tribes



DATA WORKFLOW

VISUAL SURVEY

Acquisition

DATA FILES

OBSERVATIONS
In Situ & Photo Images

SAMPLES
Inverts/Rocks

Generation

NAVIGATION

CTD

FISH

CORALS/
SPONGES

HABITAT

DEBRIS

Time
Latitude
Longitude

Time
Depth
Temperature
Salinity

Time
Species
Size
Number

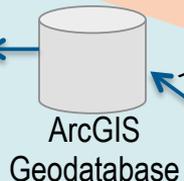
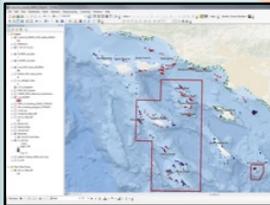
Time
Species, Size
Number
Condition

Time
Substratum
Relief

Time
Type
Number
Size

Editing

Processing



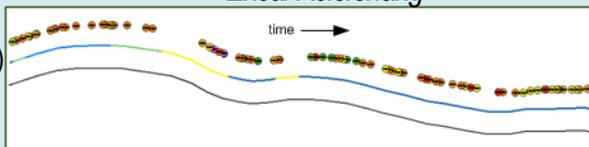
X, Y, TIME

Linear Referencing

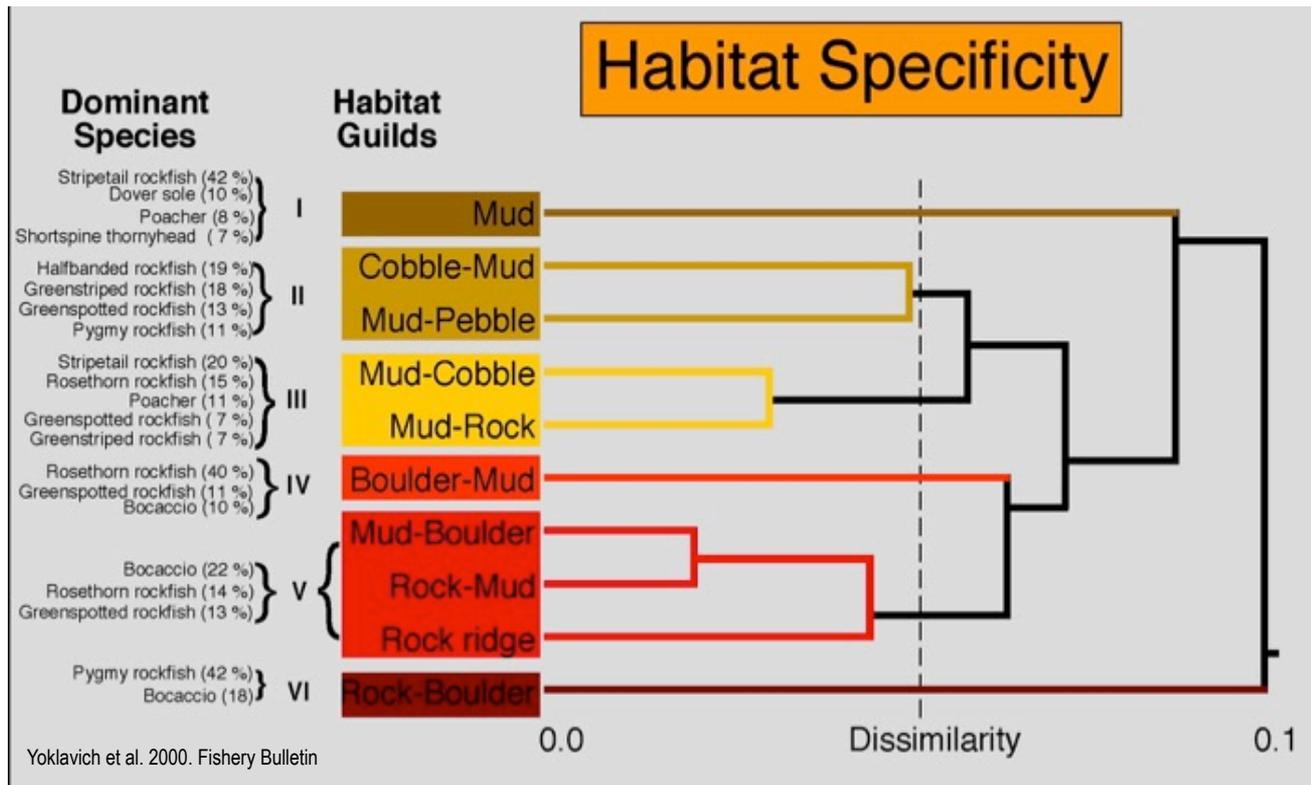


TIME, Attribute 1, ...

Events (Depth, Fish, Habitat...)
Routes (Navigation Trackline)



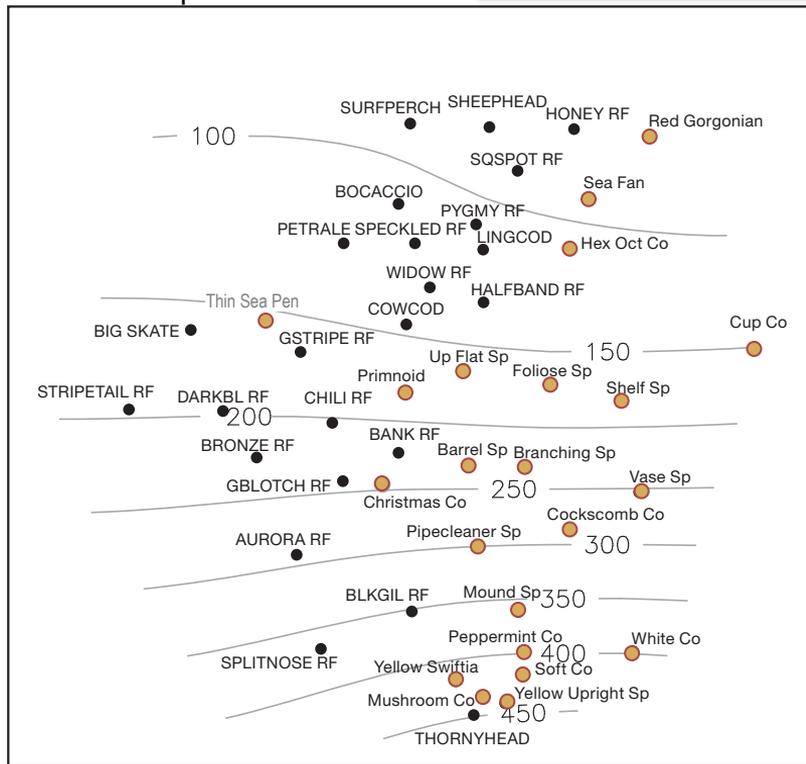
Demersal Fish Assemblages based on Substratum Types



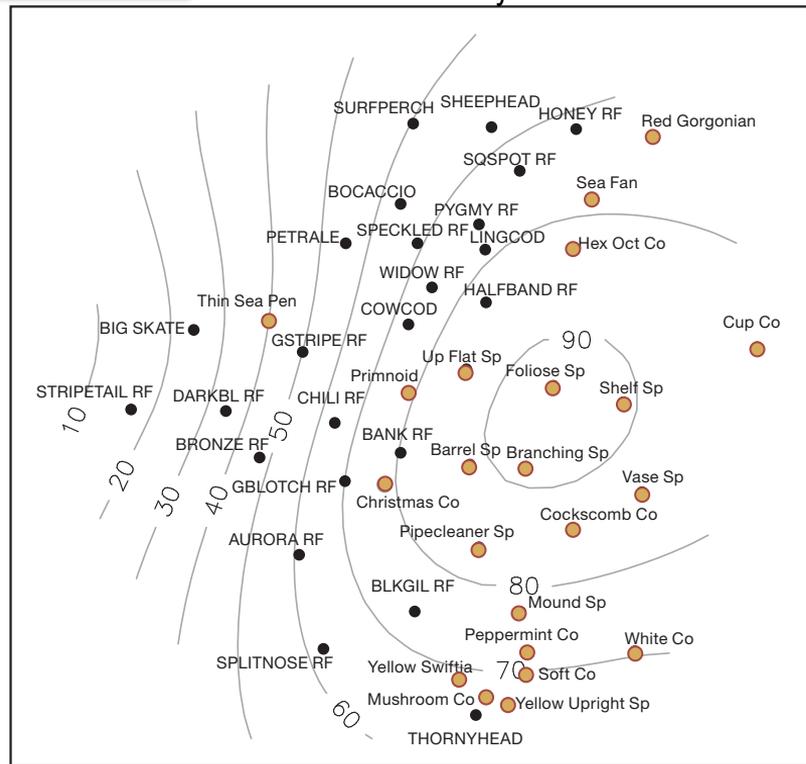
Community Structure in Context of Environmental Gradients



Depth



Percent Rocky Substratum

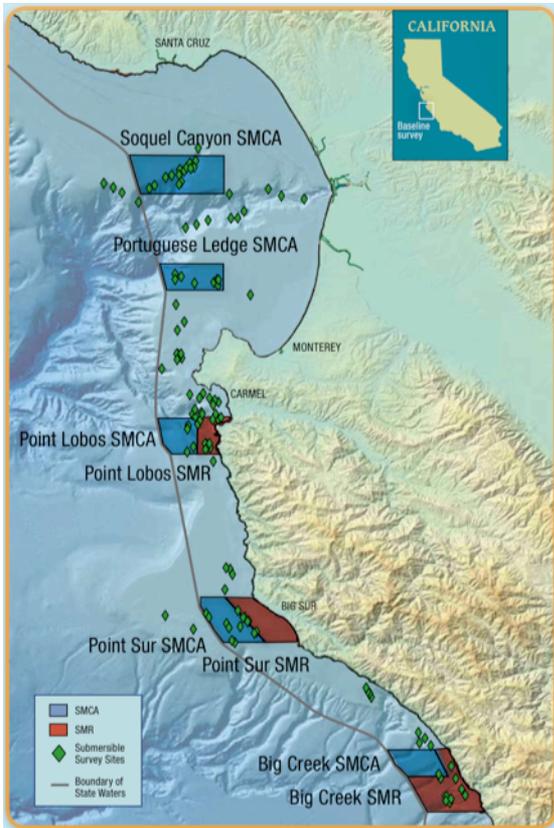


Huff et al. 2013. Marine Ecology Progress Series 494.

Data from Visual Surveys used to Locate and Monitor Marine Protected Areas for State and Feds

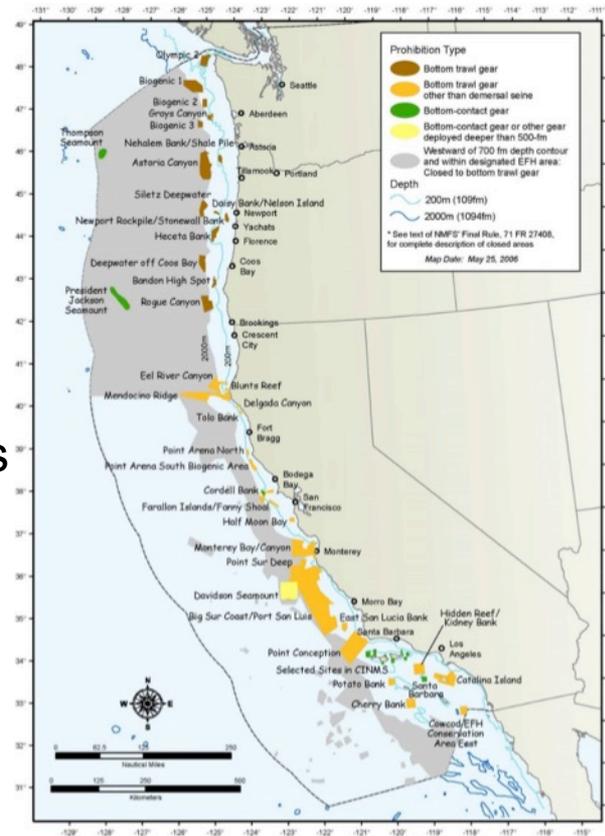
California's Marine Life Protection Act MPAs

Pacific Coast Groundfish EFH Conservation Areas



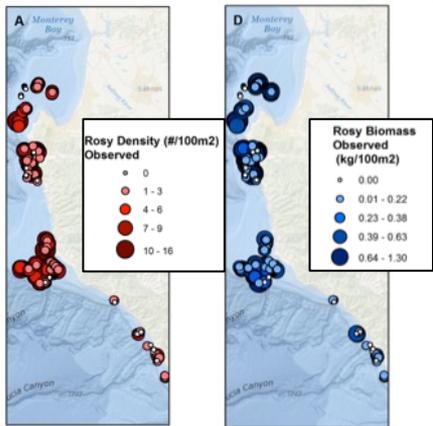
Management Outcomes:

- longterm protection of vulnerable habitats
- establish benchmark to evaluate effectiveness of MPAs

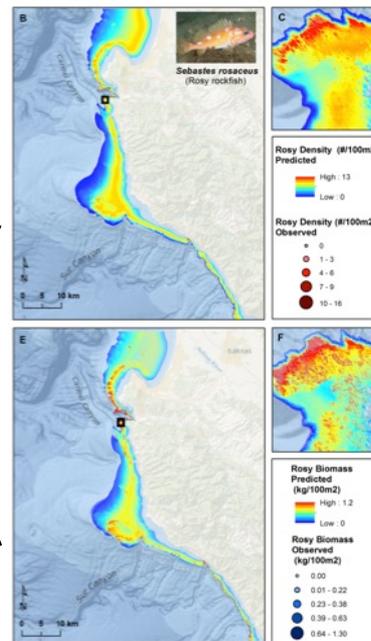


Visual Data Coupled with Seafloor Mapping to Predict Abundance and Distribution of Rockfishes

Point observations of density and biomass from visual surveys

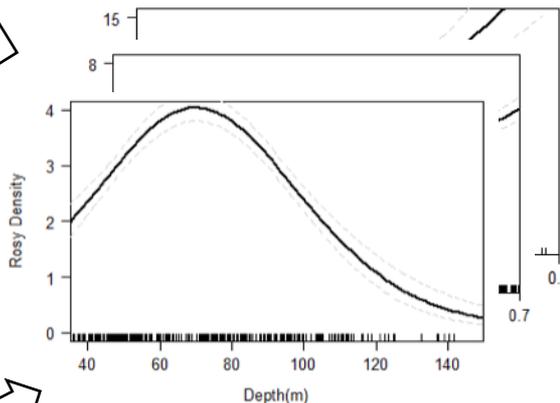


Maps of density and biomass predicted from environmental covariates

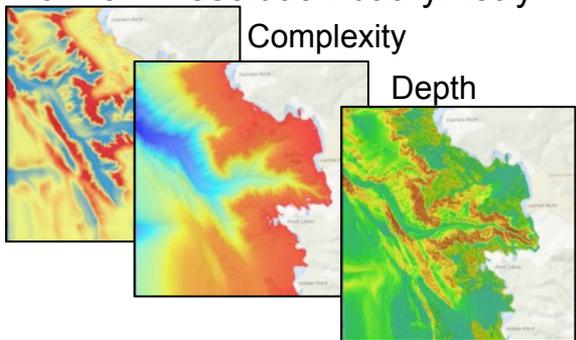


Generalized Additive Models

$$\text{ROSY} \sim \text{Depth} + \text{Slope} + \text{Complexity}$$



Gridded seafloor habitat data derived from 5-m resolution bathymetry



Management Applications:

- Estimate total biomass in study area
- Quantify habitat capacity
- Prioritize habitats for conservation
- Evaluate potential risk to rockfish stocks

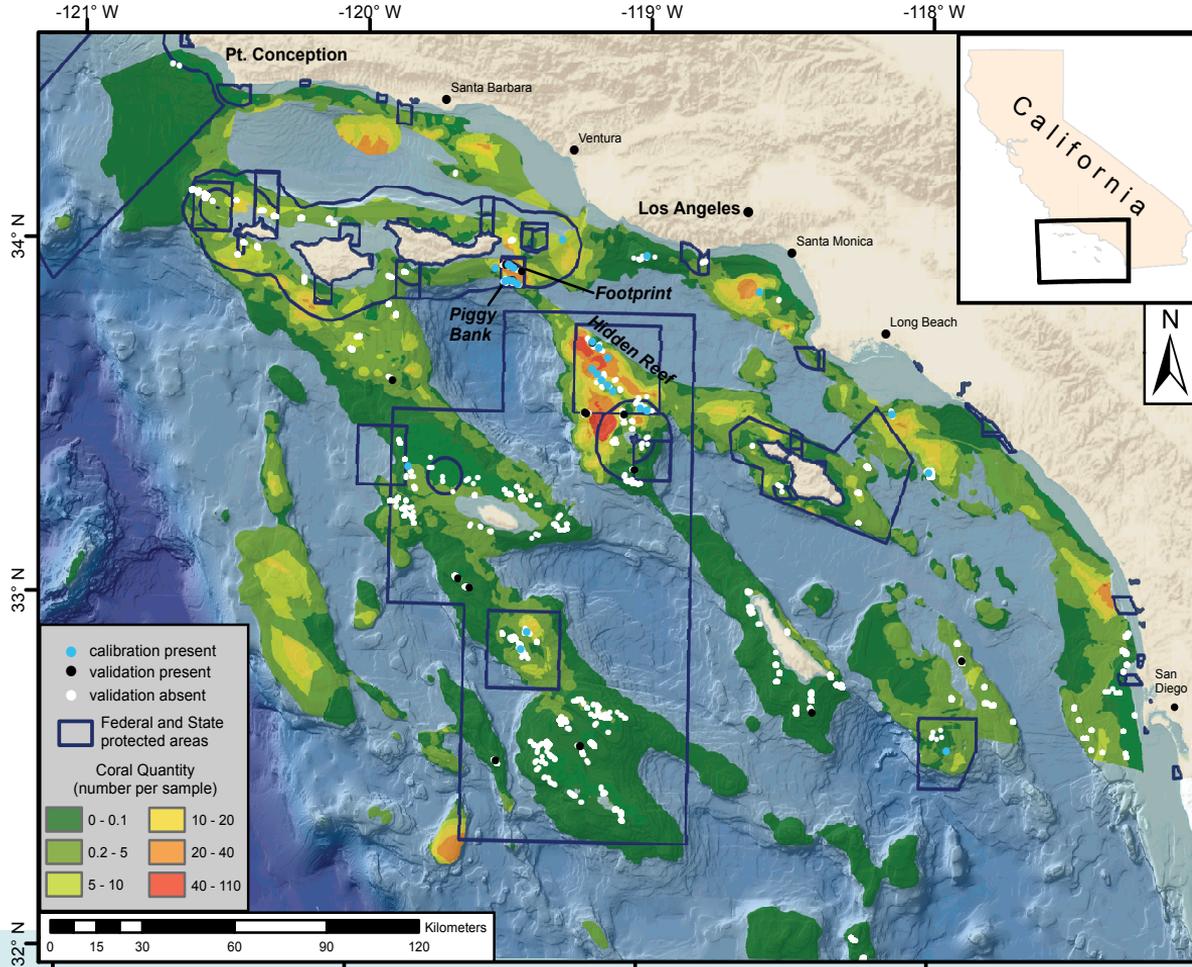
Predicting Black Coral Abundance in Southern California Bight



- Generalized Additive Models
- Response variable: density of corals
- Important predictors: Surface productivity, depth, and bottom currents

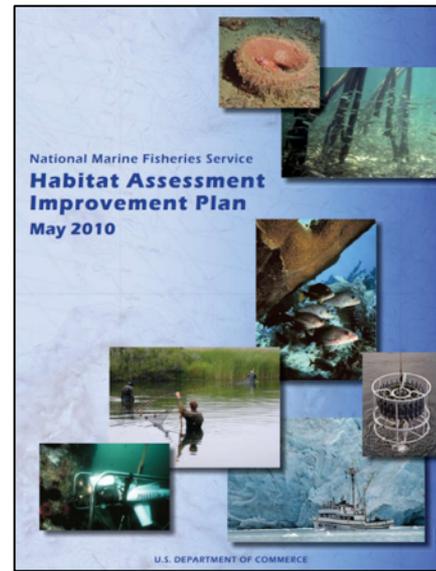
Management Outcomes:

- Assure protection of vulnerable habitats
- Evaluate effectiveness of MPAs relevant to fishing and other activities



Scientific Advice on Marine Habitats

- Chair, NMFS Habitat Assessment Improvement Plan (HAIP, 2010)
- Pacific Council's Review Committee for Groundfish Essential Fish Habitat (2008-2014)
- NOAA Deepsea Coral Program West Coast Research Planning Team (2009-2015)
- CCIEA Phase III: Selecting and Evaluating Indicators for Habitats (2013-14)
- Species Profiles for Vulnerability to Climate Change (2015)
- NMFS Untrawlable Habitat Strategic Initiative Advisory Team (2013 - present)



PACIFIC COAST GROUNDFISH 5-YEAR REVIEW OF ESSENTIAL FISH HABITAT

Agenda Item D.2.b
EFFHC Report
March 2014

REVIEW OF PACIFIC COAST GROUNDFISH ESSENTIAL FISH HABITAT

PHASE 2 REPORT TO THE PACIFIC FISHERY
MANAGEMENT COUNCIL

Groundfish Essential Fish Habitat Synthesis: A Report to the Pacific Fishery Management Council

April 2013

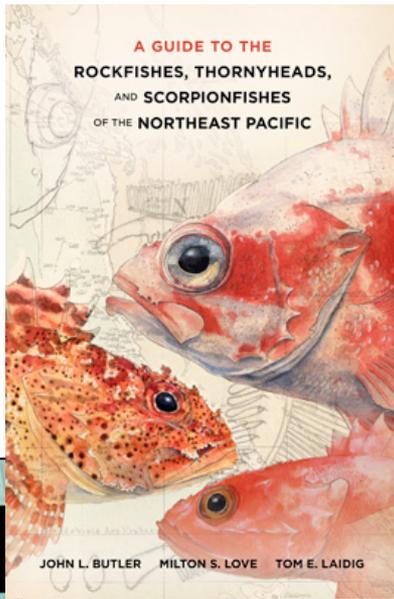


THE ROCKFISHES OF THE NORTHEAST PACIFIC



Milton S. Love, Mary Yoklavich, and Lyman Thorsteinson

A GUIDE TO THE ROCKFISHES, THORNYHEADS, AND SCORPIONFISHES OF THE NORTHEAST PACIFIC



JOHN L. BUTLER MILTON S. LOVE TOM E. LAIDIG

Our Living Oceans: Habitat

STATUS OF THE HABITAT OF U.S. LIVING MARINE RESOURCES



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Share Findings with Public

- Rockfishes of the Northeast Pacific
- A Guide to Rockfishes of the Northeast Pacific
- NMFS Our Living Oceans: Habitat. *Status of the habitat of U.S. living marine resources*
- State of deep-sea coral and sponge ecosystems of the U.S. West Coast
- 2016 Report to Congress on Deep Sea Coral Program
- NOAA's Deep-Sea Coral Data Portal
- NMFS Habitat Use Database
- California's Ocean Data Portal

Strengths

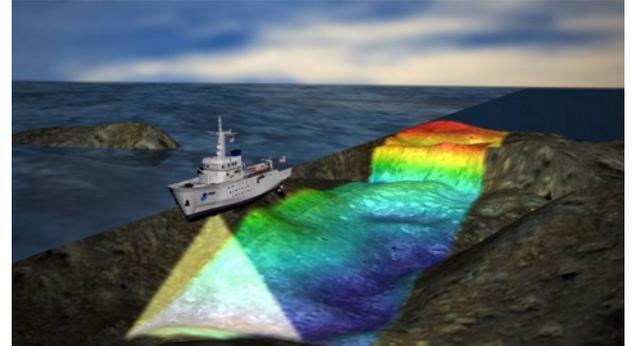
- Provide a more complete understanding of the ecosystem
- Estimate abundance of fishes, corals, and sponges in untrawlable habitats
- Able to quantify fish-habitat associations
- Non-extractive methods ideal for species of low abundance and restricted catches
- Non-destructive methods required to survey sensitive habitats in marine protected areas

Challenges

- We are dealing with Altered Ecosystems
 - Removal of large fishes over long period has resulted in rocky areas that are dominated by small 'weedy' species
 - Removal and damage to corals and sponges
 - There are almost no data on pre-fishery assemblages to evaluate change
- Limited rocky habitats with patchy spatial distributions
 - Often uncertain about distribution/abundance of these habitats particularly offshore
 - Limited high-resolution bathymetry for survey design and analyses
- No ongoing monitoring plans in deep water for any of the federal or state MPAs
 - Time series of abundance needed to evaluate recovery of the fishes, corals, and sponges in deep rocky habitats

Strategies

- Support for visual surveys in untrawlable habitats on a regular basis will require:
 - a change in business as usual (trawl surveys)
 - commitment of funds
- More high-resolution mapping of untrawlable habitat: consider use of NOAA ships with ME70 multibeam sonar
 - Increase efficiency of the visual surveys
 - Increase cost-effectiveness of survey
 - Improve precision of estimated fish abundance
- Leverage existing data and programs more than ever



Rich Diversity of Deep-sea Corals and Sponges off California



Primnoid



Anthoptilum grandiflorum



Christmas tree black coral



Lophelia pertusa



Vase sponge
with *Liponema brevicornis*



Pennatula phosphorea



Heterochone calyx



Barrel sponge with
Gorgonocephalus