



**Characterizing the Deep:  
Surveys in the Monterey Bay National Marine Sanctuary  
2007-2010**





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This publication was conceived and implemented by the faculty, staff and students of the Institute for Applied Marine Ecology at CSU Monterey Bay...

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...with key support from *Dr. Andrew DeVogelaere*, Research Coordinator for the Monterey Bay National Marine Sanctuary.

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All photos in this document (unless otherwise noted) were taken with the ROV *Beagle* in the Monterey Bay National Marine Sanctuary. Credit is to: IfAME/CSUMB/MBNMS/NOAA/MARE

Topside operations photos credit to *Adam Alfasso, Ashley Knight, Heather Kramp, Andrew DeVogelaere, Jason Adelaars*

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## Cover Legend:

- 1 – Mushroom soft coral (*Anthomastus ritteri*)
- 2 – Rex sole (*Glyptocephalus zachrius*)
- 3 – Pacific hagfish (*Eptatretus stoutii*)
- 4 – Thornyhead (*Sebastolobus* sp.)
- 5 – Sun star (*Rathbunaster californicus*, immature)
- 6 – Spiny king crab (*Paralithoides rathbuni*)
- 7 – Feather star (*Florometra serratissima*)
- 8 – Sandpaper skate (*Bathyraja kincaidii*)
- 9 – Sponges, anemones, and corals in Carmel Bay
- 10 – Blacktip poacher (*Xeneretmus latifrons*)
- 11 – Spot prawn (*Pandalus platyceros*)
- 12 – Velcro star (*Stylasterias forreri*)
- 13 – Gorgonian (Subclass Octocorallia)
- 14 – Blue rockfish (*Sebastes mystinus*)
- 15 – Spotted ratfish (*Hydrolagus collièi*)
- 16 – Sebastomus rockfish (*Sebastes* sp.)
- 17 – Bigfin eelpout (*Lycodes corteziianus*)





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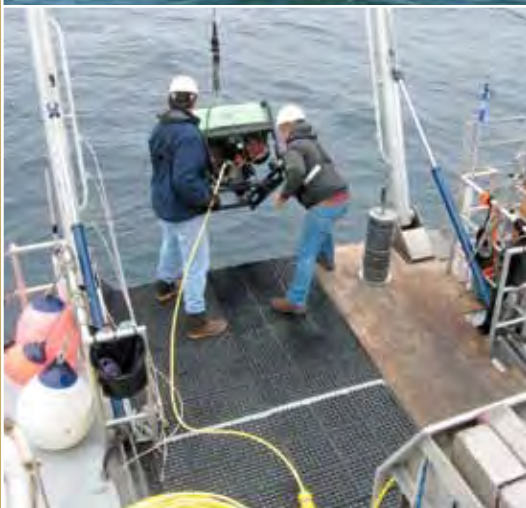
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Above top: NOAA Research Vessel *Fulmar*  
Above: Crew deploys the ROV *Beagle* off the back deck of the *Fulmar*



IfAME students and faculty offshore of Monterey with the towed camera sled.

## Introduction

In 2007, a partnership was formed between the Institute for Applied Marine Ecology (IfAME) at California State University Monterey Bay and the National Oceanic and Atmospheric Administration's Monterey Bay National Marine Sanctuary (MBNMS). The IfAME's mission is to bridge the gap between academic research and the information needs of managers and policy-makers. The MBNMS is the largest of the nation's thirteen sanctuaries. Stretching along California's Central Coast from Marin to Cambria, it encompasses 276 miles of shoreline and 6,094 square miles of ocean.

The primary goal of this collaborative project is to characterize the continental shelf (50-200 m/165-650 ft water depth) and slope (200-400 m/650-1300 ft) in the Sanctuary. Video transects are conducted at previously unexplored locations and areas of interest using a remotely operated vehicle (ROV) and a towed camera sled. Data on the distribution of fishes, invertebrates, and seafloor habitats are collected in real-time for inclusion on the Shelf Characterization and Image Display website (<http://sep.csUMB.edu/ifame/scid>).

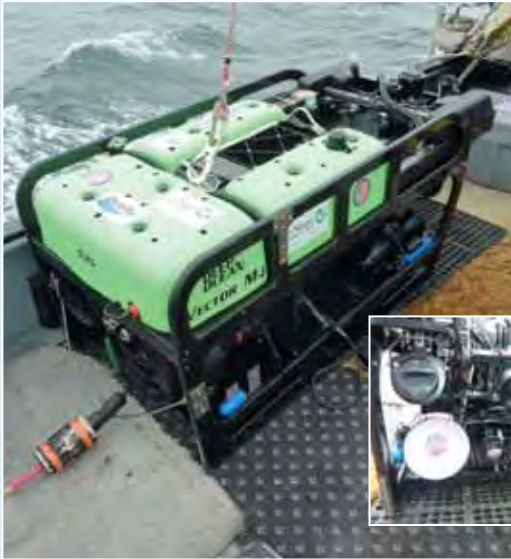
This publication encompasses the partnership's efforts over a four-year period from 2007-2010, with an emphasis on five study areas. In the following pages you will find maps depicting completed sampling at each location and the distribution of selected species at each of the study sites, as well as representative images of the many organisms we have encountered *to-date*.





# Methods

We used both a remotely operated vehicle (ROV) and a towed camera sled from the NOAA Research Vessel *Fulmar* to collect video and still photographic imagery. Both technologies allow a live video feed to be transmitted to the support vessel where researchers can collect preliminary data and monitor transect direction.



Left: ROV *Beagle* waits on deck for deployment.  
Inset: Various cameras, lights, and instruments on the front of the ROV

**The ROV *Beagle*** is owned by The Nature Conservancy and is operated and maintained by Marine Applied Research and Exploration (MARE). Weighing in at 450 pounds, the *Beagle* is equipped for deep and shallow surveys and can collect many types of information. Three video cameras provide down-facing, forward-facing, and rear-facing video, while a digital still camera takes photographs facing forward or down. Two HMI lights illuminate the depths while paired lasers (10 centimeters apart) are aimed in the center of the camera's field of view. These lasers provide scientists with a size reference for organisms and features captured in the imagery. The *Beagle* has four brushless motor thrusters that give it the power to dive as deep as 1,000 m (3,200 ft) and lateral and horizontal agility to maneuver around a variety of topographic features on the seafloor. The *Beagle* also collects environmental data as it travels along the seafloor (e.g., temperature) and its location is tracked using acoustic tracking systems.



Transects were focused on five general study areas throughout the Sanctuary

**The towed camera sled** is owned and operated by the National Marine Sanctuary Program. Weighing in at only 125 pounds, the sled is much smaller than the ROV but still provides valuable imagery. A forward-facing (adjustable) video camera, sizing lasers (10 cm), lights, navigation and power equipment are housed in a sturdy steel frame. A 300 m (980 foot) "umbilical" connects the sled to the support vessel, as well as a winch wire that is used to maneuver the sled vertically over the seafloor. The umbilical limits the sled's maximum depth to 275 m (900 ft). The sled does not have thrusters like an ROV but is instead controlled by taking in and letting out lengths of umbilical and winch wire from the surface. The boat's position is tracked along a survey line and used as a proxy for the position of the sled along the seafloor.



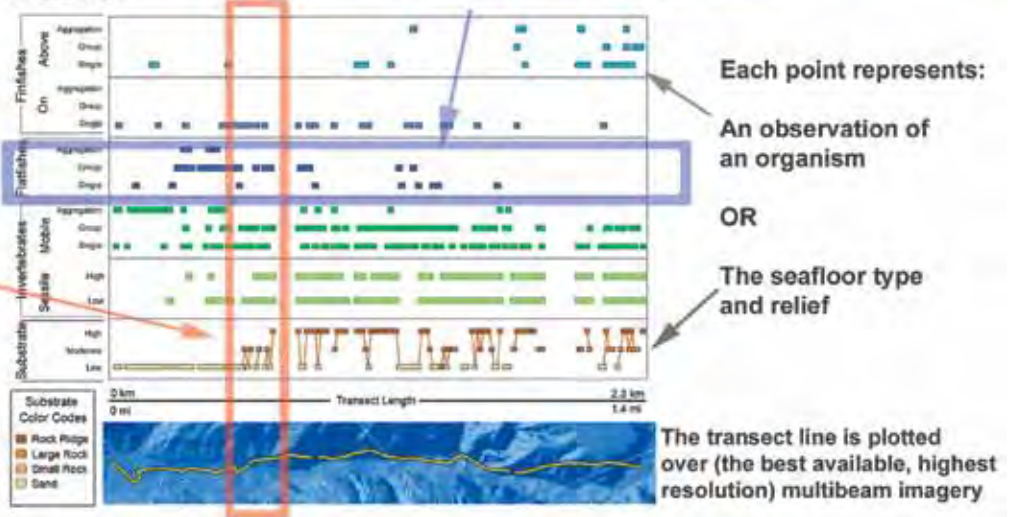
Survey locations were based on the maximum depth of the instruments as well as seafloor topography and features. The study areas discussed in this publication are areas of interest to the Sanctuary and are focused mainly on areas that have not been characterized in detail. We chose to stratify them across the latitudinal (North to South) gradient of the MBNMS to observe the differences in seafloor communities as one moves along California's central coast. In some areas flat stretches of mud and sand dominated the seafloor, at others high-relief rocky ridges were prominent, and at others there was a mixture of both habitat types and transitions between.



# HOW TO READ TAXONOMIC DISTRIBUTION PLOTS

These plots can be entered from two directions - vertically and horizontally. To enter the plot vertically, first select a location along the transect map at the bottom of the figure. You can then enter the figure along a straight line going upwards to observe what habitat features and organisms occur at that location. For example, here, where the substrate shifts to a rocky bottom and the relief becomes higher, sessile invertebrates become more common, flatfishes become less common, and finfishes on the seafloor become more common.

Enter the plot horizontally to track the distribution of an organism or type across the transect. Here, there were a lot of flatfish (in groups) in the canyon base, but as the transect progressed up into the canyon (and left softer sediments) there were fewer flatfishes...



**Finfish "ABOVE"** are any (non-flatfish) species that are observed swimming above the seafloor, but are distinctly not making contact with the seafloor.



**Finfish "ON"** are any (non-flatfish) species that are observed resting on the seafloor. Frequently these are non-schooling fish that do not move around.



**Flatfish** are Pleuronectiform fishes, such as halibut that lay flat on the seafloor, frequently on soft sediments



**Mobile Invertebrates** can move about the seafloor, regardless of how fast (e.g. crabs) or slow (e.g. urchins) they move.



**Sessile Invertebrates** are attached to the substrate either permanently (e.g. corals) or functionally permanently (e.g. anemones). They can be classified as high relief (>10cm) or low relief (<10cm).

This booklet contains just some of the thousands of photos we collect in the Sanctuary. To see more, and watch videos as well, check out our interactive map at SCID. You can explore the Sanctuary, locate all of the areas where we've collected imagery since 2006, and see hundreds of fish and invertebrates! We add new images each time we go to sea, so there is always more to see!

Check out SCID at: <http://sep.csUMB.edu/ifame/scid>

## Shelf Characterization & Image Display

Explore. Locate. Identify.

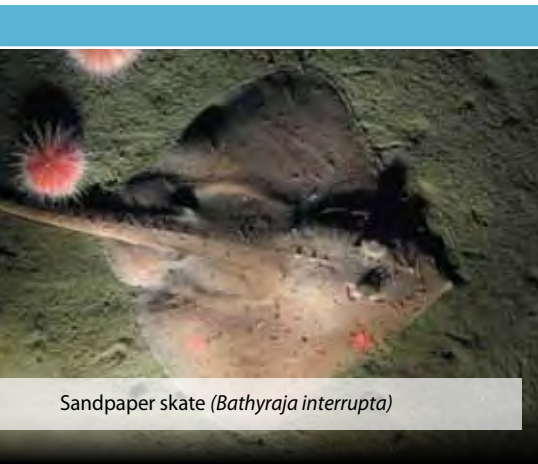
SCID is the result of a partnership between the Institute for Applied Marine Ecology (IFAME) at California State University Monterey Bay and the SIMON Program at the Monterey Bay National Marine Sanctuary.  
Background image courtesy BBNP/OT 2008





# Ascension and Año Nuevo Canyons

These two adjacent canyons lie about 15 km (9 mi) off shore, in Federal waters. The head of each canyon rises onto the continental shelf at approximately 150 m (490 ft) water depth. Both drop off gradually at first then steeply near the continental slope and eventually lead to the abyssal floor near the outflow of the Monterey Canyon. Transects were conducted on the continental shelf adjacent to the canyons and along the rim of the canyons with the camera sled. The ROV transects were done over the continental slope perpendicular to Ascension Canyon.



Sandpaper skate (*Bathyraja interrupta*)

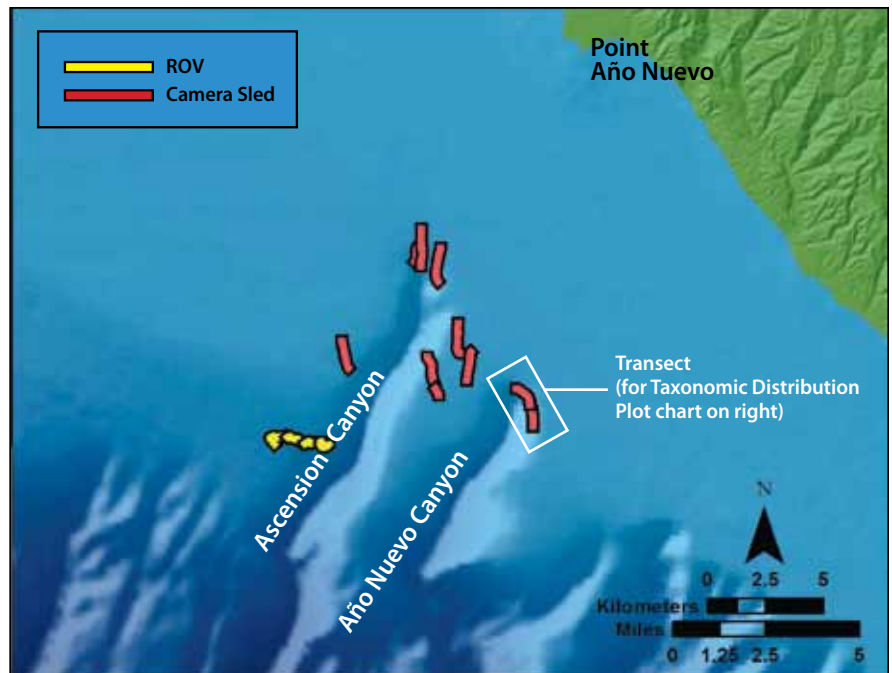


Fragile pink sea urchin (*Strongylocentrotus fragilis*), Splitnose/aurora rockfish (*Sebastes diploproa/aurora*), and rex sole (*Glyptocephalus zachirus*)



Pom-pom anemone (*Liponema brevicornis*)

	ROV	Camera Sled
<b>Total distance transected</b>	3.1 km (1.9 mi)	11.3 km (7.0 mi)
<b>Depth Range Surveyed</b>	300-315 m (980-1030 ft)	88-160 m (288-525 ft)
<b>Predominant habitat observed</b>	Soft sediment (mud and sand)	Soft sediment (mud and sand)
<b>Topography/relief</b>	Flat shelf and steep canyon	Gentle slope and steep canyon



## Common fish groups observed:

- Rockfishes (*Sebastes* spp.)
- Thornyheads (*Sebastolobus* spp.)
- Eelpouts (Family Zoarcidae)
- Cusk eels (Family Ophidiidae)
- Poachers (Family Agonidae)
- Sculpin (Family Cottidae)
- Hagfishes (Family Mynxinidae)
- Greenlings (Family Hexagrammidae)
- Flatfishes (Order Pleuronectiformes)

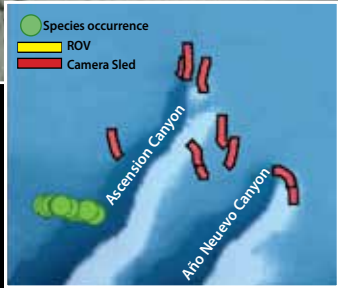
## Notable organisms observed:

- Spotted ratfishes (*Hydrolagus colliei*)
- Sandpaper skate (*Bathyraja kincaidii*)

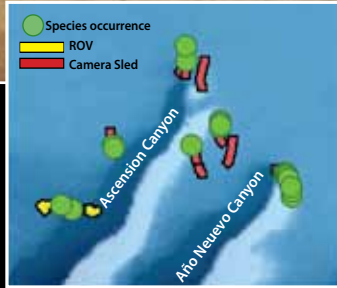
## Common invertebrates observed:

- Fragile pink urchins (*Strongylocentrotus fragilis*)
- Spot prawns (*Pandalus platyceros*)
- Plumose anemones (*Metridium farcimen*)
- Cancer crabs (*Cancer* spp.)
- Octopus (Family Octopodidae)
- Sea slugs (Family Pleurobranchidae)
- Sea pens, whips, and gorgonians (Subclass Octocorallia)
- Various sea stars (Class Asteroidea)
- Brittle stars (Class Ophiuroidea)
- Crinoids (Class Crinoidea)
- Sea cucumbers (Class Holothuroidea)
- Tunicates (Phylum Chordata)

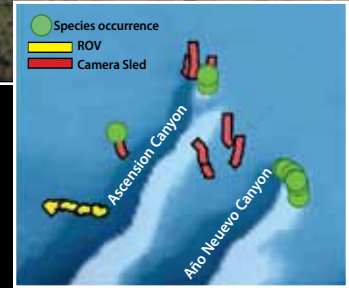
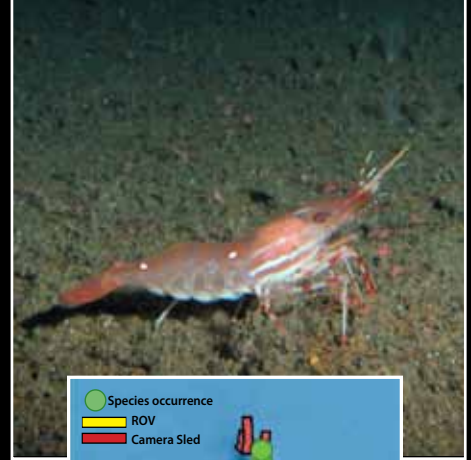




Splitnose or aurora rockfish  
(*Sebastes diploproa/aurora*)

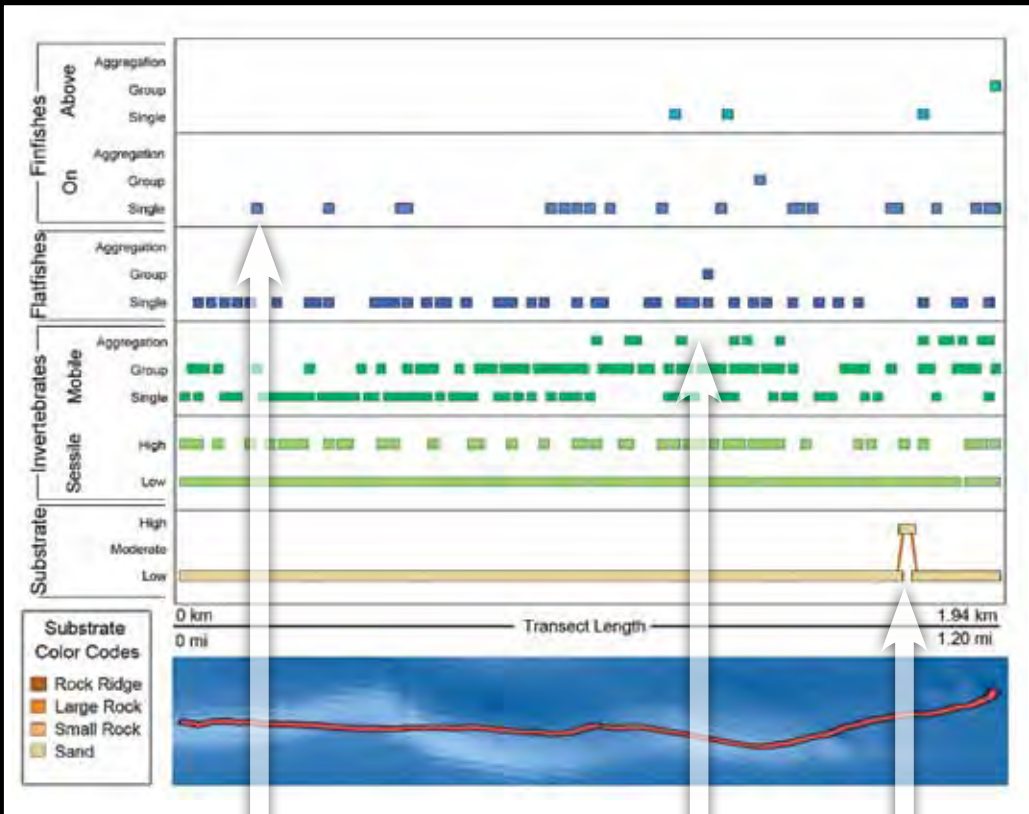


Octopus (Family Octopodidae)



Spot prawn (*Pandalus platyceros*)

**Species Distribution Maps** depict the distributions of three common organisms in the canyons area. Splitnose and aurora rockfishes (grouped together because of often indistinguishable appearances) were seen along the deep, muddy slope. Octopus were seen throughout the area, though perhaps more so along canyon rims (*Octopus californicus* is pictured above). Spot prawns were common along the canyon rims, especially at Año Nuevo Canyon.



### Taxonomic Distribution Plot

of a transect conducted around the rim of Año Nuevo Canyon, distorted (un-bent) to fit along the x-axis of the plot. Mobile invertebrates were common and were seen as individuals and in groups. Few finfishes were observed, while flatfishes were common throughout the nearly 2 km (1.2 mi) transect. The depth at the canyon head is about 150 m (490 ft) and was consistent throughout the transect.

See page three for a detailed explanation on how to read these plots.

Finfish are sparse, but flatfish are common.

Aggregations of mobile invertebrates increase (these are probably spot prawns, which were seen in high densities at the head of the canyon).

The sloping canyon edge gives way to high-relief muddy ridges here, a rare habitat combination.

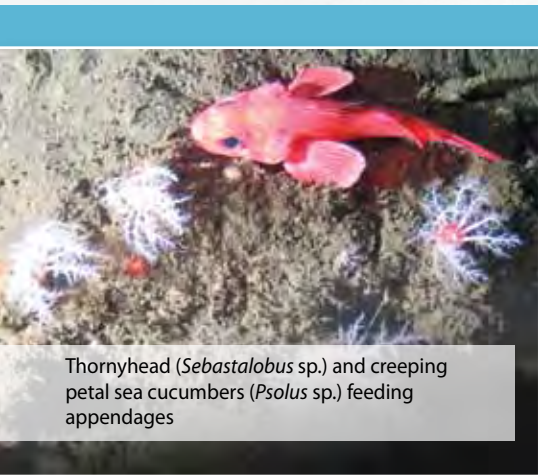




# North Monterey Bay

Although the northern shelf and slope in Monterey Bay are dominated by low-relief, muddy-sand habitats, the presence of brachiopod beds and scattered cobble fields provided an exciting departure from an otherwise flat landscape. In ROV surveys along the continental slope, soft sediment communities of flatfishes, eelpouts, and sun stars were observed. Along the shelf edge, camera sled transects revealed extensive brachiopod beds with a variety of rockfishes. Surveys at the Soquel Canyon head reveal a variety of rockfishes and invertebrates along higher relief rocky outcrops.

	ROV	Camera Sled
<b>Total distance transected</b>	2.1 km (1.3 mi)	10.3 km (6.4 mi)
<b>Depth Range Surveyed</b>	290-350 m (950-1150 ft)	55-135 m (180-440 ft)
<b>Predominant habitat observed</b>	Soft Sediment (mud)	Soft Sediment (mud and sand)
<b>Topography/relief</b>	Flat mud, some brachiopod beds	Flat mud, some brachiopod beds, rocky outcrops (in Soquel Canyon)



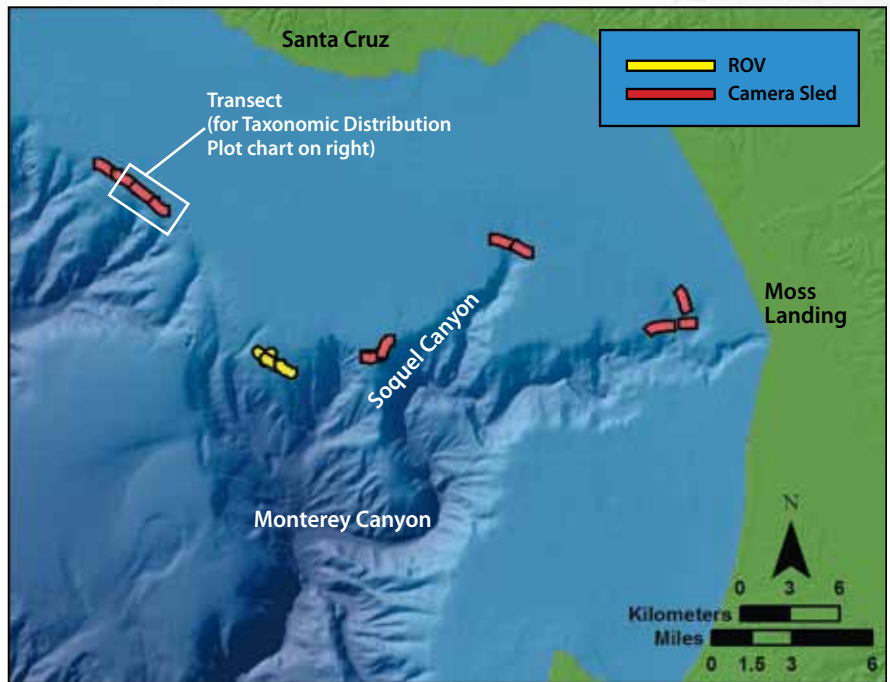
Thornyhead (*Sebastolobus* sp.) and creeping petal sea cucumbers (*Psolus* sp.) feeding appendages



Pacific hagfish (*Eptatretus stoutii*), and creeping petal sea cucumbers (*Psolus* sp.) feeding appendages



Mushroom soft coral (*Anthomastus ritteri*)



### Common fish groups observed:

- Rockfishes (*Sebastes* spp.)
- Thornyheads (*Sebastolobus* spp.)
- Lingcod (*Ophiodon elongatus*)
- Spotted ratfish (*Hydrolagus colliei*)
- Greenlings (Family Hexagrammidae)
- Poachers (Family Agonidae)
- Eelpouts (Family Zoarcidae)
- Cusk eels (Family Ophidiidae)
- Flatfishes (Order Pleuronectiformes)

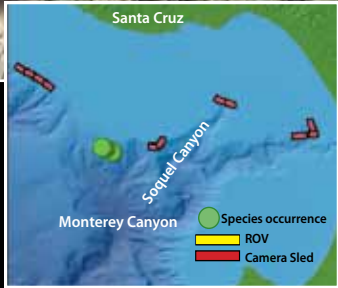
### Notable organisms observed:

- Petrale sole (*Eopsetta jordani*)
- Cowcod (*Sebastes levis*)
- Pacific hagfish (*Eptatretus stoutii*)
- Mushroom soft coral (*Anthomastus ritteri*)

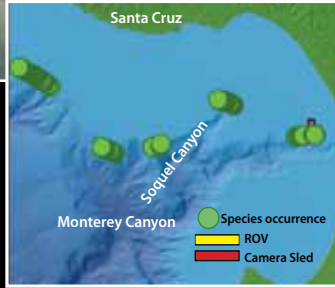
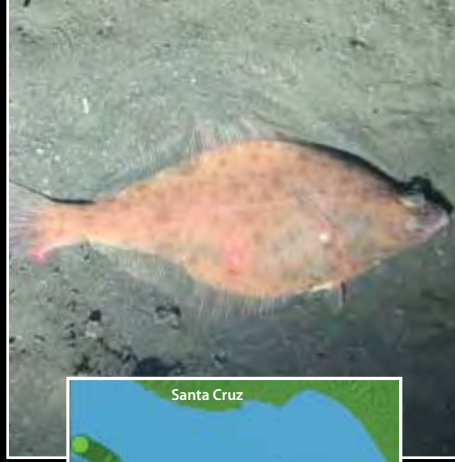
### Common invertebrates observed:

- Fragile pink urchins (*Strongylocentrotus fragilis*)
- Sun stars (*Rathbunaster* sp.)
- Creeping petal sea cucumbers (*Psolus* sp.)
- Prawns (*Pandalus* spp.)
- Plumose anemones (*Metridium farcimen*)
- Octopus (Family Octopodidae)
- Sea slugs (Family Pleurobranchidae)
- Tube anemones (Order Ceriantharia)
- Crabs (Order Decapoda)
- Sea pens, whips, and gorgonians (Subclass Octocorallia)
- Various sea stars (Class Asteroidea)
- Basket and brittle stars (Class Ophiuroidea)
- Crinoids (Class Crinoidea)
- Sea cucumbers (Class Holothuroidea)
- Brachiopods (Phylum Brachiopoda)
- Sponges (Phylum porifera)

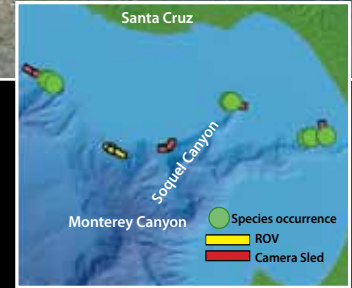




Spotted ratfish (*Hydrolagus collieri*)

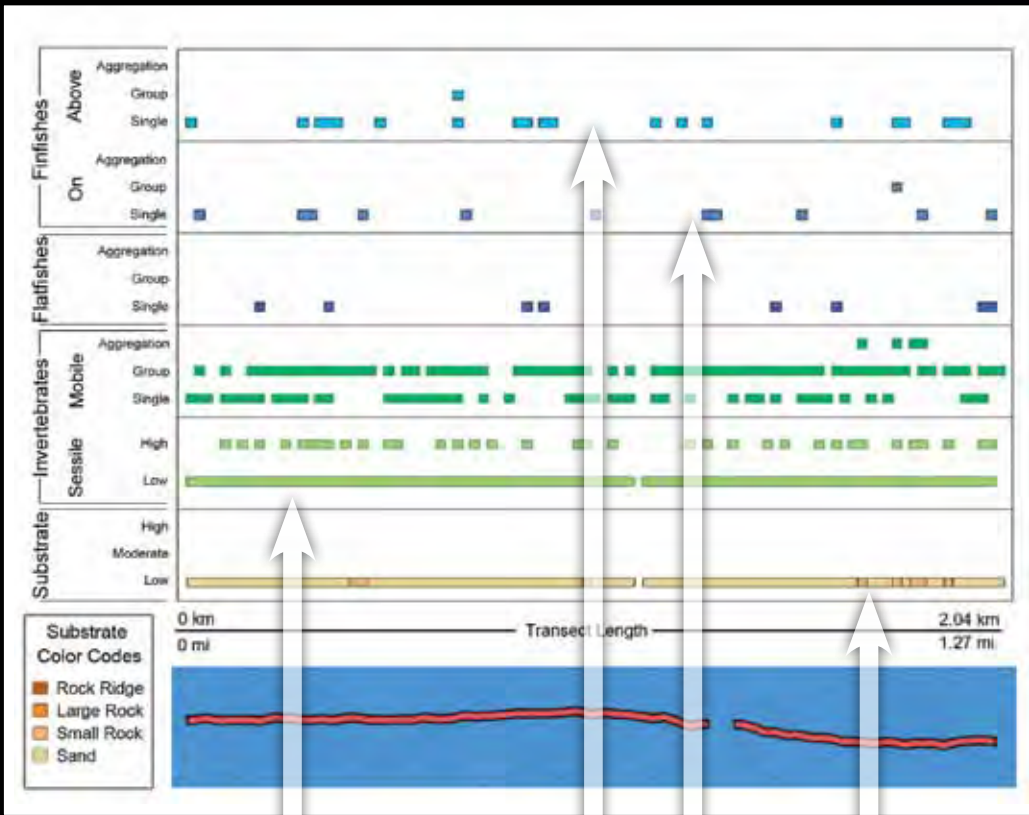


Flatfishes (Order Pleuronectiformes)



Crabs (Order Decapoda)

**Species Distribution Maps** depict the distributions of three common organisms along the North Monterey Bay shelf. Spotted ratfish were only seen on the deeper slope, on ROV transects. Flatfishes were prolific throughout the area. The map above shows the distribution of many species, including English sole (*Parophrys vetulus* pictured above), rex sole (*Glyptocephalus zachirus*), and dover sole (*Microstomus pacificus*). Cancer crabs such as the red rock crab (*Cancer productus*, pictured above) were common on transects along the shelf area, and less so on the continental slope.



### Taxonomic Distribution Plot

shows a two-hour, 2 km transect conducted with the camera sled at the continental shelf break. This particular area is over an expansive bed of brachiopods - small filter-feeding organisms that colonize large areas of the seafloor (they look like clams but are in a different biological phylum!). Small finfishes, often rockfishes and combfishes, are observed throughout the area, while few flatfishes are seen in the brachiopod habitat.

See page three for a detailed explanation on how to read these plots.

This transect was conducted over a brachiopod bed, thus there are low-profile sessile invertebrates throughout the transect.

The fish community is mostly comprised of finfishes swimming above the low-relief brachiopod cover. Some flatfishes were seen in the sandy patches between brachiopod beds.

Patchy cobbles are interspersed with low-relief mud and brachiopod cover.



# Carmel Bay and Point Lobos



Though smaller than Monterey Canyon, Carmel Canyon nonetheless represents a dramatic and steep rise from the abyssal seafloor. We surveyed areas along the shelf to the north of the canyon and conducted one 2.3 kilometer long (1.4 mi) "mega-transect". This transect ran from the deepest spot that we could put the ROV (340 m/1,115 ft), near the base of the canyon, to the shallowest we could operate the support vessel (70 m/230 ft). Another 4 km "mega-transect" conducted off Point Lobos with the camera sled flew over multiple seafloor features such as low- to moderate-relief rocky ridges and sandy soft-bottom.

	ROV	Camera Sled
<b>Total distance transected</b>	3.4 km (2.1 mi)	4.5 km (2.8 mi)
<b>Depth Range Surveyed</b>	50-340 m (170-1115 ft)	90-160 m (290-525 ft)
<b>Predominant habitat observed</b>	Cobbles and sand (mixed sediments)	Cobbles and sand (mixed sediments)
<b>Topography/relief</b>	Low relief	Low relief, small rocks, and flat sand



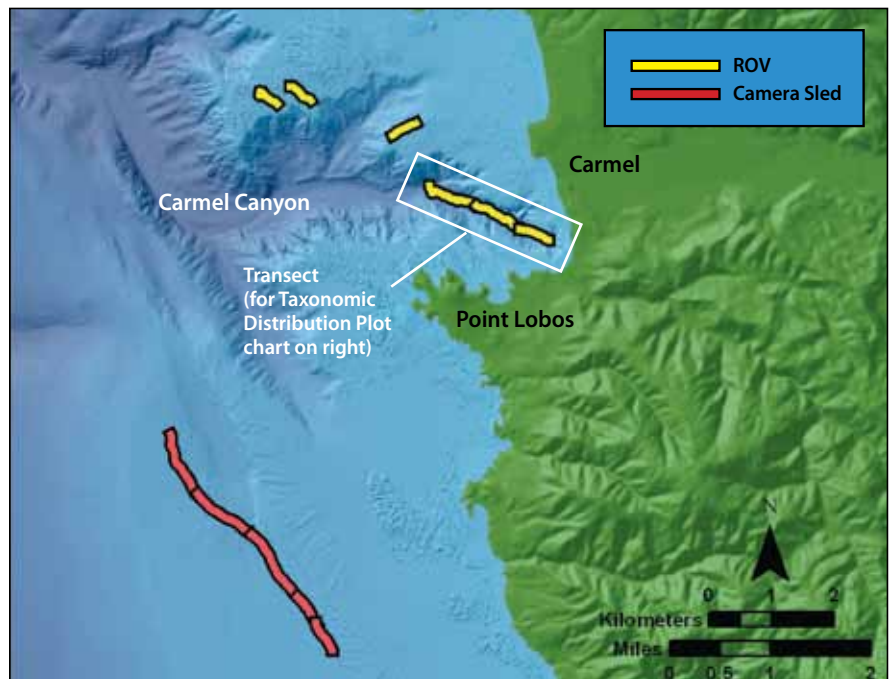
Dog face witch eel (*Facciolella equatorialis*) was seen at the base of Carmel Canyon



Rosy rockfish (*Sebastes rosaceus*)



Large groups of rex sole (*Glyptocephalus zachirus*) were observed in Carmel Canyon



## Common fish groups observed:

Rockfishes (*Sebastes* spp.)  
 Thornyheads (*Sebastolobus* spp.)  
 Lingcod (*Ophiodon elongatus*)  
 Blackeye gobies (*Rhinogobiops nicholsi*)  
 Spotted ratfishes (*Hydrolagus colliei*)  
 Catsharks (Family Scyliorhinidae)  
 Poachers (Family Agonidae)  
 Rays (Family Rajidae)  
 Flatfishes (Order Pleuronectiformes)

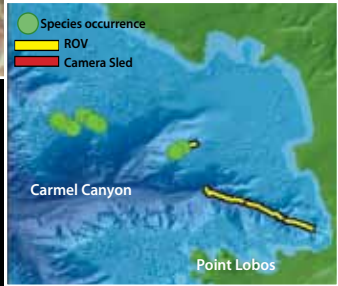
## Notable organisms observed:

Blacktail snailfish (*Careproctus melanurus*)  
 Dog face witch eel (*Facciolella equatorialis*)

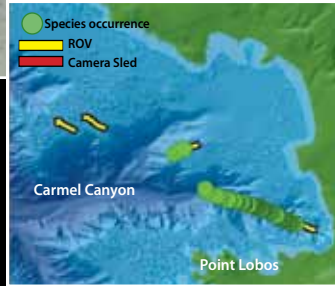
## Common invertebrates observed:

Strawberry anemones (*Corynactis californica*)  
 Creeping petal sea cucumbers (*Psolus* sp.)  
 Galatheid crabs (*Mundia* spp.)  
 Prawns (*Pandalus* spp.)  
 Plumose anemones (*Metridium farcimen*)  
 Octopus (Family Octopodidae)  
 Sea slugs (Family Pleurobranchidae)  
 Crabs (Order Decapoda)  
 Sea pens, whips, and gorgonians (Subclass Octocorallia)  
 Various sea stars (Class Asteroidea)  
 Sea cucumbers (Class Holothuroidea)  
 Basket and brittle stars (Class Ophiuroidea)  
 Crinoids (Class Crinoidea)  
 Polychaete worms (Class Polychaeta)  
 Brachiopods (Phylum Brachiopoda)  
 Tunicates (Phylum Chordata)

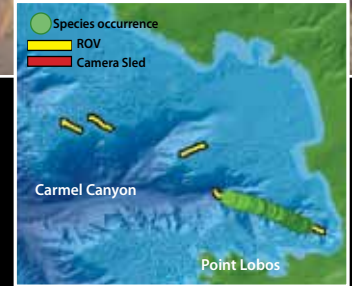




Blue rockfish (*Sebastes mystinus*)

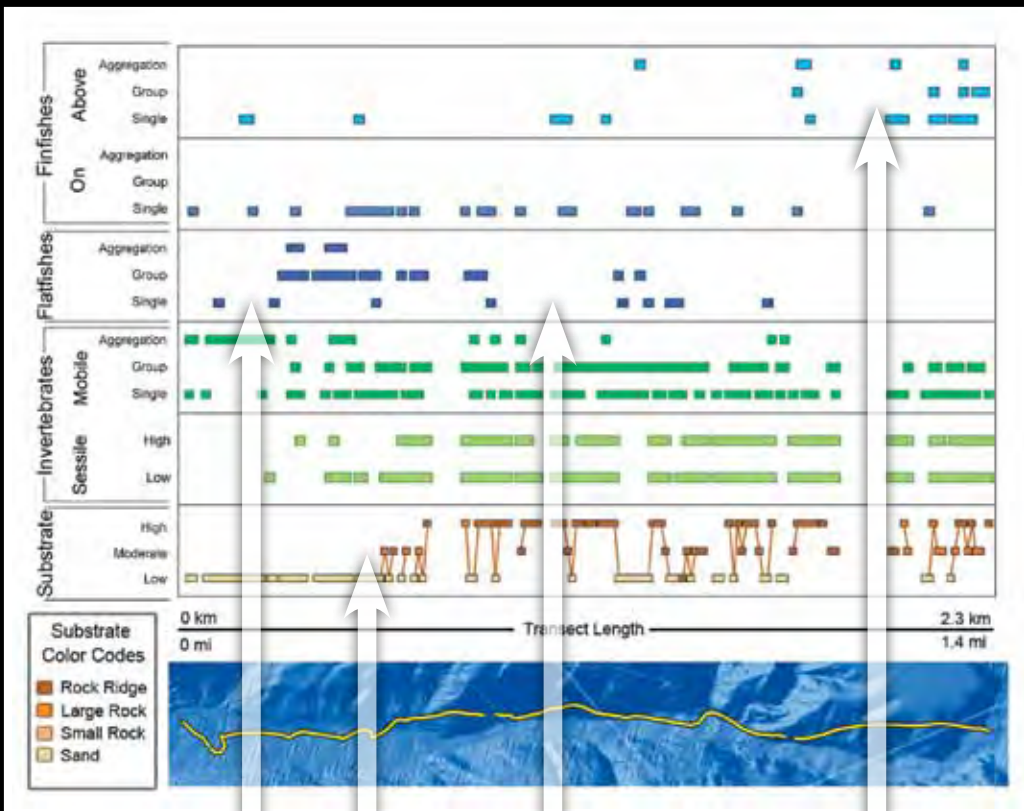


Galatheid crab (*Mundia* spp.)



Spot prawn (*Pandalus platyceros*)

**Species Distribution Maps** depict the distributions of three common organisms within Carmel Canyon and along its northern shelf area. Blue rockfish were seen in the shallow, higher-relief rocky areas on the northern shelf. Galatheid crabs and spot prawns were common within the canyon. Galatheid crabs were also seen in smaller densities on the shelf.



### Taxonomic Distribution Plot

Taxonomic Distribution Plot of a three-hour (2.3 km/1.4 mi) Carmel Canyon transect shows the changes in seafloor communities and substrates as the ROV moves from the canyon's base at 340 m (1115 ft) water depth to the head of the canyon at 70 m (160 ft).

See page three for a detailed explanation on how to read these plots.



Flat, soft-sediment seafloor is predominant at the base of the canyon. Flatfishes dominate the fish community.

The fish community begins to shift away from flatfishes as the ROV transects over rockier seafloor.

The softer sediments at the base of the canyon change to large rocks and ridges as the transect travels over a ridge.

Larger groups of finfishes are seen nearer to the ridge at the head of the canyon, flatfishes are no longer seen.





# Point Sur Shelf

The Point Sur Shelf is a wide area extending out 15.4 km (9.5 mi) from shore before dropping into the continental slope at a depth of about 200 m (670 ft). Along most of California's Central Coast the slope begins close to shore but a large part of the shelf here extends further out to Federal waters. The majority of the seafloor shelf is soft sediment but there are high-relief rock patches near the shoreline and also along the southern rim of the shelf extension. Camera sled transects were conducted in these shallower, high relief areas while the deeper soft sediment area of the slope was surveyed with the ROV.

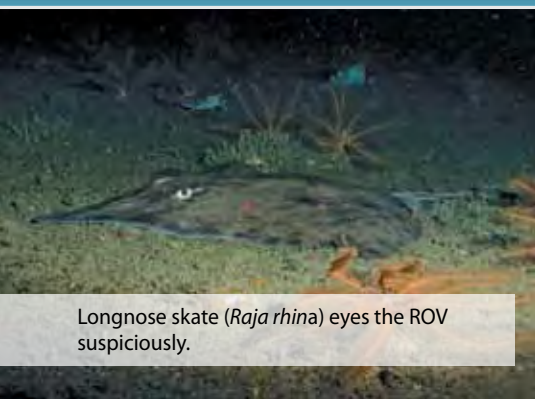
	ROV	Camera Sled
<b>Total distance transected</b>	3.5 km (2 mi)	21 km (13 mi)
<b>Depth Range Surveyed</b>	260-350 m (850-1150 ft)	45-190 m (140-620 ft)
<b>Predominant habitat observed</b>	Cobbles and sand (mixed sediments)	Cobbles, boulders, and sand (mixed sediments)
<b>Topography/relief</b>	Low relief	Low and high relief



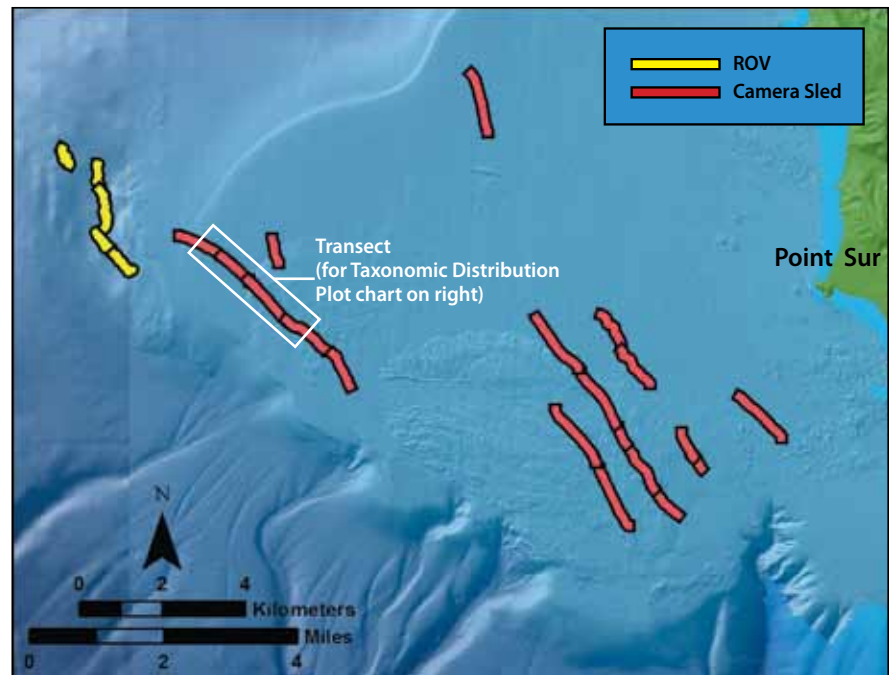
Blacktail snailfish (*Careproctus melanurus*)



Blackgill rockfish (*Sebastes melanostomus*) and sun star (*Rathbunaster californicus*) near crinoids



Longnose skate (*Raja rhina*) eyes the ROV suspiciously.



## Common fish groups observed:

- Rockfishes (*Sebastes* spp.)
- Thornyheads (*Sebastolobus* spp.)
- Blackeyed gobies (*Rhinogobiops nicholsi*)
- Ronquils (Family Bathymasteridae)
- Greenlings (Family Hexagrammidae)
- Sculpins (Family Cottidae)
- Hagfishes (Family Mynxinidae)
- Greenlings (Family Hexagrammidae)
- Poachers (Family Agonidae)
- Skates (Family Rajidae)
- Flatfishes (Order Pleuronectiformes)

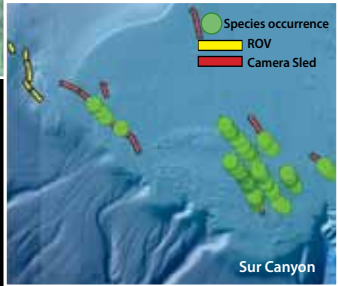
## Notable organisms observed:

- Spotted ratfishes (*Hydrolagus collieri*)
- Sheephead (*Semicossyphus pulcher*)
- Blacktail snailfish (*Careproctus melanurus*)
- Mushroom soft coral (*Anthomastus ritteri*)

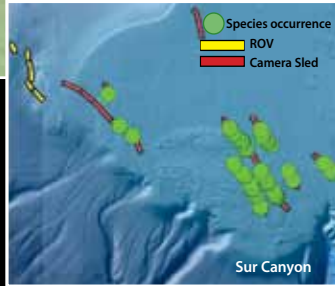
## Common invertebrates observed:

- Fragile pink urchins (*Strongylocentrotus fragilis*)
- Galatheid crabs (*Mundia* spp.)
- Prawns (*Pandalus* spp.)
- Plumose anemones (*Metridium farcimen*)
- Sun stars (*Rathbunaster californicus*)
- Cancer crabs (*Cancer* spp.)
- Octopus (Family Octopodidae)
- Sea slugs (Family Pleurobranchidae)
- Sea pens, whips, and gorgonians (Subclass Octocorallia)
- Various sea stars (Class Asteroidea)
- Basket and brittle stars (Class Ophiuroidea)
- Sea cucumbers (Class Holothuroidea)
- Polychaete worms (Class Polychaeta)
- Crinoids (Class Crinoidea)
- Tunicates (Phylum Chordata)
- Sponges (Phylum Porifera)
- Brachiopods (Phylum Brachiopoda)

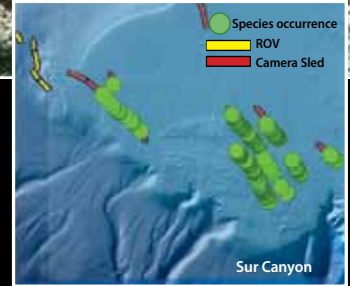




Lingcod (*Ophiodon elongatus*)

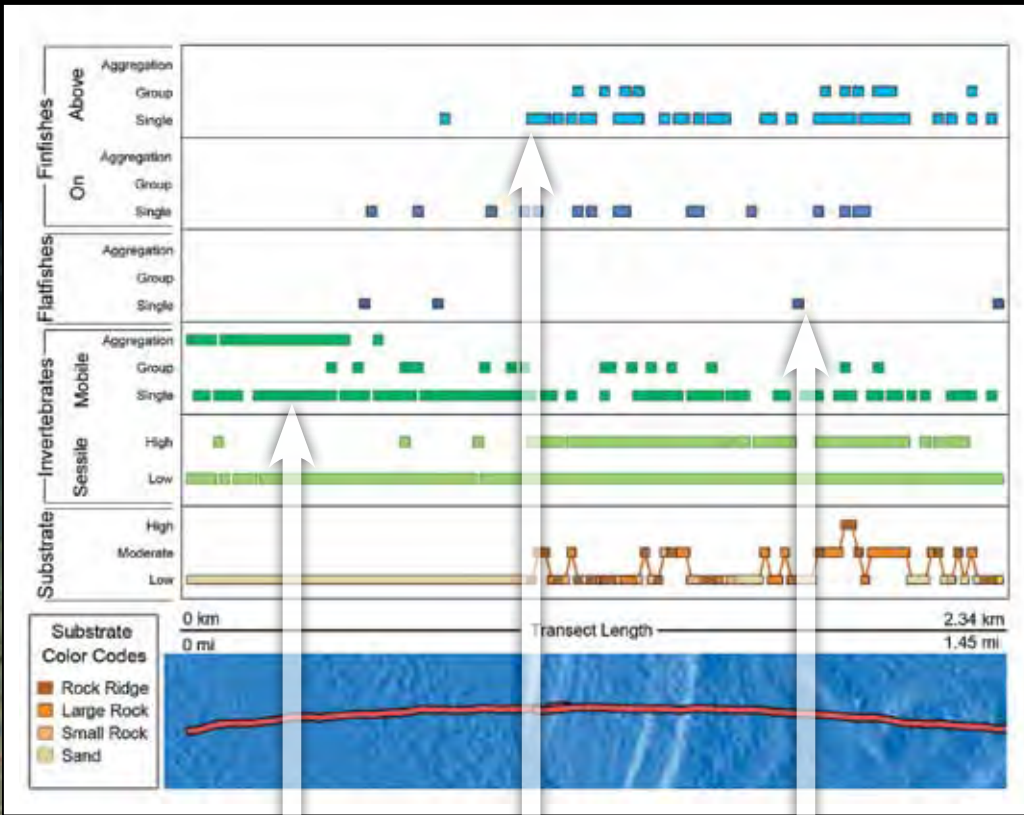


Olive/yellowtail rockfish  
(*Sebastes serranodes/flavidus*)



Blackeye goby (*Rhinogobiops nicholsi*)

**Species Distribution Maps** depict the distributions of three common fishes on the continental shelf off of Point Sur. Areas that appear rough or bumpy on the maps depict areas of a higher relief rocky seafloor and all three groups are concentrated over these habitats. All three groups were observed in the rocky areas both close to shore and on the outer shelf. However, olive/yellowtail rockfish (grouped together because of their often indistinguishable appearances) were observed less frequently on the deep, outer shelf than the other two species, despite the presence of rocky habitat.



### Taxonomic Distribution Plot

along a two-hour (2.3 km/1.4 mi) transect shows the changes in biological communities – fishes and mobile invertebrates – as the camera sled moves from low relief soft sediment to moderate-high relief rocky habitats.

See page three for a detailed explanation on how to read these plots.

Brittle stars represent dense aggregations of mobile invertebrates seen over soft sediment.

Flatfish occur in sandy channels among higher-relief rocky habitat.

As the substrate changes from low-relief soft sediment to higher-relief rocks, we see more finfishes and high-relief invertebrates.

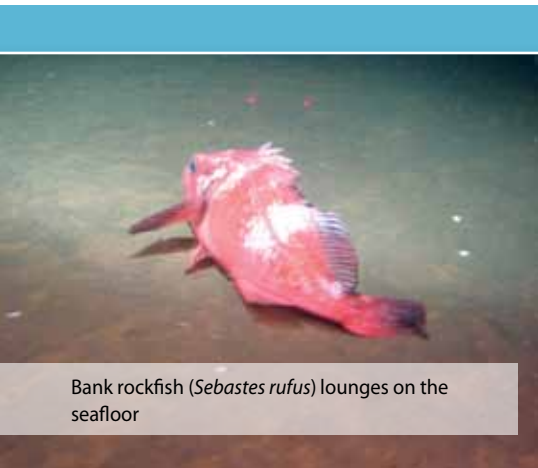




# La Cruz Canyon and Point Piedras Blancas

Located near the southern boundary of the Sanctuary, about 5 km (3 mi) offshore, La Cruz Canyon begins to cut into the continental shelf at about 120 m (400 ft) depth. Curving northwest, it drops into the slope and empties out to the abyssal floor. Transects conducted along the rim of the canyon and south along the shelf and slope revealed muddy sediment, while transects at the shelf break to the north of the canyon revealed moderate-relief boulder and cobble. Further inshore, in depths of 30-100m (100-330ft) off of Point Piedras Blancas, transects showed moderate and high relief rocky structure.

	ROV	Camera Sled
<b>Total distance transected</b>	3.0 km (2.0 mi)	38.0 km (24.0 mi)
<b>Depth Range Surveyed</b>	290-310 m (950-1020 ft)	40-130 m (130-425 ft)
<b>Predominant habitat observed</b>	Mud and sand	Boulders and cobble (La Cruz Canyon area). Rock ridges, cobbles and soft-bottom sediments (nearshore area).
<b>Topography/relief</b>	Low relief	Variable



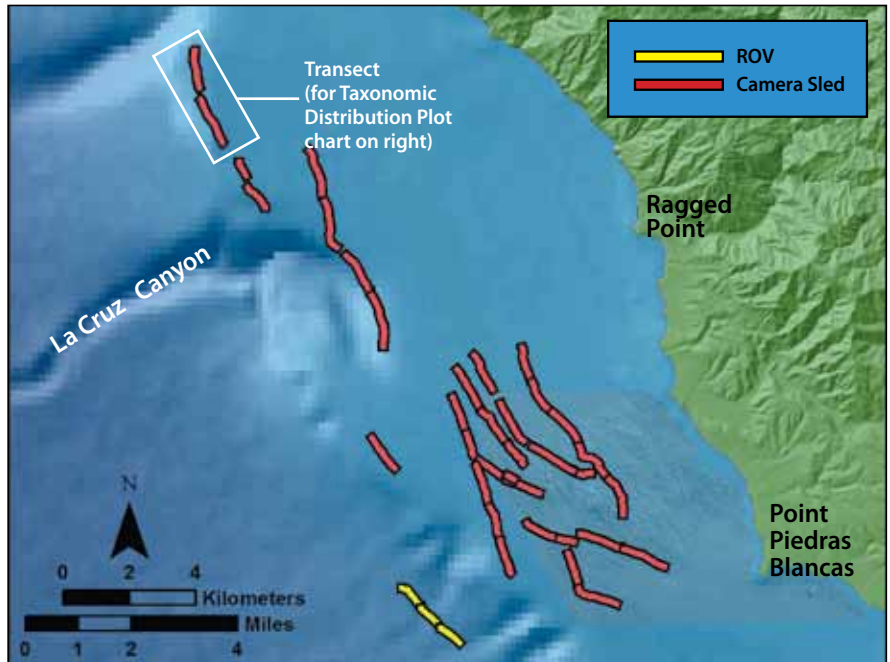
Bank rockfish (*Sebastes rufus*) lounges on the seafloor



Sea slug (*Pleurobranchaea californica*)



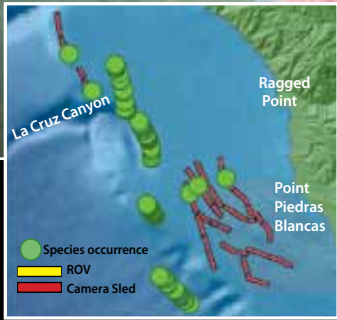
Chilipepper rockfish (*Sebastes goodei*)



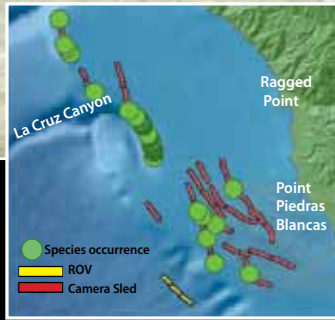
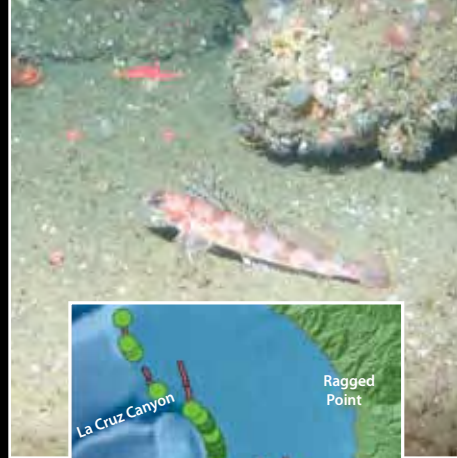
## Common fish groups observed: Common invertebrates observed:

- Rockfishes (*Sebastes* spp.)
- Lingcod (*Ophiodon elongatus*)
- Spotted ratfish (*Hydrolagus colliei*)
- Sablefish (*Anoplopoma fimbria*)
- Blackeyed gobies (*Rhinogobiops nicholsi*)
- Ronquils (Family Bathymasteridae)
- Greenlings (Family Hexagrammidae)
- Sculpins (Family Cottidae)
- Skates (Family Rajidae)
- Poachers (Family Agonidae)
- Eelpouts (Family Zoarcidae)
- Cusk eels (Family Ophidiidae)
- Flatfishes (Order Pleuronectiformes)
- Fragile pink urchins (*Strongylocentrotus fragilis*)
- Sun stars (*Rathbunaster* sp. and *Pycnopodia* sp.)
- Prawns (*Pandalus* spp.)
- Galatheid crabs (*Mundia* spp.)
- Metridium anemones (*Metridium* spp.)
- Octopus (Family Octopodidae)
- Sea slugs (Family Pleurobranchidae)
- Crabs (Order Decapoda)
- Sea pens, whips, and gorgonians (Subclass Octocorallia)
- Polychaete worms (Class Polychaeta)
- Various sea stars (Class Asteroidea)
- Basket and brittle stars (Class Ophiuroidea)
- Crinoids (Class Crinoidea)
- Sea cucumbers (Class Holothuroidea)
- Brachiopods (Phylum Brachiopoda)
- Sponges (Phylum Porifera)
- Other anemones (Phylum Cnidaria)

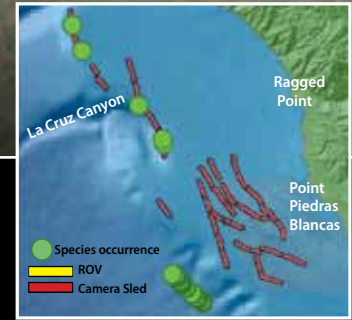




Octopus (Family Octopodidae)

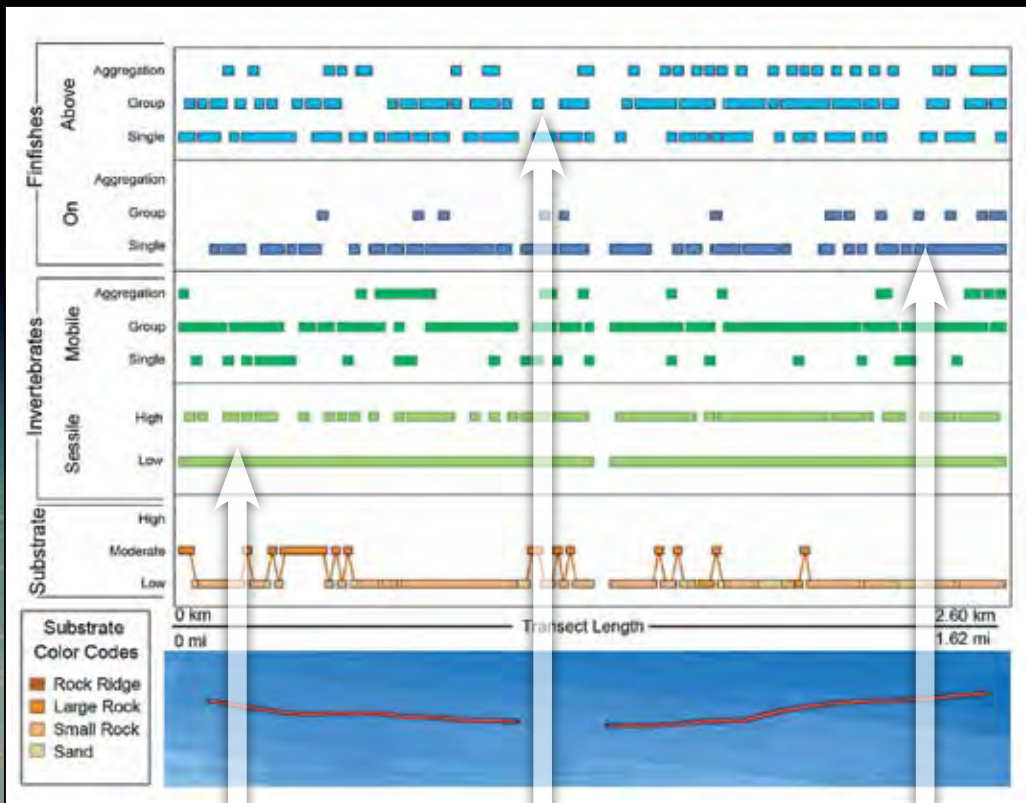


Combfishes (*Zaniolepis* spp.)



Eelpouts (Family Zoarcidae)

**Species Distribution Maps** depict the distributions of three common organisms on the outer and inner shelf areas. Octopus were very common in deeper, soft sediment areas both along the outer shelf and the slope. Combfishes - both shortspine (*Zaniolepis frenata*, pictured above) and longspine combfish *Zaniolepis latipinnis* - were very common along the edge of La Cruz Canyon though a few are seen inshore and along the northern outer shelf. Eelpouts, including the bigfin (*Lycodes corteziianus*, pictured above) were very common in the deeper slope area, and some were seen near the canyon and on the shelf near the canyon.



**Taxonomic Distribution Plot**

shows two-hour (2.6 km/1.6 mi) camera sled transect of the robust biological community associated with predominantly low relief boulder-cobble habitat along the edge of the continental shelf north of La Cruz Canyon. This habitat was populated by many species of rockfishes and also by many lingcod. Boulders and cobbles were encrusted in low-relief sponges and corals and covered in sea stars, cucumbers, and other small mobile invertebrates. Flatfishes were not observed on this transect and were omitted from the plot.

See page three for a detailed explanation on how to read these plots.

Many finfish were seen throughout the transect, most of them were swimming above the seafloor in groups of greater than 2 individuals.

Sessile invertebrate cover is consistent throughout the transect, both low- and high-relief invertebrates attach to the rocky habitat.

Single finfish resting on the seafloor were also common throughout this area.





Longnose skate (*Raja rhina*)  
off the coast of Point Sur

