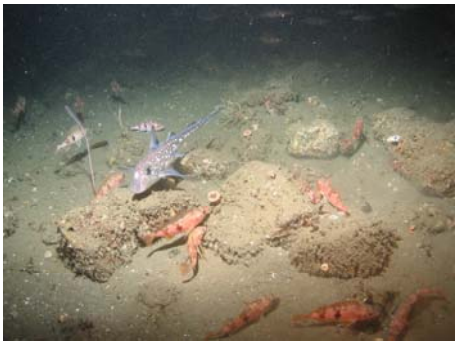
Baseline Characterization and Monitoring of the Marine Protected Areas in the South Coast Study Region and surrounding San Clemente Island: ROV Surveys of the Subtidal (20-450m)

Annual Report (Year 2)

A Report to California Sea Grant, Project Number RMPA-26A
30 September 2013



Ratfish (*Hydrolagus colliei*) and Halfbanded Rockfish (*Sebastes semicinctus*), offshore Point Vicente, CA (90m depth)

Copper and Honeycomb Rockfish (*Sebastes caurinus and umbrosus*) in at Farnsworth Bank, offshore of Catalina Island, CA (75m depth)

Vermilion Rockfish (*Sebastes miniatus*) in La Jolla Canyon, offshore La Jolla , CA (70m depth)

Invertebrates and rockfishes, off of San Clemente Island's eastern shore (380m depth)

Submitted by:
James Lindholm and Ashley Knight[1]
Dirk Rosen[2]

With data processing support from:
Bryon Downey, Michael Esgro, Molly Fredle, Matt Jew, Heather Kelley, Elizabeth Lopez, Rhiannon McCollough, Jessica Moye, Devon Warawa, and Jessica Watson[1]

Andy Lauermann, Rick Botman, Yuko Yokozawa, and Steve Holz[2]

1 – Institute for Applied Marine Ecology (IfAME), California State University Monterey Bay
2 – Marine Applied Research and Exploration (MARE)

Acknowledgements

Funding provided by:
California Ocean Protection Council
California Sea Grant
United States Department of Defense
Undergraduate Research Opportunity Center (UROC) at CSU Monterey Bay
James W. Rote Professorship of Marine Science & Policy at CSU Monterey Bay

Key Partnerships:
Dr. William Head and Jessica Brown - Undergraduate Research Opportunity Center (UROC) at CSU Monterey Bay
Local fishermen – Captain Tim Maricich and the crew of the FV *Donna Kathleen*
Southern California Marine Institute (SCMI)

Table of Contents

Summary

This report summarizes year two (2012), the final year of data collection for 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 (20-450m) 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. Also included in this report is a summary of the first year (2012) of a two-year baseline survey conducted at San Clemente Island's Navy Exclusion Zones and paired control sites. In an effort to accompany the Marine Life Protection Act baseline monitoring, the Navy contracted the IfAME and MARE to collect similar baseline data in areas closed to fishing within the Naval jurisdiction surrounding San Clemente Island.

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 video imagery for use in future analyses. We completed our objectives by assembling over 70 hours of video imagery and 6500 still photographs, documenting over 70 km of seafloor.

The four locations we surveyed were selected to include sites across the full extent of the study region, including the mainland and offshore islands. They were, from north to south: 1) Point Vicente and Abalone Cove State Marine Conservation Areas (SMCAs); 2) Catalina Island's Farnsworth Bank SMCAs; 3) La Jolla's Matlahuayl State Marine Reserve (SMR) and Scripps Coastal SMCA; and 4) San Clemente Island Zones B, C, D, F, G, and Wilson Cove. 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.

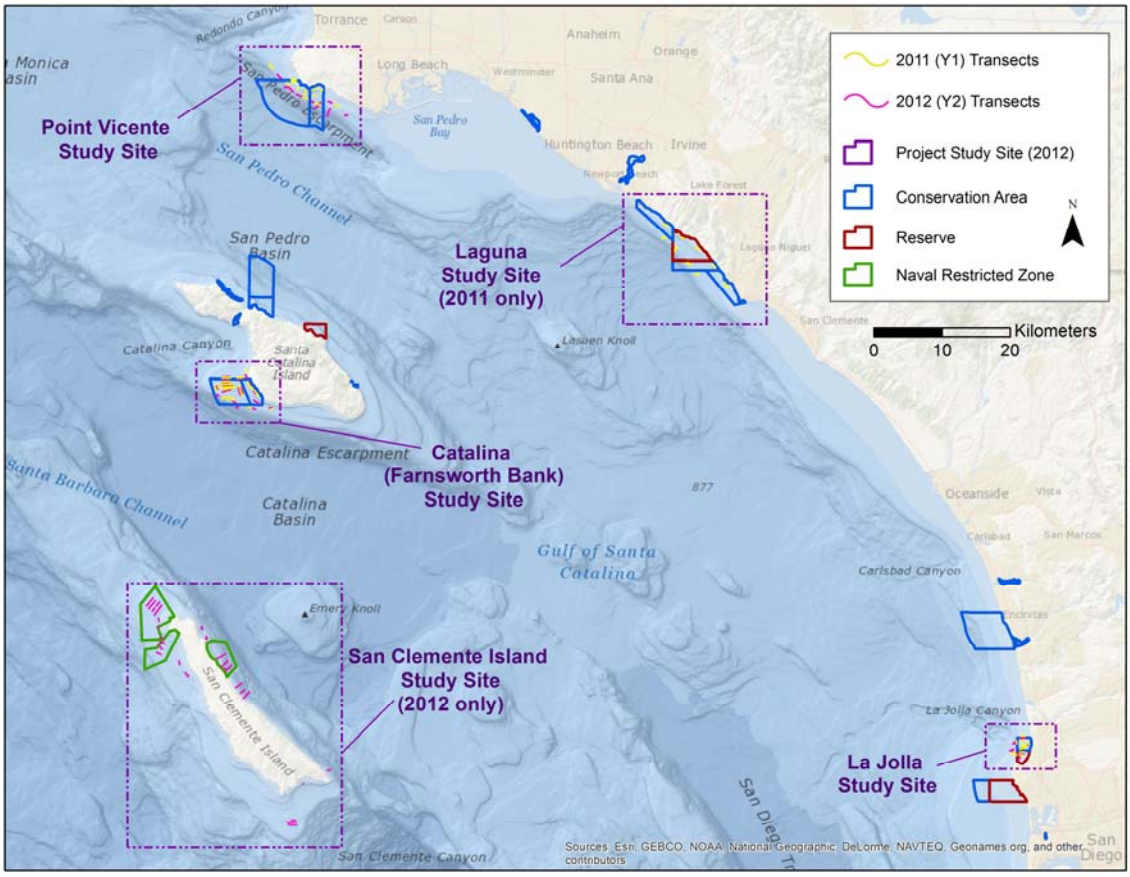


Figure 1. Map of study locations (purple squares) across the South Coast Study Region.

Cruise Report

Cruise Dates: 11 November 2012 – 01 December 2012

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)

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
ROV Engineer:	Rick Botman (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 and at San Clemente Island. Visual surveys were conducted using the ROV *Beagle* (operated by project partners at MARE) on board the fishing vessel *Donna Kathleen.* Equipment was mobilized onboard in San Diego and demobilized at Santa Barbara Harbor.

This cruise was the second of two annual cruises for the larger study funded by Sea Grant. All sampling goals for year two were achieved, with additional ROV transects conducted at Catalina Island, Point Vicente, and La Jolla.

This cruise was the first of two cruises planned to establish the baseline characterization at the San Clemente Island Naval Exclusion Zones (a proxy to the state marine protected areas).

Table 1. Summary of daily operations for November-December 2012

Date	Operations	Location	Notes
11 Nov	MOB ROV	Mission Bay, San Diego	
12 Nov	ROV Operations	Inside Scripps Coastal SMCA	Test dive; Vertical transects
13 Nov	ROV Operations	Inside/outside Matlahuayl SMR	Vertical transects
14 Nov	ROV Operations	Inside/outside Matlahuayl SMR and Scripps Coastal SMCA	Regular (horizontal) transects
15 Nov	ROV Operations	Inside/outside Matlahuayl SMR and Scripps Coastal SMCA	
16 Nov	No Ops; Transit	From La Jolla to Catalina Study Site	
17 Nov	ROV Operations	Inside and outside Farnsworth Bank Onshore and Offshore SMCAs	
18 Nov	ROV Operations	Inside Farnsworth Bank Onshore and Offshore SMCAs	
19 Nov	ROV Operations	Inside and outside Farnsworth Bank Onshore and Offshore SMCAs	
20 Nov	ROV Operations	Inside and outside Farnsworth Bank Onshore and Offshore SMCAs	
21 Nov	ROV Operations; Transit	Inside and outside Farnsworth Bank Onshore and Offshore SMCAs	½ day of surveys at Catalina; then transit to San Clemente
22 Nov	ROV Operations	San Clemente; Zone B & Wilson	
23 Nov	ROV Operations	San Clemente Zone G	
24 Nov	ROV Operations	San Clemente Zone G & F	
25 Nov	ROV Operations	San Clemente Zone D & C	
26 Nov	ROV Operations	San Clemente Zone F & Wilson	
27 Nov	ROV Operations; Transit	San Clemente Zone Wilson & B	½ day SCI; transit to San Pedro Harbor
28 Nov	No operations	Point Vicente/San Pedro Harbor	Crew time off
29 Nov	ROV Operations	Inside/outside Abalone Cove SMR & Pt Vicente SMCA	
30 Nov	ROV Operations	Inside/outside Abalone Cove SMR & Pt Vicente SMCA	
01 Dec	ROV Operations; DeMOB ROV	Inside/outside Abalone Cove SMR & Pt Vicente SMCA	

ROV Sampling

The *ROV Beagle* (below) was configured with five cameras: two video cameras (forward-oblique and down-looking), one forward-looking digital still camera, one forward looking HD video, and a rear-facing safety video camera. Additionally, paired sizing lasers (spaced at 10cm) were visible in the all but the rear-facing camera. The ROV is also equipped with two HMI and two Quartz halogen lights, a strobe for the still camera, forward-facing sonar, and a CTD+DO_2.

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

The vehicle was also equipped with an altimeter and was "flown" at an altitude of approximately 0.2-0.3 m above the seafloor at a speed of approximately 0.5-0.7 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. The position of the ROV on the seafloor was derived by the Trackpoint III ® acoustic positioning system with the resulting coordinates logged into Hypack® navigational integration software, yielding subsea GPS position of the ROV on the seafloor. Completed transects for each site are shown below in the summaries for each site.

Sampling Effort

Imagery was collected during each of the seventeen planned operational days of the cruise. Some partial days were due to transiting among study sites and for ROV repairs. Two full days had no ROV operations and were used for either transit among sites or to give the boat and science crew a day off. ROV surveys covered over 70km of the seafloor at depths from 20-450m.

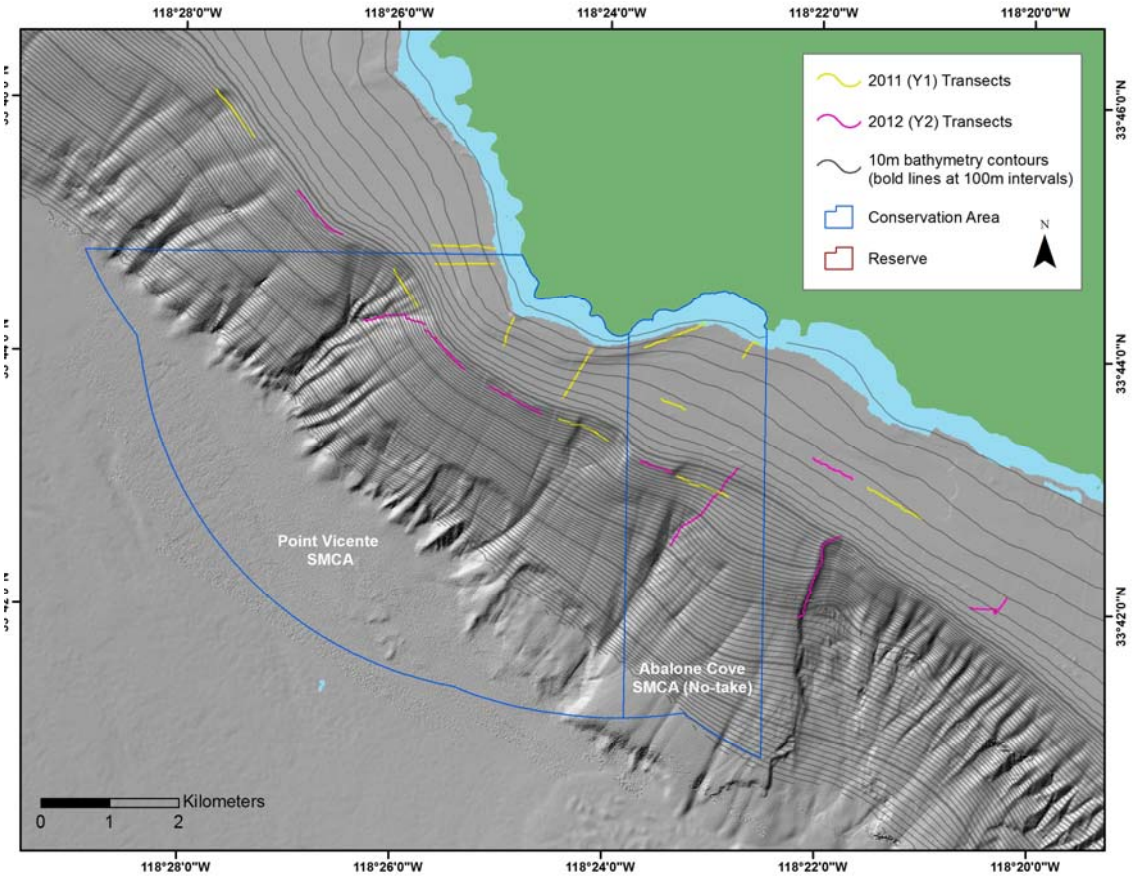
Table 2. Summary of ROV sampling effort

Study Site	Treatment		Transects	Km Surveyed
Point Vicente	Abalone Cove SMCA		2	2.16
	Point Vicente SMCA (no-take)		3	2.98
	Outside		4	4.11
		Total:	**9**	**9.25**
Catalina	Farnsworth Onshore SMCA		3	2.70
	Farnsworth Offshore SMCA		12	14.54
	Outside		6	5.44
		Total:	**21**	**22.68**
La Jolla	San Diego-Scripps Coastal SMCA		11	3.19
	Matlahuayl SMR		4	1.77
	Outside		6	3.73
		Total:	**21**	**8.69**
San Clemente Island	Zone B		3	4.01
	Zone C		1	0.59
	Zone D		3	3.88
	Zone F		6	5.49
	Zone G		7	9.34
	Zone W		7	7.53
		Total:	**27**	**30.83**
Year 2 Total			**78**	**71.45**

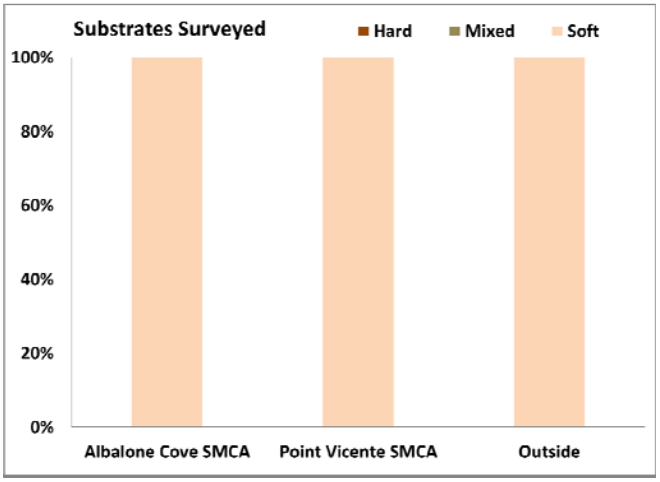
Site Summaries

Here, we provide summaries of the work conducted in year two at each of the three study sites within the South Coast Study region proposed in the research proposal, as well as at the additional study sites at San Clemente Island. Data include a brief summary habitats surveyed, the proportion of benthic substrates surveyed, a catalog of organisms observed at each site, and a map transects.

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



Survey dates:	29 Nov - 1 Dec 2012	**Number of dives:**	8
Linear distance:	9.5km	**Total video time:**	10hrs, 7min
Min. bottom depth:	10m	**Total still photos:**	756
Max. bottom depth:	391m		

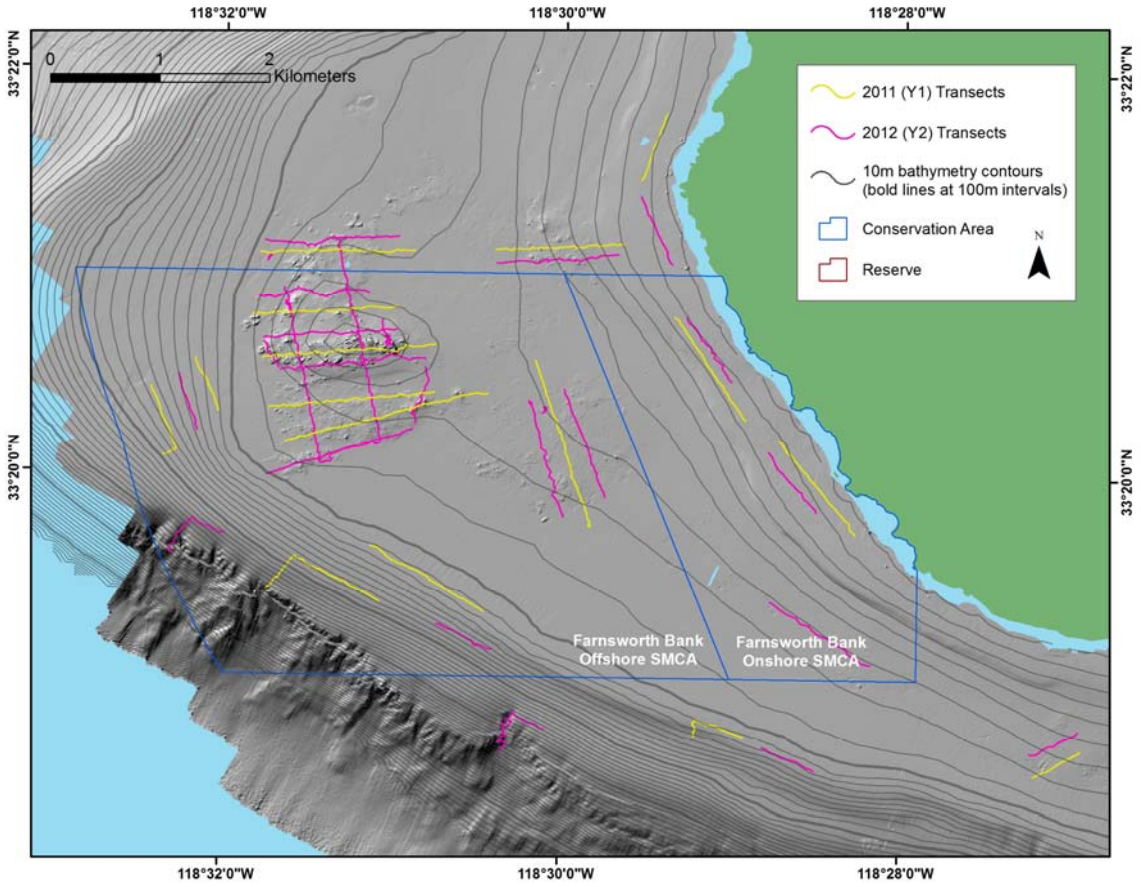


Substrates were classified as (1) Rocky, including the large pinnacles of Farnsworth Bank, large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Unconsolidated sediment, including soft sediment veneer over underlying hard substrates that cannot be verified. At this study site, all surveys were conducted over soft sediments. Poor visibility in areas shallower than 50m during the allotted sampling time restricted imagery collection to the outer shelf and canyons of the slope.

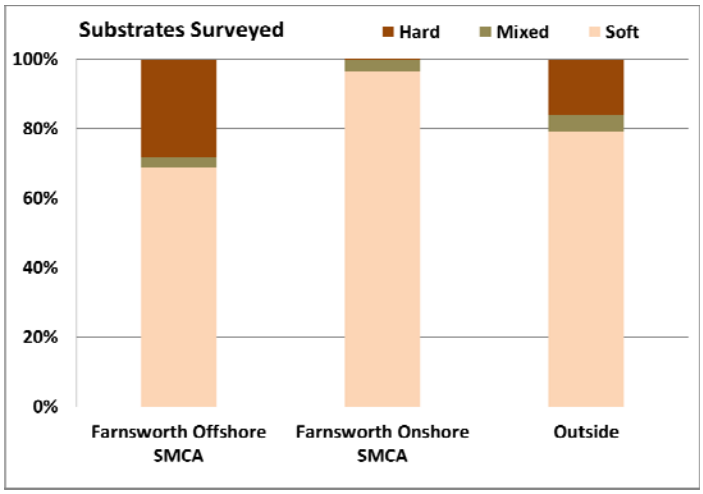
Notable Observations

- Large numbers of ridgeback prawns (*Sicyonia ingentis*) and spot prawns (*Pandalus playceros*) were observed in transects running perpendicular to the isobaths, up the canyons along the slope. There appears to be some differences in habitat selection between the two species, which is being investigated further.
- Large schools of Halfbanded Rockfish (*Sebastes semicinctus*) were observed along the shelf canyons.

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



Survey dates:	17-21 Nov 2012	Number of dives:	13
Linear distance:	22.7km	Total video time:	18hrs, 42min
Min. bottom depth:	3m	Total still photos:	2008
Max. bottom depth:	341m		



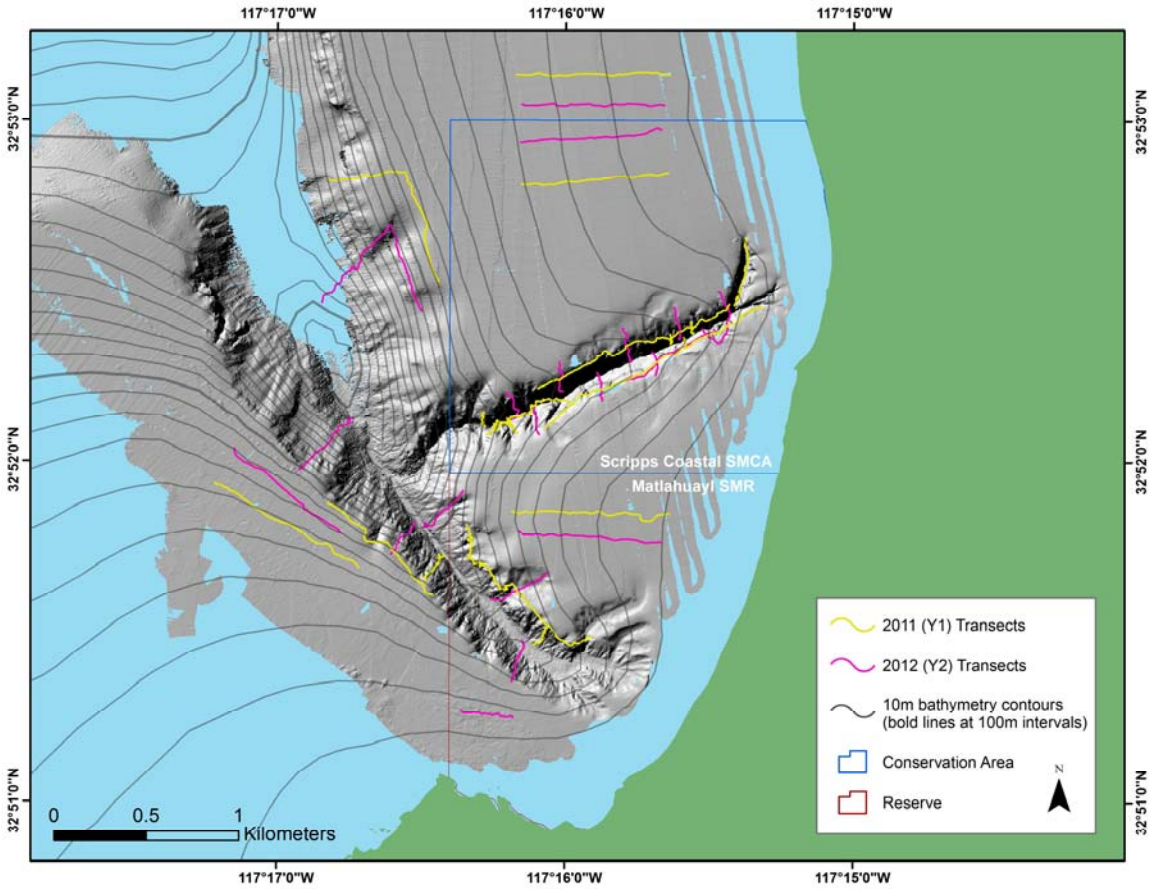
Substrates were classified as (1) Rocky, including the large pinnacles of Farnsworth Bank, large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Unconsolidated sediment, including soft sediment veneer over underlying hard substrates that cannot be verified. The figure to the right depicts the relative abundance of the area surveyed with the ROV. The offshore SMCA and the outside control sites were contained the highest concentrations of hard substrates. 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. Additional surveys included the canyons along the deep slope, which fall inside the Offshore SMCA.

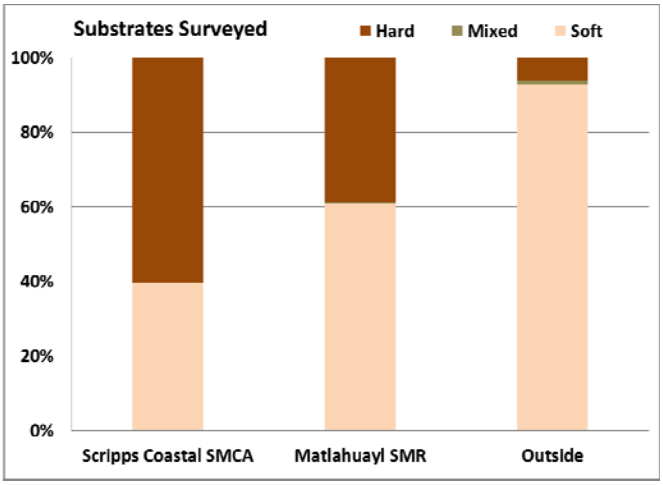
Notable Observations

- Many species of rockfishes (*Sebastes* spp.) were observed in the rocky outcrops and pinnacles of Farnsworth Bank proper. Commonly seen fishes included: Olive/yellowtail Rockfishes (*Sebastes flavidus/serranoides*), Vermilion Rockfish (*Sebastes miniatus*), Halfbanded Rockfish (*Sebastes semicinctus*), and Blue Rockfish (*Sebastes mystinus*).
- Other common fishes on the Bank included: California Sheephead (*Semicossyphus pulcher*), lingcod (*Ophiodon elongatus*), Pink Seaperch (*Zalembuis rosaceus*), and, though somewhat less common, Pacific Electric Ray (*Torpedo californica*).
- Surveys of the shelf canyons that fall within the Offshore SMCA revealed diverse, steep slopes with deepwater species including: Cowcod (*Sebastes levis*), Swordspine Rockfish (*Sebastes ensifer*), and the benthic siphonophore (*Dromelia alexandri*).
- Shallow, soft-bottom sites accounted for many sanddab (*Citharichthys* spp.) observations as well as squid egg clusters and the occasional mantis shrimp (i.e. *Hemisquilla ensigera californiensis*).

La Jolla (Scripps Coastal SMCA, Matlahuayl SMR)



Survey dates:	12-15 Nov 2012	**Number of dives:**	10
Linear distance:	8.7km	**Total video time:**	14hrs, 49min
Min. bottom depth:	10m	**Total still photos:**	1639
Max. bottom depth:	302m		

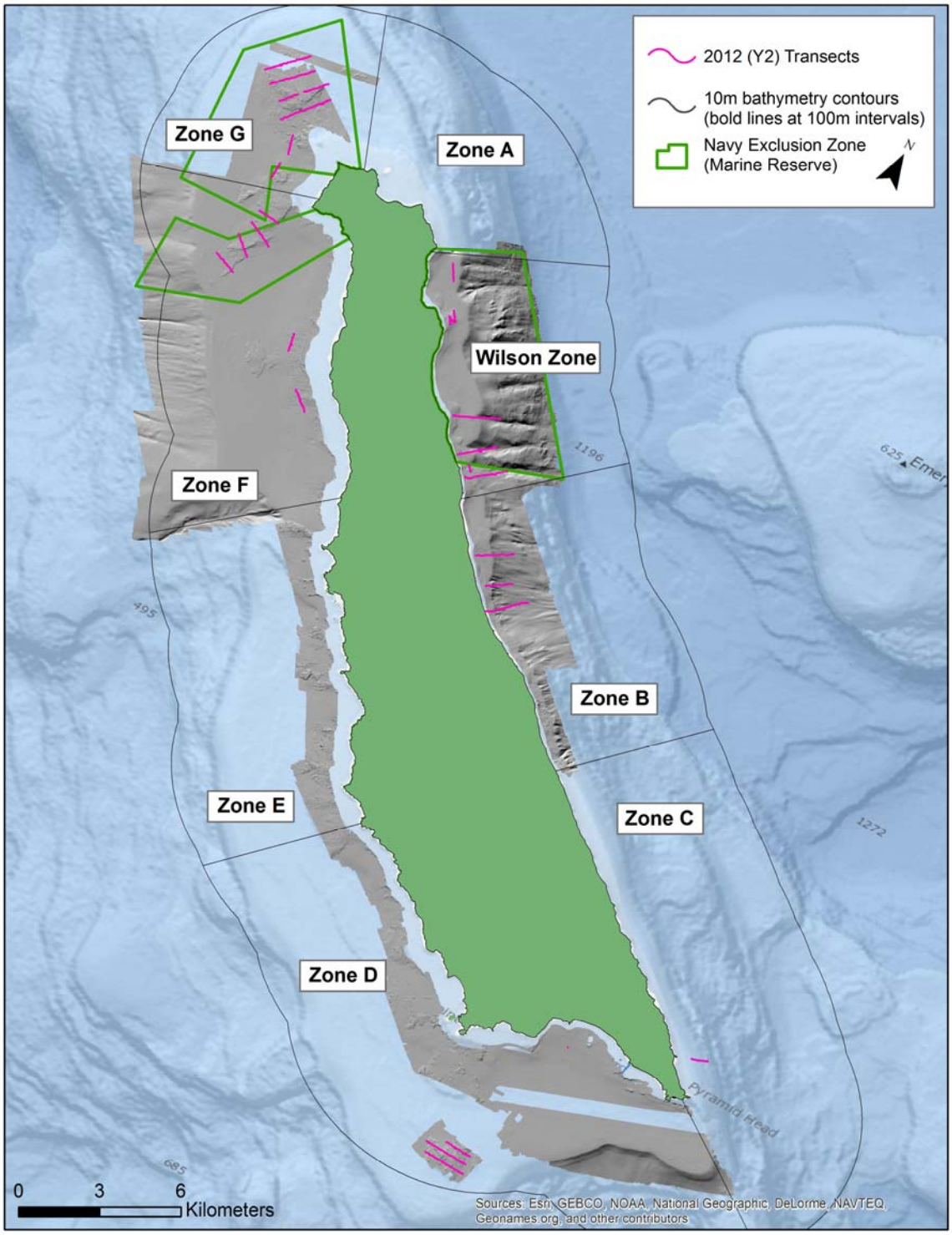


Substrates were classified as (1) Rocky, including large boulders, rocky outcrops, and some cobbles; (2) Mixed, including a combination of unconsolidated soft sediments with boulder, cobbles, or rock; and (3) Unconsolidated sediment, including soft sediment veneer over underlying hard substrates that cannot be verified. The figure to the right depicts 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.

Notable Observations

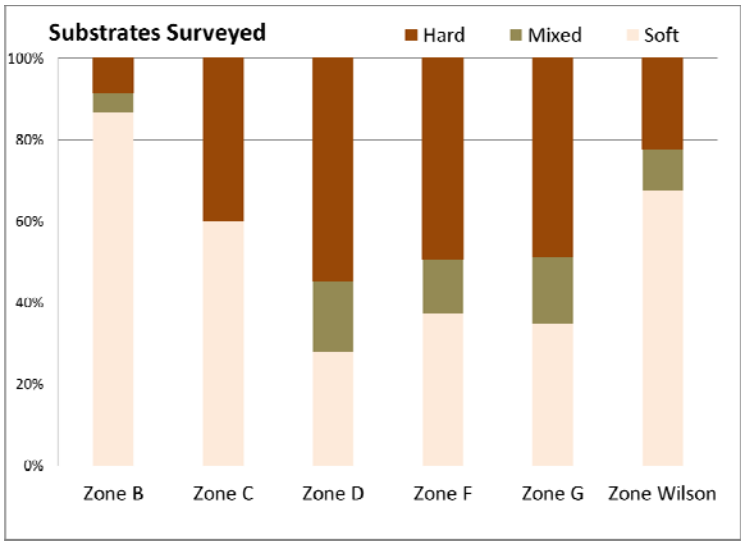
- A possible spawning aggregation of California Scorpionfish (*Scorpaena guttata*) was encountered within a cobble field along the shelf above Scripps Canyon (within the Scripps Coastal SMCA). Hundreds of these fishes were seen gathered in an area smaller than the size of a football field.
- A total of fourteen vertical transects were conducted traveling up the very steep walls of the La Jolla and Scripps Canyons. These transects will allow a description of how the organism and habitat availability changes along the steep canyon walls that make up an important ecosystem within these MPAs.
- Soft-bottom, shallow transects revealed organisms such as mantis shrimp, sea cucumbers, octopus, and California Lizardfish (*Synodus lucioceps*).

San Clemente Island Study Site (Naval Exclusion & Restricted Zones)



Survey dates:	22-27 Nov 2012	**Number of dives:**	24
Linear distance:	30.8km	**Total video time:**	26hrs, 24min
Min. bottom depth:	5m	**Total still photos:**	2489
Max. bottom depth:	457m		

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 the area surveyed with the ROV. Effort was made to sample in each of the substrates within each zone surrounding the island. On the steep slopes along the eastern edge of the island (Zones C, B, and Wilson), transects were conducted travelling up the soft sediment canyons of the slope. On the shallower shelf areas of the northwestern and southern areas of the island (Zones D, F, and G), transects were conducted over rocky outcrops as revealed by multibeam bathymetry.



Notable Observations

- Because the eastern side of the island slopes so dramatically, we conducted a number of transects perpendicular to the depth gradient (Zones C, B, Wilson) along canyons and ridges. These transects revealed many deeper species such as Aurora Rockfish (*Sebastes aurora*), Sablefish (*Anaplopoma fimbriata*), Squat lobsters (Family Galatheoidea), and Spot Prawns (*Pandalus platyceros*).
- Along the western, more gradually-sloping side of the island (Zone F), as well as the northern and southern tips (Zones G and D), we conducted a number of transects over shallower rocky outcroppings. Common organisms in these areas included rockfishes (*Sebastes* spp.), California Sheephead (*Semicossyphus pulcher*), Blacksmith (*Chromis punctipinnis*), various perches (Family Embiotocidae), gorgonians, and elk kelp (*Pelagophycus porra*).
- California Spiny Lobster (*Panulirus interruptus*) were seen in shallow rocky and boulder areas surrounding the entire island. There were many traps set for lobsters, often along the boundary lines of the no-take areas set by the Navy.
- In a number of areas, marine debris was observed providing vertical structure in otherwise low-relief terrain, possibly supporting a high diversity of organisms. These debris items included: a sunken barge covered in a derelict purse seine, derelict lobster traps, multiple discarded weapons casings, and a scuttled old submarine.

Outreach Efforts

Invited talks:

November 2012.*Through a glass darkly: Baseline characterization of California's MPAs.* Coastal and Watershed Science and Policy Seminar, CSU Monterey Bay.

January 2013. *Baseline characterization of California's MPA network*. Monterey Bay National Marine Sanctuary's Research Activities Panel, Seaside, CA.

January 2013. Presentation of South Coast MPA techniques to BOEM in Camarillo, CA.

January 2013. Presentation of South Coast MPA video and deepwater technologies at Claremont Middle School, Oakland, CA.

May 2013. *What is beneath the blue?* Oceans Week, Carmel River School, Carmel, CA.

May 2013. Presentation of South Coast ROV efforts to The Climate Ride, outside Leggett, CA.

May and June 2013. Presentation of South Coast MPA GIS products to San Francisco State University, San Francisco, CA.

May 2013. Various discussions in Washington DC with scientists, NGOs and foundations at the Blue Ocean Summit, 14-16 May, 2013.

June 2013. Presentation of South Coast MPA greatest hits video, and progress to date on the MPA front at the Sustainable Fish Dinner held at the South End Rowing Club, San Francisco, CA.

Legislative briefings:

April 2013. *Archiving the sea: Collecting a permanent record of California's MPAs and Beyond.* California Ocean Day, Sacramento.

Various discussions in Washington DC including with CA Congress people, the Ocean Foundation and at the Blue Ocean Summit, 14-16 May, 2013

September 2013. Various discussions with CDF&W, the Commission, and Resources Department about survey status in South Coast MPA monitoring in Sacramento, CA.

Appendix A: Species Observed

Below is a list (to-date) of species that were observed during 2012 data collection at all four study sites.

Scientific Name	**Common Name**					
Fishes			**Pt Vicente**	**Catalina**	**La Jolla**	**San Clemente**
Anoplopoma fimbria	Sablefish					✓
Cephaloscyllium ventriosum	Swell shark			✓		
Chilara taylori	Spotted cuskeel		✓		✓	
Chromis punctipinnis	Blacksmith			✓		✓
Citharichthys stigmaeus	Pacific sanddab			✓	✓	✓
Cottidae	Sculpin			✓		✓
Embiotoca jacksoni	Black surfperch			✓		
Facciolella equatorialis	Dogfaced witch-eel		✓	✓		
Family Agonidae	Poacher		✓	✓	✓	✓
Family Clinidae	Kelpfish					✓
Family Embiotocidae	Perch					✓
Family Rajidae	Skates			✓		
Family Zoarcidae	Eelpout		✓	✓	✓	
Glyptocephalus zachirus	Rex sole					✓
Hippoglossus stomata	Bigmouth Sole					
Hydrolagus collei	Spotted ratfish		✓			✓
Hypsypops rubicundus	Garibaldi				✓	✓
Lyopsetta exilis	Slender sole				✓	✓
Lythrypnus dalli	Bluebanded goby					✓
Medialuna californiensis	Halfmoon					✓
Microstomus pacificus	Dover sole			✓	✓	✓
Ophiodon elongatus	Lingcod		✓	✓	✓	✓
Order Pleuronectiformes	Flatfishes unidentified		✓	✓	✓	✓
Oxyjulis californica	Senorita			✓	✓	✓
Oxylebius pictus	Painted greenling			✓		✓
Paralabrax clathratus	Kelp bass				✓	
Paralichthyscalifornicus	California halibut				✓	
Peprilus similimus	Pacific Butterfish				✓	
Pronotogrammus multifaciatus	Threadfin bass					✓
Raja binoculata	California skate			✓		
Raja rhina	Longnose skate		✓			
Raja stellulata	Starry skate		✓			
Rathbunella alleni	Stripefin ronquil				✓	
Rathbunella hypoplecta	Bluebanded ronquil			✓	✓	✓
Rhinogobiops nicholsii	Blackeye goby		✓	✓	✓	✓
Scomber japonicus	Pacific (chub) mackerel			✓		
Scorpaena guttata	California scorpionfish		✓	✓	✓	✓
Scorpaenichthys marmoratus	Cabezon		✓	✓		✓
Sebasted goodei	Chillipepper rockfish				✓	✓
Sebastes atrovirens	Kelp Rockfish					✓
Sebastes aurora	Aurora rockfish					✓
Sebastes aurora/diploproa	Aurora/splitnose rockfish		✓	✓	✓	
Sebastes carnatus	Gopher rockfish					✓
Sebastes caurinus	Copper rockfish		✓	✓		✓
Sebastes chlorostictus	Greenspotted rockfish			✓	✓	✓
Sebastes constellatus	Starry rockfish			✓		✓
Sebastes diploproa	Splitnose rockfish			✓		✓
Sebastes elongates	Greenstriped rockfish		✓	✓	✓	✓
Sebastes ensifer	Swordspine rockfish			✓		✓
Sebastes hopkinsi	Squarespot rockfish		✓	✓	✓	✓
Sebastes jordani	Shortbelly rockfish			✓	✓	✓
Sebastes lentiginosus	Freckled rockfish			✓		
Sebastes levis	Cowcod			✓		
Sebastes melanostomus	Blackgill rockfish					✓
Sebastes miniatus	Vermilion rockfish			✓	✓	✓
Sebastes moseri	Whitespeckled rockfish			✓		✓
Sebastes mystinus	Blue rockfish			✓		✓
Sebastes nigrocinctus	Tiger rockfish		✓			
Sebastes ovalis	Speckled rockfish			✓		
Sebastes paucispinis	Bocaccio rockfish			✓		✓
Sebastes pinniger	Canary rockfish			✓		
Sebastes pinniger/miniatus	Canary/vermillion rockfish		✓	✓		

Scientific Name	Common Name					
Fishes (continued)			Pt Vicente	Catalina	La Jolla	San Clemente
Sebastes rosaceus	Rosy rockfish			✓		
Sebastes rosenblatti	Greenblotched Rockfish				✓	✓
Sebastes rubrivinctus	Flag rockfish			✓	✓	✓
Sebastes rufianus	Red-dwarf rockfish					✓
Sebastes rufinanus	Dwarf-red rockfish			✓		✓
Sebastes saxicola	Stripetail rockfish		✓			
Sebastes semicinctus	Halfbanded rockfish		✓	✓	✓	✓
Sebastes serranoides/flavidus	Olive/Yellowtail rockfish		✓	✓		✓
Sebastes serriceps	Treefish			✓		✓
Sebastes spp.	Rockfish			✓	✓	✓
Sebastes umbrosus	Honeycomb rockfish			✓	✓	✓
Sebastes umbrosus	Ocean whitefish			✓		✓
Sebastes wilsoni	Pygmy rockfish			✓		
Sebastolobus spp.	Thornyhead			✓	✓	✓
Sebastomus spp.	Sebastomus complex		✓	✓	✓	✓
Semicossyphus pulcher	California sheephead			✓	✓	✓
Squatina californica	Angel shark			✓		✓
Synodus lucioceps	California lizardfish		✓	✓	✓	
Torpedo Californica	Pacific electric ray			✓		✓
Xenerentmus latifrons	Blacktip poacher				✓	✓
Zalembius rosaceus	Pink surfperch		✓	✓	✓	✓
Zaniolepis frenata	Shortspine combfish		✓	✓	✓	✓
Zaniolepis latipinnis	Longspined combfish		✓	✓	✓	
Zaniolepis spp.	Combfish				✓	✓
Mobile Invertebrates						
Family Gorgonocephalidae	Basket star			✓	✓	✓
Dromelia alexandri	Benthic siphonophore		✓	✓	✓	✓
Ophiuroidea	Brittlestar		✓	✓	✓	✓
Aplysia californica	California sea hare					
Panulirus interruptus	California spiny lobster			✓	✓	✓
Cypraea spadicea	Chestnut cowry			✓		
Mursia gaudichaudii	Crab (Armed box)			✓	✓	
Loxorhynchus spp.	Crab (Masking/Sheep)			✓	✓	✓
Metacarcinus productus	Crab (Red rock)			✓		
Paralithodes californiensis	Crab (Spiny king)		✓	✓		✓
Grimpoteuthis spp.	Dumbo octopus				✓	
Megathura crenulata	Giant keyhole limpet			✓	✓	
Stomatopoda	Mantis shrimp			✓	✓	
Loligo opalescens	Market squid		✓	✓	✓	✓
Euspira lewisii	Moon snail			✓		
Hermissenda crassicornis	Nudibranch					
Octopods	Octopods		✓	✓	✓	
Chlamys rubida	Pacific pink scallop			✓		
Sicyonia ingentis	Ridgeback prawn				✓	
	Salp			✓		✓
Parastichopus sp.	Sea cucumber		✓	✓	✓	✓
Pleurobranchaea spp.	Sea slug				✓	✓
Henricia spp.	Sea star			✓	✓	
Mediaster aequalis	Sea star			✓	✓	✓
Solaster stimpsoni	Sea star					
Pisaster gigantaeus	Sea star			✓	✓	✓
Asterina miniata	Sea star (Bat star)			✓	✓	✓
Ceramaster spp.	Sea star (Cookie)			✓	✓	✓
Orthasterias koehleri	Sea star (Rainbow star)			✓	✓	✓
Luidia spp.	Sea star (Sand star)			✓	✓	
Pycnopodia/Rathbunaster spp.	Sea star (Sunflower star)			✓	✓	
Stylasterias forreri	Sea star (Velcro)				✓	✓
Pandalus platyceros	Spot prawn		✓	✓	✓	✓
Mundia spp.	Squat lobster			✓	✓	✓
Allocentrotus fragilis	Urchin (Fragile pink)			✓	✓	✓
Strongolocentrotus purputatus	Urchin (Purple)				✓	
Strongolocentrotus franciscanus	Urchin (Red)			✓	✓	✓
Lytechinus anamesus	Urchin (White)			✓	✓	✓

Scientific Name	Common Name					
Sessile and functionally sessile invertebrates			**Pt Vicente**	**Catalina**	**La Jolla**	**San Clemente**
Brachiopoda	Brachiopod					✓
Bryzoan	Bryzoan			✓	✓	✓
Stylaster californicus	California hydrocoral			✓		✓
Class Crinoidea	Crinoid				✓	
Balanophyllia spp.	Cup coral			✓	✓	✓
Gorgonian complex	Gorgonacea		✓	✓	✓	✓
Hydrozoa	Hydroid			✓		✓
Metridium spp.	Metridium		✓	✓	✓	✓
Polymastia spp.	Nipple sponge				✓	✓
Family Pectinidae	Scallop				✓	✓
Ptilosarcus gurneyi	Sea pen		✓	✓		✓
Stylatula/Pennatula spp.	Sea whip/pen		✓	✓	✓	✓
Phylum Porphera	Sponge			✓	✓	✓
Corynactis californica	Strawberry anemone			✓		✓
	Tunicate			✓		✓