Report Date: 08 July 2010 **Dates of Mission:** 27 June – 02 July 2010

Project Title: Deep Sea Corals and Benthic Habitat Surveys In and Around Channel Islands National Marine Sanctuary

Cruise Number: NOAA McArthur M2-10-02: Leg 3

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Summary of cruise results: Underwater surveys of corals, sponges, and associated habitats, invertebrates, and fishes were conducted on a deep rocky bank off southern California using non-extractive transect methodologies and direct observations from University of Connecticut's *Kraken II* remotely operated vehicle (ROV) and the NWFSC/PIFSC Seabed autonomous underwater vehicle (AUV) onboard the NOAA ship *McArthur II*. Our survey area was in and adjacent to the Channel Islands National Marine Sanctuary, in the Southern California Bight. Our study site was the Piggy Bank, which is a rocky area of about 30 km^2 in the general vicinity of 33°54.84' N and 119°28.35' W.

The specific objectives of this research were to (1) collect baseline data on abundance, size, condition, and distribution of deep-sea coral (DSC) and sponge communities on the Piggy Bank; (2) quantify fish and invertebrate associations with DSC to help understand the value of DSC as habitat; (3) document environmental conditions of DSC habitats, including variables related to depth, temperature, substratum types, topography, and carbonate saturation state to help understand habitat factors that influence DSC settlement and distribution; and (4) collect specimens of DSC and associated organisms to confirm taxonomic identifications and for genetic, reproductive, and stable isotope analyses.

We conducted underwater surveys around the clock during 4.5 days of essentially ideal sea conditions. About 45 hrs of video data were collected during daytime (est. 0700 – 1700) operations using a Kongsberg high-definition camera positioned forward on the ROV. Observers verbally annotated the video. The video data were captured on HD-DVCAM and HD mini-DV tapes, as well as digital files. Two parallel lasers were installed at 20 cm apart on either side of the Kongsberg video camera. A second video camera was positioned below the Kongsberg survey camera and was used to pilot the ROV; these video data were collected onto SD-DVCAM tapes. A third video camera was used to document sample-collection activities; this footage was captured onto SD-DVCAM tapes. A digital still camera and associated strobes on the ROV were used to assist in documenting corals, sponges, and fishes. The ROV also was equipped with a Seabird CTD and associated sensors, which continuously recorded temperature, salinity, depth, pH, and oxygen concentration during each dive. Navigation data were collected via an ORE

Trackpoint II USBL system and WinFrog software for each ROV dive. A hand-held video camera was used to document topside survey activities (e.g., launch and retrieval of the various vehicles and sensors).

The ROV surveys covered about 18 km of seafloor at depths 280-890 m (Fig. 1), including habitats of high-relief rock boulders, pinnacles 10s of meters in height, and steep slopes of soft sediments and rock rubble. We identified 136 taxa of invertebrates and fishes from preliminary observations of the video footage during the survey (Table 1). There were at least 22 taxa of corals, including Christmas tree coral (*Antipathes dendrochristos*; alive and dead; big and little; pink and white); several species of Gorgonacea: Primnoidae, *Swiftia* spp., and Paragorgiidae; *Halipteris californicus*; *Anthomastus ritteri*; *Telestula*; some large dense stands of *Lophelia pertusa* (dead and alive; only on the top of the bank); Zoanthidae; and others. We observed numerous sponges in a variety of shapes (plate; vase; trumpet; barrel; other), sizes (tiny encrusting types on rocks to those almost 3 meters in height), and colors (porcelain white; pale yellow; dirty gray). Other observations included methane cold seeps with associated bacterial mats and vesicomyid clams, and a surprisingly small amount of marine debris (documenting only 1 derelict trap, 1 fishing line entangling a sponge, a few beverage cans, and minor amounts of other items). We collected 33 samples, including 16 corals, 10 sponges, and 7 other invertebrates for identification confirmation and studies on genetics, internal structure, and reproduction.

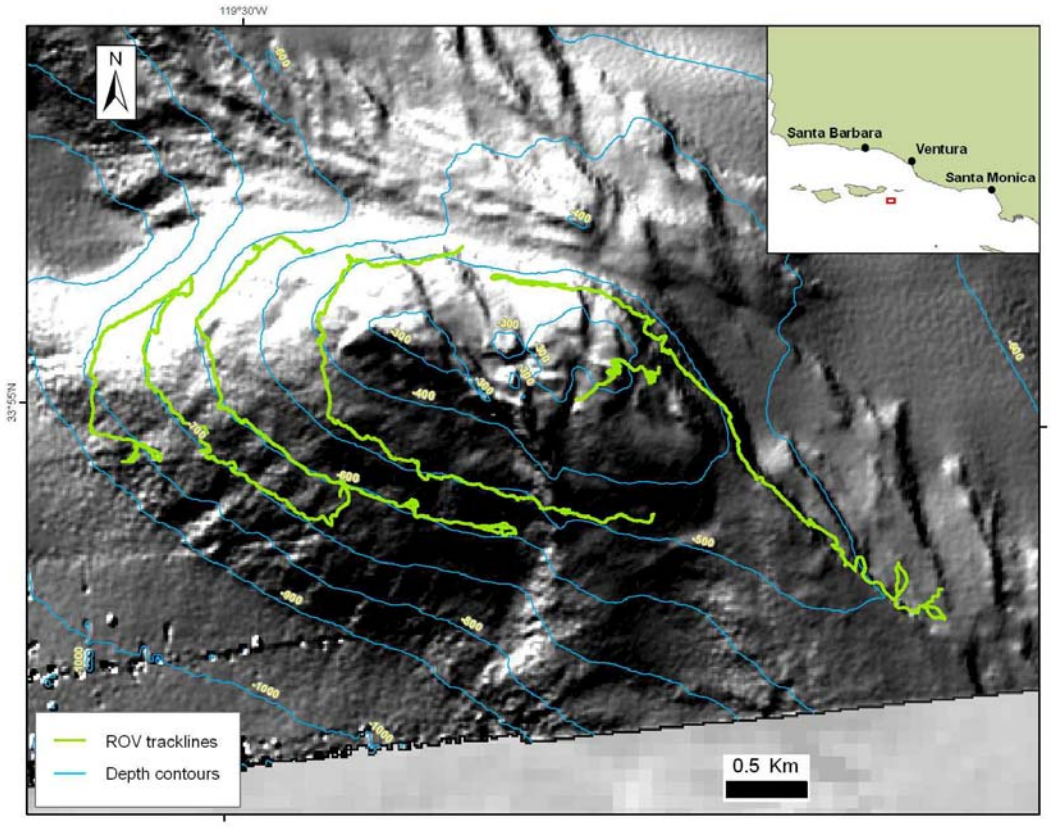

Figure 1. Tracks of the ROV survey on the Piggy Bank in southern California during Leg 3 of the NOAA McArthur II West Coast Deepsea Coral Cruise, June 27 – 2 July 2010.

Table 1. Preliminary list of invertebrate and fish taxa observed from video surveys conducted with an ROV on the Piggy Bank in southern California during Leg 3 of the NOAA McArthur West Coast Deepsea Coral Cruise, 27 June – 2 July 2010.

Taxa	Type	Habitat
Anemone (several colors, unidentifiable)	Anemone	Benthic
Cerianthidae	Anemone	Benthic
Liponema brevicornis	Anemone	Benthic
Sabellidae	Annelid	Benthic
Sabellidae (red)	Annelid	Benthic
Serpulidae	Annelid	Benthic
Teribellidae (black radio tower worms)	Annelid	Benthic
Hirudinea - marine leach	Annelid	Benthic
Benthopectin sp.	Asteroid	Benthic
Brisingida	Asteroid	Benthic
Ceramaster sp.	Asteroid	Benthic
Dipsacaster sp.	Asteroid	Benthic
Henricia sp.	Asteroid	Benthic
Hippasteria sp.	Asteroid	Benthic
Myxoderma sp.?	Asteroid	Benthic
Poraniopsis inflata ?	Asteroid	Benthic
Pterasteridae	Asteroid	Benthic
Rathbunaster californicus	Asteroid	Benthic
Solaster sp.	Asteroid	Benthic
Stylasterias sp.?	Asteroid	Benthic
Bacterial mat (orange, white)	Bacteria	Benthic
Asteronyx sp.	Brittlestar	Benthic
Gorgonocephalus eucnemis	Brittlestar	Benthic
Ophiocanthidae	Brittlestar	Benthic
Ophiuroidea	Brittlestar	Benthic
Bryzoan	Bryzoan	Benthic
Dosidicus gigas	Cephalopod	Midwater
Enteroctopus sp.	Cephalopod	Benthic
Gonatus sp.	Cephalopod	Midwater
Octopus sp.	Cephalopod	Benthic
Chiton	Chiton	Benthic
Acesta sphoni	Clam	Benthic
Vesicomyidae	Clam	Benthic
Anthoptillum grandiflorum	Coral	Benthic
Antipathes dendrochristos	Coral	Benthic
Desmophyllum dianthus	Coral	Benthic
Halipteris californicus	Coral	Benthic
Lophelia pertusa	Coral	Benthic
Paracyathus sp.?	Coral	Benthic
Paragorgia pacifica?	Coral	Benthic
Paragorgia sp.	Coral	Benthic

Parastenella sp.	Coral	Benthic
Pennatula phosphorea?	Coral	Benthic
Primnoidae - pale pink, lightly branched	Coral	Benthic
Primnoidae - yellow	Coral	Benthic
Scleractinia	Coral	Benthic
Swiftia pacifica	Coral	Benthic
Swiftia simplex	Coral	Benthic
Swiftia sp. with white polyps	Coral	Benthic
Switia kofoidi	Coral	Benthic
Telestula sp.	Coral	Benthic
Umbellula lindhali	Coral	Benthic
Virgularia sp.	Coral	Benthic
Zoanthidea	Coral	Benthic
Anthomastus ritteri	Soft coral	Benthic
Chionoecetes sp.	Crab	Benthic
Chorilia sp.	Crab	Benthic
Lithodidae	Crab	Benthic
Munida sp.	Crab	Benthic
Florometra serratissima	Crinoid	Benthic
Cydippida	Ctenophore	Midwater
Lobata	Ctenophore	Midwater
Cucumaridae	Cucumber	Benthic
Pannychia moselyi	Cucumber	Benthic
Parastichopus californicus	Cucumber	Benthic
Parastichopus sp.	Cucumber	Benthic
Psolus squamatus	Cucumber	Benthic
Agonidae (*Xeneretmus* sp.)	Fish	Benthic
Alepocephalus tenobrosus	Fish	Bentho-pelagic
Anoplopoma fimbria	Fish	Benthic
Bathyraja trachura	Fish	Benthic
Careproctus melanurus	Fish	Benthic
Coryphaenoides acrolepis	Fish	Benthic
Embassichthys bathybius	Fish	Benthic
Eptatretus stoutii	Fish	Benthic
Hydrolagus collei	Fish	Benthic
Icelinus sp.	Fish	Benthic
Lycenchelys sp.	Fish	Benthic
Lycodapus sp.	Fish	Benthic
Lycodes cortezianus	Fish	Benthic
Macrouridae	Fish	Benthic
Melanostigma pammelas	Fish	Benthic
Merluccius productus	Fish	Benthic
Microstomus pacificus	Fish	Benthic
Myctophidae	Fish	Midwater
Raja rhina	Fish	Benthic
Scyliorhinidae	Fish	Benthic

Sebastes aurora	Fish	Benthic
Sebastes diploproa	Fish	Benthic
Sebastes jordani	Fish	Benthic
Sebastes melanostomus	Fish	Benthic
Sebastes rufus	Fish	Benthic
Sebastolobus alascanus	Fish	Benthic
Sebastolobus altivelus	Fish	Benthic
Sebastomus	Fish	Benthic
Squalus acanthias	Fish	Benthic
Sternoptychidae	Fish	Midwater
Torpedo californica	Fish	Benthic
Calliostoma sp.	Gastropod	Benthic
Neptunea sp.	Gastropod	Benthic
Hydroid ?	Hydrozoa	Benthic
Caprellidae	Isopoda	Benthic
Aegina sp.	jelly	Midwater
Little red jelly	jelly	Midwater
Poralia sp. ?	jelly	Midwater
Mysid	Mysid	Bento-pelagic
Aeloidea	Nudibranch	Benthic
Dendronotus sp.	Nudibranch	Benthic
Orange Nudibranch - *Dendronotus* or *Tritonia*	Nudibranch	Benthic
Tritonia diomedea	Nudibranch	Benthic
Purple Polychaete	Polychaete	Benthic
Pandalopsis sp.?	Shrimp	Benthic
Apolemia sp.	Siphonophore	Midwater
Dromalia alexandri	Siphonophore	Benthic
Nanomia sp.	Siphonophore	Midwater
Asbestopluma sp.	Sponge	Benthic
Cauliflower sponge	Sponge	Benthic
Farrea occa	Sponge	Benthic
Heterochone calyx	Sponge	Benthic
Hexactinellida	Sponge	Benthic
White and black unknown sponge	Sponge	Benthic
Palm frond sponge	Sponge	Benthic
Pipe sponge	Sponge	Benthic
Poecilosclerida	Sponge	Benthic
Sclerothamnopsis compressa	Sponge	Benthic
Staurocalyptus sp.	Sponge	Benthic
Thenea muricata	Sponge	Benthic
Tube sponge	Sponge	Benthic
White ball sponge	Sponge	Benthic
Yellow nipple sponge (*Polymastia*)	Sponge	Benthic
Cnemidocarpa sp.	Tunicate	Benthic
Megalodicpoia hians	Tunicate	Benthic
Clear tunicate	Tunicate	Benthic

fluorescent green tunicate	Tunicate	Benthic
white, colonial tunicate	Tunicate	Benthic
Bathocordaeus sp.	Tunicate	Midwater
Allocentrotus fragilis	Urchin	Benthic

We used the NWFSC/PIFSC Seabed AUV and associated lasers and cameras during nighttime (est. 2130 – 0545) to quantitatively survey DSC and habitats at depths from 284 to 888 meters. High-resolution (i.e., 5.0 MegaPixel) downward looking and forward-angled cameras on the AUV were used to collect 16,784 digital images at a height of 3-5 meters from the seafloor in habitats of high-relief pinnacles and boulders as well as on steep sediment and rock-rubble slopes. Images were retrieved and initially processed at the end of each night, and were reviewed by the scientists to plan subsequent missions. Eight AUV missions were conducted for a total of 12.5 hrs, both in areas and depths surveyed by the ROV (for comparative purposes) as well as in areas with no ROV surveillance.

Nine CTD casts and about 130 water samples (for DIC and nutrients) were collected at the beginning and end of each ROV trackline (except on day-1 when one cast was made at the end of the track only, because of logistics and time constraints) at depths from 280 to 775 m.

All data from this cruise currently are being processed and will be entered into databases for further analyses. We should have sufficient data from this cruise to characterize the DSC community and associated habitats on the Piggy Bank. The results of our study will represent a baseline for future monitoring of change to the DSC community on the Piggy Bank and evaluation of the effectiveness of Marine Protected Areas (MPA) to conserve biodiversity of habitats and assemblages with increased time of protection inside the relatively new Footprint MPA and EFH Conservation Area. This research directly supports the goals of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Marine Sanctuaries Act (NMSA), and is a contribution to NOAA's Deep-Sea Coral Research and Technology Program. In addition, the partnerships developed among investigators on this cruise will facilitate our ability to share research results with a broad group of constituents that are interested in deepsea coral and sponge communities. Highlights of video and still images will be distributed among investigators when available. Samples from our collections will be distributed to scientists with specific research interests in sponges, Primnoids, sea pens, tunicates, *Lophelia*, and other taxa. This expedition was featured in an article published in the Ventura County Star (http://www.vcstar.com/news/2010/jul/02/scientists-peer-at-sea-life-near-anacapa-island/).

This was an extraordinarily successful cruise that was executed over a very short period of time (4.5 days at sea). That said, and as expected with an ocean research cruise that includes multiple investigators, disciplines, and survey tools, we have identified several issues related to cruise planning and implementation that will need improvement in order to ensure the continued success of NOAAs West Coast Deepsea Coral Research. We recommend that a de-brief meeting

be convened as soon as possible with the principal investigators from all three legs of the FY10 *McArthur II* cruise.

Logistics and support activities: The captain (Greg Hubner), officers, and crew of the NOAA vessel *McArthur II* worked very hard and competently to make all aspects of our project run smoothly and successfully. In particular, the captain, chief bos'n (Brad Delinski), and crew accommodated our needs to launch/retrieve three different underwater survey tools using crane, A-frame, and J-frame at three different locations on the ship. In deploying equipment, our biggest concern always is weather and sea conditions. We were fortunate to have near-perfect conditions during our cruise, and all equipment was deployed and recovered safely.

We also recognize the special skills needed to handle the ship while tracking underwater vehicles along designated survey lines; this was done with increasing competence over a very short period of time. Operations Officer John Petersen was especially helpful both with our planning efforts prior to the cruise and with implementation of our research during the cruise. We also recognize the willingness of the Survey Tech (Todd Walsh) to assist with CTD operations both from the ROV and the ship. We greatly appreciate the efforts of all on the *McArthur II* in supporting our round-the-clock research program.