Baseline Characterization and Monitoring of the Marine Protected Areas along the South Coast Study Region: ROV Surveys of the Subtidal (20-500m)

Annual Report (Year 1)

A Report to California Sea Grant
Project Number RMPA-26A

31 August 2012

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Market squid (*Loligo opalescens*) at 225m depth in Scripps Canyon in the Scripps Coastal SMCA

Electric ray (*Torpedo californica*) at Farnsworth Bank Offshore SMCA, Catalina Island

California scorpionfish (*Scorpaena guttata*) at Farnsworth Bank Offshore SMCA, Catalina Island

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Key Partnerships:

Dr. Mary Gleason – The Nature Conservancy. California Marine Program
Dr. William Head and Jessica Brown - Undergraduate Research Opportunity Center (UROC) at CSU Monterey Bay
Local fishermen – Captain Tim Maricich and the crew for the FV *Donna Kathleen*
Southern California Marine Institute (SCMI)

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Summary

This report summarizes the first year (2011) of the South Coast MPA Baseline ROV Data Collection Project and is submitted to the California Sea Grant as a deliverable for Project RMPA-26A. The data presented here were collected in the deep (20-250m) rocky- and soft-bottom seafloor habitats of the South Coast Region of California's MPA Network. The project is funded by the California Ocean Protection Council (OPC) through the University of California Sea Grant, by private donations, and through the in-kind contributions of project partners.

Our primary objective was to collect data on the distribution of fishes and key invertebrates relative to the physical and biological attributes of seafloor habitats across the region. A closely related secondary objective was to collect and maintain an archive of still photographic and videographic imagery for use in future analyses. The four locations we surveyed were selected to include sites across the full extent of the study area, including the mainland and offshore islands. They were, from north to south: 1) Point Vicente and Abalone Cove SMCAs; 2) Laguna Beach SMR and SMCA, Crystal Cove SMCA, and Dana Point SMCA ; 3) Catalina Island's Farnsworth Bank SMCAs; and 4) La Jolla's Matlahuayl SMR and Scripps Coastal SMCA. Remotely operated vehicle (ROV) surveys were conducted inside and adjacent to MPAs at each location across a range of water depths and substrate types. The information produced by this study will provide a comprehensive assessment on the distribution of fishes and key invertebrates while also serving as a baseline against which any future changes in the communities can be measured.

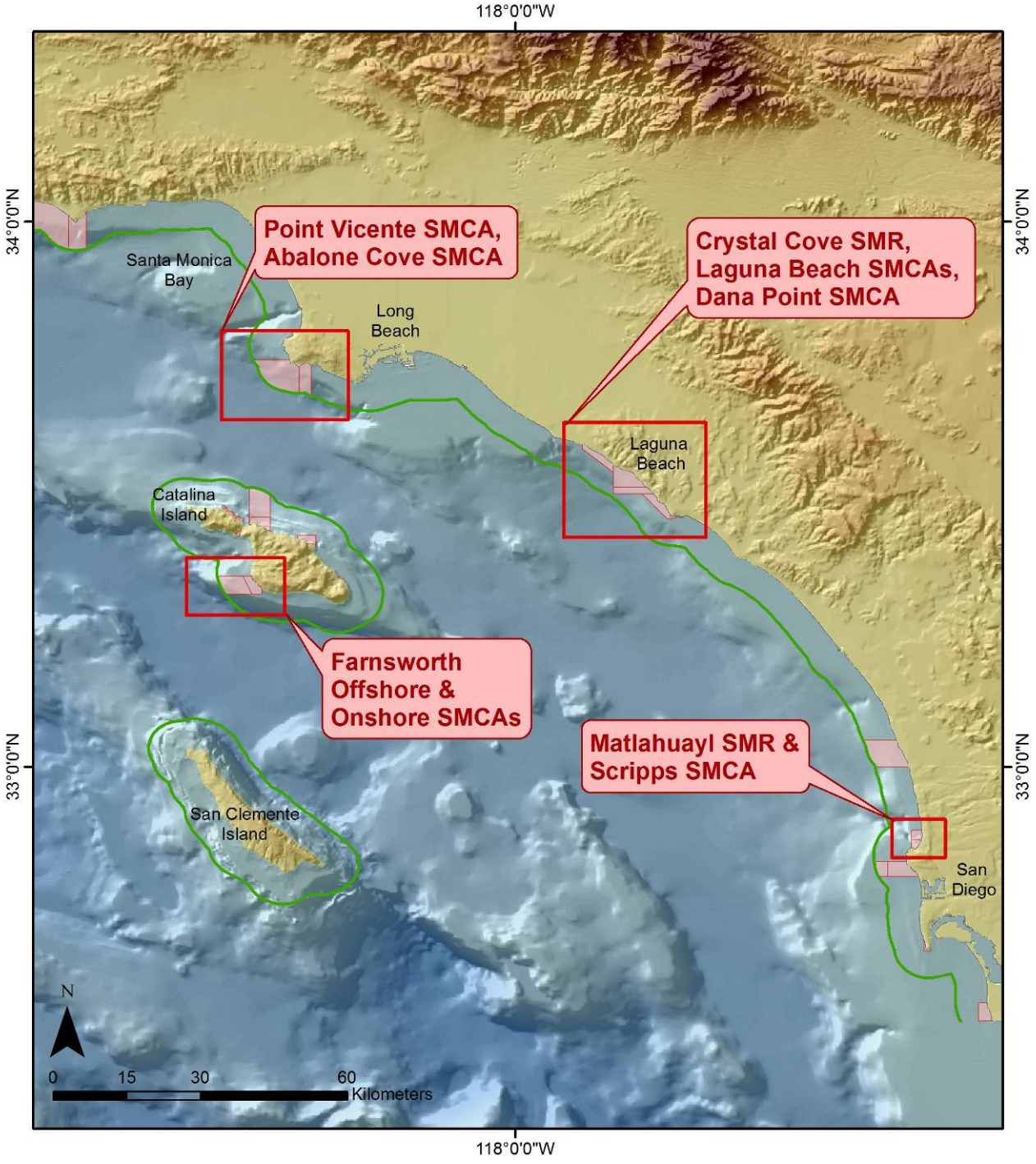


Figure 1. Map of study locations (red squares) across the South Coast Study Region.

Cruise Report

Cruise Dates: 04 November 2011 – 19 November 2011

Science Team Personnel

Chief Scientist/Co-Principal Investigator:	James Lindholm (IfAME, CSUMB)
Research Associate/On-board scientist:	Ashley Knight (IfAME, CSUMB)
Research Assistant/On-board scientist:	Jessica Watson (IfAME, CSUMB)
Research Assistant/On-board scientist:	Chelsea Parrish-Kuhn (IfAME, CSUMB)

ROV Team Personnel

Co-Principal Investigator:	Dirk Rosen (MARE)
ROV Pilot:	Andy Lauermann (MARE)
ROV Navigation:	Yuko Yokozawa (MARE)
ROV Deck Manager:	Steve Holtz (MARE), Don Baldwin (MARE)
ROV Engeneer:	AJ Reiter (MARE)

Vessel Crew Personnel

Vessel Captain:	Tim Maricich (FV *Donna Kathleen*)
Vessel Crew:	Donna Maricich (FV *Donna Kathleen*)
Vessel Crew:	Tyler Maricich (FV *Donna Kathleen*)

Summary of cruise results

Sub-tidal surveys of fishes, mobile invertebrates, sessile structure-forming invertebrates, and associated seafloor habitats were conducted in state waters at four locations within the South Coast Study Region's MPA Network. Visual surveys were conducted using the ROV *Beagle* (operated by project partners at Marine Applied Research and Exploration) on board the fishing vessel *Donna Kathleen.* Equipment was mobilized and demobilized onboard the vessel at Long Beach Harbor.

This cruise was the first of two planned cruises for the larger study (the second one is planned for November 2012). All sampling goals for year 1 were achieved, with additional ROV transects conducted at Catalina Island, Point Vicente, and La Jolla. For instance, additional transects were conducted in Scripps Canyon (La Jolla site) to examine the vertical submarine canyon walls in that area. Further, supplementary funding was made available by private donors during the cruise, and one additional sampling day was added, allowing for surveys to be conducted in four additional MPAs near Laguna Beach.

Table 1. Summary of daily operations for November 2011

Date	Operations	Location	Notes
4 November	MOB ROV	Southern California Marine Institute	
5 November	ROV Operations	Outside Abalone Cove SMCA, Inside Abalone Cove SMCA, Inside Point Vicente SMCA (No-Take)	Test dive, full day imagery collection.
6 November	ROV Operations	Inside Point Vicente SMCA (No-Take), Outside Point Vicente SMCA (No-Take), Inside Abalone Cove SMCA	Full day of imagery collection.
7 November	ROV Operations	Inside Abalone Cove SMCA, Inside Point Vicente SMCA (No-Take)	½ day of imagery collection.
8 November	Transit/ ROV Operations	Inside Farnsworth Offshore SMCA	Transit to Catalina Island, Full day of imagery collection.
9 November	ROV Operations	Outside Farnsworth Offshore SMCA, Inside farnsworth Offshore SMCA, Outside Farnsworth Onshore SMCA	Full day of imagery collection.
10 November	ROV Operations	Inside Farnsworth Onshore SMCA, Outside Farnsworth Onshore SMCA	Full day of imagery collection.
11 November	Transit/ROV Operations	Inside Farnsworth Offshore SMCA, Outside Farnsworth Onshore SMCA	½ day of imagery collection, transit to La Jolla
12 November	No Operations	La Jolla	Crew time off.
13 November	ROV Operations	Inside San Diego-Scripps Coastal SMCA, Inside Matlahuayl SMR, Outside Matlahuayl SMR	Full day of imagery collection.
14 November	ROV Operations	Inside San Diego-Scripps Coastal SMCA, Outside Matlahuayl SMR	Full day of imagery collection.
15 November	ROV Operations	Inside San Diego-Scripps Coastal SMCA	½ day of imagery collection, ROV maintenance and repair.
16 November	ROV Operations/ Transit	Inside Dana Point SMCA, Inside Laguna Beach SMCA (No-Take), Inside Crystal Cove SMCA, Inside Laguna Beach SMR	Full day of imagery collection.
17 November	ROV Operations	Inside Laguna Beach SMR, Inside Laguna Beach SMCA (No-Take), Inside Crystal Cove SMCA, Inside Laguna Beach SMR	Full day of imagery collection.
18 November	ROV Operations	Inside Laguna Beach SMR, Inside Laguna Beach SMCA (No-Take), Outside Laguna Beach SMCA (No-Take)	Full day of imagery collection.
19 November	ROV DEMOB	Southern California Marine Institute	End of cruise.

ROV Sampling

The *ROV Beagle* (below) was configured with two video cameras (forward-oblique and down-looking), a down-looking digital still camera, as well as paired down-looking and forward-looking lasers for estimating size of organisms. The vehicle was also equipped with an altimeter and was "flown" at an altitude of approximately 0.6 – 0.8 m above the seafloor at a speed of approximately 0.5-0.75 knots. Transects were positioned to optimize imagery collection in all three substrate types (unconsolidated, rocky, and mixed) within each site based on high-resolution topographic maps of the seafloor.

Figure 2. The ROV "*Beagle*" during deployment in southern California.

The ROV was equipped with five geo-referenced cameras (forward-looking video and digital still, down-looking video and digital still, and rear facing video), two Quartz halogen HMI lights, paired forward- and down-looking lasers, and a strobe for still photos. The ROV was also equipped with an altimeter, forward-facing multibeam sonar, and a CTD. The position of the ROV on the seafloor was maintained by the Trackpoint III ® acoustic positioning system with the resulting coordinates logged into Hypack® navigational software. The ROV was 'flown' over the seafloor at a mean altitude of 0.8 m and a speed of approximately 0.6 knots. Completed transects for each site are shown below in the summaries for each site.

Sampling Effort

Imagery was collected during each of the fourteen planned operational days of the cruise. Some partial days were lost due to transiting among study sites and for ROV repairs. ROV surveys covered over 55km of the seafloor at depths from 10-220m.

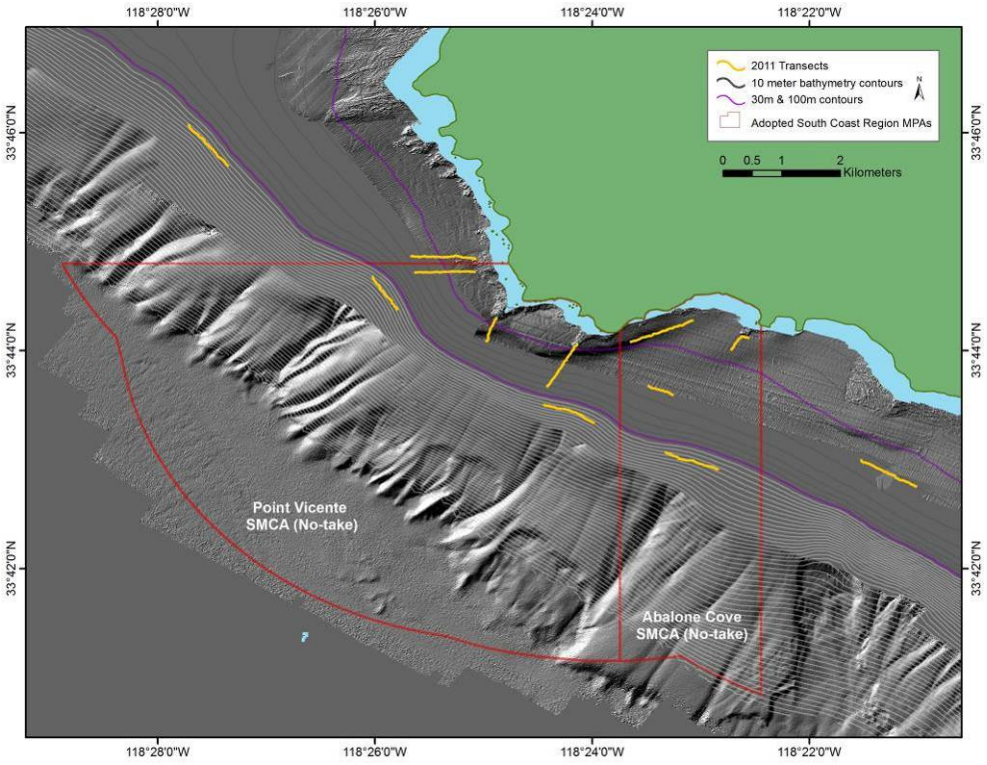
Table 2. Summary of ROV sampling effort

Study Site	Treatment	Transects	Km Surveyed
Point Vicente	Abalone Cove SMCA	4	2.73
	Point Vicente SMCA (no-take)	5	3.85
	Outside	3	2.93
	Total:	**12**	**9.50**
Catalina	Farnsworth Onshore SMCA	2	2.35
	Farnsworth Offshore SMCA	9	12.42
	Outside	5	4.59
	Total:	**16**	**19.35**
La Jolla	San Diego-Scripps Coastal SMCA	10	5.89
	Matlahuayl	3	2.59
	Outside	5	4.08
	Total:	**18**	**12.56**
	Canyon Rim Transects	6	6.77
	Canyon Wall (vertical) Transects	7	0.97
Laguna	Crystal Cove SMCA	1	0.88
	Laguna Beach SMR	5	2.70
	Laguna Beach SMCA (no-take)	2	1.83
	Dana Point SMCA	1	1.10
	Outside	3	1.76
	Total:	**12**	**8.28**

Site Summaries

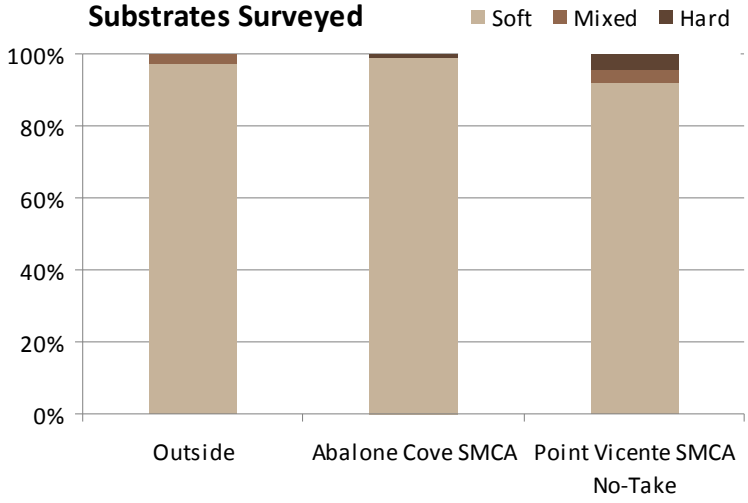
Below we provide summaries of the work conducted to-date at each of the four locations within the South Coast Study region, including the substrates surveyed with the ROV and taxonomic distribution and abundance plots depicting the results of rapid assessments conducted on selected transects across the study region.

Point Vicente Study Site (Abalone Cove SMR & Pt Vicente SMCA)



Survey dates:	5-7 Nov 2011	**Number of dives:**	12
Linear distance:	9.5km	**Total video time:**	11hr 53min
Min. bottom depth:	10m	**Number still photos:**	1468
Max. bottom depth:	167m		

Substrates were classified as (1) Hard, including large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Soft sediment. The figure to the right depicts the relative abundance of each substrate within and outside the MPAs, as well as the relative abundance of the area surveyed with the ROV. Effort was made to sample in each of the substrates within each MPA treatment, though with a focus on hard and mixed substrates where they occurred.

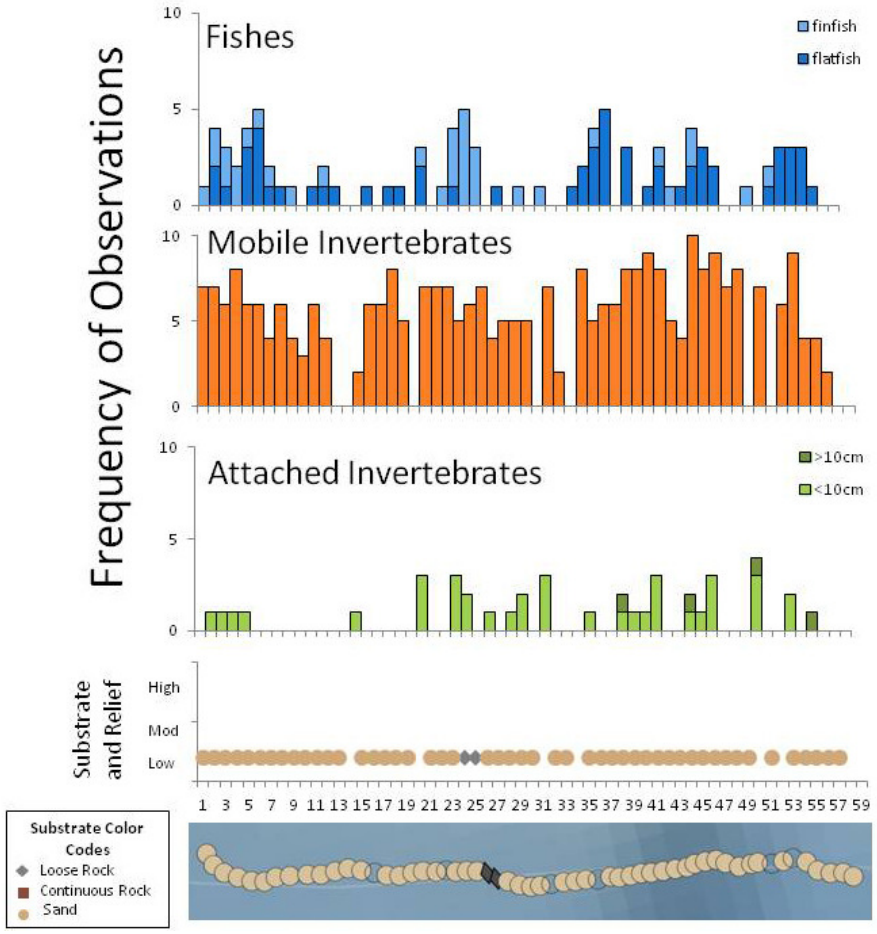


Point Vicente Study Site (Abalone Cove SMR & Pt Vicente SMCA)

Common Organisms Observed

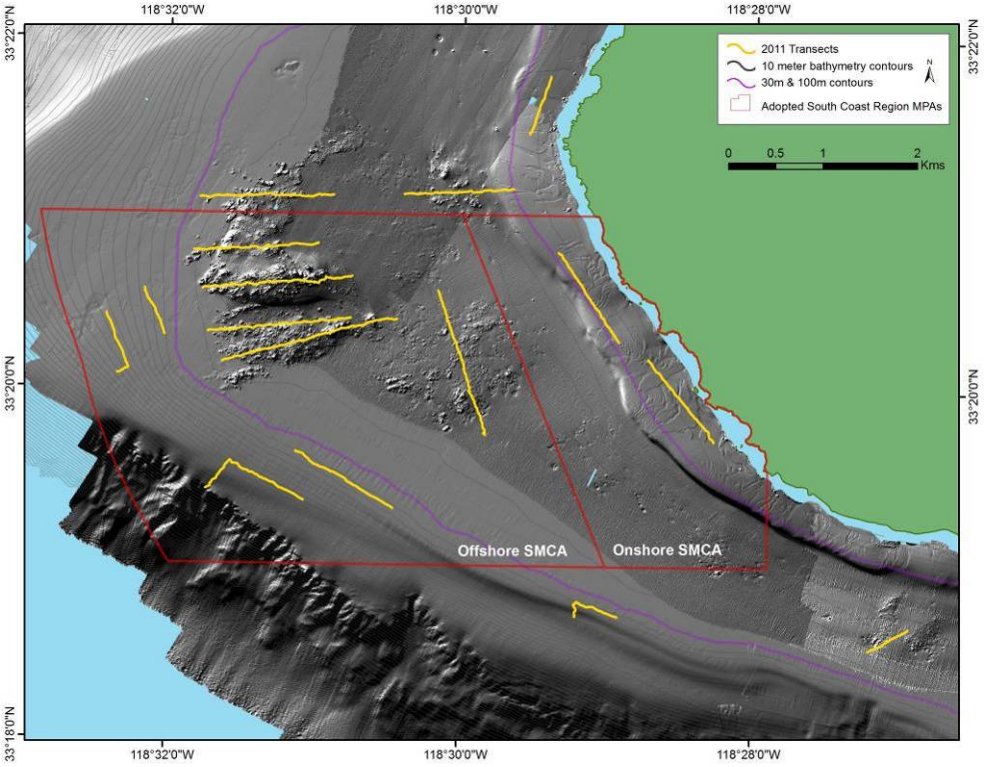
Soft Sediments
California lizardfish (*Synodus lucioceps*)
Halfbanded Rockfish (*Sebastes semicinctus*)
Longspine combfish (*Zaniolepis latipinnis*)
Shortspine combfish (*Zaniolepis frenata*)
Sanddab (*Citharichthys sp*)
Brittle star (Ophiuroidea)
Sea pens and whips (Octocorallia sp)
Sandstar (*Luidia sp)*

Rocky Reefs
Painted Greenling (*Oxylebius pictus*)
Gorgonian complex (Gorgonacea)
Strawberry anemone (*Corynactis californica*)
Sponges



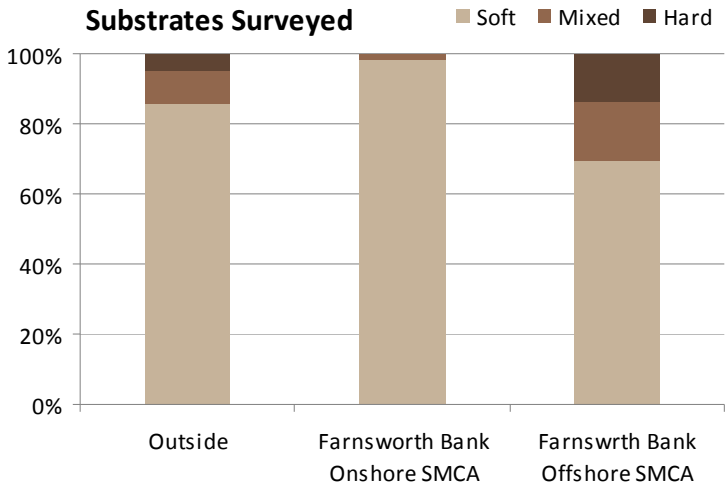
A taxonomic distribution and abundance plot (TDAP, above) depicting rapid assessment data from a representative transect from the Point Vicente Study Site shows ubiquitous soft sediment and abundant mobile invertebrates (mostly urchins).

Catalina Island Study Site (Farnsworth Bank Offshore & Onshore SMCAs)



Survey dates:	8-11 Nov 2011	**Number of dives:**	11
Linear distance:	19.35km	**Total video time:**	21 hrs 29min
Min. bottom depth:	21.6 m	**Number still photos:**	3559
Max. bottom depth:	224.7 m		

Substrates were classified as (1) Hard, including large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Soft sediment. The figure to the right depicts the relative abundance of each substrate within and outside the MPAs, as well as the relative abundance of the area surveyed with the ROV. Effort was made to sample in each of the habitats within each MPA treatment, though with a focus on hard and mixed substrates where they occurred.

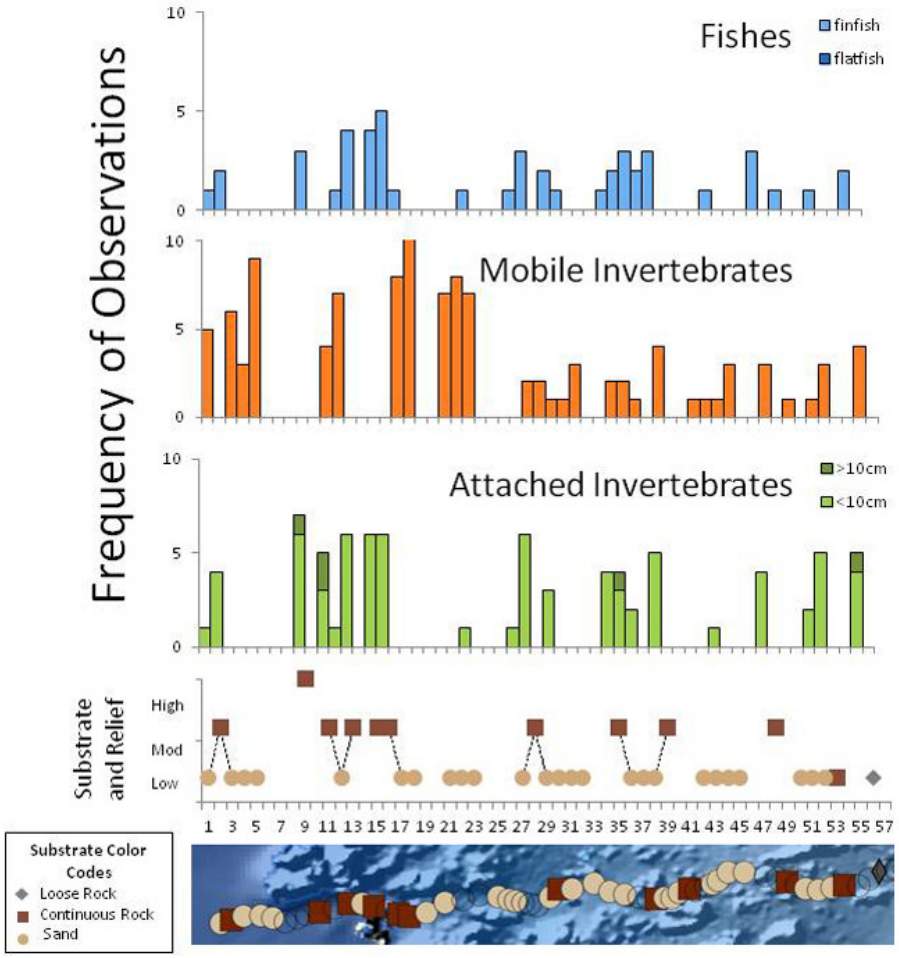


Catalina Island Study Site (Farnsworth Bank Offshore & Onshore SMCAs)

Common Organisms Observed

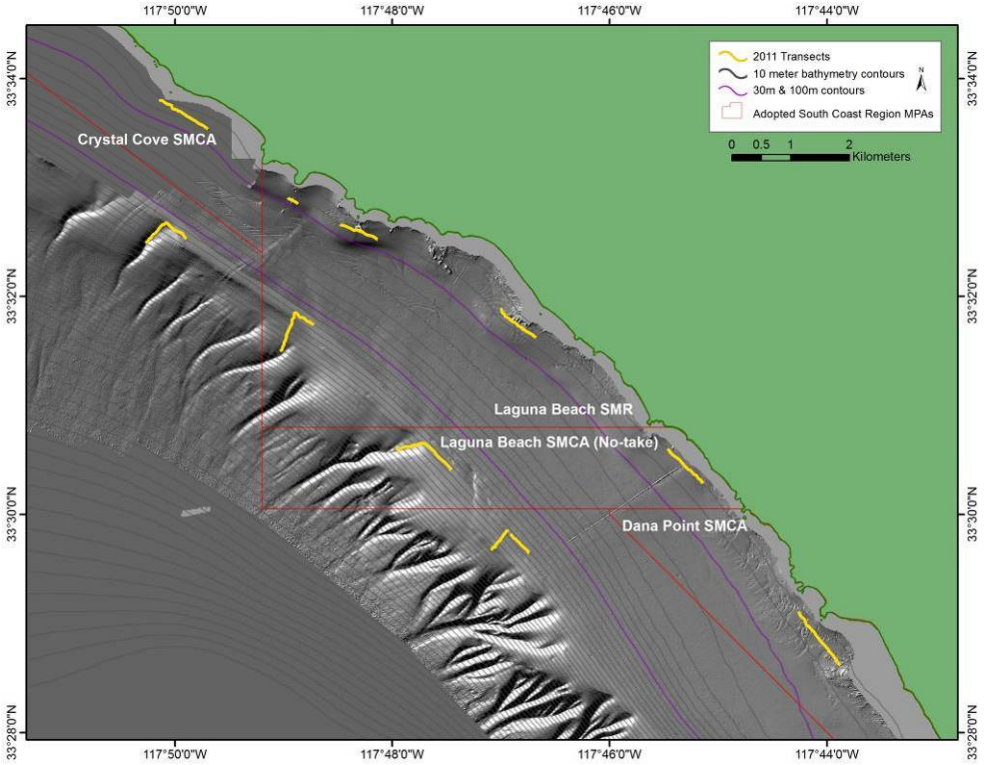
Soft Sediments
CA Scorpion Fish (*Scorpaena guttata*)
Halfbanded Rockfish (*Sebastes semicinctus*)
Pink Sea Perch (*Zalembius rosaceus*)
Sanddab (*Citharichthys sp*)
Brittle star (Ophiuroidea)
Sea pens and whips (Octocorallia sp)
Sandstar (*Luidia sp)*

Rocky Reefs
CA Sheephead (*Semicossyphus pulcher*)
Senorita (*Oxyjulis californica*)
Blacksmith (*Chromis punctipinnis*)
Blackeyed goby (*Rhinogobiops nicholsii*)
Pacific Electric Ray (*Torpedo Californica*)
Hydrocoral (*Stylaster californicus*)
Gorgonian (Gorgonacea sp)
Urchin (Echinoidea *sp)*



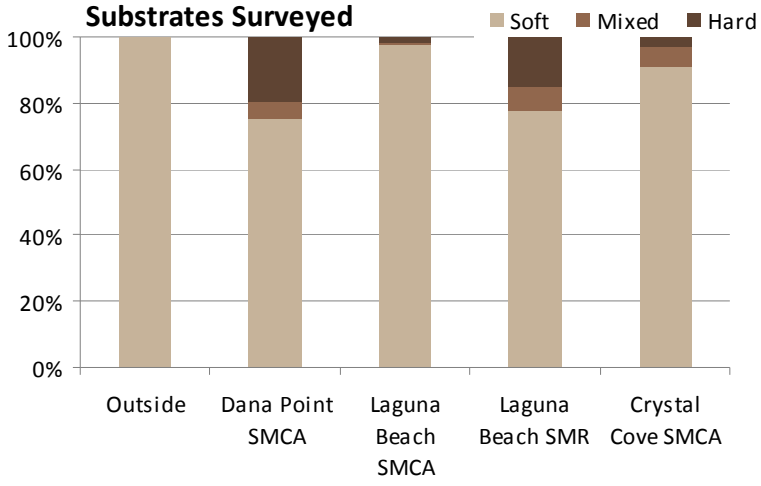
A taxonomic distribution and abundance plot (TDAP, above) of rapid assessment data from a representative transect from the Farnsworth Bank Study Site shows rocky reef mixed with sandy patches. High relief rocks often support high relief attached invertebrate structure (often, purple hydrocoral)

Laguna Study Site (Crystal Cove SMR, Laguna Beach SMCAs, Dana Point SMCA)



Survey dates:	17-18 Nov 2011	**Number of dives:**	12
Linear distance:	8.3km	**Total video time:**	7 hrs 53min
Min. bottom depth:	10.1 m	**Number still photos:**	1182
Max. bottom depth:	205.7		

Substrates were classified as (1) Hard, including large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Soft sediment. The figure to the right depicts the relative abundance of each substrate within and outside the MPAs, as well as the relative abundance of the area surveyed with the ROV. Effort was made to sample in each of the substrates within each MPA treatment, though with a focus on hard and mixed substrates where they occurred.

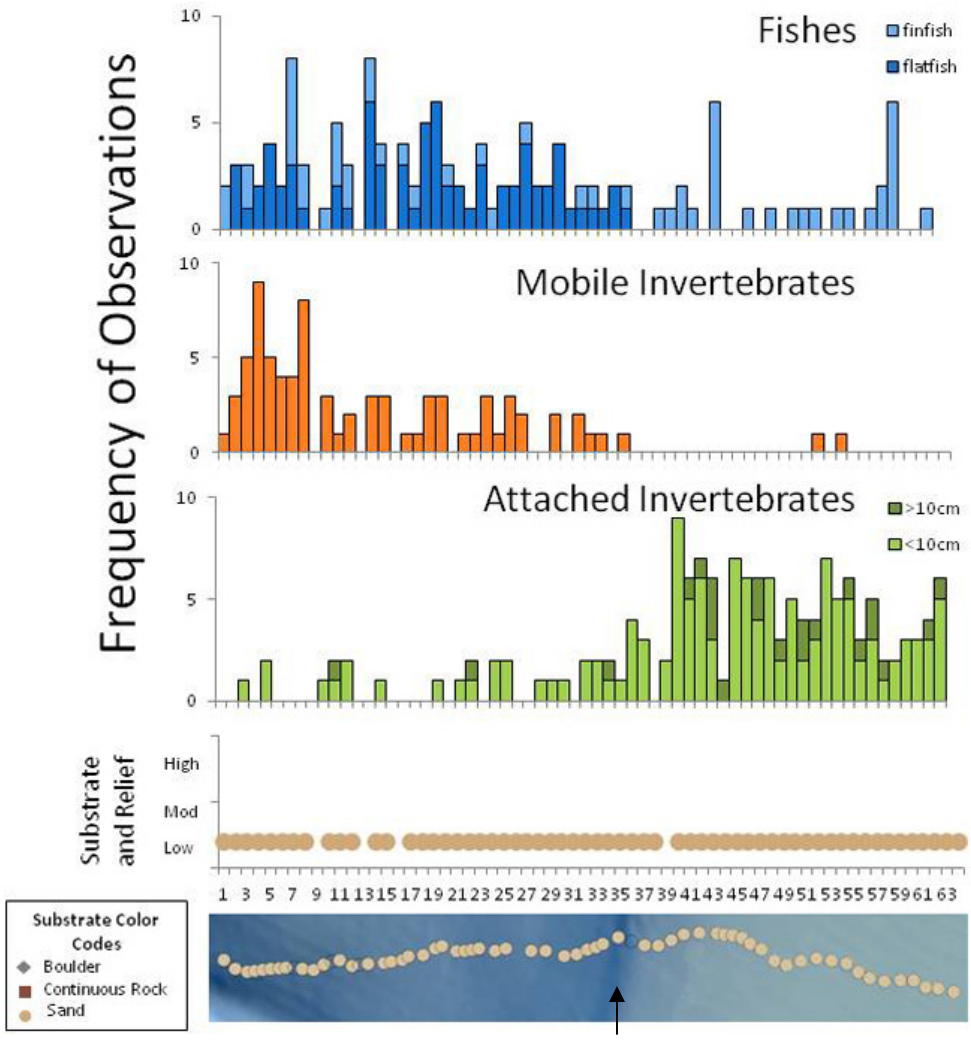


Laguna Study Site (Crystal Cove SMR, Laguna Beach SMCAs, Dana Point SMCA)

Common Organisms Observed

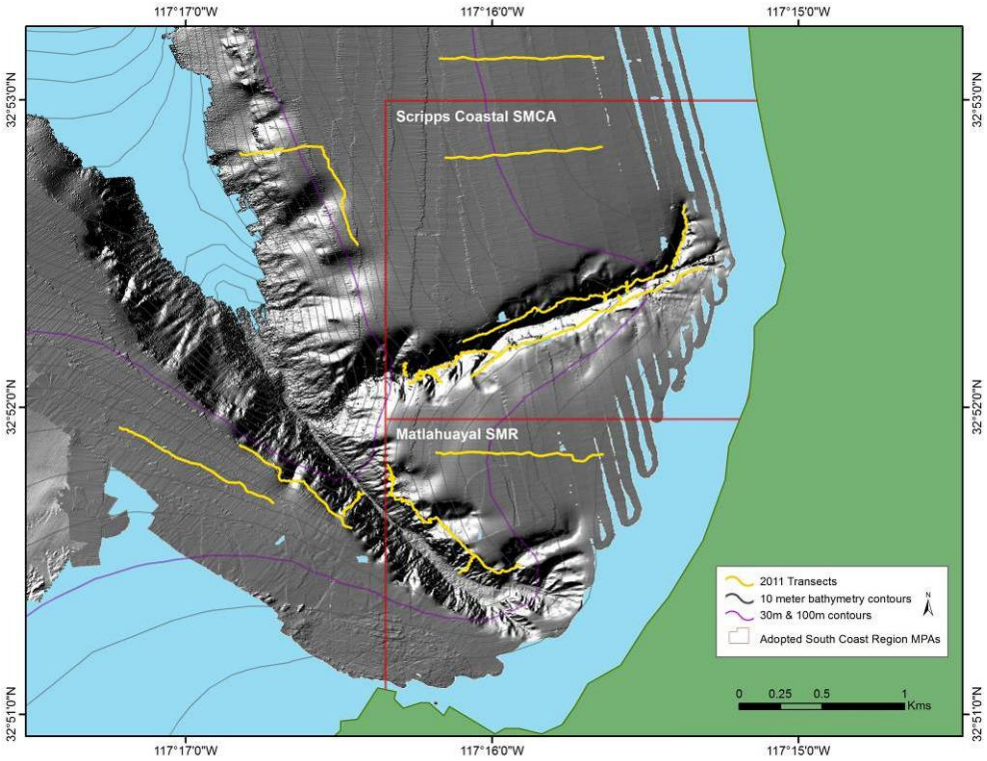
Soft Sediments
CA Lizardfish (*Synodus lucioceps*)
Sanddab (*Citharichthys sp*)
Sandstar (*Luidia sp)*

Rocky Reefs
Blacksmith (*Chromis punctipinnis*)
Blackeyed goby (*Rhinogobiops nicholsii*)
Garabladi (*Hypsypops rubicundus*)
Strawberry anemone (*Corynactis californica*)
Gorgonian (Gorgonacea sp)
Urchin (Echinoidea *sp)*

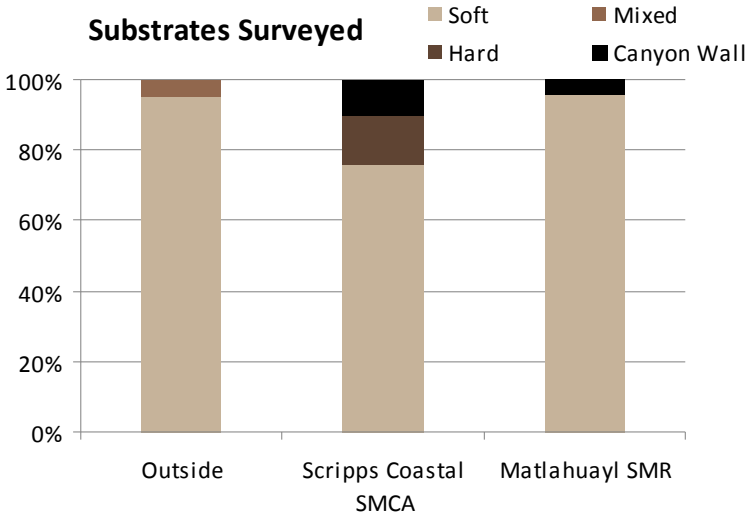


A taxonomic distribution and abundance plot (TDAP, above) of rapid assessment data from a representative transect from the Laguna Beach Study Site shows ubiquitous soft sediments. Attached invertebrate abundance increases when flatfish and mobile invertebrate abundances decrease, as the survey clears the edge of the continental shelf (arrow).

La Jolla (Scripps Coastal SMCA, Matlahuyal SMR)



Survey dates:	13-16 Nov 2011	**Number of dives:**	14
Linear distance:	12.6km	**Total video time:**	15 hrs 32min
Min. bottom depth:	68.1 m	**Number still photos:**	2146
Max. bottom depth:	222.8m		

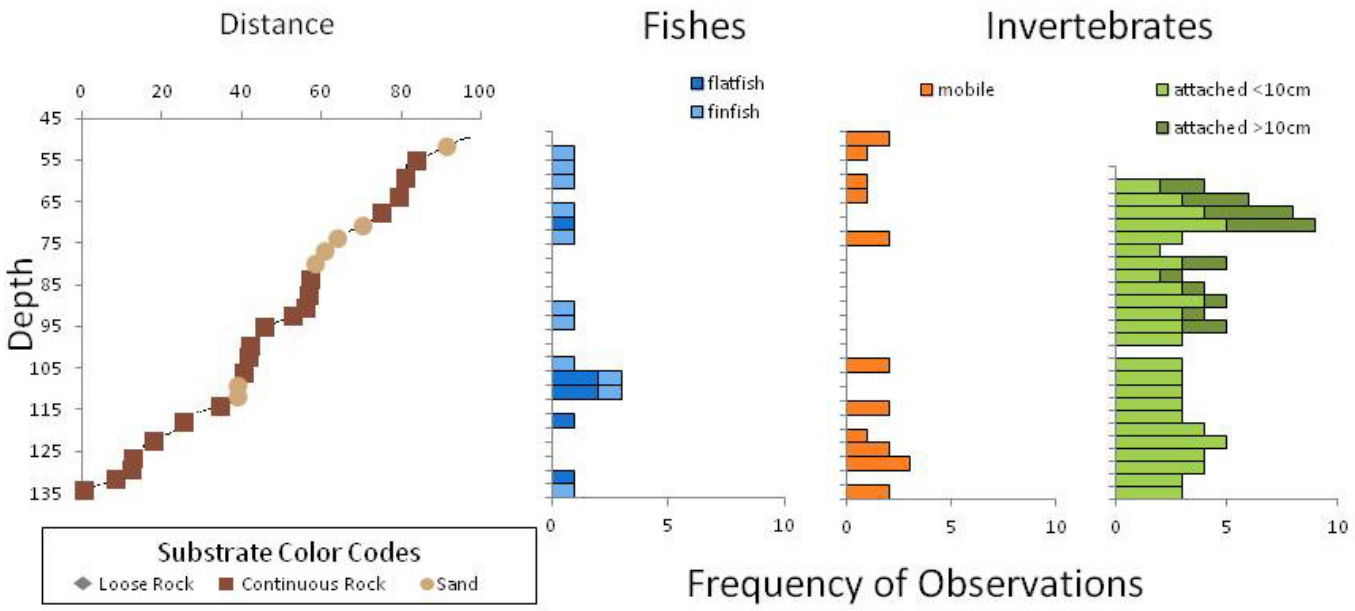


Substrates were classified as (1) Hard, including large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Soft sediment, including soft sediment veneer over underlying hard substrates that cannot be verified. The figure to the right depicts the relative abundance of each substrate within and outside the MPAs, as well as the relative abundance of the area surveyed with the ROV. Effort was made to sample in each of the substrates within each MPA treatment, though with a focus on canyon wall habitats at this location.

Common Organisms Observed

Soft Sediments
CA Scorpion Fish (*Scorpaena guttata*)
Halfbanded Rockfish (*Sebastes semicinctus*)
Gorgonian (*Gorgonacea sp*)
Spot Prawn (*Pandalus platyceros*)
Squat Lobster (*Galatheoidea*)
Basket star (*Gorgonocephalus eucnemis*)
Market squid (*Loligo opalescens*)

Rocky Reefs
CA Sheephead (*Semicossyphus pulcher*)
Senorita (*Oxyjulis californica*)
Blacksmith (*Chromis punctipinnis*)
Blackeyed goby (*Rhinogobiops nicholsii*)
Pacific Electric Ray (*Torpedo Californica*)
Hydrocoral (*Stylaster californicus*)
Gorgonian (Gorgonacea sp)
Urchin (Echinoidea *sp)*



A vertical taxonomic distribution and abundance plot (TDAP, above) of rapid assessment data from canyon wall transect at the La Jolla Study Site shows a steed rocky wall. Attached invertebrate abundance increases as the transect moves up the wall and more soft sediments are observed.

Outreach Efforts

Invited talks:

January 2012. *Through a Glass Darkly: Characterizing the Deep*. Pacific Grove Rotary, Pacific Grove, CA.

February 2012. *What Does it Mean to Characterize?* Castroville Rotary, Castroville, CA.

March 2012. *Beneath the Blue: Exploration of the Carmel Canyon and Beyond*. Carmel Rotary, Carmel-by-the-Sea, CA.

April 2012. *Into the Deep*. Sanctuary Currents Symposium, Seaside, CA.

Upcoming Presentations:

Contributed talk:
October 2012. *Baseline on the Backside: Monitoring Western Catalina Island's Farnsworth Bank State Marine Conservation Areas, Year 1*. California Islands Symposium, Ventura, CA.

Contributed poster:
October 2012. *The Newest Voyage of the Beagle (the ROV, that is): Baseline Characterization and Monitoring of State Marine Protected Areas Along the South Coast*. California Islands Symposium, Ventura, CA.

Appendix A: Species Observed *To-Date*

Scientific Name	Common Name
Fishes	
Agonidae	Poacher
Argentinia sialis	Pacific Argentine
Citharichthys sordidus	Speckled Sanddab
Citharichthys stigmaeus	Pacific Sanddab
Cottidae	Sculpin
Glyptocephalus zachirus	Rex Sole
Hippoglossus stomata	Bigmouth Sole
Hypsypops rubicundus	Garibaldi
Oxyjulis californica	Senorita
Ophiodon elongatus	Lingcod
Oxylebius pictus	Painted Greenling
Paralabrax clathratus	Kelp Bass
Parophrys vetulus	English Sole
Peprilus similimus	Pacific Butterfish
Plectobranchus evides	Bluebarred prickleback
Pleuronectiformes	Flatfishes Unidentified
Raja sp.	Skates
Rhacochilus toxotes	Rubberlip Surfperch
Rhinogobiops nicholsii	Blackeye Goby
Sebastes carnatus	Gopher Rockfish
Sebastes caurinus	Copper Rockfish
Sebastes chlorostictus	Greenspotted Rockfish
Sebastes constellatus	Starry Rockfish
Sebastes dallii	Calico Rockfish
Sebastes elongates	Greenstriped Rockfish
Sebastes entomelas	Widow Rockfish
Sebastes flavidus	Yellowtail Rockfish
Sebastes hopkinsi	Squarespot Rockfish
Sebastes miniatus	Vermilion Rockfish
Sebastes mystinus	Blue Rockfish
Sebastes pinniger	Canary Rockfish
Sebastes rosaceus	Rosy Rockfish
Sebastes rubrivinctus	Flag Rockfish
Sebastes semicinctus	Halfbanded Rockfish
Sebastes serranoides	Olive Rockfish
Sebastes sp.	Rockfish
Sebastes wilsoni	Pygmy Rockfish
Sebastomus spp	Sebastomus
Torpedo Californica	Pacific Electric Ray
Zalembius rosaceus	Pink Surfperch
Zaniolepis frenata	Shortspine Combfish

Zaniolepis latipinnis	Longspined Combfish
Zoarcidae	Eelpout
Chromis punctipinnis	Blacksmith
Sebastes paucispinis	Bocaccio Rockfish
Synodus lucioceps	California Lizardfish
Scorpaena guttata	California Scorpionfish
Semicossyphus pulcher	California Sheephead
Zaniolepis	Combfish

Mobile Invertebrates

Cancer magister	Dungeness crab
Loxorhynchus grandis	Sheep crab
Mundia sp.	Squat lobster
Stomatopoda	Mantis shrimp
Sicyonia ingentis	Ridgeback prawn
Pandalus platyceros	Spot prawn
Aplysia californica	California sea hare
Hermissinda crassicornis	Nudibranch
Pleurobranchea sp.	Sea slug
Grimpoteuthis sp.	Dumbo octopus
Loligo opalescens	Market squid
Octopods	Octopods
Strongolocentrotus franciscanus	Red urchin
Strongolocentrotus purputatus	Purple urchin
Cypraea spadicea	Chestnut cowrie
Euspira lewisii	Moon snail
Kelletia kelletii	Kellets whelk
Megathura crenulata	Giant keyhole limpet
Parastichopus sp.	Sea cucumber
Asterina miniata	Bat star
Ceramaster sp.	Asteroid
Dermasterias imbricata	Leather star
Henricia sp.	Asteroid
Luidia sp.	Sand star
Mediaster aequalis	Asteroid
Ophiuroidea	Brittlestar
Orthasterias koehleri	Rainbow star
Pycnopodia helianthoides	Sunflower star
Solaster stimpsoni	Asteroid

Sessile and functionally sessile invertebrates

Bryzoan	Bryzoan
Stylaster californicus	California hydrocoral
Halipteris californicus	Sea whip
Stylatula spp.	Octocoral

Pennatula sp.	Sea pen
Ptilosarcus gurneyi	Sea pen
Crinoidea	Crinoid
Hydrozoa	Hydroid
Porphera	Sponge
Tunicata	Tunicate
Corynactis californica	Strawberry anemone
Balanophyllia spp.	Cup coral
Gorgonian complex	Gorgonacea
Dromelia alexandri	Benthic siphonophore
Gorgonocephalus eucnemis	Basket star
Brachiopoda	Brachiopod