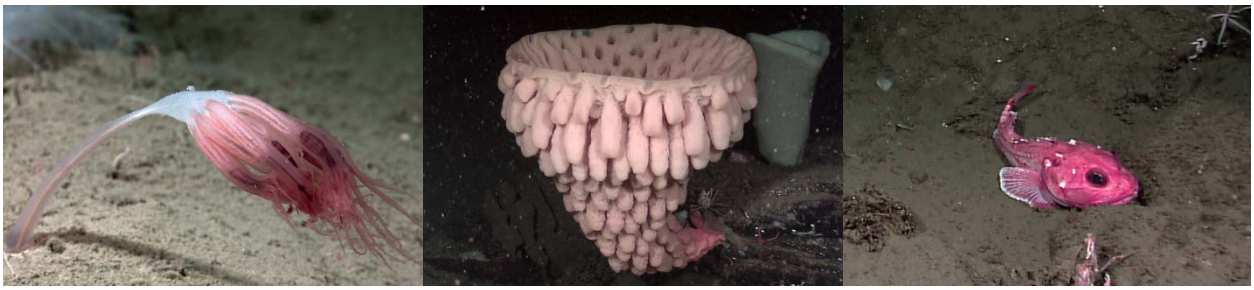
***CRUISE NUMBER: ROV 1102*** ***STUDY AREA: CHANNEL ISLANDS***

# A CHARACTERIZATION OF DEEP-SEA CORAL AND SPONGE COMMUNITIES ON THE CONTINENTAL SHELF OF CHANNEL ISLANDS NATIONAL MARINE SANCTUARY USING A REMOTELY OPERATED VEHICLE

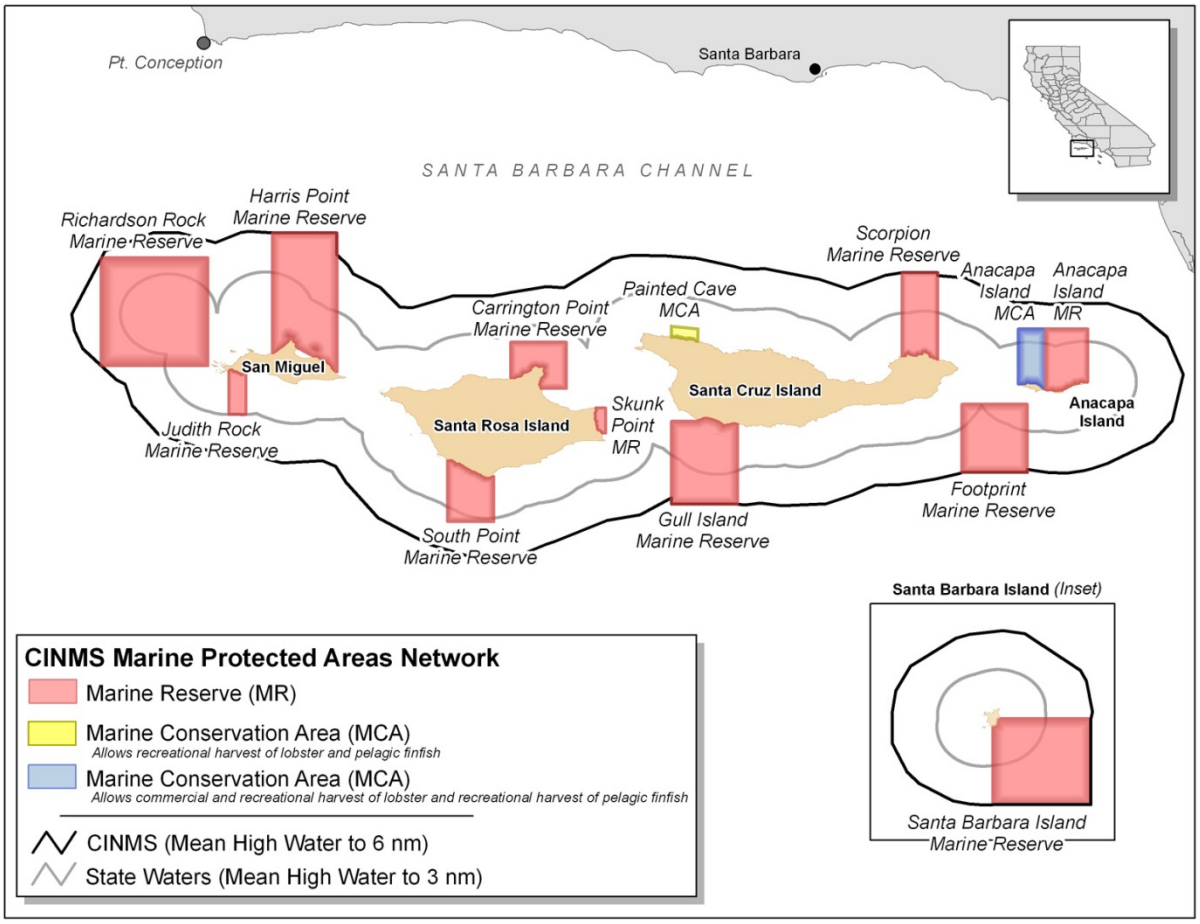
Danielle Lipski[1], Jennifer Bright[2], Dr. Steve Katz[1]
[1]NOAA Channel Islands National Marine Sanctuary, Santa Barbara, CA
[2]NOAA Olympic Coast National Marine Sanctuary, Port Angeles, WA



## STATION OVERVIEW

| | |
|---|---|
| **Project** | U.S West Coast, Okeanos Explorer ROV shakedown |
| **Chief Scientist** | Dr. Steve Katz |
| **Contact Information** | CINMS, Steve.Katz@noaa.gov |
| **Purpose** | ROV shakedown engineering dive in 2011 |
| **Vessel** | NOAA Ship *Okeanos Explorer*, *Little Hercules* ROV |
| **Science Observers** | ROV lead, Dave Lovalvo |
| **External Video Tapes** | 1 HD |
| **Internal Video Tapes** | n/a |
| **Digital Still Photos** | 344 from Okeanos Explorer, 913 from VARS |
| **Positioning System:** | Ship: DPS, DGPS; ROV, USBL |
| **CTD Sensors** | Yes |
| **O2 Sensor** | Yes, no data reported |
| **pH Sensor** | Yes, no data reported |
| **Specimens collected** | No |
| **Other** | Hard drive with video files |
| **Video and report analyst** | Jennifer Bright, Olympic Coast National Marine Sanctuary |
| **Date Compiled** | 17 December 2012 |

## STUDY SITE




In 1980, a portion of the Santa Barbara Channel was given a special protected status with the designation of the Channel Islands National Marine Sanctuary. The sanctuary is an area of national significance because of its exceptional natural beauty and resources. It encompasses approximately 1,470 square miles (or 1,110 square nautical miles) of water surrounding Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara Islands, extending from mean high tide to six nautical miles offshore around each of the five islands. The sanctuary's primary goal is the protection of the natural and cultural resources contained within its boundaries.

## PURPOSE OF FIELD SURVEY

The following information was taken from the *Okeanos Explore*r website oceanexplorer.noaa.gov/okeanos/explorations/ex1101/welcome.html, and written by Meme Lobecker, Expedition Coordinator, Physical Scientist, NOAA Office of Ocean Exploration and Research.

**California Shakedown Cruise 2011: Exploring California's National Marine Sanctuaries**

In 2011, the NOAA Ship *Okeanos Explorer* began their field season with a shakedown cruise through Channel Islands National Marine Sanctuary. This cruise number EX1101 was focused on preparing for the upcoming field season by performing sonar patch testing. The test cruise in the sanctuary provided an opportunity to test systems and equipment prior to integrating the use of the ROV on board. The cruise also provided an opportunity to conduct bathymetric mapping and to select targets to use for ROV testing for subsequent cruises. Bathymetry files are available at the Okeanos Explorer website listed here: http://oceanexplorer.noaa.gov/okeanos/explorations/ex1101/welcome.html.

This cruise also provided an opportunity for the ships scientists to test the performance of scientific equipment and instrumentation. During this cruise, the EM 302 (30 khz) multibeam sonar, EA 600 (12 khz) singlebeam sonar, and Kundsen sub-bottom profiler were tested.

After the ship shakedown objectives were met, the cruise took the opportunity to conduct mapping in the vicinity of southern California where the majority of areas mapped were requested by other NOAA offices including Channel Islands National Marine Sanctuary. On board mapping personnel collaborated with scientists from the Office of National Marine Sanctuaries (ONMS) to map areas and collect video imagery within the sanctuary.

## VESSEL AND ROV DESCRIPTION

The *Okeanos Explorer* is dedicated to exploration around the world, mapping the seafloor and characterizing unknown areas of the ocean. The ship has a multibeam sonar mapping system, conductivity, temperature and depth sensor (CTD), and a remotely operated vehicle (ROV).

The images and high-definition video from the ROV can be sent from the vehicle to the ship to the shore in real-time, referred to as "telepresence". Besides images and video other oceanographic data can be sent to scientists ashore so they can follow the cruise from one of the five Exploration Command Centers (ECC) located in places such as NOAA facilities in Silver Spring, MD and Seattle, WA, and the University of Rhode Island.

The *Okeanos Explorer* is the only NOAA ship to have a dedicated ROV. The ship is also equipped with an integrated control room for operating the multibeam, ROV and telepresence communication equipment.

The Little Hercules is a 4000m depth rated ROV and came to the *Okeanos Explorer* through collaboration between NOAA's Office of Ocean Exploration and Research and Dr. Robert Ballard's Institute for Exploration at the University of Rhode Island (IFE).

For video images, Little Hercules has two single chip color CCD cameras, two LED lights, two 400watt HMI lights and a state-of-the-art high definition video camera.

## VESSEL AND ROV IMAGES

*Okeanos Explorer*


Little Hercules ROV


## POST-DIVE VIDEO ANALYSIS AND DATA PROCESSING

Post-dive video analysis and data processing was performed by Jennifer Bright, a marine biologist and NOAA contractor for, and out of the offices of Olympic Coast National Marine Sanctuary.

The video acquired for the video analysis was from a shakedown cruise off of southern California to start the field season in 2011. The *Okeanos Explorer* ship is an exploration vessel rather than a research vessel and does not follow standard protocols for research surveys. For this cruise, there were no transects pre-determined ahead of time, instead there was a bottom exploration investigating habitats and organisms. The Little Hercules rarely used lasers throughout the seven dives in this shakedown cruise through the Channel Islands National Marine Sanctuary. No specimen collections were made.

Additionally, there wasn't a time stamp imprinted on any of the video acquired for the analysis. With the ROV exploring the seafloor in a random manner and without lasers and video time stamp, area calculations could not be determined for this project. Despite these limitations, this opportunistic video provides insight into the underexplored deep sea habitat of CINMS and some analysis of habitat and organisms was possible.

Sea floor habitats were classified by type of substratum, in order of decreasing particle size and vertical relief after Greene, et al. 1999: mud (M), sand (S), cobble (C), boulder (B), rock (R), and wall (W) for this survey. A two letter code was used to identify patches of uniform substratum

type. A habitat with a code of BC would designate a boulder cobble habitat with at least 50% of the area observed as boulder and at least 20% of the area as cobble. I also incorporated WC which stands for water column since there were multiple species observed in the water column.

Captured video clips were analyzed using Monterey Bay Aquarium Research Institute's Video Annotation and Reference System (VARS) program to annotate the video clips. The VARS system was then queried and placed into an Excel spreadsheet for further analysis. Additional analysis consisted of determining the approximate size of invertebrates and annotating associations for each dive. Since lasers were not used throughout the video, the video analyst approximated size using previous knowledge of general size categories (small, medium, large) of invertebrates. For example, *Swiftia* corals range within certain parameters, so a small *Swiftia* would be visually determined based on the general size of *Swiftia.*

## SUMMARY OF PROJECT

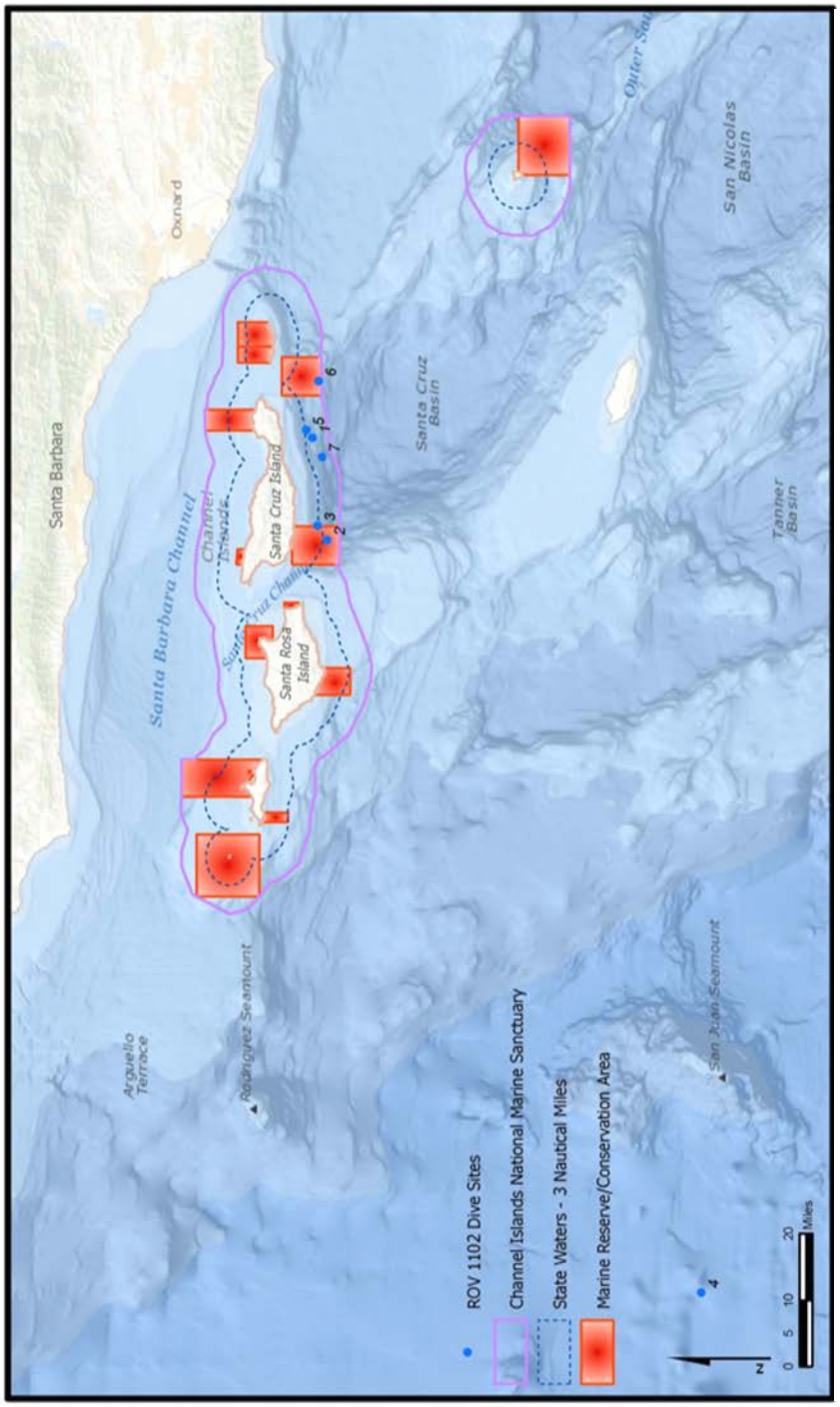
| | |
|---|---|
| Project | Focused on ship shakedown and sonar patch testing to prepare for upcoming field season. |
| Chief Scientist | Dr. Steve Katz |
| Contact Info | CINMS, Steve.Katz@noaa.gov |
| Purpose | ROV Shakedown Cruise |
| Vehicle | Little Hercules ROV |
| ROV lead | Dave Lovalvo |
| Acknowledgements | |
| Video and report Analyst | Jennifer Bright |
| See dive locations on map: | |

## ABOUT THIS REPORT

In this report we present summaries, by dive, of the diversity of corals, sponges, fishes and associated habitats observed during seven dives. We also present profiles of sea temperature and salinity reported by depth for each dive. We have included habitats, corals, sponges, fishes and other invertebrates observed. A table delineating observed size for corals and sponges follows these categories for each dive. Included in the report are observations of associations between organisms (see image). Selected images have been incorporated in the report for further clarification. This report is consistent with reporting requirements for the NOAA's Deep Sea Coral Research and Technology Program.

*Heterochone calyx* sponge associated with *Lithodes cousei* crab

## STUDY SITE DIVE TRACK MAP




Overview of study area in Southern California, off the coast of Santa Barbara

## INVERTEBRATE AND FISH TAXA OBSERVED

Invertebrate and fish taxa observed during video analysis from surveys conducted on seven dives with a remotely operated vehicle (ROV) in the Channel Islands National Marine Sanctuary. The total number of species observed during seven dives were 271 corals, 264 sponges, 261 fish and a 3,322 other invertebrates for a total of 4,118 observed species. Observed species are listed below:

| Scientific Name | Common Name | Taxon |
|---|---|---|
| *Anthomastus ritteri* | Mushroom coral | Coral |
| *Clavularia* sp. | Soft coral | Coral |
| *Halipteris californica* | Sea pen | Coral |
| *Paragorgia* sp. | White with red polyps | Coral |
| *Pennatula phosphorea* | Phosphorescent sea pen | Coral |
| Pennatulacea | Unidentified sea pen | Coral |
| Plexuridae | Swiftia like | Coral |
| *Umbelllula lindahli* | Droopsy sea pen | Coral |
| *Virgularia* sp. | Sea pen | Coral |
| | | |
| *Farrea occa* | Lace (cloud) foliose sponge | Sponge |
| *Heterochone calyx* | Fingered goblet | Sponge |
| *Hexaxtinella* sp. | Sponge (white) | Sponge |
| Porifera | Unidentified barrel sponges | Sponge |
| Porifera | Unidentified globular sponges | Sponge |
| Porifera | Unidentified vase sponges | Sponge |
| Porifera | Unidentified columnar sponges | Sponge |
| Porifera | Unidentified multi-tube sponges | Sponge |
| Porifera | Unidentified shelf sponges | Sponge |
| Porifera | Unidentified encrusting sponges | Sponge |
| Porifera | Unidentified lobate sponges | Sponge |
| Porifera | Unidentified stalked-funnel sponges | Sponge |
| | | |
| Actiniaria | Unidentified anemones | Anemone |
| Cerianthidae | Unidentified tube anemones | Anemone |
| Corallimorphidae | Unidentified white tip anemone | Anemone |
| *Liponema brevicornis* | Pom pom anemone | Anemone |
| Sabellidae (red) | Feather duster worm | Annelid |
| Sabellidae | Feather duster worm | Annelid |
| Serpulidae | Tube worm | Annelid |
| Brisingida | Sea star | Asteroid |
| *Ceramaster* sp. | Cushion sea star | Asteroid |
| *Gephyreaster* sp. | Sea star | Asteroid |
| *Henricia* sp. | Sea star | Asteroid |
| *Poraniopsis inflata* | spiny sea star | Asteroid |
| *Solaster* sp. | Sea star | Asteroid |

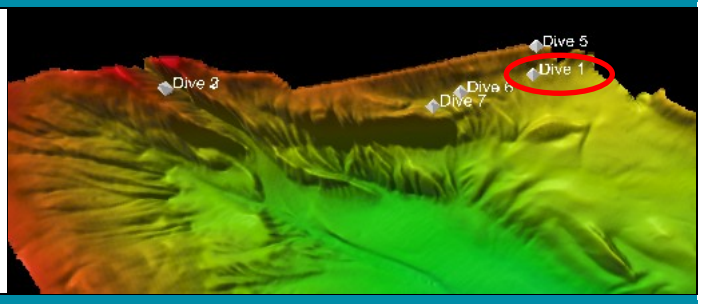
| Scientific Name | Common Name | Taxon |
|---|---|---|
| *Zoroaster* sp. | Sea star | Asteroid |
| *Asteronyx* sp. | Brittle star | Brittle star |
| Ophiuroidea | Brittle star | Brittle star |
| *Octopus* sp. | Octopus | Cephalopod |
| *Chionoecetes* sp. | Crab | Crab |
| *Chorillia* sp. | Decorator crab | Crab |
| Lithodidae | Crab | Crab |
| *Munida* sp. | Squat lobster | Crab |
| *Florometra serratissima* | Sea lily | Crinoid |
| *Pannychia moseleyi* | Sea cucumber | Cucumber |
| *Psolus* sp. | Sea cucumber | Cucumber |
| *Calliostoma* sp. | Top snail | Gastropod |
| *Neptunea* sp. | Whelk | Gastropod |
| Caprellidae | Skeleton shrimp | Amphipod |
| *Benthocodon* sp. | jelly (dark red) | jelly |
| *Poralia rufescens* | jelly (dark red) | jelly |
| Tritoniidae | Nudibranch (white) | Nudibranch |
| Pectinidae | Scallop | Mollusk |
| *Pandalopsis* sp. | Shrimp | Shrimp |
| *Dromalia alexandri* | Siphonophore | Siphonophore |
| *Cnemidocarpa* sp. | Pink sea squirt | Tunicate |
| *Corynascicia* sp. | Tunicate (clear) | Tunicate |
| *Megalodicpoia* sp. | Predatory tunicate | Tunicate |
| *Strongylocentrotus fragilis* | Fragile urchin | Urchin |
| Agonidae | Unidentified poachers | Fish |
| *Apristurus brunneus* | Catsharks | Fish |
| Cottidae | Unidentified sculpins | Fish |
| *Embassichthys bathybius* | Deepsea sole | Fish |
| *Eptatretus stoutii* | Pacific hagfish | Fish |
| *Lycenchelys crotalinus* | Snakehead eelpout | Fish |
| *Lycodapus* spp. | Unidentified eelpouts | Fish |
| *Microstomus pacificus* | Dover sole | Fish |
| Osteichthyes | Unidentified fishes | Fish |
| *Raja rhina* | Longnose skate | Fish |
| Scyliorhinidae | Unidentified catsharks | Fish |
| Scorpaenidae | Unidentified scorpion fishes | Fish |
| *Sebastolobus* sp. | Unidentified thorneyheads | Fish |
| Zoarcidae | Unidentified eelpouts | Fish |

## DIVE NUMBER: *01* SURVEY AREA: *Channel Islands*

### GENERAL LOCATION AND DIVE TRACK

7 km south of Santa Cruz Island, Channel Islands, CA

Overall map of the dive area




### SITE OVERVIEW

This was an engineering dive so there was not a lot of ground covered. Although the ROV spent about 7.5 hours in the water, the ROV left the bottom at approximately the same location it reached the bottom. Therefore, this dive did not survey much habitat.

| | |
|---|---|
| Forward View HD File | 49 clips |
| Digital Still Images | 17 from OE, 37 from VARS |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.4 at 805m depth |
| Temperature ºC (avg) | 5.0 at 805m depth |
| # of Samples Collected | 0 |

### SITE DATA

| | |
|---|---|
| Start Date | 2011-04-20 |
| End Date | 2011-04-20 |
| Minimum Bottom Depth (m) | ~ -800 |
| Maximum Bottom Depth (m) | -803 |
| Deployment (PDT) | 15:30 |
| Recovery (PDT) | 23:03 |
| Total Bottom Time | 4.32 |

| | |
|---|---|
| Start Latitude | N 33° 55.323' |
| Start Longitude | W 119° 36.491' |
| End Latitude | N 33° 55.323' |
| End Longitude | W 119° 36.491' |
| Bottom Current (kts) | n/a |
| Bottom Current Direction: | n/a |

**DIVE NUMBER:** ***01*** **SURVEY AREA:** ***Channel Islands***

## IMAGE GALLARY

IMAGE A: *Halipteris californica*

IMAGE B: Globular sponge morph

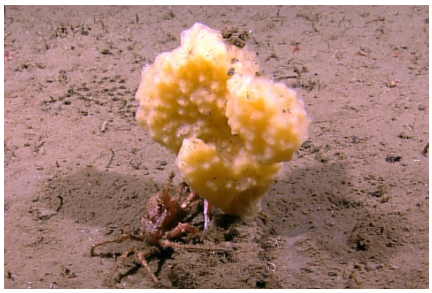


IMAGE C: *Apristurus brunneus*

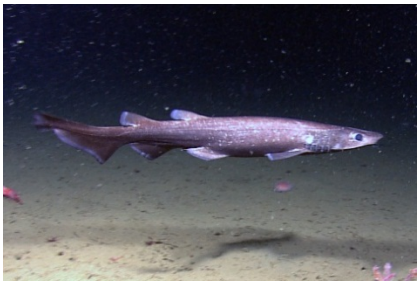


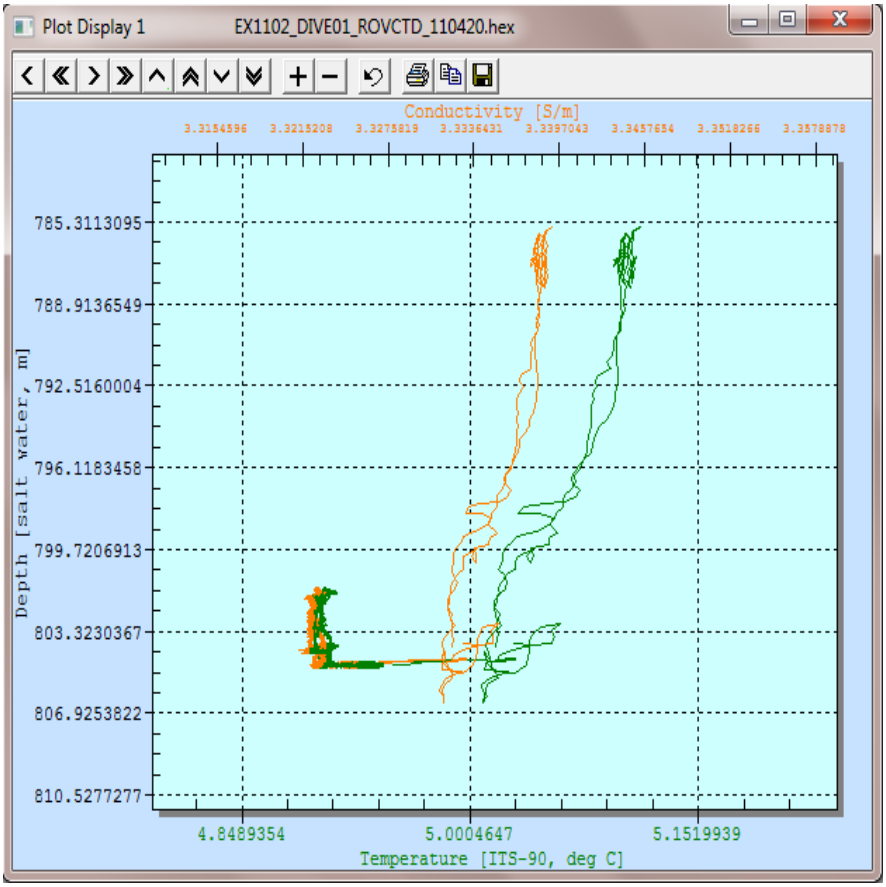
IMAGE D: *Pannychia moseleyi*

## CTD Data

The CTD data from each ROV dive was processed with Seabird processing software SBEData Processing-Win32 and the raw data plots using Seasave software. The greatest depth, corresponding temperature and Salinity were obtained from the processed data files in ascii format.

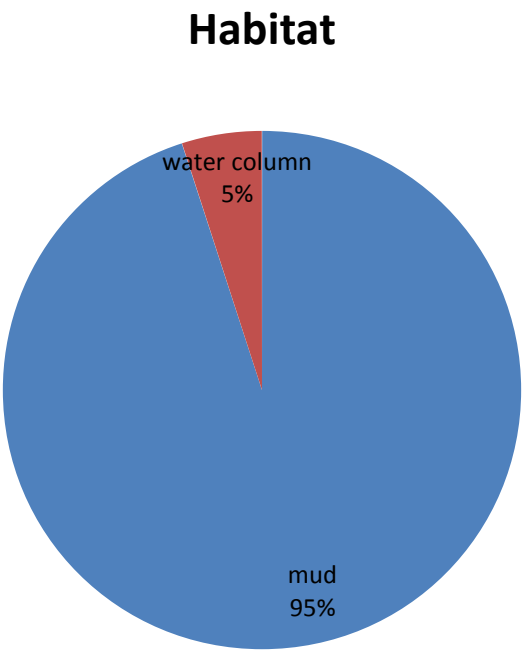
The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 1: 805m, 5.0$^{o}$ c, 34.4 psu



**Area calculations could not be performed for surveys from this exploratory cruise.**

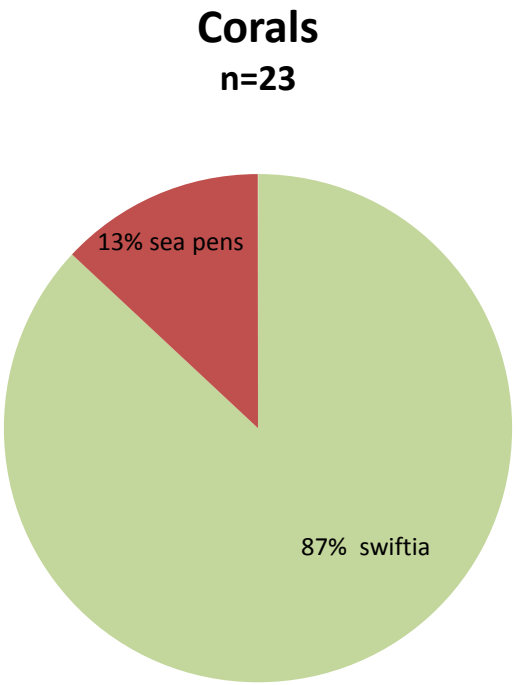
## Habitats Surveyed




The observed seafloor of dive 01 consisted of low relief areas of predominantly mud with occasional small rock outcrops. There were some organisms swimming in the water column at the beginning of the dive captured in frame grabs. Area could not be determined for this exploratory cruise.

## Corals

A total of 23 individual corals, comprising of *Swiftia* like (no specimens have been collected for determination) taxa and two taxa of seapens were found in this mud habitat during Dive 01 using the Little Hercules ROV from the NOAA vessel *Okeanos Explorer*. The two seapen species observed were *Ptilosarcus gurneyi* and *Halipteris californica*. There was little coral diversity observed during this dive.




Dive 1 Coral taxa

| Coral | Name | Number |
|---|---|---|
| | *Ptilosarcus gurneyi* | 2 |
| | *Halipteris californica* | 1 |
| | Plexauridae; *Swiftia* like | 20 |
| **Total** | | 23 |

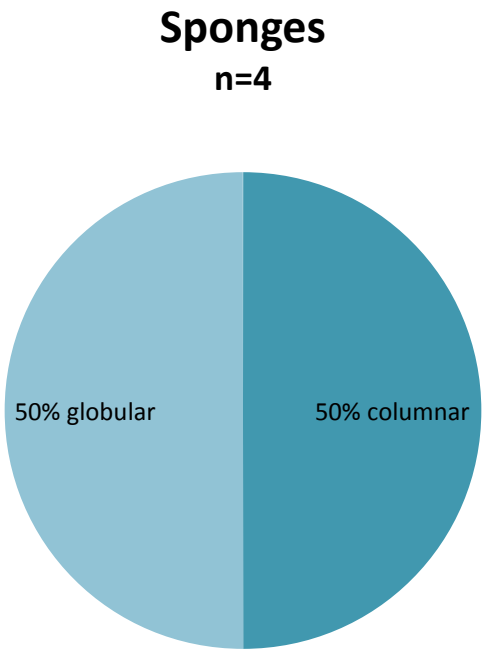
## Corals (cont.)

Dive 1 Coral size

| **Coral** | **Size** | **Number** |
|---|---|---|
| *Swiftia* like | medium | 17 |
| *Swiftia* like | small | 3 |
| seapen | small | 3 |
| **Total** | | 23 |

## Sponges

This dive was sparsely populated with invertebrates or fish. A total of four sponges were observed consisting of two globular and two columnar sponge morphs.




Dive 1 Sponge morphology

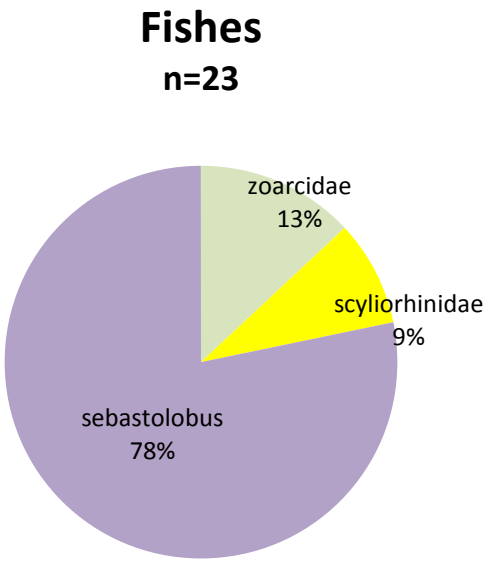
| Sponge | Morph | Number |
|---|---|---|
| | globular | 2 |
| | columnar | 2 |
| **Total** | | 4 |

Dive 1 Sponge size

| Sponge | Size | Number |
|---|---|---|
| globular | medium | 1 |
| globular | small | 1 |
| columnar | large | 1 |
| columnar | small | 1 |
| **Total** | | 4 |

## Fishes

Fishes observed during dive 01 consisted primarily of *Sebastolobus* sp., a few of these may have been rockfish but when they were seen in the distance could not be confirmed. There were also two brown cat sharks (*Apristurus brunneus*), and three unidentified eelpouts (*Zoarcidae* sp.) observed.




Dive 1 Fish Species

| Fishes | Scientific name | Common name | Number |
|---|---|---|---|
| | *Sebastolobus* sp. | unidentified thorneyhead | 18 |
| | *Apristurus brunneus* | brown cat shark | 2 |
| | *Zoarcidae* sp. | unidentified eelpout | 3 |
| **Total** | | | 23 |

## Species Associations

There were only three associations observed during dive 01.

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 1 | globular sponge | decorator crab | 1 |
| 2 | *Swiftia* like | brittle star | 3 |
| 3 | *Swiftia* like | brittle star | 1 |

## ADDITIONAL COMMENTS

This was the first dive of this leg and site selection was limited by spatial closures of the Pacific Missile Testing Range that overlaps the intended survey areas. Within the accessible area, this site was chosen to provide even low relief terrain, and it was. The bottom was dominated by low relief, low gradient soft sediment with occasional small rock outcrops. The smooth sediment was populated with common soft bottom animals – sea cucumbers (numerous *Pannychia moseleyi* and occasional *Psolus sp.*), sparsely distributed ground fish (thorneyheads and other rockfish), small decorator crabs (Brachiuran crabs) and whelks. Rock outcrops were small (<10m in longest dimension), and were commonly anchors for deep water sponge species. It was also interesting to see a brown cat shark in the first hour of the dive – most of what we know of them is from trawl by-catch and those specimens are not in good condition.

## DIVE NUMBER: *02* SURVEY AREA: *Channel Islands*

## GENERAL LOCATION AND DIVE TRACK

| | |
|---|---|
| Santa Cruz Canyon | |

## SITE OVERVIEW

**This dive was aborted at 50m depth to recover vehicles and resolve software issues.**

| | |
|---|---|
| Forward View HD File: | 10 clips |
| Digital Still Images | 3 from OE |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.0 at 85m depth |
| Temperature ºC (avg) | 9.1 at 85m depth |
| # of Samples Collected | 0 |

## SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-21 | Start Latitude | none reported |
| End Date | 2011-04-21 | Start Longitude | none reported |
| Minimum Bottom Depth (m) | none reported | End Latitude | none reported |
| Maximum Bottom Depth (m) | none reported | End Longitude | none reported |
| Deployment (PDT) | 20:34 | Bottom Current (kts) | n/a |
| Recovery (PDT) | 21:40 | Bottom Current Direction: | n/a |
| Total Bottom Time | 0 | | |

## DIVE NUMBER: *02* SURVEY AREA: *Channel Islands*

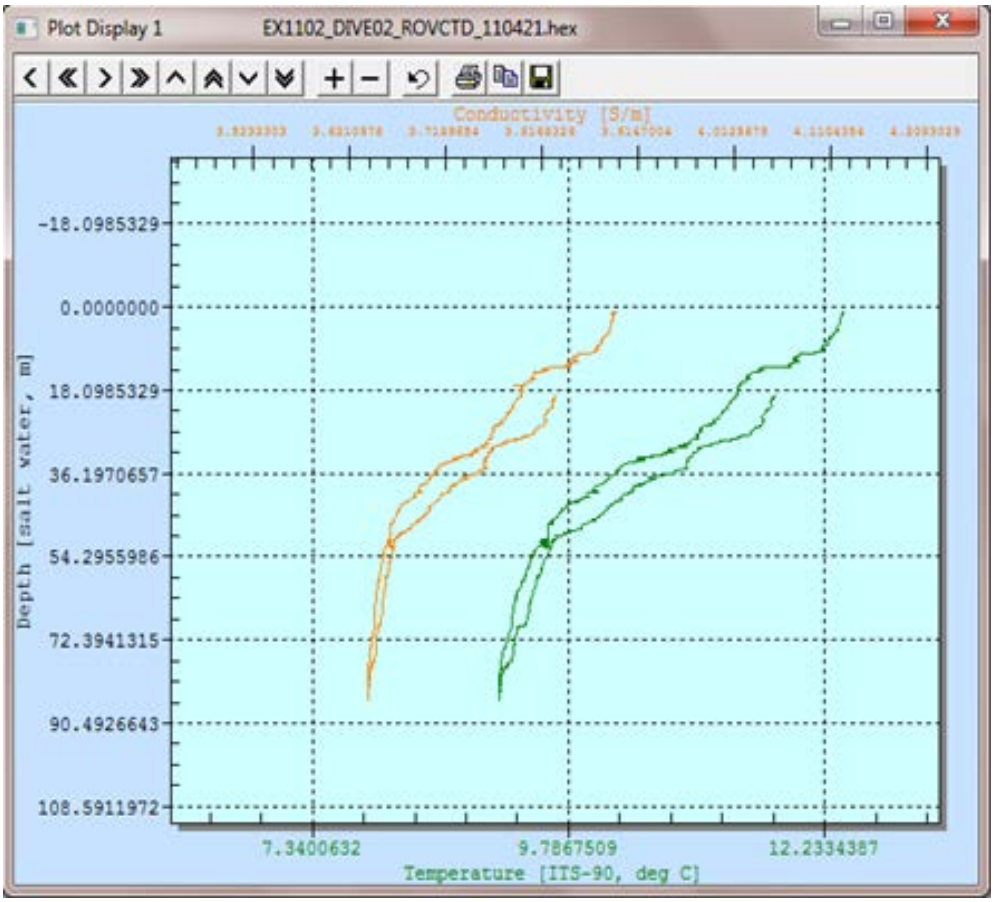
## IMAGE GALLARY

IMAGE A: Unidentified translucent fish

## CTD Data

The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 2: 85m, 9.1$^{o}$ c, 34.0 psu



**DIVE NUMBER:** *02* **SURVEY AREA:** *Channel Islands*

**PHYSICAL ENVIRONMENT**

## Habitats Surveyed

This was an aborted dive and a brief view of the bottom revealed mud habitat.

**DIVE NUMBER:** *02* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Corals

No corals were observed during this aborted dive.

**DIVE NUMBER:** *02* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Sponges

No sponges were observed during this aborted dive.

**DIVE NUMBER:** *02* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Fishes

One *Sebastolobus* sp. and one unknown translucent fish were observed during this aborted dive.

**ADDITIONAL COMMENTS**

There were a few invertebrates observed prior to the aborted 50m depth dive. See table below.

**Dive 2 all species**

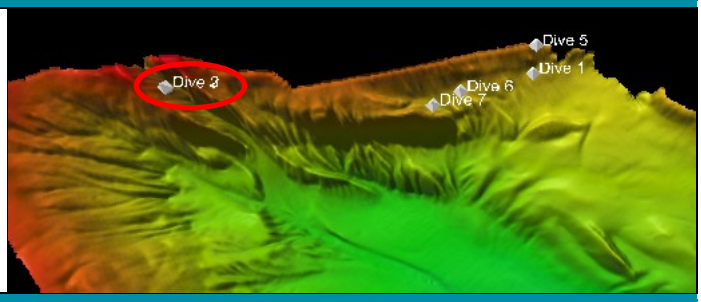
| **Invertebrate** | **Number** | |
|---|---|---|
| ***Strongylocentrotus fragilis*** | **3** | |
| ***Pannychia moseleyi*** | **2** | |
| **Gastropoda** | **3** | |
| **Actiniaria** | **2** | |
| **Total** | **10** | |

## DIVE NUMBER: *03* SURVEY AREA: *Channel Islands*

## GENERAL LOCATION AND DIVE TRACK

6 km South of Santa Cruz Island, Channel Islands, CA

Overall view of dive area




## SITE OVERVIEW

This dive started at the bottom of the Gull Island submarine canyon on the south side of Santa Cruz Island. The dive began on the floor of the canyon at approximately 800m, a sedimented soft bottom was observed, and then progressed up the west wall of the canyon, which is steep rock walls, ending at 425m deep. In addition to transiting across a wide range of relief, the dive crossed into the Gull Island Federal Marine Protected Area (MPA).

| | |
|---|---|
| Forward View HD File | 86 clips |
| Digital Still Images | 68 from OE, 188 from VARS |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.3 at 473m depth. 3b: 34.4 at 786m depth |
| Temperature ºC (avg) | 6.8 at 473m depth. 3b: 5.0 at 786m depth |
| # of Samples Collected | 0 |

## SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-22 | Start Latitude | N 33° 54.631" |
| End Date | 2011-04-22 | Start Longitude | W 119° 47.930" |
| Minimum Bottom Depth (m) | -425m | End Latitude | N 33° 54.473" |
| Maximum Bottom Depth (m) | -786m | End Longitude | W 119° 48.400" |
| Deployment (PDT) | 16:17 | Bottom Current (kts) | n/a |
| Recovery (PDT) | 23:19 | Bottom Current Direction: | n/a |
| Total Bottom Time | 5.21 | | |

**DIVE NUMBER: *03*** **SURVEY AREA: *Channel Islands***

**IMAGE GALLARY**

IMAGE A: *Heterochone calyx* sponge

IMAGE B: *Anthomastus ritteri*

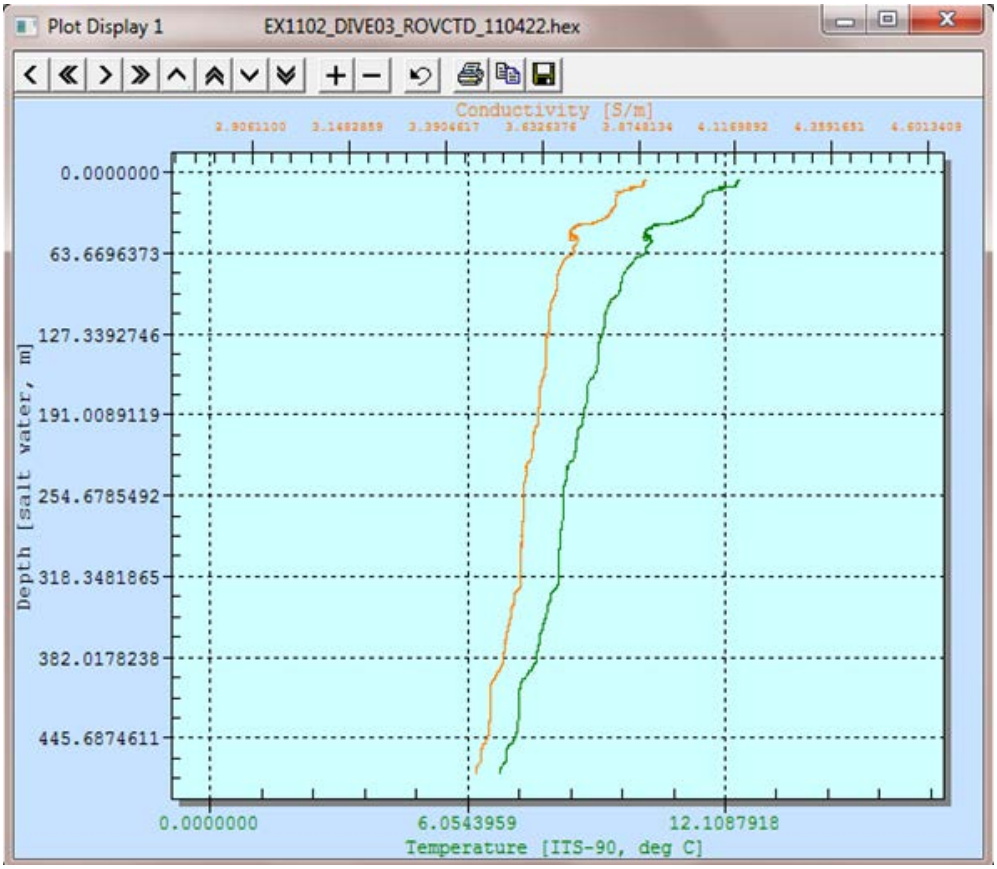
IMAGE C: Sponge, ruffled morph

IMAGE D: *Microstomus pacificus*

## CTD Data

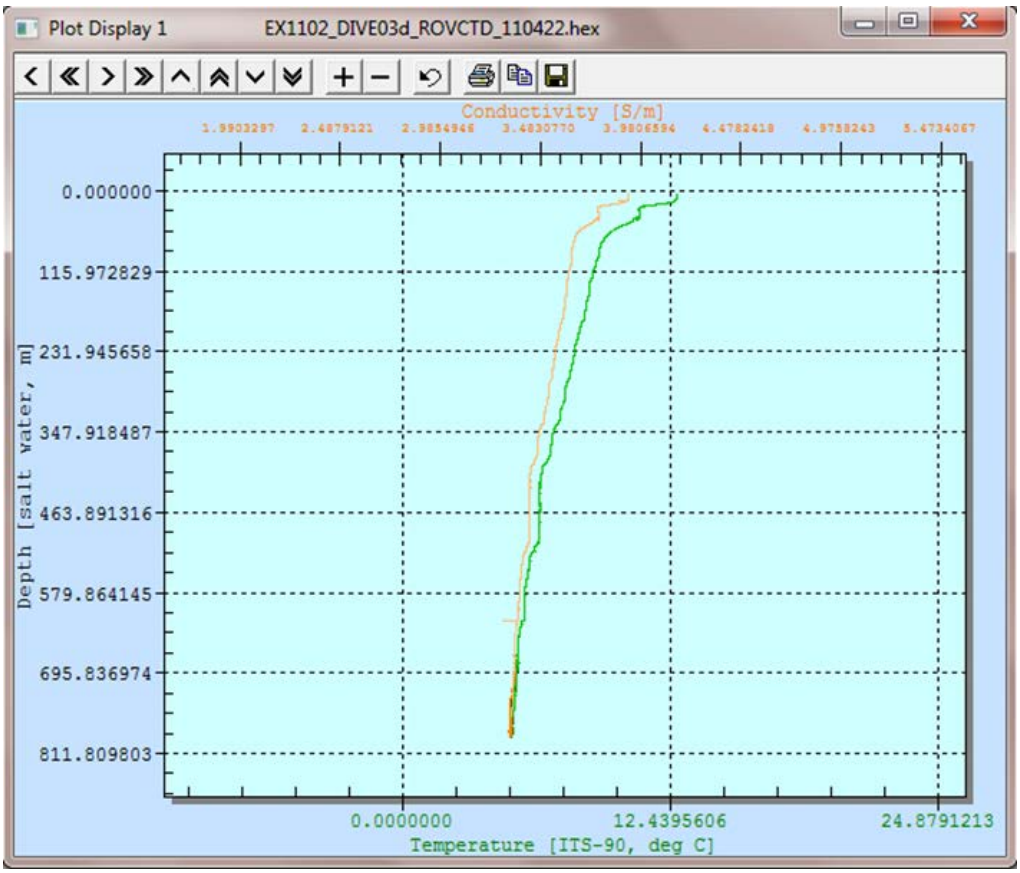
The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 3: 473m, 6.8$^{o}$ c, 34.3 psu



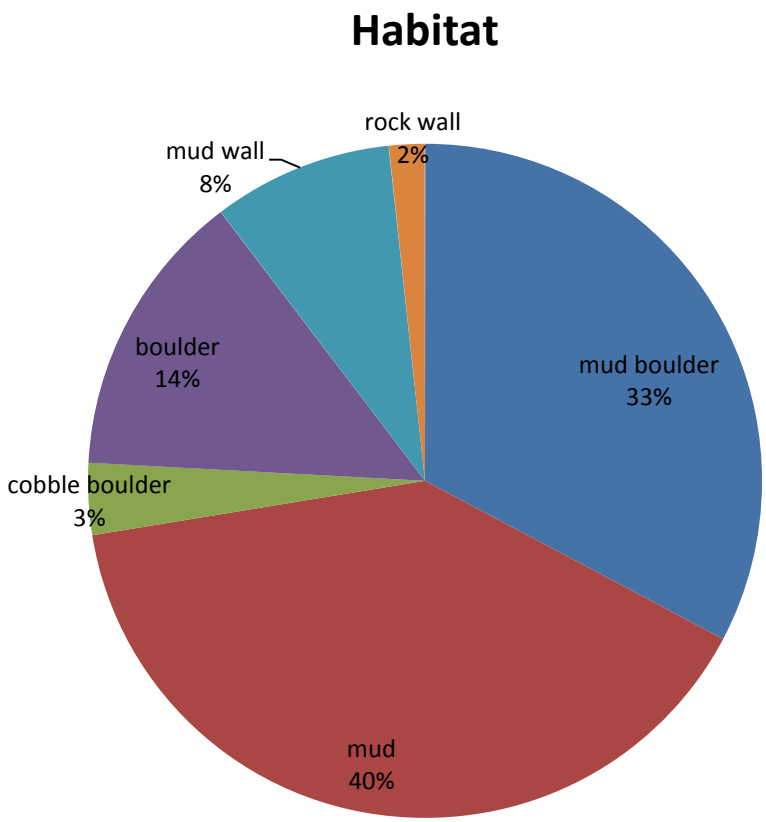
## CTD Data (cont.)

Dive 3b: 786 m, 5.0$^{o}$ c, 34.4 psu



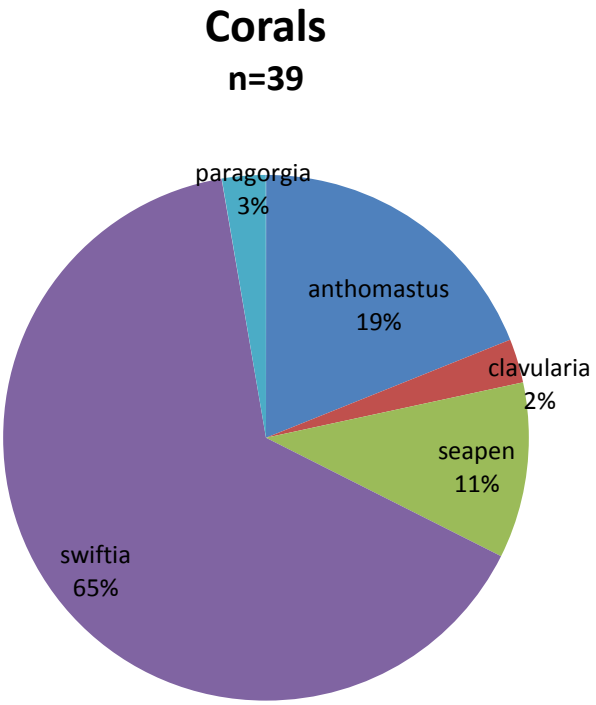
## Habitats Surveyed

The seafloor during dive 03 was predominantly covered in heavy sediment with a few occasional outcrops hosting sessile organisms. These small rocks hosted small sponges and sea anemones. The diverse invertebrate fauna consisted primarily of sponges, soft corals and large light bulb tunicates. Mud was the predominant habitat (40%) followed by mud and boulders (33%). There were a few areas of boulders (14%) and a mud wall.



## Corals

Of the 39 corals observed, the predominant coral documented during dive 03 was the pink *Swiftia* like coral on many of the boulders. Seven mushroom corals (*Anthomastus ritteri*) were seen in this area and a few seapen type corals were observed in the soft sediment.




Dive 3 Coral taxa

| Coral | Name | Number |
|---|---|---|
| | Plexauridae; *Swiftia* like | 24 |
| | *Anthomastus riterri* | 7 |
| | *Halipteris californica* | 2 |
| | seapens | 4 |
| | *Clavularia* sp. | 1 |
| | *Paragorgia* sp. | 1 |
| **Total** | | 39 |

## Corals (Cont.)

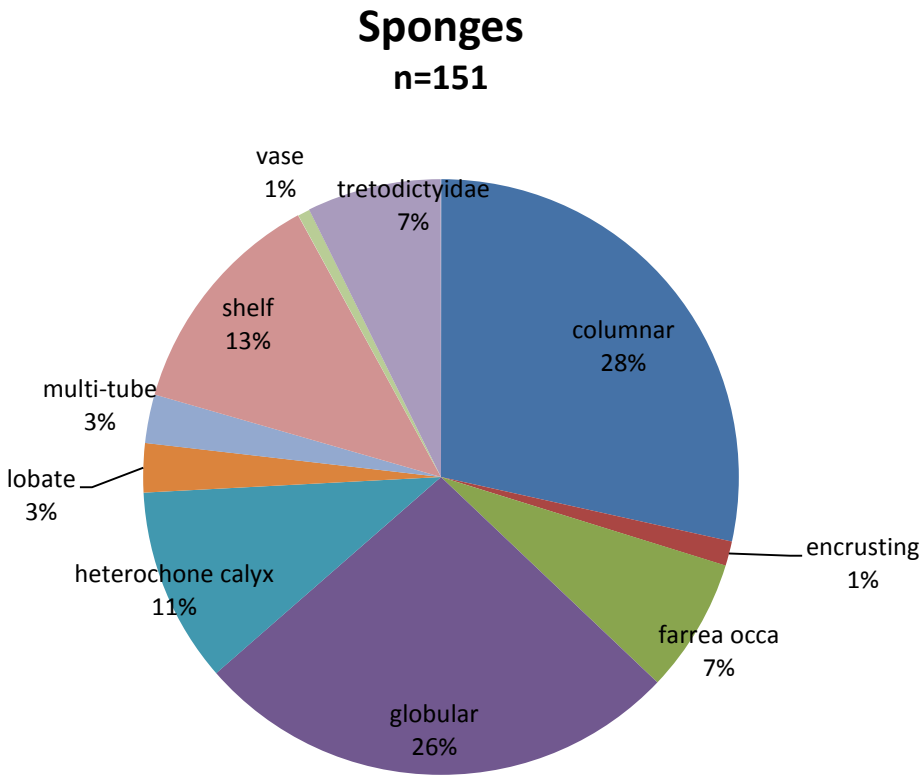
Dive 3 Coral size

| **Coral** | **Size** | **Number** |
|---|---|---|
| *Anthomastus* sp. | medium | 5 |
| *Anthomastus* sp. | small | 2 |
| *Clavularia* sp. | medium | 1 |
| *Paragorgia* sp. | small | 1 |
| seapen | small | 5 |
| seapen | medium | 1 |
| *Swiftia* like | medium | 16 |
| *Swiftia* like | large | 2 |
| *Swiftia* like | small | 6 |
| **Total** | | 39 |

## Sponges

Sponge species diversity was high. There were 152 sponges observed during dive 03 with many different sponge morphs represented. The most predominant were columnar and globular morphs, followed by shelf sponge morphs and the glass sponges *Heterochone calyx, Farrea occa* and *Tretodictyidae* spp. There were a few multi-tube, lobate, encrusting and vase sponge morphs also observed.

There was one relatively large *Heterochone calyx* sponge that was overturned on the seafloor and another one with a mat growth. Several sponges were observed growing on a derelict fishing long line stretched above the seafloor.



## Sponges (cont.)

Dive 3 Sponge morphology

| Sponge | Morph | Scientific name | Number |
|---|---|---|---|
| | columnar | | 44 |
| | globular | | 40 |
| | shelf | | 19 |
| | | *Heterochone calyx* | 16 |
| | | *Farrea occa* | 11 |
| | | *Tretodictyidae* sp. | 10 |
| | multi-tube | | 4 |
| | lobate | | 4 |
| | encrusting | | 2 |
| | vase | | 1 |
| **Total** | | | 151 |

Dive 3 Sponge size

| **Sponge** | **Size** | **Number** |
|---|---|---|
| columnar | large | 3 |
| columnar | medium | 28 |
| columnar | small | 13 |
| encrusting | large | 1 |
| encrusting | medium | 1 |
| *Farrea occa* | medium | 6 |
| *Farrea occa* | small | 5 |
| globular | medium | 6 |
| globular | small | 34 |
| *Heterochone calyx* | large | 6 |
| *Heterochone calyx* | medium | 10 |
| lobate | large | 2 |
| lobate | medium | 1 |
| lobate | small | 1 |
| multi-tube | medium | 4 |
| shelf | medium | 9 |
| shelf | small | 10 |
| *Tretodictyidae* sp. | medium | 1 |
| *Tretodictyidae* sp. | small | 9 |
| vase | medium | 1 |
| Total | | 151 |

**Juvenile cat sharks (*Apristurus brunneus*)**

**Thorneyheads (*Sebastolobus* sp.)**

**Flatfish *(Pleuronectidae* sp.*)***

**Eelpouts *(Zoarcidae* sp.*)***

**Pacific flatnose (*Antimora microlepis*)**

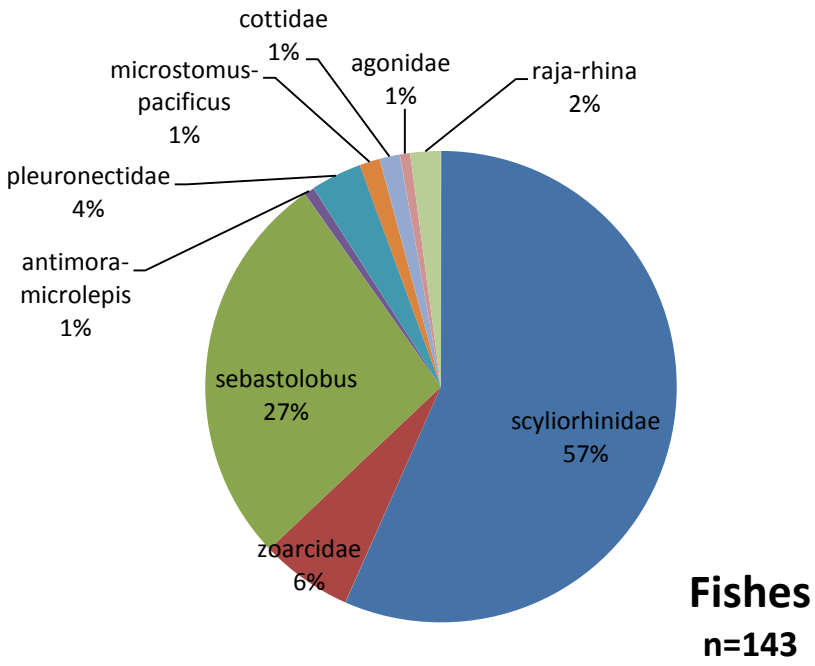
## Fishes

At this dive site many brown cat sharks *(Apristurus brunneus)* were observed swimming in the water column with most of them appearing to be juveniles.

There were also many thorneyhead (*Sebastolobus* sp.) observed on the seafloor and a few eelpouts (*Zoarcidae* sp.) and flatfish (*Pleuronectidae* sp.). One observation was made of a Pacific flatnose *(Antimora microlepis)*.

## Fishes (cont.)

Also observed in the video were two areas where trawl tracks were apparent and a fishing gear long line was also noted.




Dive 3 Fish Species

| Fishes | Scientific name | Common name | Number |
|---|---|---|---|
| | *Scyliorhinidae Apristurus* | brown cat shark | 81 |
| | *Sebastolobus* sp. | unidentified thorneyhead | 39 |
| | *Zoarcidae* sp. | unidentified eelpout | 9 |
| | *Pleuronectidae* sp. | flatfish | 7 |
| | *Raja rhina* | skate | 3 |
| | *Cottidae sp.* | sculpin | 2 |
| | *Agonidae sp.* | poacher | 1 |
| | *Antimora microlepis* | Pacific flatnose | 1 |
| **Total** | | | 143 |

## Species Associations

There were 24 associations observed during dive 03, many of these associations were shrimp on sponges.

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 4 | lobate sponge morph | shrimp | 2 |
| 5 | *Heterochone calyx* | shrimp | 2 |
| | | *Pandalopsis* ampla shrimp | 8 |
| 6 | columnar sponge morph | Pandalopsis ampla shrimp | 2 |
| 7 | *Heterochone calyx* | shrimp | 1 |
| 8 | *Farrea* sp. | decorator crab | 1 |
| 9 | *Heterochone calyx* | shrimp | 1 |
| 10 | *Heterochone calyx* | shrimp | 1 |
| 11 | columnar sponge morph | shrimp | 1 |
| 12 | lobate sponge morph | shrimp | 3 |
| 13 | columnar sponge morph | shrimp | 1 |
| 14 | columnar sponge morph | decorator crab | 1 |
| | | shrimp | 1 |
| 15 | lobate sponge morph | shrimp | 1 |
| 16 | *Heterochone calyx* | shrimp | 1 |
| | | sculpin | 2 |
| 17 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 18 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 19 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 20 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 21 | *Heterochone calyx* | shrimp | 6 |
| 22 | *Swiftia* like | *Ophiuroid* | 1 |
| 23 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 24 | *Anthomastus ritteri* | shrimp | 1 |

## ADDITIONAL COMMENTS

An observation was made immediately adjacent to the Marine Protected Area boundary near the beginning of the dive, documenting the presence of trawl marks on the bottom and numerous dead scallop shells. The portion of the dive that progressed up the canyon wall revealed an unexpectedly high density and diversity of benthic invertebrate fauna. This was the first encounter with really large, cold water sponges; especially impressive were the goiter sponges (*Heterochone calyx*).

Dive 3. Trawl marks next to a scallop shell mentioned in comments

| DIVE NUMBER: *04* | SURVEY AREA: *Channel Islands* |
|---|---|

## *GENERAL LOCATION AND DIVE TRACK*

| | |
|---|---|
| 170 km west of San Nicolas, Channel Islands, CA<br>This dive was outside of Channel Islands National Marine Sanctuary | Cupcake Deep |

## *SITE OVERVIEW*

**The dive was aborted. ROV port vertical thrusters stopped operating during descent.**

| | |
|---|---|
| Forward View HD File | 11 clips |
| Digital Still Images | 3 from OE |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.7 at 4007m depth |
| Temperature ºC (avg) | 1.5 at 4007m depth |
| # of Samples Collected | 0 |

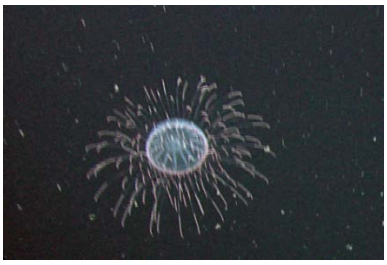
## SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-23 | Start Latitude | N 33° 04.735" |
| End Date | 2011-04-24 | Start Longitude | W 121° 27.989" |
| Minimum Bottom Depth (m) | -3,988m | End Latitude | N 33° 04.735" |
| Maximum Bottom Depth (m) | -3,988m | End Longitude | W 121° 27.989" |
| Deployment (PDT) | 16:17 | Bottom Current (kts) | |
| Recovery (PDT) | 00:42 | Bottom Current Direction: | |
| Total Bottom Time | .45 | | |

| DIVE NUMBER: *04* | SURVEY AREA: *Channel Islands* |
|---|---|

## IMAGE GALLARY

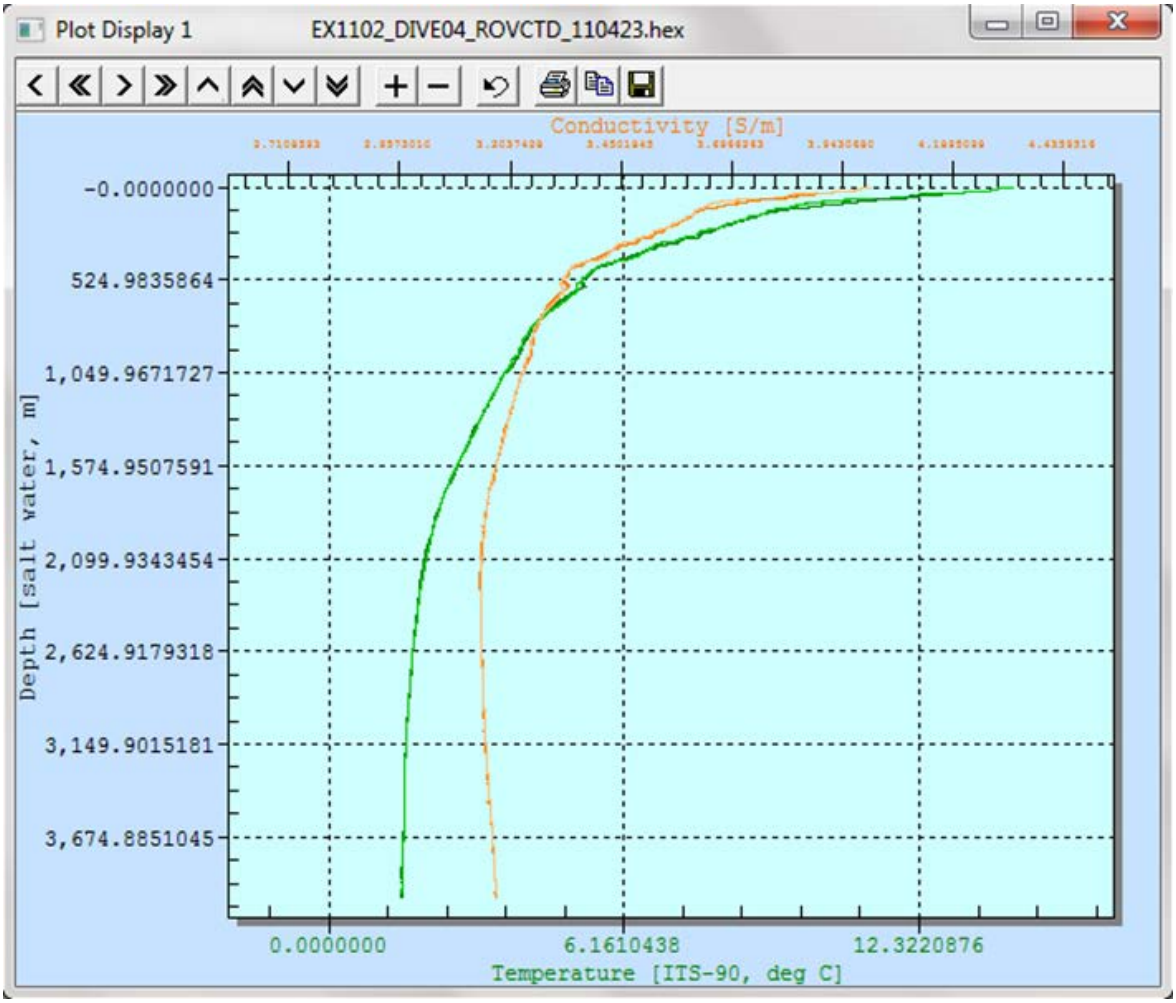
IMAGE A: An unidentified jelly in the water column.



## CTD Data

The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 4: 4007m, 1.5$^{o}$ c, 34.7 psu



**DIVE NUMBER:** *04* **SURVEY AREA:** *Channel Islands*

**PHYSICAL ENVIRONMENT (cont.)**

## Habitats

The dive was aborted

**DIVE NUMBER:** *04* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Corals

The dive was aborted.

**DIVE NUMBER:** *04* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Sponges

The dive was aborted.

**DIVE NUMBER:** *04* **SURVEY AREA:** *Channel Islands*

**BIOLOGICAL ENVIRONMENT**

## Fishes

The dive was aborted.

**ADDITIONAL COMMENTS**

The dive was aborted due to problems with the ROV.

## DIVE NUMBER: *05* SURVEY AREA: *Channel Islands*

### GENERAL LOCATION AND DIVE TRACK

6 km south of Santa Cruz Island, Channel Islands, CA


### SITE OVERVIEW

This dive was one of the deeper dives on the south Santa Cruz Island escarpment at ca. 750m. In this dive there were numerous observations of deep water scallops. Many of the sponges observed housed associated species, mostly crabs and one hagfish.

| | |
|---|---|
| Forward View HD File | 90 clips |
| Digital Still Images | 131 from OE, 281 from VARS |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.4 at 744m depth |
| Temperature ºC (avg) | 5.3 at 744m depth |
| # of Samples Collected | 0 |

### SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-25 | Start Latitude | N 33° 56.139" |
| End Date | 2011-04-25 | Start Longitude | W 119° 35.489" |
| Minimum Bottom Depth (m) | -˜745 | End Latitude | N 33° ˜56.139" |
| Maximum Bottom Depth (m) | -˜745 | End Longitude | W 119° ˜35.489" |
| Deployment (PDT) | 18:24 | Bottom Current (kts) | |
| Recovery (PDT) | 23:24 | Bottom Current Direction: | |
| Total Bottom Time | 3.19 | | |

**DIVE NUMBER: *05*** **SURVEY AREA: *Channel Islands***

**IMAGE GALLARY**

IMAGE A: *Umbellula lindahli*

IMAGE B: *Tretodictyidae* spp.

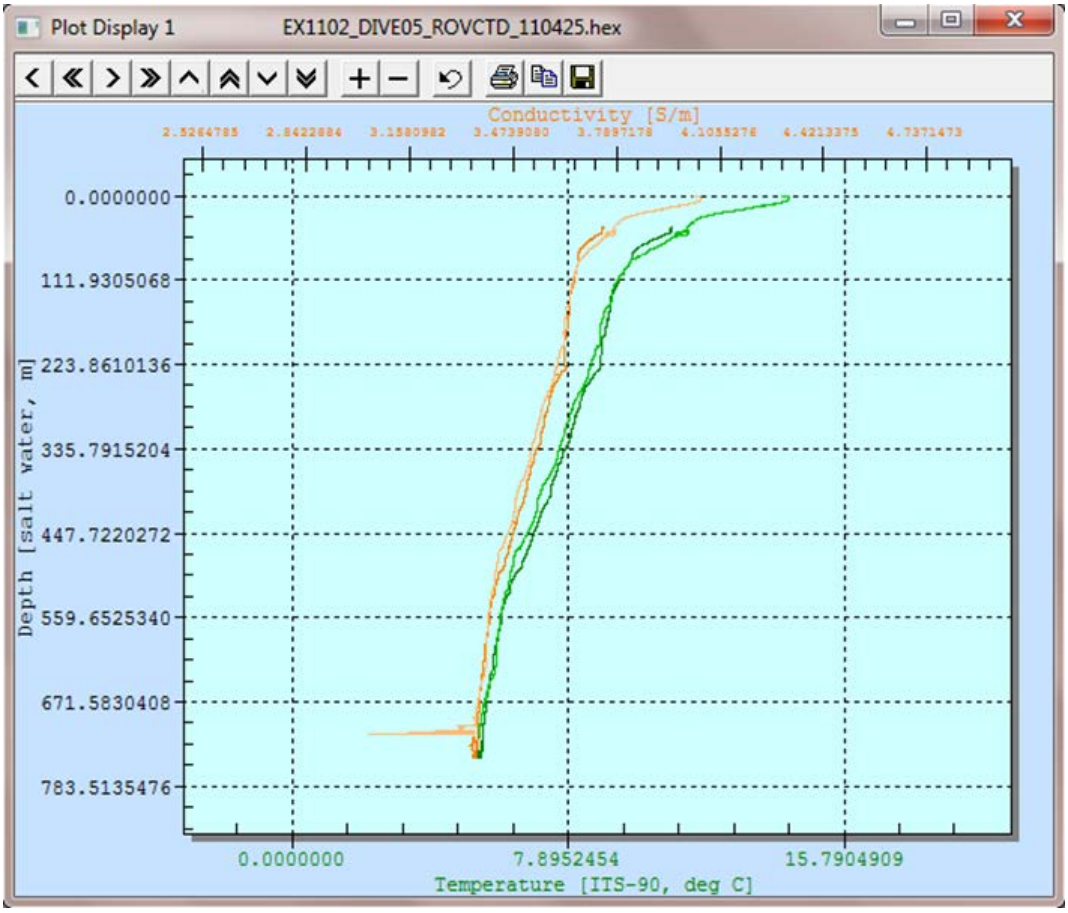
IMAGE C: *Ceramaster* sp.

IMAGE D: *Pectinidae* sp., scallops

## CTD Data

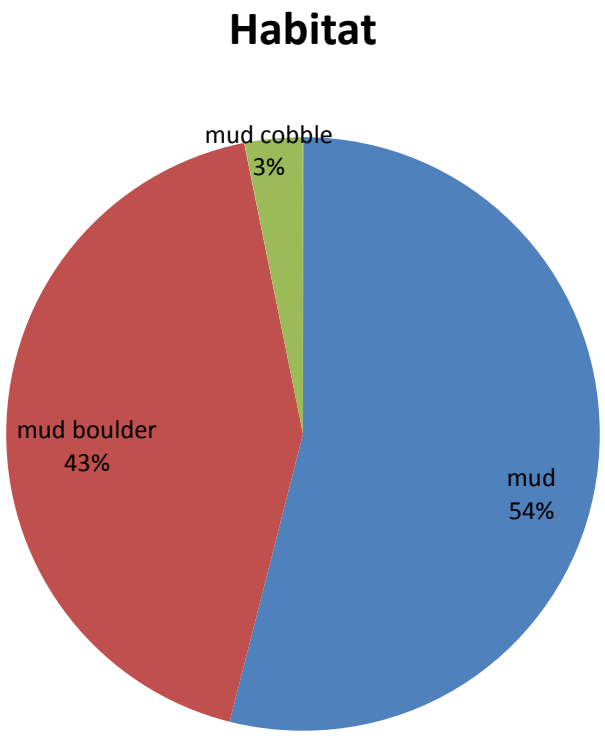
The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 5: 744 m, 5.3$^{o}$ c, 34.4 psu



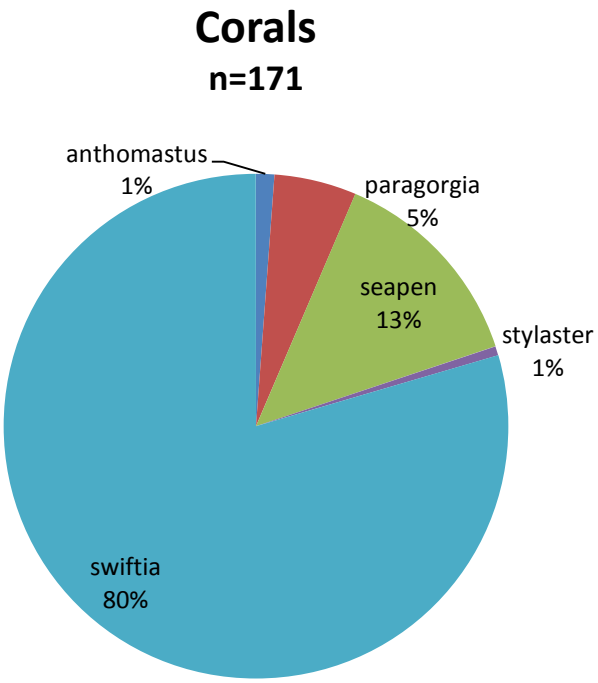
## Habitats Surveyed

The predominant habitat was mud at 54%, followed by mud boulder (43%) and mud cobble (3%). The habitat was dominated by soft mud sediment with occasional small to medium sized rock boulders or outcrops. The rock outcrops were almost completely colonized by benthic invertebrates.



## Corals

Coral species diversity was high, with at least eight coral species identified including 136 Plexauridae; *Swiftia* like corals. After discussing these *Swiftia* observations with Tom Laidig (per. comm.), he mentioned these *Swiftia* like corals have not yet been identified from sampling in the Southern California Bight. There were also four different seapen species observed as well as nine small white *Paragorgia* sp.




Dive 5 Coral taxa

| Coral | Name | Number |
|---|---|---|
| | Plexauridae; *Swiftia* like | 136 |
| | *Halipteris californica* | 16 |
| | *Umbelulla lindahli* | 4 |
| | *Virgularia* sp. | 2 |
| | *Stylatula* sp. | 1 |
| | *Paragorgia* sp. | 9 |
| | *Anthomastus ritteri* | 2 |
| | *Stylaster* sp. | 1 |

| | | | |
|---|---|---|---|
| | Total | | 171 |



## Corals (Cont.)

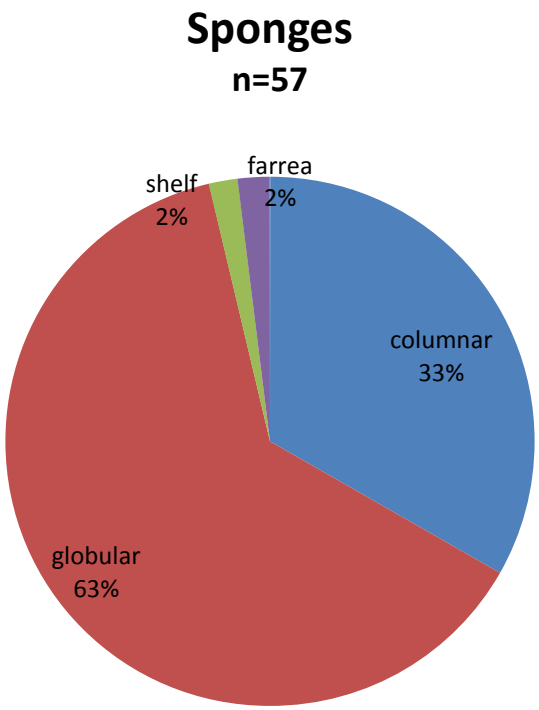
Coral size is determined relative to other like species (example: a large *Swiftia* like is comparable to other *Swiftia* species).

Dive 5 Coral size

| **Coral** | **Size** | **Number** |
|---|---|---|
| *Swiftia* like | large | 43 |
| *Swiftia* like | medium | 68 |
| *Swiftia* like | small | 25 |
| seapen | medium | 10 |
| seapen | small | 13 |
| *Paragorgia* sp. | small | 9 |
| *Anthomastus* sp. | medium | 1 |
| *Anthomastus* sp. | small | 1 |
| *Stylaster* sp. | small | 1 |
| Total | | 171 |

## Sponges

A total of 57 sponge morphs were observed during dive 05. The most abundant sponge morph consisted of small globular sponges, almost 63%. Columnar sponge morphs represented 33% of the sponges noted at the site split between small, medium and large sponges.




Dive 5 Sponge morphology

| Sponge | Morph | Scientific name | Number |
|---|---|---|---|
| | globular | | 36 |
| | columnar | | 19 |
| | shelf | | 1 |
| | | *Farrea* sp. | 1 |
| **Total** | | | 57 |

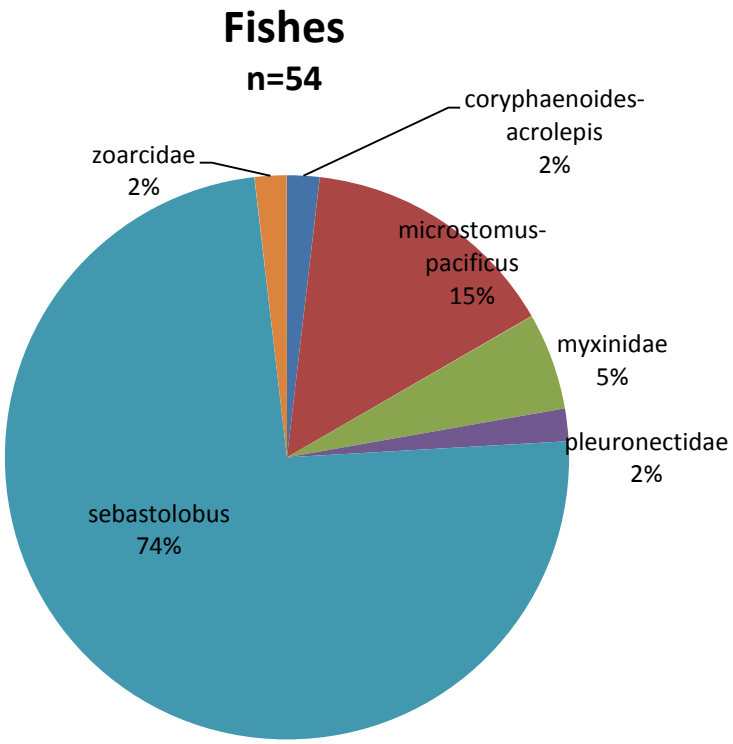
## Sponges (Cont.)

Dive 5 Sponge size

| **Sponge** | **Size** | **Number** |
|---|---|---|
| globular | medium | 5 |
| globular | small | 31 |
| columnar | large | 5 |
| columnar | medium | 9 |
| columnar | small | 5 |
| shelf | medium | 1 |
| *Farrea* sp. | medium | 1 |
| **Total** | | 57 |

## Fishes

During this deep dive there were many thorneyhead (*Sebastolobus* sp.) observed. It's possible a few of these were *Sebastes* rockfish, but not confirmed due to the distance from the ROV. A few Dover sole (*Microstomus pacificus*) were also observed.




Dive 5 Fish Species

| Fishes | Scientific name | Common name | Number |
|---|---|---|---|
| | *Sebastolobus* sp. | unidentified thorneyhead | 40 |
| | *Microstomus pacificus* | Dover sole | 8 |
| | *Myxinidae* sp. | hagfish | 3 |
| | *Zoarcidae* sp. | unidentified eelpout | 1 |
| | *Pleuronectidae* sp. | flatfish | 1 |
| | *Coryphaenoides acrolepis* | Pacific grenadier | 1 |
| **Total** | | | 54 |

## Species Associations

Many associations were observed during dive 05, the most of any dive with a comprehensive list below

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 30 | seastar | copepods | 3 |
| | | shrimp | 1 |
| 31 | *Swiftia* like | *Ophiuroid* | 1 |
| 32 | columnar sponge | crab | 1 |
| | | hagfish | 1 |
| 33 | columnar sponge | crab | 1 |
| | | shrimp | 5 |
| 34 | scallop | crab | 1 |
| | scallop | | |
| 35 | columnar sponge | scallop | 1 |
| | | crab | 1 |
| | | hagfish | 1 |
| 36 | columnar sponge | *Ophiuroid* | 1 |
| 37 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 38 | anemone | crab | 1 |
| 39 | anemone | decorator crab | 1 |
| 40 | columnar sponge | crab | 1 |
| 41 | columnar sponge | crab | 1 |
| 42 | columnar sponge | hagfish | 1 |
| | | seastar | 1 |
| | | crab | 1 |
| | | *Ophiuroid* | 4 |
| 43 | globular sponge | *Ophiuroid* | 4 |
| 44 | *Swiftia* like | *Ophiuroid* | 1 |
| 45 | *Swiftia* like | *Ophiuroid* | 1 |
| 46 | *Pannychia moseleyi* | *Ophiuroid* | 1 |
| 47 | *Pannychia moseleyi* | *Ophiuroid* | 1 |
| 48 | *Pannychia moseleyi* | *Ophiuroid* | 1 |
| 49 | *Pannychia moseleyi* | *Ophiuroid* | 1 |
| 50 | *Pannychia moseleyi* | *Ophiuroid* | 1 |
| 51 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 52 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 53 | anemone | crab | 2 |
| 70 | *Swiftia* like | Ophiuroid | 2 |
| 71 | *Swiftia* like | *Ophiuroid* | 2 |

## Species Associations (cont.)

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 72 | *Swiftia* like | *Ophiuroid* | 1 |
| 73 | *Swiftia* like | *Ophiuroid* | 2 |
| 74 | *Swiftia* like | *Ophiuroid* | 1 |
| 76 | *Swiftia* like | *Ophiuroid* | 4 |
| 77 | *Paragorgia* sp. | *Ophiuroid* | 1 |
| 78 | *Swiftia* like | *Ophiuroid* | 2 |
| 79 | *Swiftia* like | *Ophiuroid* | 4 |
| 80 | columnar sponge | squat lobster | 1 |
| 81 | *Swiftia* like | crab | 1 |
| 82 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 83 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 84 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 85 | *Halipteris* sp. | *Asteronyx* sp. | 1 |
| 86 | columnar sponge | brittle star | 1 |

## ADDITIONAL COMMENTS

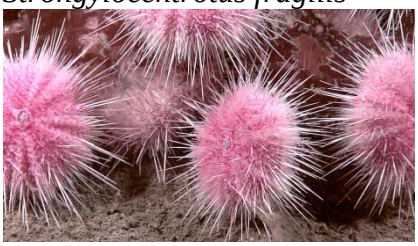
There was a high diversity of deep water sponges observed during this dive. Three different sponge Orders were noted Poecilosclerida, Hexactinosida and Lyssachinosida, but the species are yet to be identified.

Many other invertebrates were noted during dive 05. Two predominant species were apparent, *Pannychia moseleyi*, and *Ophiurida*, brittle stars. Other invertebrates observed in large numbers were *Strongylocentrotus fragilis*, pink urchins. Fewer observations of *Asteroidea, Actiniaria, Decapoda, Galatheidae, Pectinidae, Rhodaliidae, Liponema brevicornis and p Poralia rufescens* were noted.

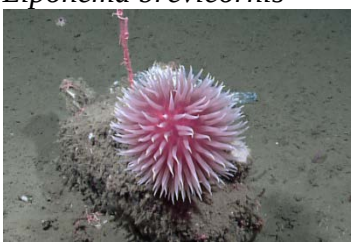
*Pannychia moseleyi*

*Ophiurida* brittlestars

*Strongylocentrotus fragilis*



*Liponema brevicornis*



Rhodaliidae sp.

*Poralia rufescens*

**DIVE NUMBER:** *06* **SURVEY AREA:** *Channel Islands*

## GENERAL LOCATION AND DIVE TRACK

8 km south of Santa Cruz Island, Channel Islands, CA


## SITE OVERVIEW

The first half of this dive ascended a steep wall that was largely covered with sediment with occasional hard outcrops. The second part of the dive was on the plateau above the wall and was low relief, low gradient soft sediment.

| | |
|---|---|
| Forward View HD File | 83 clips |
| Digital Still Images | 77 from OE, 210 from VARS |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.4 at 877m depth |
| Temperature ºC (avg) | 4.8 at 877m depth |
| # of Samples Collected | 0 |

## SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-26 | Start Latitude | N 33° 54.541" |
| End Date | 2011-04-26 | Start Longitude | W 119° 38.086" |
| Minimum Bottom Depth (m) | -886 | End Latitude | N 33° 54.821" |
| Maximum Bottom Depth (m) | -779 | End Longitude | W 119° 38.310" |
| Deployment (PDT) | 15:55 | Bottom Current (kts) | n/a |
| Recovery (PDT) | 22:42 | Bottom Current Direction: | n/a |
| Total Bottom Time | 5.09 | | |

**DIVE NUMBER: *06*** **SURVEY AREA: *Channel Islands***

**IMAGE GALLARY**

IMAGE A: Stalked sponge morph with *Chorilla sp.* crab *and* Dover sole *(Microstomus pacificus)*

IMAGE B: *Pennatula Phosphorea,* phosphorescent sea pen.

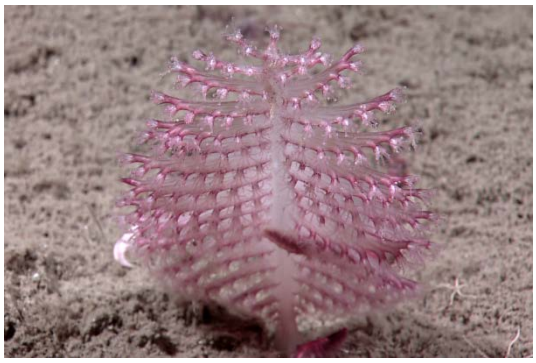


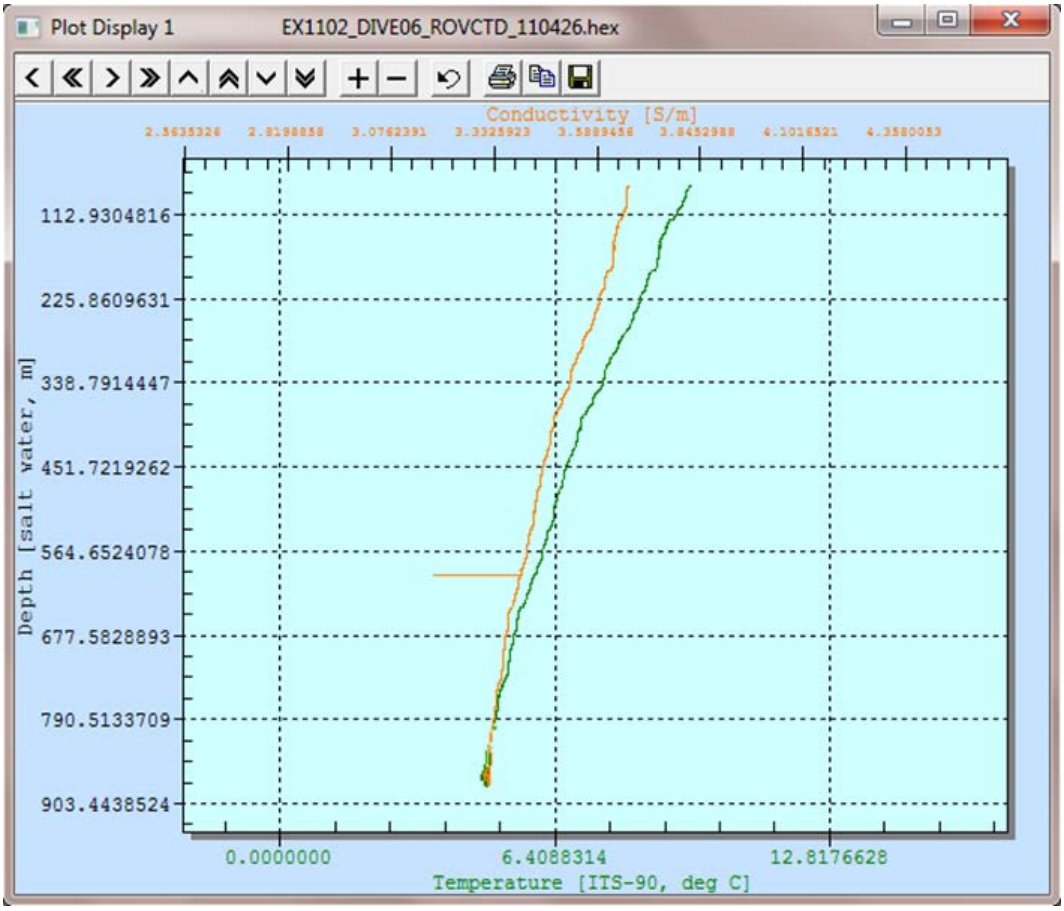
IMAGE C: *Lycenchelys crotalinus,* snakehead eelpout

IMAGE D: *Dromalia alexandri,* siphonophore

## CTD Data

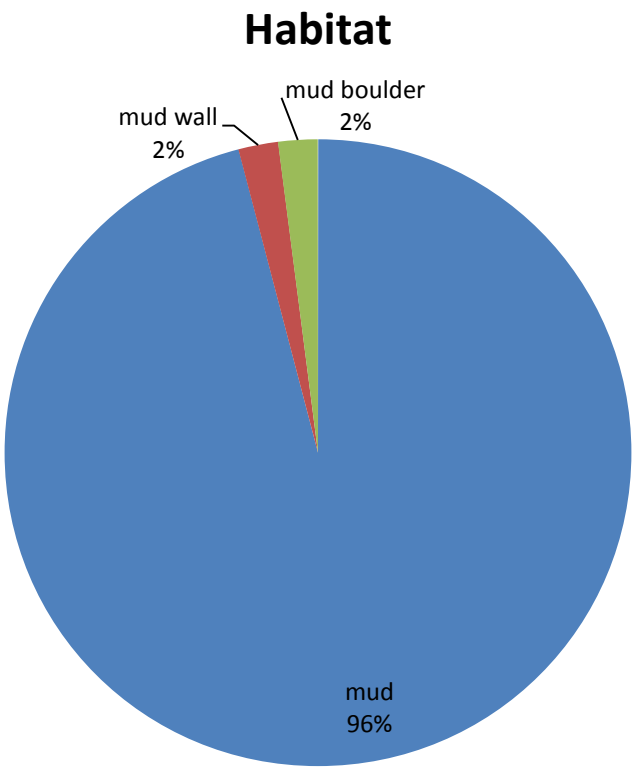
The maximum depth in meters (m), temperature in degrees centigrade (c), salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 6: 877m, 4.8$^{o}$ c, 34.4 psu



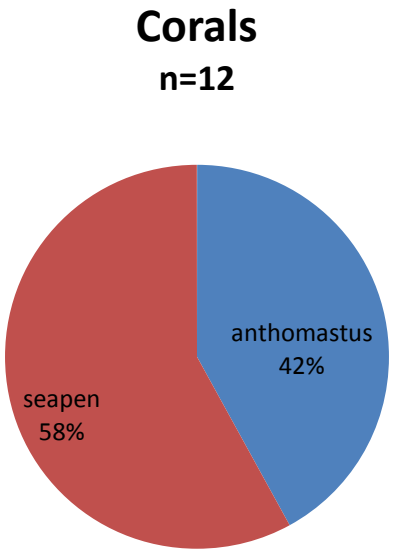
## Habitats Surveyed

Although the dive was in predominantly mud habitat there were some areas of mud wall. The dive took place on the steep escarpment south of Santa Cruz Island. There is high productivity in the shallower waters in this area which result in high sediment rates to the deeper habitats down slope.



## Corals

Corals observed during this dive were primarily seapens at the deeper depths in mud habitat. They consisted of *Halipteris californica, Pennatula Phosphorea*, and *Umbellula lindahli*. There were also a few observations of *Anthomastus ritteri*.




Dive 6 Coral taxa

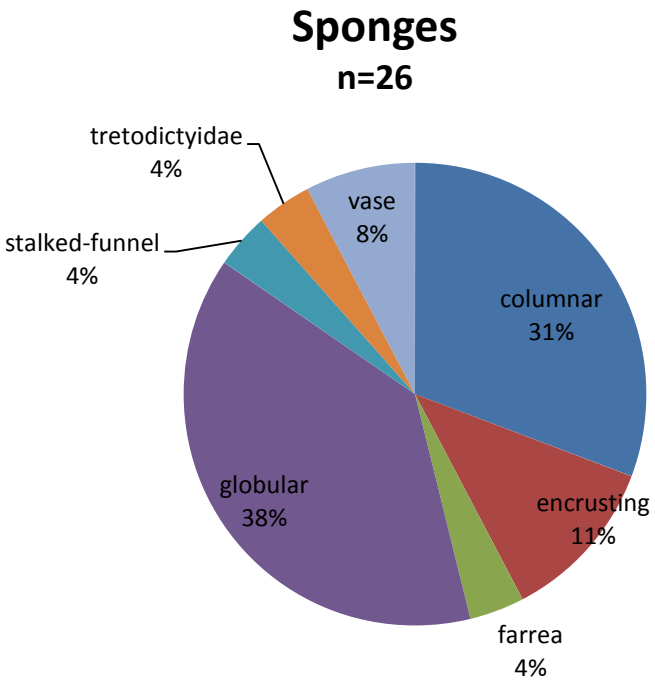
| Coral | Name | Number |
|---|---|---|
| | *Halipteris californica* | 3 |
| | *Pennatula Phosphorea* | 3 |
| | *Umbellula lindahli* | 1 |
| | *Anthomastus ritteri* | 5 |
| **Total** | | 12 |

Dive 6 Coral size

| Coral | Size | Number |
|---|---|---|
| *Anthomastus* sp. | medium | 4 |
| *Anthomastus* sp. | small | 1 |
| seapen | large | 1 |
| seapen | medium | 3 |
| seapen | small | 3 |
| **Total** | | 12 |

## Sponges

Most of the sponges observed in dive 06 were globular and columnar sponge morphs. There were also a few encrusting and vase sponge morphs noted. Two glass sponge species were observed in this area, both the *Ferrea* sp. and *Tretodictyidae* spp. were noted. There was a mat growth observed on one of the vase sponges in this area.




Dive 6 Sponge morpholoogy

| Sponge | Morph | Scientific name | Number |
|---|---|---|---|
| | globular | | 10 |
| | encrusting | | 3 |
| | vase | | 2 |
| | stalked-funnel | | 1 |
| | | *Farrea* sp. | 1 |
| | | *Tretodictyidae* sp. | 1 |
| | columnar | | 8 |
| **Total** | | | 26 |

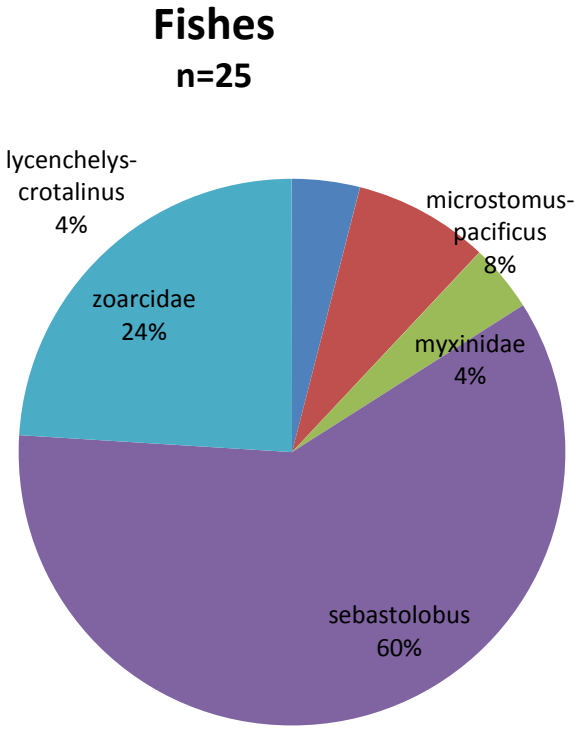
## Sponges (Cont.)

Dive 6 Sponge size

| **Sponge** | **Size** | **Number** |
|---|---|---|
| globular | medium | 2 |
| globular | small | 8 |
| encrusting | small | 3 |
| vase | medium | 2 |
| stalked-funnel | medium | 1 |
| *Farrea* sp. | medium | 1 |
| *Tretodictyidae* sp. | medium | 1 |
| columnar | small | 1 |
| **Total** | | 26 |

## Fishes

The predominant fishes observed were thorneyheads (*Sebastolobus* sp.) and eelpouts (*Zoarcidae* spp.). There were also Dover sole (*Microstomus pacificus*), a hagfish (*Myxinidae spp.*) and a snakehead eelpout *(Lycenchelys crotalinus)* observed.




Dive 6 Fish Species

| Fishes | Scientific name | Common name | Number |
|---|---|---|---|
| | *Sebastolobus* sp. | unidentified thorneyhead | 15 |
| | *Zoarcidae* sp. | unidentified eelpout | 6 |
| | Microstomus pacificus | Dover sole | 2 |
| | *Myxinidae* sp. | hagfish | 1 |
| | *Lycenchelys crotalinus* | snakehead eelpout | 1 |
| **Total** | | | 25 |

**DIVE NUMBER:** ***06*** **SURVEY AREA:** ***Channel Islands***

## BIOLOGICAL ENVIRONMENT

### Species Associations

There were six species associations observed during dive 06 and are listed below.

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 54 | columnar sponge | sea star | 1 |
| | | shrimp | 1 |
| 55 | *Farrea sp.* | *Ophiuroid* | 12 |
| 56 | columnar sponge | *Ophiuroid* | 1 |
| 57 | stalked funnel sponge | king crab | 1 |
| 58 | vase sponge | sea star | 1 |
| | | crab | 1 |
| 59 | columnar sponge | crab | 4 |

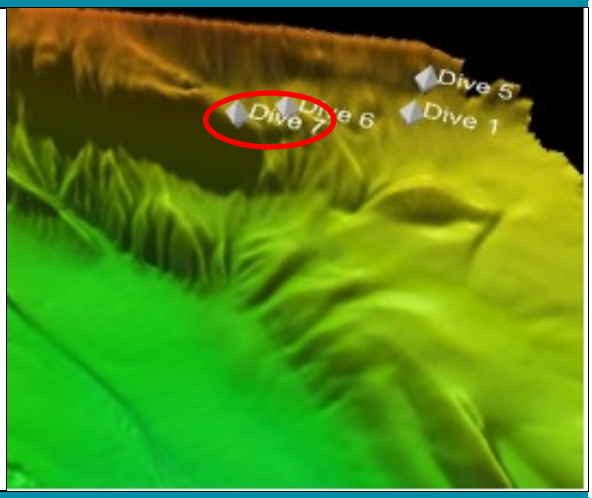
## ADDITIONAL COMMENTS

The steep wall in dive 06 was heavily sedimented and indicates lamina of historic sedimentation. The sponges observed on the wall were attached to the hard bottom just beneath the thin sediment layer.

## DIVE NUMBER: *07* SURVEY AREA: *Channel Islands*

### GENERAL LOCATION AND DIVE TRACK

9 km south of Santa Cruz Island, Channel Islands, CA




### SITE OVERVIEW

Dive 07 was the last dive of the leg. The dive occurred on a moderate gradient slope on the escarpment south of Santa Cruz Island. The entire dive was deep for this area at approximately 900-1000m deep.

| | |
|---|---|
| Forward View HD File | 64 clips |
| Digital Still Images | 45 from OE, 197 from VARS |
| Oxygen mg/L (avg) | Not recorded |
| Salinity psu (avg) | 34.4 at 1007m depth |
| Temperature ºC (avg) | 4.4 at 1007m depth |
| # of Samples Collected | 0 |

### SITE DATA

| | | | |
|---|---|---|---|
| Start Date | 2011-04-27 | Start Latitude | N 33° 54.026" |
| End Date | 2011-04-27 | Start Longitude | W 119° 38.954" |
| Minimum Bottom Depth (m) | -910 | End Latitude | N 33°54.137" |
| Maximum Bottom Depth (m) | -1,014 | End Longitude | W 119° 38.967" |
| Deployment (PDT) | 14:48 | Bottom Current (kts) | n/a |
| Recovery (GMT) | 20:40 | Bottom Current Direction: | n/a |
| Total Bottom Time | 3.46 | | |

**DIVE NUMBER: *07*** **SURVEY AREA: *Channel Islands***

**IMAGE GALLARY**

IMAGE A: *Paragorgia* sp. (white)

IMAGE B: *Clavularia* spp. on rock

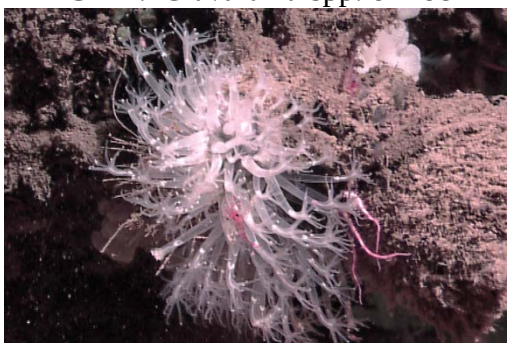


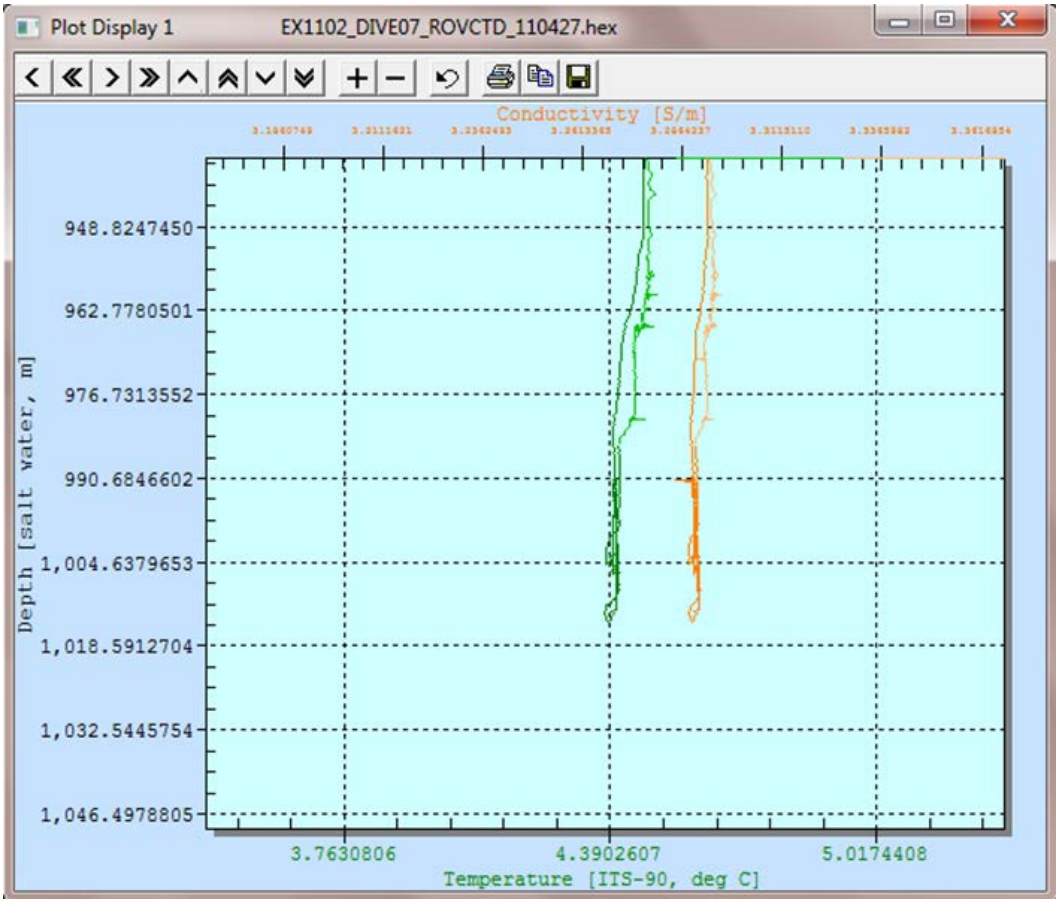
IMAGE C: *Heterochone calyx* with *Lithodes cousei* crab

IMAGE D: *Benthocodon* sp.

## CTD Data

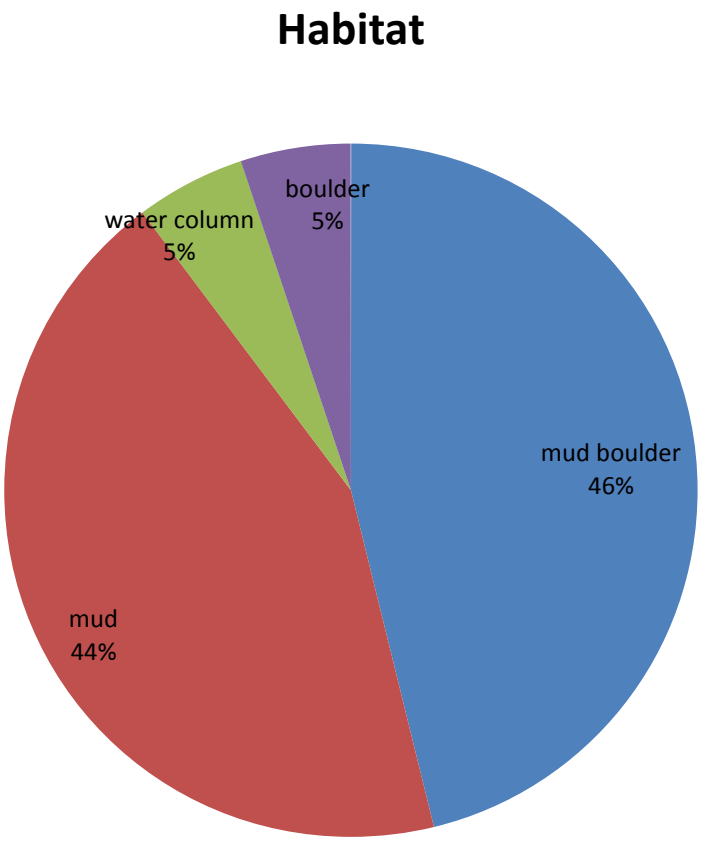
The maximum depth in meters (m), temperature in degrees centigrade ©, salinity in practical salinity units (psu) along with the raw data plots are shown below:

Dive 7: 1007m, 4.4$^{o}$ c, 34.4 psu



## Habitats Surveyed

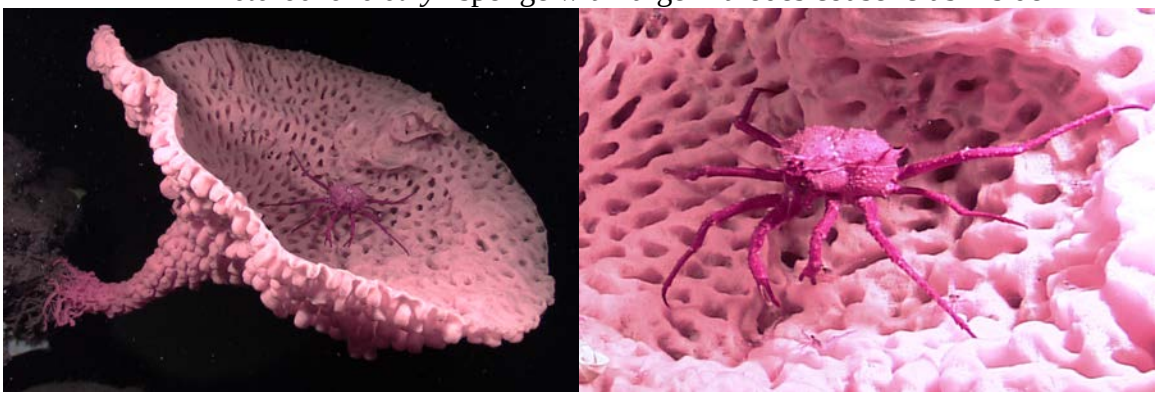
A more mixed habitat was observed during dive 07. The predominant habitat type was mud boulder and mud bottom habitat. About four hours into the dive, a small rock reef of boulder habitat was observed with a very large (~2m across) *Heterochone calyx* sponge on one of the boulders (see image). In the center of the sponge was a large King crab and numerous Pandalid shrimps were present surrounding the surface lobes of the sponge. A portion of video was taken in the water column where other species were noted.



## Habitats (cont.)

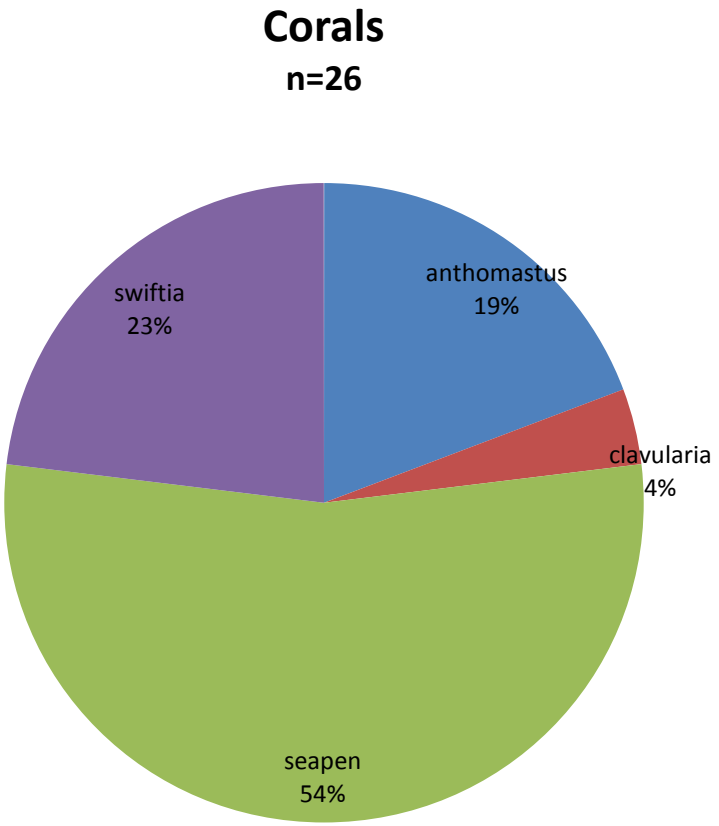
Large sponge observed in boulder habitat.

*Heterochone calyx* sponge with large Lithodes cousei crab inside



## Corals

In this deep dive, most of the corals were seapens present in the soft bottom sediment. There were also Plexauridae; *Swiftia* like corals on the boulders and a *Clavularia* sp. coral was observed attached to a boulder adjacent to a very large *Heterochone calyx* sponge.




Dive 7 Coral taxa

| Coral | Name | Number |
|---|---|---|
| | *Halipteris* sp. | 11 |
| | *Umbellula lindahli* | 2 |
| | Plexauridae; *Swiftia* like | 6 |
| | *Anthomastus ritteri* | 5 |
| | *Clavularia* sp. | 1 |
| **Total** | | 26 |

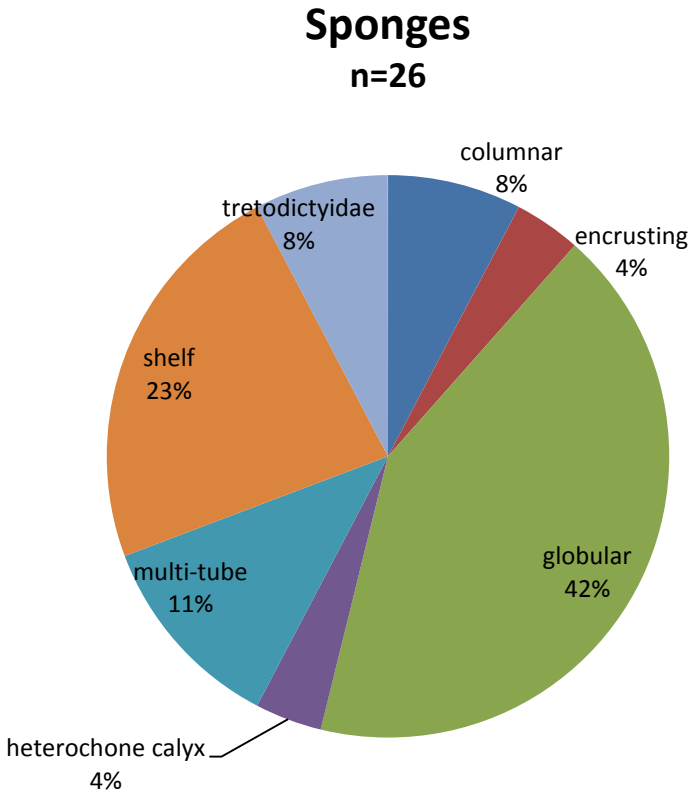
## Corals (cont.)

Dive 7 Coral size

| **Coral** | **Size** | **Number** |
|---|---|---|
| *Halipteris* sp. | medium | 1 |
| *Halipteris* sp. | small | 11 |
| *Umbellula lindahli* | small | 2 |
| *Swiftia* like | medium | 4 |
| *Swiftia* like | small | 2 |
| *Anthomastus ritteri* | medium | 5 |
| *Clavularia* sp. | small | 1 |
| **Total** | | 26 |

## Sponges

Dive 07 was observed to have a large diversity of sponges. Most of the sponge morphs were small globular sponges. There were a few medium shelf and multi-tube morphs noted in the rock reef area. There was one large *Heterochone calyx* sponge observed (˜2m across).




Dive 7 Sponge morphology

| Sponge | Morph | Scientific name | Number |
|---|---|---|---|
| | globular | | 11 |
| | shelf | | 6 |
| | multi tube | | 3 |
| | | *Tretodictyidae* sp. | 2 |
| | columnar | | 2 |
| | encrusting | | 1 |
| | | *Heterochone calyx* | 1 |
| **Total** | | | 26 |

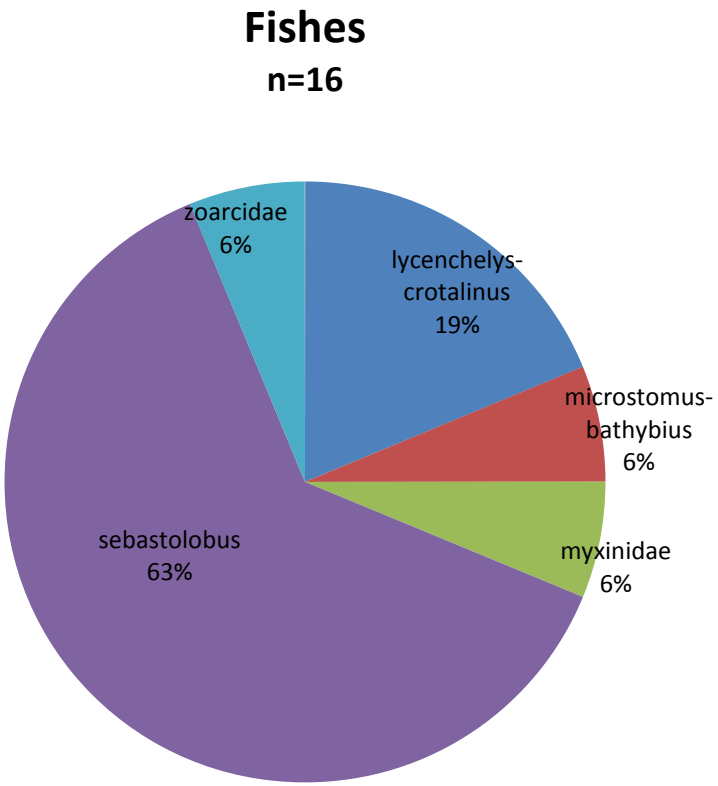
## Sponges (cont.)

Dive 7 Sponge size

| **Sponge** | **Size** | **Number** |
|---|---|---|
| globular | large | 1 |
| globular | medium | 1 |
| globular | small | 9 |
| shelf | medium | 4 |
| shelf | small | 2 |
| multi tube | medium | 3 |
| *Tretodictyidae* sp. | medium | 2 |
| columnar | large | 1 |
| columnar | medium | 1 |
| encrusting | small | 1 |
| *Heterochone calyx* | large | 1 |
| **Total** | | 26 |

## Fishes

There were not many fishes observed in the deep depths of dive 07. There were a few thorneyhead (*Sebastolobus* sp.), and snakehead eelpouts (*Lycenchelys crotalinus*). Also observed was a deepsea sole (*Microstomus bathybius*), a hagfish (*Myxinidae spp.*), and an eelpout (*Zoarcidae spp.).*




Dive 7 Fish Species

| Fishes | Scientific name | Common name | Number |
|---|---|---|---|
| | *Sebastolobus* sp. | unidentified thorneyhead | 10 |
| | *Lycenchelys crotalinus* | snakehead eelpout | 3 |
| | *Microstomus bathybius* | deepsea sole | 1 |
| | *Myxinidae* sp. | hagfish | 1 |
| | *Zoarcidae* sp. | unidentified eelpout | 1 |
| **Total** | | | 16 |

**DIVE NUMBER:** ***07*** **SURVEY AREA:** ***Channel Islands***

## BIOLOGICAL ENVIRONMENT

### Species Associations

Six associations were observed during dive 07.

| Assoc. # | Association | Associated with | # of assoc. |
|---|---|---|---|
| 61 | anemone | decorator crab | 1 |
| 62 | globular sponge | shrimp | 1 |
| 63 | *Tretodictyidae* sp. | crab | 1 |
| 64 | *Heterochone calyx* | king crab | 1 |
| | | shrimp | 12 |
| 65 | columnar sponge | crab | 1 |
| | | shrimp | 7 |
| 66 | *Paragorgia* sp. | shrimp | 1 |

## ADDITIONAL COMMENTS

Dive 07 was in a similar location to dive 06 and the species encountered were also similar. It should be noted that the Channel Islands are in an area of high productivity in the shallow water, and input rates of high sediment are dispersed into the deeper habitats down slope.

Other invertebrates were observed in this dive including other sponges, seapens, *Swiftia* like corals, soft corals, anemones, and scallops. An observation of a predatory tunicate was also made during this dive. These poorly known tunicates have been seen frequently in the Monterey Canyon, but they have not been previously observed in the depths around the Channel Island.

## CONCLUSION

For this survey, seven dives were conducted and six were inside the sanctuary boundary. Depths for the six dives within the sanctuary ranged from 745 m to 886 m and the depth for the seventh dive outside the sanctuary reached 1,014 m. The first dive of the survey was an engineering dive, this site was chosen to provide even low relief terrain. The bottom was dominated by low relief, low gradient soft sediment with occasional small rock outcrops. Both dives 2 and 4 were aborted due to mechanical issues.

The seafloor during dive 3 was predominantly covered in heavy sediment with a few occasional outcrops hosting sessile organisms. Sponge species diversity was high and there were 152 sponges observed during the dive with many different sponge morphs represented.

The habitat of dive 5 was similar to dive 3, dominated by soft mud sediment with occasional small to medium sized rock boulders or outcrops. The rock outcrops were almost completely colonized by benthic invertebrates. Coral species diversity was high, with at least eight coral species identified including 136 Plexauridae; *Swiftia* like corals. A total of 57 sponges were observed during dive 5, approximately two-thirds fewer than in dive 3.

Although dive 6 was in predominantly mud habitat there were some areas of mud wall. The steep wall was heavily sedimented and indicates lamina of historic sedimentation. Corals observed during this dive were primarily seapens at the deeper depths in mud habitat. Most of the sponges observed during dive 6 were globular and columnar sponge morphs reflecting a lower sponge diversity than both dives 3 and 5.

A more mixed habitat was observed during dive 7which was the deepest dive during the survey. The predominant habitat type was mud boulder and mud bottom habitat. About four hours into the dive, a small rock reef of boulder habitat was observed with a very large (~2m across) *Heterochone calyx* sponge on one of the boulders. In the center of the sponge was a large crab.

Dive 7 was in a similar location to dive 6 and the species encountered were also similar even though dive 7 was a much deeper dive. Since the Channel Islands are in an area of high productivity in the shallow water, this productivity can reach the habitats at the deeper depths of dive 7 as the input rates travel down slope.

The characterization of the deep-sea community and associated habitats for this cruise in the Channel Islands National Marine Sanctuary provides information that can be used in future surveys to monitor biodiversity of habitats and species richness.

## ACKNOWLEDGEMENTS

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