OceanBights

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The Catalina Marine Society is a nonprofit membership corporation founded in 2009 in Los Angeles to marshal volunteer resources to study the marine environment of Santa Catalina Island and the Southern California Bight.

Submissions. The magazine may publish submitted articles that pertain to our mission statement. Contact the e-mail address below for more information.

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This Issue

We are pleased to produce our second issue of *OceanBights*, on time for distribution at the SCUBA Show in Long Beach. Our researcher's article is by Lindsay King of Orange Coast College, describing studies of our coastal bottlenose dolphins. Soon after her article was submitted, we encountered a pod of bottlenose outside of the Channel Islands Harbor. Much of the material in this issue describes the mechanics of our physical labors regarding CMS projects including the pilot program of deploying instrumentation at the scientific mooring and the beginnings of our thermograph array off the Los Angeles metropolitan coast. Our Spotlight articles are on the mammoth University of California, Santa Barbara and the much smaller Heal the Bay organization. The former is so large that we focused on small segments that may be most familiar to our community, and made a separate topic of a UCSB specialty: oil seeps. For the first time, we review a scientific meeting and relate it to ongoing activity at the CMS. The newsletter portion of *OceanBights* will keep you up to date on non-scientific happenings at CMS, including board of director elections and officers. We hope you learn something from the articles, and, of course, your comments are welcome. ■

Spotlight on: Heal the Bay

By Chris Howell and C. Gelpi

Although mainly thought of as an advocacy organization urging protection and restoration of Santa Monica Bay, Heal the Bay also collects scientific data, organizes and prepares synopses of data from other organizations, and interprets the data for the general public. We asked Kirsten James, Heal the Bay's Water Quality Director, about some current Heal the Bay projects. She quickly named three, including monitoring the Malibu Creek watershed, producing the Beach Report Card, and outreach.

The health of Santa Monica Bay, of course, depends strongly on properties of water that drain into the Bay. One of the major, still natural tributaries to the Bay is Malibu Creek. Fundamentally, Heal the Bay is working to understand the Malibu Creek watershed, and collects data toward that end which it then shares with resource agencies and managers responsible for water quality. Monitoring the Malibu Creek watershed is the Stream Team composed of trained volunteers. They measure pH, turbidity, dissolved oxygen, conductivity and nutrients such as phosphorus and nitrogen. Note that these are many of the parameters that we wish ultimately to measure at our scientific mooring at WIES.

Heal the Bay Aquarium
Image courtesy of C. Howell

Volunteers perform valuable tasks such as actually walking the streams in the watershed, noting and photographing sources of pollution and other problems while using high-end GPS units to locate precisely the phenomenon. The Stream Team can also mechanically remove invasive species. This is in addition to the data collections described above. These activities would be cost prohibitive for paid staff of governmental organizations.

Heal the Bay has given much thought to the use of volunteers on the Stream Team. They, as does the CMS, have to balance the desire to use free, often temporary help against the requirement to measure scientifically valuable data, which often takes a focus and training not commonly found in volunteers. Heal the Bay interviews its Stream Team volunteers on what are the difficult data collection procedures and then tries to improve the procedures, perhaps, for example, by acquiring instrumentation that is easier to calibrate.

Of course, the scientific job is not complete until the results are understood and disseminated. Heal the Bay has performed a tremendous job in this regard with its Beach Report Card program. It analyzes bacteria data from monitoring agencies organizations, such as those collected by Recreational Waters Program of the Los Angeles County of Public Health, and the Hyperion treatment plant. The data are given as number of colony-forming units per milliliter of water of various bacteria including *Enterococcus*, total coliform and fecal coliform. If no bacteria are present, a beach score is 100%. The score is reduced when the count for particular bacteria exceeds some threshold. Other complications arise, such as number of samples and samples taken during dry and wet weather and these are adjusted for in the calculation. The final score is then converted to the common alphabet-type school report card format of A to F which is easier for the public to understand quickly.

Heal the Bay also investigates specific sources of pollution. For example, they conducted repetitive sampling of the water for total coliform, *E. coli*, and *Enterococcus sp*. in the surf zone about and under the Santa Monica Pier. According to the Beach Report Card, this area is one of the worse beaches in California, and Heal the Bay worked with the city of Santa Monica to determine why. Looking at all possible sources, including leaking pipes, transients, pigeons, etc., Heal the Bay found an open storm drain that was probably the culprit as bacterial counts were higher in the vicinity of the drain.

According to Amanda Griesbach, Beach Water Quality Scientist, Heal the Bay's research facility is a basic laboratory used for water quality analysis, including testing for standard indicative bacteria, namely total coliform, fecal coliform and *Enterococcus*. Although not used for research, the aquarium at the Santa Monica Pier is run by Heal the Bay. The aquarium is used to teach the public about the Bay and its inhabitants, and

is also the venue for special functions.

Heal the Bay is, like the CMS, a unique organization and we can learn much from its history and development. Mark Gold, Heal the Bay's President, was kind enough to meet with CMS and share some of the history and many achievements of the organization. Mark first met Heal the Bay's founder Dorothy Green in 1986 while

Inside HtB aquarium. Image by C. Howell

earning his doctoral degree in environmental science and engineering at UCLA. Dorothy, a guest speaker in an urban planning class led by Stephanie Pincet, was passionate about unsafe conditions on the beaches and in the waters of the bay. Toxic outflow from the Hyperion Sewage Treatment Plant in Playa Del Rey was found to be the prime offender with "spills" taking place not just during heavy rains, but ongoing in seemingly random events. The EPA (Environmental Protection Agency) was having little if any impact on addressing the issue. The doctoral program Mark was engaged in required two years of studies and a dissertation based on firsthand experience in the work place. Mark began volunteering with the organization, completed his dissertation, and never left. In 1988, he was the first person to be hired by Heal the Bay.

In the beginning, the organization was focused on massive sewage spills flushing into the bay from the Hyperion treatment plant. The ocean floor surrounding the plant's output was virtually dead. A five-mile outflow region held nothing but sea worms and a solitary species of clam. Beyond the outflow, the surrounding waters were producing fish with massive tumors and fin rot. Beaches were being routinely closed due to toxic bacterial blooms, and very little was being done to address the issue.

In 1985, an ocean swimmer and Culver City high school teacher named Howard Bennett was the first person to successfully bring these issues to the attention of the public. Having become sick a number of times from what he suspected was the pollution present in the bay water, Howard also found that local fishermen were consistently pulling in catch with obvious signs of disease, unsafe for human consumption. A dead zone had formed in the bay. Tom Hayden, a local assembly member soon to become a state senator, became a major force in the first decade of Heal the Bay's work to address the issues, bring the story to the press, legislate change and help the Santa Monica Bay to begin a healing process.

Now, the old Hyperion plant has been replaced with a state of the art, non-polluting wastewater reclamation and compost producing facility, largely due to Heal the Bay's advocacy. In concert with its highly effective Beach Report Card, Heal the Bay is focused on identifying the causes of toxic runoff in our local creeks and storm drains. Their Beach Report Card program, described above, has been hugely successful in bringing about the reduction of toxic runoff and naturally occurring pollution in and around our public beaches. Through water testing and research, beaches, such as those surrounding Santa Monica Pier, have gone from receiving an "F" grade, unsafe for public use, to an "A." ■

Coastal Bottlenose Dolphins

By Lindsay King

Walking along the beaches of Southern California could be considered one of the most delightful pastimes of local beach-goers. For many who frequent these beaches, a common sight is a group of dolphins swimming just outside the surf line. Residents of Newport Harbor might even notice a few fins broaching the surface as they enjoy the view or dine harbor-side in one of the many restaurants along Pacific

Coast Highway. Onlookers and even surfers who have shared

Researcher Lindsay King

the occasional wave with one of these inquisitive mammals seem to enjoy their presence, but few know how these particular dolphins are special to Southern California.

These dolphins may spend their whole lives just off the coast of Southern California where they breed and give birth. Here they have to face the many environmental issues that influence their habitat including pollution and fishing-gear entanglement. To ensure the success of their local dolphin population the public should be aware and informed of these issues.

The bottlenose dolphin (*Tursiops truncates*) can be found in all oceans around the world. Off the coast of California there are two distinct populations of bottlenose dolphin known: offshore and coastal. The average population size of bottlenose off the coast of California is 169. This is according to the National Marine Fisheries Service as of the year 1999 when an aerial survey was taken. Spending most of their time within 1 km of shore, the coastal populations of bottlenose dolphin have to share this habitat with humans who also call the California coast their home. This relationship has led to the monitoring of these populations to understand what impact the public has on them.

The Coastal Dolphin Survey Project (CDSP), funded entirely by public donations, has been studying the population dynamics, biology and ecology of the coastal bottlenose dolphin since 1978. Through the efforts of Professor Dennis Kelly and marine science students of Orange Coast College, the CDSP has monitored and catalogued many of the coastal dolphins. This monitoring has resulted in interesting and important discoveries.

Dolphins at Newport. Picture courtesy of Sgt. John Hollenbeck of Newport Harbor Patrol.

For instance, the CDSP discovered that in select coves along southern California, dolphins form circular units of at least 6 individuals to help a laboring female give birth. This formation had previously been called a “spoke” but no one had ever been witness to a birth, which can take as long as two hours. In December of 1982 this behavior was observed by Dennis Kelly and was then determined to be a birthing behavior. Other reports of this behavior were documented in Three Arch Bay, Crystal Cove, and Corona Del Mar. This is an important discovery in that these locations are birthing areas and should be preserved for the future of this dolphin population.

Crystal Cove was a location for another study known as “night watch”. It was performed in 2003 and focused on the nocturnal behavior of dolphins to compare it to their behavior during the day. This

was the first time a study like this had ever been performed in Orange County. Data were collected using night-vision equipment and sonobuoys, which measure acoustic signals. This acoustic information helped determine the level of activity the dolphins displayed through their calling and sonar use. This also allowed observers to make more of an informed observation being able to hear the dolphins as well as see them. Travel and feeding displays were witnessed that corresponded with sonar use captured by the sonobuoys. The research determined that dolphins are actually more active at night than they are during the day. These data correlate well with previous research done in San Diego suggesting that some of the best feeding times may be during evening hours. Dolphins may also have to keep a better look out for sharks and other creatures that they could potentially fall prey to since the predators are more active at night as well. These findings are important in understanding nocturnal behavior in dolphins.

One of the most recent focuses of the project was on the 2007 discovery of dolphins entering and utilizing harbors along Southern California, most notably Newport Harbor. Student interns were stationed in different locations around Newport Harbor for several hours at a time to collect any sightings of the dolphins. Posters were also distributed around the harbor to encourage the public to keep an eye out and note when dolphins were sighted. Much of the data were from public sightings as well as from the Harbor Patrol officers. When sightings occurred, data were collected to determine what the dolphins were doing in the harbor and if there were any patterns. The data collected included time, tidal level, number of dolphins, location, behavior, and presence of juveniles. Unfortunately CDSP lacked the funds for proper

Dead dolphin from Newport Bay. Image courtesy of L. King

camera equipment and were unable to identify individuals from their dorsal fin markings. A total of 109 sightings were taken on 65 different days during an 18-month period. These sightings seemed to correlate with tidal level, having more sightings during flood tides. Behaviors seen during these sightings were mainly feeding and travel. A paper was written with the findings for that year and presented along with a poster at the 2008 American Cetacean Society Conference in Monterey, CA. A copy of the abstract can be found on the American Cetacean Society website as well as a full copy in the library of the marine science department at Orange Coast College.

In more than thirty years of research, this is the first time the behavior of utilizing harbors has been witnessed in this population. Concern for the dolphins' well-being became a big factor in the study due to a 2004 incident when two dolphins (mother and calf) took up residence in upper Newport Bay and then died here four months later. The body of the calf was collected and taken back to Orange Coast College where a necropsy was performed with the supervision of a marine mammal veterinarian. Samples were taken from various tissues including the brain, liver, blubber and heart and were then sent to a Los Angeles-based lab for analysis. The results were astounding. The study determined the dolphin died from extremely high levels of pollutants such as DDT, PCB, Tributyltin, and mercury. Since the levels were in the hundreds of parts per million, the dolphin's carcass was considered to be toxic waste and had to be disposed accordingly. All of these pollutants can be found in high quantities within harbor fish and are evidence of the high levels of toxic waste that exists in the Newport Harbor area today. Some of the main concerns for

the dolphins that continue to use the harbors are whether they are feeding on the harbor fish and how long they stay in the harbor. Human interaction is another concern since the dolphins are making themselves so much more accessible to the public who use the harbor. Harassment including physical interaction, noise, and approaching too closely are all interactions that pose harm to these dolphins.

The study thus far has been able to make some correlations with the sightings of the dolphins and tidal level. Dolphins seemed to enter more often during a flood tide than an ebb tide. This is somewhat promising news since flood tides bring in fish from outside the harbor which the dolphins may be feeding on. These fish likely have smaller levels of pollutants and therefore pose less danger to the dolphins. Another observation made during the study was that the dolphins weren't always feeding. In some cases they actually seemed to seek out human interactions by bow-riding passing boats. In other cases they seemed to avoid boats and just traveled through. Data are still being collected today through monitoring of the harbor.

The future of the CDSP relies on the ability to maintain the funding needed to run it successfully. With a lack of proper equipment to perform important parts of the research, such as photographing and identifying particular dolphins, the future success of the project is threatened. The CDSP is a non-profit organization that relies on passionate marine science students of Orange Coast College to organize and run the research project. Our hope is that this project can continue and that we may be able to contribute greatly to the conservation and knowledge of these magnificent animals.

L. King is senior director of special projects for CDSP. ■

Starting the Continental Thermograph Array

The Catalina Marine Society is deploying an array of marine temperature recording devices off the coast of the Los Angeles metropolitan area. Surprisingly, although the islands offshore Los Angeles are well instrumented by such organizations as the Channel Islands National Park and the Catalina Conservancy Divers, there is no equivalent array off the mainland. Data from the thermographs will be used to study the effects of Santa Ana winds on the ocean, the distribution of internal waves, upwellings, El Nino/La Nina temperature conditions and other phenomena.

The CMS allocated funds to begin building the array at the beginning of this year. We are planning for this array to extend from Malibu to Laguna, consisting of approximately 10 sites with a total of perhaps 15 thermographs. Already a couple of thermographs have been sited off the Palos Verdes peninsula. More have been prepared and are awaiting deployment off Malibu. The Palos Verdes locations are expected to be active internal

Adopt-A-Thermograph Program

The CMS is seeking donors and site managers for its Adopt-A-Thermograph program. These sponsors will extend and complete the Continental Thermograph Array that is currently under development.

Participants will donate the minimum cost for a single thermograph setup, currently totaling $150. The Catalina Marine Society will supply the sensors and associated mounting hardware and will perform QA and calibration procedures on the sensors before they are deployed and when they are retrieved. The sponsors, if they desire, may also be the site manager, providing the resources for deploying and retrieving the thermograph, or have the CMS arrange for the diving.

The Adopt-A-Thermograph is directed by David Tsao. For more details, contact David at david@catalinamarinesociety.org.

wave-generation sites, while the Malibu locations are especially well suited for recording upwelling produced by Santa Ana winds.

Phil Gardner examining thermograph setup. Courtesy of M. Passage

To speed the development of the array, the CMS is instituting a new program called "Adopt-A-Thermograph". We seek sponsors who will contribute the cost of a thermograph and its supporting anchors or perhaps multiple thermographs that can provide additional depth coverage at a site. The donor may also act as the site manager, providing or managing diving resources to both deploy and retrieve the instruments for data downloading and replacement. See the accompanying article on the "Adopt-A-Thermograph" program.

Deployed thermograph Courtesy of M. Passage

After the data are downloaded, the quality will be assured by the CMS and archived on a web site with accompanying notes and calibration graphs. The data will be eventually concatenated into files corresponding to calendar years and sites, similarly to how the National Oceanic and Atmospheric Administration formats its buoy data sets. We believe this process will make the data easily available to a wide range of researchers and other interested parties.

We hope the Continental Thermograph Array program will be a long-duration data collection effort, lasting perhaps five years or longer. Such a long-lived program will require the help of many donors, volunteers and data analysts. Based on previous efforts, and boosted by the Adopt-A-Thermograph program, we believe the new program will produce much scientifically valuable data. ■

Ocean Acidification: CalCOFI meeting Dec 2010.

By Craig Gelpi

One of the most remarkable California oceanography programs is CalCOFI, the California Cooperative Oceanic and Fisheries Investigation. CalCOFI started in 1950 in response to the sardine collapse, collecting data from dedicated ship cruises to understand California's marine ecology. It has been collecting data since its inception and conducts an annual symposium to disseminate results. I was fortunate to be able to attend the 2010 CalCOFI symposium, December 6-8, in La Jolla. As usual the meeting was composed of 3 parts: the state of the California Current, the state of the fisheries, and finally, the theme of the conference, which last year was Ocean Acidification and Hypoxia, a topic of importance as the CMS considers a scientific mooring at WIES.

This year the state of the California Current was anomalous. However, it was pointed out that every year the Current is anomalous, so perhaps it is rather typical. The current was considered to be in a weak La Nina phase, though with hindsight the 2010-2011 winter was very wet like an El Nino year!

I took away two points from the state of the fisheries, namely that there are plenty market squid in the ocean and that the status of abalone in Southern California is still low population numbers. I saw squid eggs in La Jolla Cove Thanksgiving weekend. That location is not known for squid egg beds so I suspect that the scientists are correct on the

squid. Subsequently, we saw a great squid egg season at Catalina. Regarding abalone, the presentation was made by Derek Stein, who co-authored the abalone article in the previous issue of *OceanBights*.

Of great interest were talks on the symposium theme. That the ocean absorbs a significant amount of anthropogenic-generated CO_2 is well known, and does so by converting CO_2 to carbolic acid. Increasing CO_2 levels and the resulting lower pH of seawater decreases the saturation state of calcium carbonate ($CaCO_3$). This decrease in saturation state is believed to be one of the main factors leading to decreased calcification in marine organisms, as it has been found that the inorganic precipitation of $CaCO_3$ is directly proportional to its saturation state. The increasing acidity of the ocean threatens to reduce the availability of calcium carbonate required by animals to build their shells. These animals include coccoliths, foraminifera, corals, marine snails and even lobster.

Low oxygen levels are highly correlated with low pH (greater acidity). Professor Lisa Levin of Scripps described fluctuations found in dissolved oxygen (DO) data, from inter-decadal to semidiurnal time scales. She indicated that, surprisingly there are very strong events in kelp beds where episodic pH events are associated with a 50% drop in DO levels.

The questions raised by Prof. Levin include how marine biology will react to the changing acidity and DO environment. Natural events that change the pH and DO with depth, e.g., upwelling, may be enhanced by the long-term trends of decreasing DO and increasing acidity may affect the local biology significantly. Especially concerning are that non-motile species or attached life stages of species may be susceptible to hypoxia.

Other talks at the symposium included biological studies of hypoxia and acidification and modeling studies. One was on the statistical impact of low oxygen levels on deep-water fishes as tabulated from CalCOFI data, finding that decreases in fish numbers were correlated with low oxygen levels. Another was on the finding that low oxygen levels reduce egg hatching and development of copepods. Modeling studies indicate that acidification will be very significant in the California Current System and the Southern California Bight.

We expect to hear much about ocean acidification and hypoxia in coming years as the effects of climate change become more evident. The CMS hopes to collect data germane to this topic with its scientific mooring at the Wrigley Institute of Environmental Studies as discussed in the last issue of *OceanBights*. The sensor currently measures dissolved oxygen and there are tentative plans to extend the measurements to pH as funding permits. ■

CMS presents to dive clubs

We made presentations to the Sole Searchers and Pacific Explorers dive clubs. The talks discussed the origins of the CMS, its various projects and how volunteers can help.

California Oil Seeps

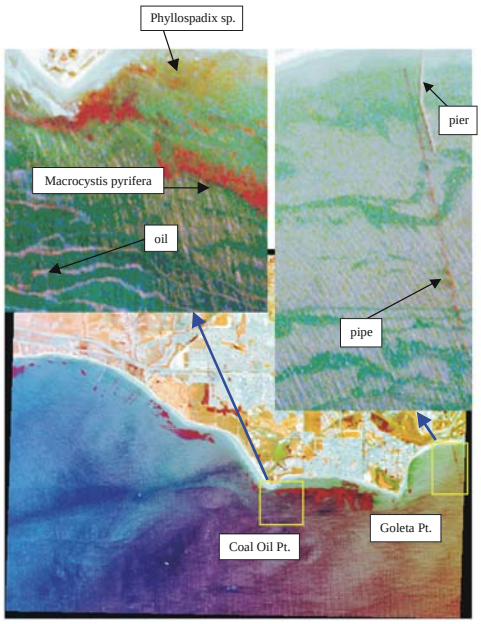
Everyone in Southern California is familiar with tar balls on the beach. If you look closely, you may find oil stains on rocks at the surf line. This oil and tar has probably come from one of the underwater oil seeps commonly found off our coast. Although marine oil seeps are found elsewhere, and are usually the original clue to the discovery of offshore oil fields, California can claim some of the most spectacular ones. We suspect this may be due to the proximity of the seeps to the shore and populations centers, making them well known. One of the most famous seep areas is Coal Oil Point near the University of California, Santa Barbara. The oil you find on the

beach probably came from the seeps near here. These seeps are so prolific and constant that they are often employed as targets for remote sensing experiments executed to detect offshore oil fields.

We snorkeled Coal Oil Point several years ago to study the seeps first hand. There were certainly thin blobs of oil floating on the surface. It would get on your skin and wet suit and if you rubbed it into your skin it was hard to remove. The seeping oil can be seen from another perspective, that from fishing and dive boats that visit the offshore oil platforms off Ventura. When water visibility is good, droplets of oil can be seen slowly floating to the surface, looking like precious gems in the water column. When they reach the surface they expand into a thin layer and dissipate, leaving the ocean surface calm as they remove the wind's purchase needed to generate waves.

The center of oil seep analysis is the University of California, Santa Barbara. Much scientific interest in the natural seeps sparked after the famous large oil spill produced by a leaking well in 1969. UCSB was the natural institution to perform much of the analysis and it continues to study the seeps to this day.

There are over 2000 mapped marine seeps in California. There are several off Coal Oil Point, leaking between 15 and 50 barrels of oil a day, every day. What happens to this oil? Recent studies by UCSB researchers and others have followed the oil from the seep, to the surface, its subsequent advection and eventual sinking and burial. Natural oil is known to contain thousands of hydrocarbon compounds and other molecules. This combination from the seeps must be less dense than water as the oil floats. Apparently, when it gets to the surface, the more volatile components evaporate as the oil is advected by the currents, typically flowing northwest from Coal Oil Point. In addition, light breaks down some of the hydrocarbons and microbes digest much of the rest. Eventually, only the heavier hydrocarbon components remain. These sink and are buried in the sediments at the bottom of the ocean similarly to foraminifera as was discussed in the previous issue of *OceanBights*. A UCSB expedition followed the expected path of the oil from estimated currents, taking sediment samples along the cruise and finding the buried remnants.



Hyperspectral image of Coal Oil Point. Courtesy of C. Gelpi

This process may illuminate the fate of the oil released during the Deep Horizon disaster in the Gulf of Mexico. The amount of oil released estimated from the underwater video of the spewing well head far exceeds the amount accounted for from surface cleanup, burning, estimated microbial consumption and beach depositions. However, much oil is now being found on the seabed, either deep offshore or just past the surf line.

Deep-sea oil seeps, like those in the Gulf of Mexico, are known to support life based on chemosynthesis, in contrast to

the photosynthesis that surface life depends on. Hydrothermal seeps off Palos Verdes are also known to support chemosynthetic bacteria communities. Do the near-surface seeps support specialized life forms? The Coal Oil Point seeps appear to increase biomass abundance because of nutrients, specifically organic carbon that they add to the environment. The hydrocarbons are broken down by bacteria and this so-called microbial production contributes to the trophic web. However, there are no known organisms that specifically live off and require the petroleum emanating from the Coal Oil Point seeps. ■

Summary of CMS Annual Meeting

The CMS held its annual meeting at the Long Beach Aquarium of the Pacific on April 10. The results of the e-mail election were announced and are that the current Board of Directors was reinstalled for two-year terms. The Board elected the CMS officers, who are: Jon Davies, President; Karen Norris, Secretary; and, Craig Gelpi, Chief Financial Officer. Craig will also continue to serve as Chief Scientist, which is a vice-president position. During the four-hour meeting, a presentation was given on the prior year's accomplishments and challenges. New fundraising activities were discussed as well as new ideas to further the continental thermograph array currently being deployed. ■

Scientific Mooring

By Mike Doran

A YSI sonde supporting sensors with the capability of collecting data on temperature, chlorophyll content, dissolved oxygen, and conductivity of the water was deployed on December 4, 2010, in the Wrigley Marine Reserve, located at Big Fisherman Cove, Santa Catalina Island. A pilot project to deploy the instrument, with the goal of collecting a data stream for at least a one-year period of time, is being undertaken as a collaborative effort by the USC Wrigley Marine Science Center /Wrigley Institute for Environmental Studies (WIES), Catalina Conservancy Divers (CCD, a support group of the Catalina Island Conservancy), and the Catalina Marine Society. The sonde is deployed at a depth of 60 feet, on a deep-water mooring line in Big Fisherman Cove.

The CCD originally obtained and deployed the sonde 8 years ago. It was recently refurbished and readied for re-deployment, under the direction of Karla Heidelberg and Lauren Czarnecki of the Wrigley Marine Science Center, WIES. Lauren Czarnecki wears two hats in association with this project; she is lab manager at WIES, and is also the point person on the project as a member of the board of directors for the Catalina Marine Society. Catalina Conservancy Divers, including JP Pylkkanen, Ari Requicha, and Mike Doran (who also wears two hats, as a CCD volunteer diver, and member of

YSI Deployment group
L-R: Gerry, Trevor, JP, Mike & Ari

the board of directors of Catalina Marine Society) deployed the sonde. Diving was under the supervision of Gerry Smith, dive safety officer at WIES, with the use of WIES facilities and the assistance of waterfront staff including Trevor Oudin.

For deployment, a protective cap over the instruments is removed, and a vented covering over the instruments is screwed on in its place. The entire instrument is then placed inside the custom fitted outer housing constructed by Ted Sharshan. The outer housing is then attached to the mooring line, at 60-foot depth. The instrument will be retrieved every 30 to 60 days after deployment, to download data, replace battery packs, clean off fouling by marine organisms, and recalibrate the sensors.

The instrument has been retrieved on 2/6/11, redeployed on 4/10/11, and again retrieved on 5/14/11. The additional retrievals and redeployments have taken place with the help of additional CCD volunteer divers Ted Sharshan and Dirk Burcham (who is also a Catalina Marine Society member).

On 4/6/11, data were downloaded at the Wrigley Marine Science Center, and the instrument was recalibrated and readied for deployment at that time. The download and recalibration was accomplished by Lauren Czarnecki and Kelly Spafford of WIES, as well as Craig Gelpi of the Catalina Marine Society.

Ari and Mike diving with sonde.

A preliminary review of data from the initial deployment period, which was approximately 60 days in December, 2010 through January, 2011, indicates the sensors are working and recording good data. There are unexpected, variations in oxygen content and salinity reflected in the data, as well as a couple of very interesting events in chlorophyll content. The sonde was retrieved early from its second deployment when an underwater inspection indicated a large amount of biofouling. Data from the latest deployment awaits evaluation.

This pilot program is intended to develop the mechanical process of deployment, retrieval, maintenance, calibration and data analysis. We hope that at the end of the year-long data stream we will capture seasonal variations of scientific value, in addition to data indicating potential correlations with tides, currents, and vertical movement in the water column. We will also better understand the logistics for developing a multi-year time series. ■

Spotlight on: UCSB

One can hardly attend a local conference concerning our ocean without meeting a student or graduate of the University of California, Santa Barbara. This attests to the size of the institution and its location, on the ocean. There are perhaps nearly 2,000 people associated with marine studies at UCSB, including students, researchers and supporting staff. A whirl through UCSB websites indicates that much of the marine research work is interdisciplinary. For instance, the physical oceanography work is performed in the Department of Earth Sciences, while marine biology is in the Department of Ecology, Evolution and

Calibrating the sensors.
L-R: Kelly, Craig and Lauren.

Development. The university has too many research programs to report on here, so we will concentrate on a few projects carried on in our neck of the ocean.

On a trip to the Channel Islands have you ever wondered what was underneath the boat? The distance from Ventura to Anacapa Island is less than 20 miles. If the underwater topography varies on the same spatial scales as that found on land, then consider what wonders you are travelling over as you make your way to the islands. If you travel 20 miles in any direction from where you are now, you will discover many biomes and environmental niches, besides a great number of natural wonders. Hence, you would expect many interesting things under your boat. One of these has recently been discovered: asphalt volcanoes. Located at the bottom of the Santa Barbara Channel over 200 m in depth, the asphalt structures are the results of oil seepage, similar to the oil seeps found near the campus described in an adjacent article (California Oil Seeps), only much deeper. Scientists found seven cones with the largest one being almost 20 m tall and reportedly covering an area equivalent to two football fields.

Oil platform census.
Photo by James Forte.

DO sensor in kelp.
Courtesy of LTER gallery

Surprisingly, the phenomenon of asphalt volcanoes are a recent discovery, first found in the Gulf of Mexico in 2003. UCSB scientists discovered the Santa Barbara Channel asphalt volcano cones from a submersible in 2007 after bathymetric analysis of the Channel. The mounds support benthic life as they provide a hard substrate in an otherwise muddy region. The volcanoes are old, perhaps as old as 40,000 years, and indicate how long oil has been leaking from the seabed.

Nearer to shore, UCSB houses the Santa Barbara Coastal (SBC) Long-Term Ecological Research (LTER) project. The LTER network is a national effort to understand long-term ecological phenomena. Our local LTER emphasizes the ecology of kelp (*Macrocystis pyrifera*) forests. Understanding kelp forest ecology requires knowledge of the life within, the interactions among the life forms and the flow of energy and nutrients among species through the forest. A test of this understanding is predicting the response of the forest to shocks, such as climate change.

Achieving this understanding requires intensive observations of the kelp forests. The LTER study includes measurements of temperature, salinity, turbidity, chlorophyll and various nutrients and dissolved oxygen. These are some of the same measurements made at our scientific mooring at Santa Catalina Island. LTER data are correlated with biological measurements including metrics on kelp biomass and chemical composition as well as fish density and size measurements for species in the kelp ecology. The project also embraces the effects of land and land use on kelp forests. These measurements are conducted in kelp forests on both sides of the Santa Barbara Channel, at sites near the university and on the north side of Santa Cruz Island, where land use differs significantly. Of course, the studies make extensive use of SCUBA divers.

A long-term study of ecological processes is expected to take decades. SBC LTER has been able to jump start the process by acquiring decades of kelp data from the commercial company that harvested California kelp. Using aerial (and areal) surveys conducted by the company, LTER is able to quantify changes in the kelp overage for more than 60 years.

One recent finding obtained by SBC LTER is that climate change is expected to reduce the complexity and diversity of the food web of our giant-kelp forests. How does one determine this? Well, one manifestation of climate change is expected to be an increase in the number of storms per year. The frequency of large-wave events in the Santa Barbara Channel has been found to be increasing over the last 60 years. The effects of these storms can be observed in the LTER metrics and the effects of an increase in the number and severity of storms can be extrapolated from these observations. Large winter storms rip out the kelp, reducing the next summer's kelp canopy, but sometimes increasing the number of species in the kelp forest. However, if large storms occur every year, then species richness declines and the food web is said to simplify. Pertinent observations were drawn from the LTER data. However, as a further test, 2 sections of natural reef were expressly denuded of kelp for two consecutive years to emulate the effects of large, consecutive-year storms. Metrics from these sections were compared to those obtained from similarly-sized control sections that were left intact. The experiment verified the results of the models.

UCSB is also a leader in observing the Santa Barbara Channel with high-frequency (HF) radar. HF radar operates in the frequency range of 3 to 30 MHz, the same band that ham radio operators use. From non-descript, inconspicuous antennae located at many popular beaches and locations, including Santa Catalina Island, along our coast these radars measure surface currents by observing the advection of surface waves. These current measurements are useful in juvenile recruitment studies, the analysis of large-scale coastal-wave propagation, and determining average current velocities. In fact, average currents determined by HF radars were useful in the hunt for sediments produced by advected oil from the Coal Oil Seeps (see California Oil Seeps article). For a near real-time view of the radar-measured currents, go to the Southern California Coastal Ocean Observing System web site: www.sccoos.org.

A discussion of UCSB's contribution to local marine research must mention the work of the Love Lab. Many local ocean lovers will be familiar with Milton Love's humorous fish ID book "Probably more than you want to know about the fishes of the Pacific Coast." If you have mastered it then watch out for his next book "Certainly more than you want to know about the fishes of the Pacific Coast".

Love in sub.
Courtesy of Milton Love

CMS at AOP Divers Day

The CMS manned a display table during Divers Day at the Aquarium of the Pacific in Long Beach, March 20, 2011. Certified divers were granted free admission to the Aquarium if they showed their C-card. Almost 900 divers took advantage of the event. We met many old friends, connected new faces to old names and, in general, had a fine time as we discussed CMS projects and volunteering opportunities with many who came to visit the Aquarium that day.

However, ocean lovers may not be knowledgeable about research the Love Lab conducts regarding the ecology and significance of local offshore oil production platforms to fish. Anyone diving our local platforms will immediately recognize what a magnet they are for fish and invertebrates.

If you have ever dived platform Edith off Long Beach, you probably wondered what the bottom looked like. Well, it was examined by submarine in the course of research performed by the Love Lab. That scallop shell you dropped is one of many, joined by the shellfish debris produced by cleaning the supports for inspection, and typically forming a shell mound around the base of the platform and producing a deep-water reef attractive to fish.

The Love Lab has quantified the effect by comparing fish assemblages around platforms and nearby rock outcroppings. Using both SCUBA and manned submersibles (the ultimate Reef Check dive) they have conducted fish censuses annually. They found that fish numbers, particularly the young-of the year, varied greatly among their samples. Densities were usually greater in the western part of the Santa Barbara Channel, attributed to the greater productivity of the waters of Central California which enters the Channel from the western end. However, there is no doubt that oil platforms are good fish nurseries. Check out the Love Lab web site and see for yourself ■

Need a Speaker?
Perhaps the CMS can provide a suitable presentation for your next club meeting or event.
E-mail us at :
information@catalinamarinesociety.org

Upcoming Meetings

American Geophysical Union, Dec 5-9, 2011, San Francisco. There will be several ocean-related sessions.

CalCOFI
Dec 12-14, 2011 La Jolla, San Diego. Topics are not yet posted.

Ocean Sciences Meeting Feb 19-24, 2012, Salt Palace, Salt Lake City. This meeting, held every 2 years, is the pre-eminent gathering of ocean scientists of all specialties.

Southern California Academy of Sciences, May 4-5, 2012 at Occidental College, Eagle Rock. The symposium showcases research in all fields pertaining to Southern California, especially marine biology.

Catalina Marine Society Membership

Catalina Marine Society Members support the goals of the Society through their dues and also elect the Society's directors. Membership is described in the bylaws and is granted to those who 1) agree with the mission statement, 2) submit an application that is approved by the board; and, 3) pay the annual dues (currently $100). An e-application is available on

http://www.catalinamarinesociety.org/CMSMembership.html

Manual Membership Application

Please send the following required information to the Catalina Marine Society via e-mail or post to the address below.

Name, e-mail address, postal address, reason you wish to join the Society, and that you agree with our mission statement.

Dues can be paid through the "Donate" link or checks made payable to the "Catalina Marine Society" sent to the following address:

Catalina Marine Society
19872 Collins Road
Canyon Country CA 91351

If you are interested in contributing to the work of the Society in other ways, please let us know. Categories and examples of needed volunteer work are listed below.

Lab

Data analysis
GIS
Programming

Field

Boating
Diving
Instrument calibration
Hardware/Equipment fabrication and mounting

Office

Web design/programming
Graphics
Photography/Videography

Magazine/newsletter

Reporting
Publishing
Editing
Departments

Fund raising

Event planning
Event volunteer
Grant writing

Press/publicity

Public speaking
Newspaper articles