National EFH Summit

Monitoring, Modeling, and Mapping Demersal Communities in Untrawlable Habitats

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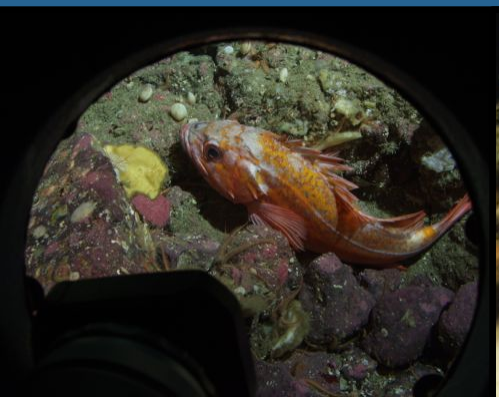
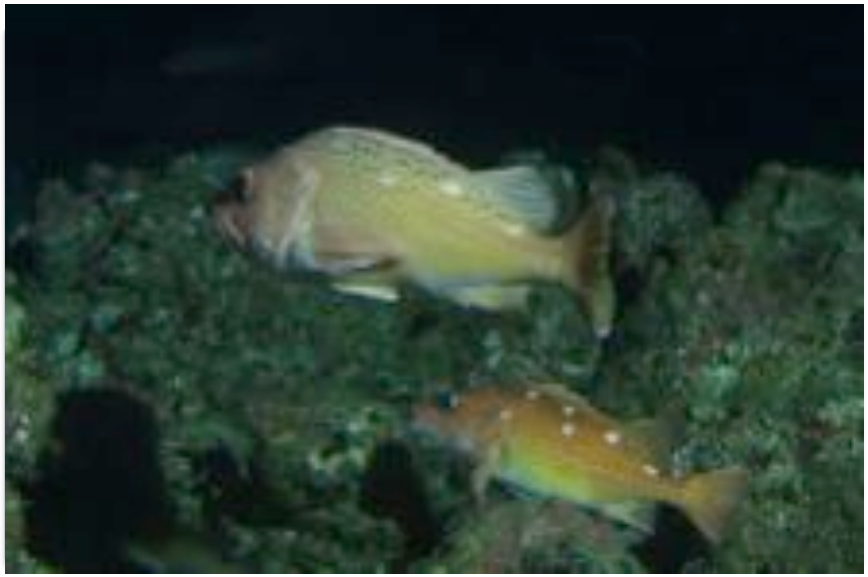


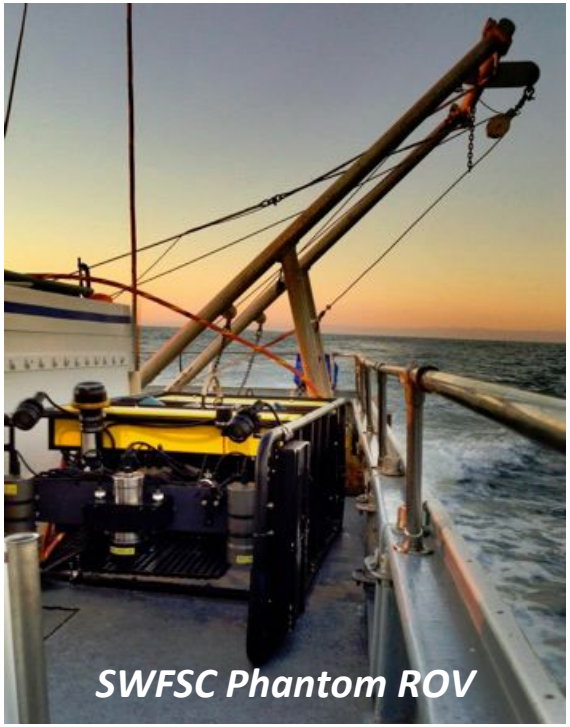

Our Research Objectives are Focused on West Coast Rockfishes



- Characterize rockfish and habitat associations
- Improve assessments of West Coast rockfishes in untrawlable habitats
- Understand the significance of deep-sea coral habitats

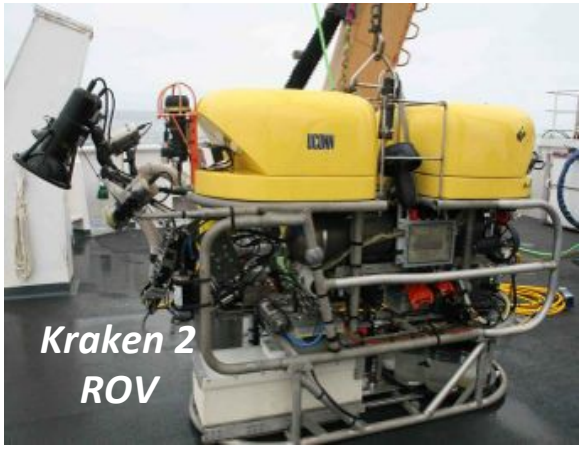
Visual Survey Tools We Use to Characterize Demersal Communities

Deep Worker Manned Sub


SWFSC Phantom ROV


NWFSC PIFSC SeaBED AUV


Delta Manned Sub


Kraken 2 ROV

USGS Towed Camera Sled

DATA WORKFLOW

VISUAL SURVEY

Acquisition

DATA FILES

OBSERVATIONS
In Situ & Photo Images

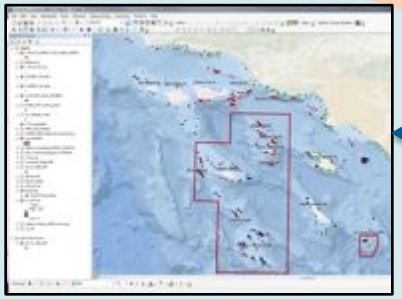
SAMPLES
Inverts/Rocks

Generation

NAVIGATION	CTD	FISH	CORALS/SPONGES	HABITAT	MARINE DEBRIS
Time	***Time***	***Time***	***Time***	***Time***	***Time***
Latitude	Depth	Species	Species	Substratum	Type
Longitude	Temperature	Number	Number	Relief	Number
	Salinity	Size	Size		Size
	Altitude	Distance	Condition		Material

Editing

Processing



ArcGIS Geodatabase

X, Y, TIME

Linear Referencing

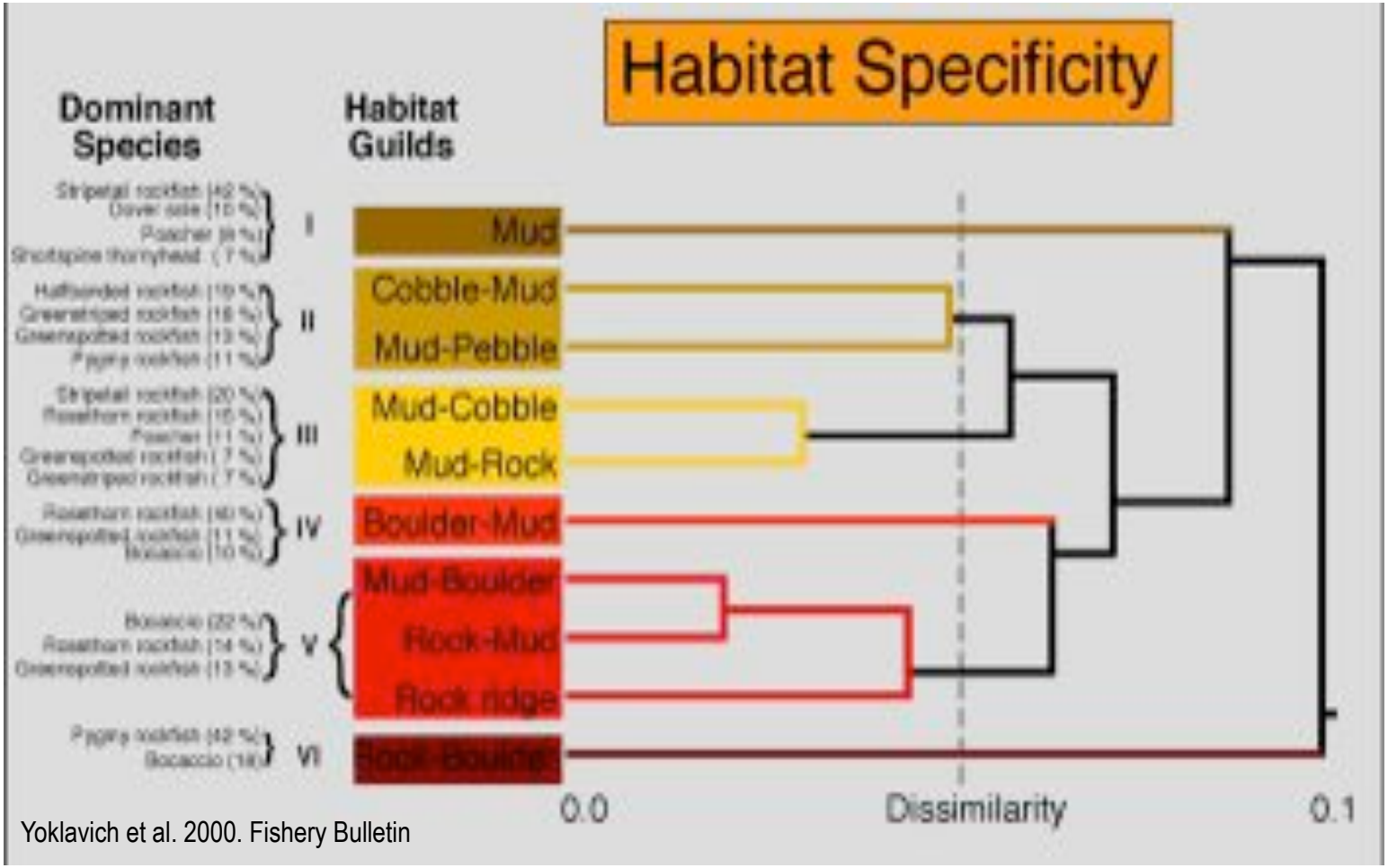
TIME, Attribute 1, …

SQL Server Database

Events (Depth, Fish, Habitat…)

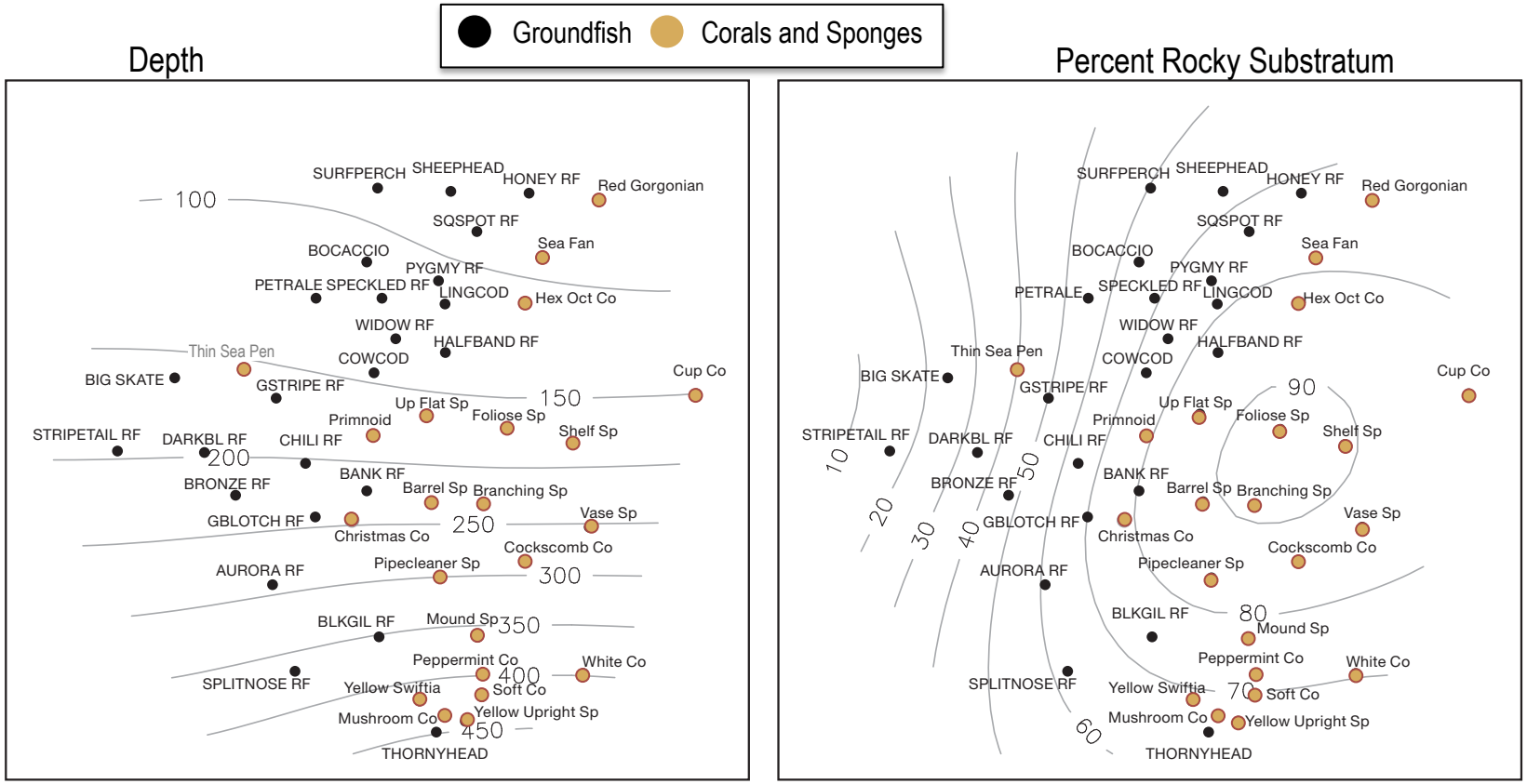
Routes (Navigation Trackline)

Demersal Fish Assemblages based on Substratum Types



Yoklavich et al. 2000. Fishery Bulletin

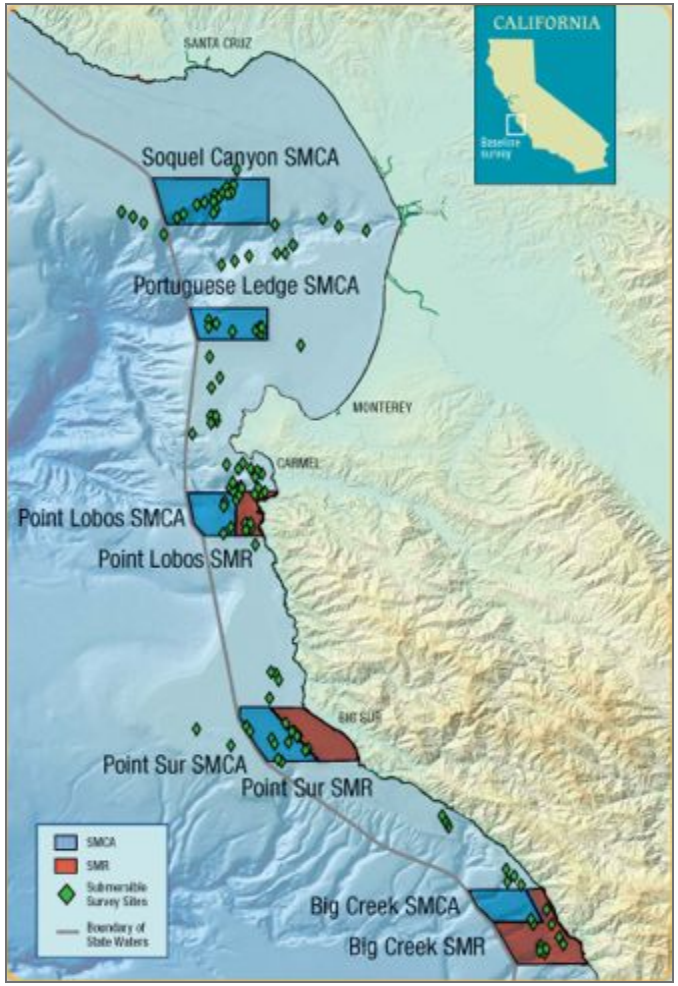
Community Structure in Context of Environmental Gradients



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

Example 1: Data from our Visual Surveys used to Locate and Monitor MPAs in Deep Water for State and Feds

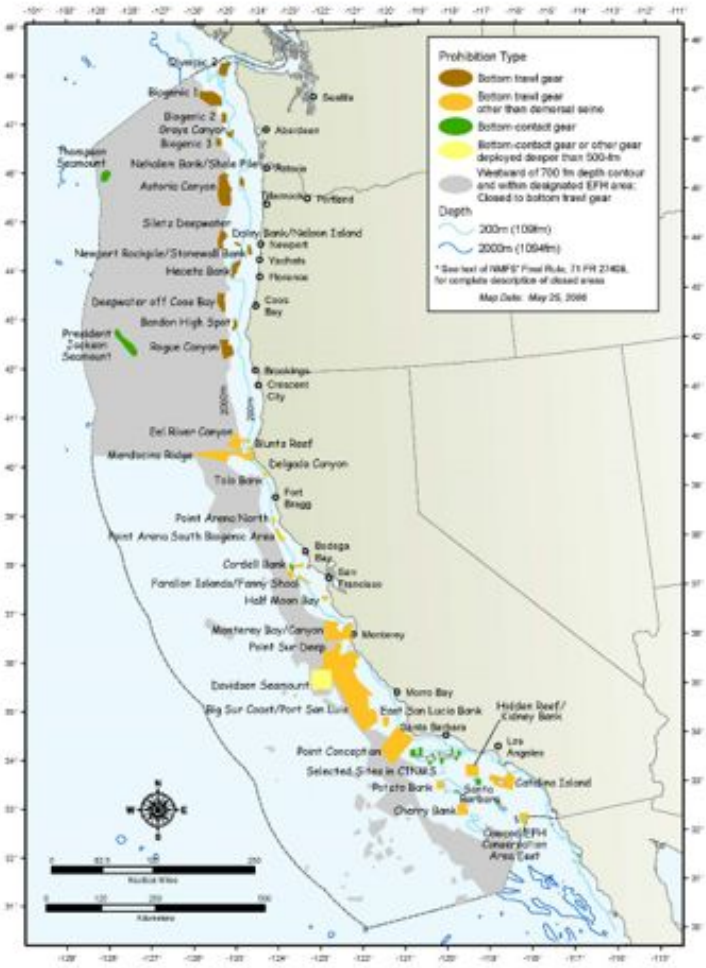
California's Marine Life Protection Act MPAs



Management Outcomes:

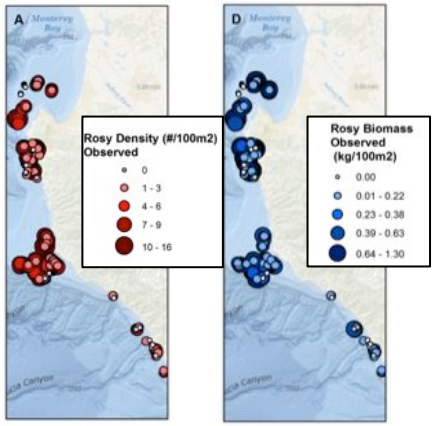
- longterm protection of vulnerable habitats
- establish benchmark to evaluate effectiveness of MPAs

Pacific Coast Groundfish EFH Conservation Areas



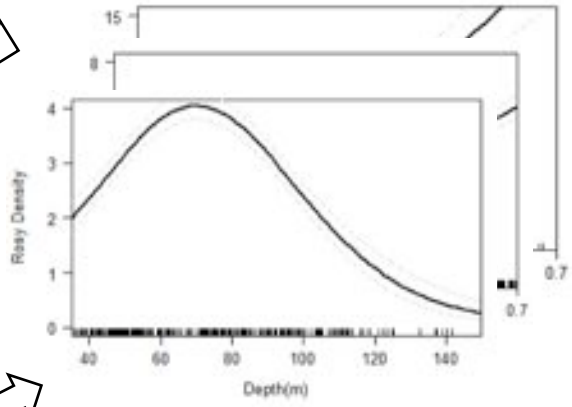
Example 2: Visual Data Coupled with Seafloor Mapping to Predict Abundance and Distribution of Rockfishes

Point observations of density and biomass from visual surveys

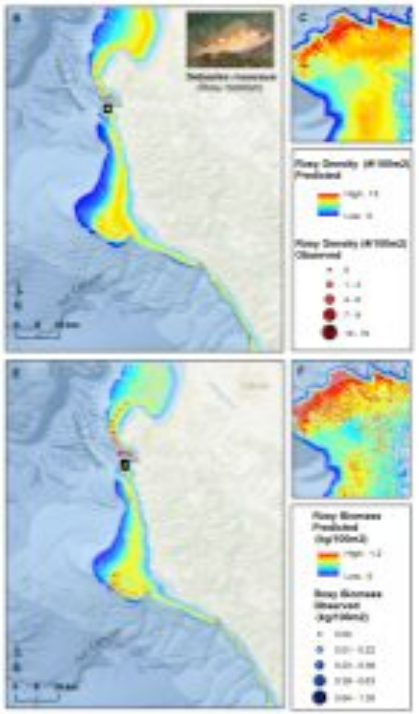


Generalized Additive Models

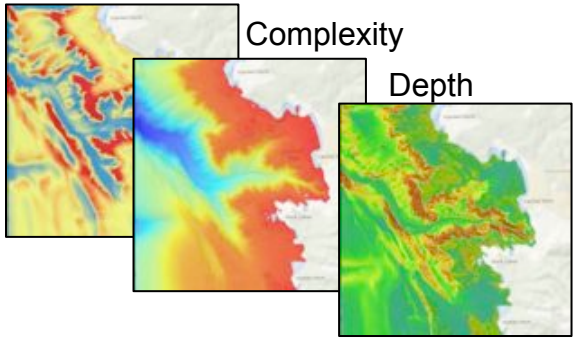
ROSY ~ Depth + Slope + Complexity



Maps of density and biomass predicted from environmental covariates



Gridded seafloor habitat data derived from 5-m resolution bathymetry



Wedding and Yoklavich 2015. Mar Ecol Prog Ser. 540

Management Applications:

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

Strengths of Habitat-specific Visual Surveys

- Provide a more complete understanding of the ecosystem
  - Estimate abundance of all demersal fishes, corals, and sponges in untrawlable habitats
  - Determine use of benthic habitats, including structure-forming macroinvertebrates
- Non-extractive methods, ideal for species of low abundance and restricted catches
- Non-destructive methods, which are needed 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 is needed to evaluate recovery of the fishes, corals, and sponges in deep rocky habitats

Strategies to Improve Habitat-specific Surveys

- Support is needed for coastwide visual surveys in untrawlable habitats on a regular basis. This will require:
  - a change in business as usual (trawl surveys)
  - commitment of funds

- Support for coastwide high-resolution mapping of untrawlable habitat
  - Increase efficiency of the visual surveys
  - Increase cost-effectiveness of survey
  - Improve precision of estimated fish abundance
  - Use NOAA ships with ME70 multibeam sonar