OceanBights

The Magazine of the Catalina Marine Society

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Contents

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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.

Letters to the editor should be sent via e-mail to the address below.
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Editorial: Not Citizen Scientists.

We are working on an article for a future issue of *OceanBights* in which the idea of citizen scientist is invoked. We have always disliked the phrase citizen scientist. First, it is ambiguous. Is it the science of citizens? That is not the modern connotation. Is it science performed by citizens? That's probably not a distinction worth considering as there must be few scientists who are not citizens of some polity. Second, we dislike the phrase because it seems to qualify some aspect of science in a bad way.

What is citizen science? Wikipedia uses the following definition for citizen science: the systematic collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities by researchers on a primarily avocational basis. Hmmm. Apply that concept to marine and oceanographic research in our local ocean and the definition corresponds exactly to the science the Catalina Marine Society does.

However, somehow this qualifier leaves the impression that the systematic study is not quite up to snuff. That the results obtained are tainted by the pedigree of the researchers. We are of the opinion that good science is good science. Sure, there are distinctions between work on important and insignificant issues, approaches that are elegant and those that are brunt-force, and those that require massive resources and those that require little. But if the end result of a study is not good science, then the study was not worth doing. And if it is good science, then it shouldn't be qualified in this manner.
►*Continued, see editorial on page 5.*

Spotlight on Santa Barbara Museum of Natural History.

We never thought of the Santa Barbara Museum of Natural History as a marine research institution, but then, we remembered the museum has often studied beached whale carcasses and also has sponsored publications of the proceedings of the California Island Symposia. This led us to investigate the museum's other marine-research related activities, where we found a gem of an institution, with significant facilities for doing typical, but exciting natural history museum work.

One of the museum's most distinguished facilities is its extensive collection of invertebrates, purported to contain 3 million specimens and including thousands of marine species. Given that the museum is about 100 years old, to achieve a collection of this size means that specimens are acquired at a rate of 100 per day. We talked with Paul►

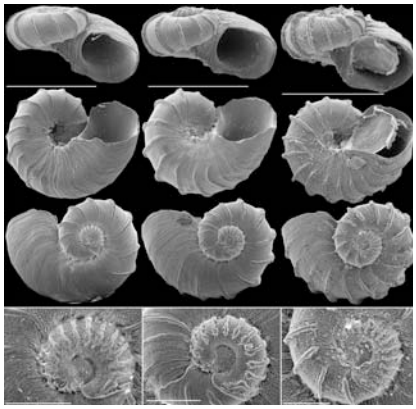
Valentich-Scott, malacology (study of mollusks) curator at the museum to learn more about this staggering number. The museum does mount field campaigns that add to its archives. However, the collection is composed of many specimens that arrive at the museum as parts of other, subsumed collections. Indeed one recent gift contained about 100,000 items.

According to Paul, the field work is the fun part. The hand labor of cleaning, sorting and identifying the specimens is immense. And then, the real work begins in the back room with the detailed analysis of the specimens and their description. Here is where possible new species are identified, and discussed with world experts to determine if the specimens do, indeed, represent species that are new to science. Paul indicated that over 30 new species were discovered and described by the museum's staff last year.

The collections include species obtained over time, so that shells collected at Santa Catalina Island over 150 years ago can be compared with modern specimens to analyze species compositional and morphological changes that may have occurred over that period. Documenting such changes enables scientist to discern evolutionary trends or perhaps human impacts on the species.

Such studies require fine observational techniques and the museum's facilities include digital photography shops and a DNA library. The museum has a scanning electron microscope that enables very fine scale observation; it can magnify structures by factors of several millions, or a few hundred times the best magnification obtained by an optical microscope. This instrument has been used to distinguish among specimens, sometimes leading to the discovery of new species.

One of those new species is *Coronadoa demisispira*, a small marine snail related to top snails. However, the Latin name refers to the depressed spire, the point of the top being depressed or sunken. Related species were first obtained from offshore Santa Catalina Island, on Farnsworth Bank (collecting specimens that are one millimeter in size during an open ocean dive at Farnsworth seems a bit incongruous but the specimens could have been obtained by dredge). The museum's scanning electron microscope was used to discern fine features and differentiate it from a prior description of the founding specimen.



Coronadoa demisispira from Cortez and Farnsworth Banks. Shells are about 0.5 mm long.

In addition to its Department of Invertebrate Zoology, the museum also has a department of Vertebrate Zoology and a collection of 50,000 vertebrate specimens, including many marine fauna. Getting animal specimens could be a bit dicey but the museum obtains many vertebrate specimens by pulling them off the beach.

The whale necropsies are just the most visible part of mammal strandings that the museum handles. We spoke to Michelle Berman (associate curator) who performs the necropsies, to learn more about the science. One of the first things I learned is that strandings can be dead or alive. The live ones are handled by groups that may nurse the injured animal back to health. But the museum is charged with handling the dead strandings found in Ventura, Santa Barbara and San Luis Obispo Counties. These include not only the whales, but the more numerous dolphins, porpoises, and occasional sea otter. Ms. Berman has performed approximately 400 necropsies. As noted above, these dead animals contribute to the museums specimen collections, which would otherwise be hard to obtain.

The dead animals are measured and weighed when possible and tissue samples taken for laboratory analysis and storage. Various organs are also excised and measured. Stomach contents and feces are examined to determine what the animal has recently eaten. Tissue samples are used for DNA extraction. Tissues are also analyzed for the presence of bio toxins, heavy metals and poisonous pollutants such as PCBs.

Beach necropsy of northern right-whale dolphin, *Lissodelphins borealis*. From M. Berman.

The museum began this work in 1975, and now after more than 35 years, one can imagine a time series describing aspects of our local ocean being contained in the collection of tissue samples at the museum. Ms. Berman sees anthropogenic changes in the studied animals, which she calls a sentinel species. These changes include increasing amount of toxins and pollutants.

I asked Ms Berman how she learned to do necropsies. First, she studied anatomy and physiology so she understood how the body basically works. But she was also somewhat of an apprentice, watching and participating in the procedures performed by others.

Although, the necropsies do not normally determine the cause of death, the symptoms of trauma are obvious. Death by ship strike has been a significant contributor to blue whale strandings. However, there is another non-ship-strike case where the cause of death was determined. In the stranding of a minke whale, the necropsy revealed cell fragments of a toxigenic diatom in the feces, a large number of northern anchovy otoliths in the stomach contents, and high levels of domoic acid in the feces, indicating that the whale died from a harmful algal bloom transmitted up the food chain.

The museum maintains online databases (www.sbcollections.org) for both invertebrates and vertebrates with over 65,000 and 10,000 entries, respectively. Their site enables a user to peruse some of the museum's collection from home. One quickly finds that the collections include specimens from around the earth as well as from California. As an example of how the archives are used, we note that coincidentally, a paper in the latest issue of the Bulletin of the Southern California Academy of Sciences mentions the archives in a search for the southern range limits of the sand sole, *Psettichthys melanostictus*. We'll end the suspense by saying one was recently found in the water intake of the San Onofre nuclear power plant, a new range limit.

Computer tomographic scan of northern right-whale dolphin. Courtesy of M. Berman.

Many people use the museum probably

CMS presents to South Shore Yacht Club

On a rainy evening in Newport Beach, adjacent to beautiful Balboa Island. CMS described its ongoing projects that may be especially attractive to volunteer boaters.

without realizing it. The museum owns and operates the Ty Warner Sea Center located on Stearns Wharf, a Santa Barbara visitor fan favorite. There are interesting things for ocean lovers to do at the Sea Center as I remember a docent catching plankton by lowering a net through a hole in the floor into the ocean and then searching through the contents with a microscope.

We first became aware of the museum's interest in marine research through its publication of the proceedings of the Sixth California island Symposium. Proceedings of other California Island Symposia can also be purchased at the museum (a note: the eighth of the irregularly held symposia is schedule for October this year). We have found these collections of papers to be an invaluable source of data and research results for our local ocean produced by local scientists.■

Editorial continued

► We think that what is normally meant by the term citizen science should be described as public-participation science. We also like the term amateur science if the term amateur is used in its old-fashion definition, that is, lover of science. As the list of environmental and ecological issues grows, and the necessity for performing scientific work to address these issues increases, the role of the public becomes more important. After all, the planet needs all the scientific help it can get. We at the Catalina Marine Society have recognized that organized volunteers may have capabilities and institutional structures that enable them to perform work not suited to professional scientists, for example, long-term, non-career-enhancing, studies. We invite the public to participate.■

Northrop Grumman continues its Community Service Grants to CMS

NASA Reprints *OB* article

Chris Howell's article on NASA's Aquarius mission, published in the last issue of *OceanBights*, was republished on NASA's website. The Aquarius mission measures ocean surface salinity from space with the goal of understanding the earth's hydrological cycle. Chris worked very hard to obtain an interview with JPL Principle Investigator and produce a polished product for our magazine.
Congratulations Chris!■

Leo Carrillo thermograph recovered

The thermograph deployed at 60 ft (18.3 m) off Leo Carrillo beach in Malibu was replaced and its data recovered. The seabed beyond the inner reefs at Leo provide little relief for reference to aid the retrieval of the small instruments. Additionally, the gently sloping seabed reaches the 60-ft depth approximately 300 m offshore. This distance is a significant surface swim for a SCUBA diver, increasing the difficulty of retrieval.

A recovery team consisting of Mike Bushell, David Bentley, Jon Davies and David Tsao worked for 3 hours, using a kayak and GPS to position the divers above the sensor. The divers then executed a search pattern, eventually finding and replacing the thermograph.

Its boot had teeth marks and solicited many comments when displayed at the SCUBA show a week after recovery. The consensus speculation was that the marks were produced by a sheepshead mistaking the white boot for a squid.►

Upcoming Meetings

8th California Island Symposium, October 23-26 in Ventura.

CalCOFI December 3-5, in Pacific Grove.

Southern California Academy of Sciences, ~May 2013 at CSLB, in Long Beach

Data from the instrument exhibited many instances where the temperature decreased rapidly, an indication of upwelling.■

Spray Gliders in the Bight

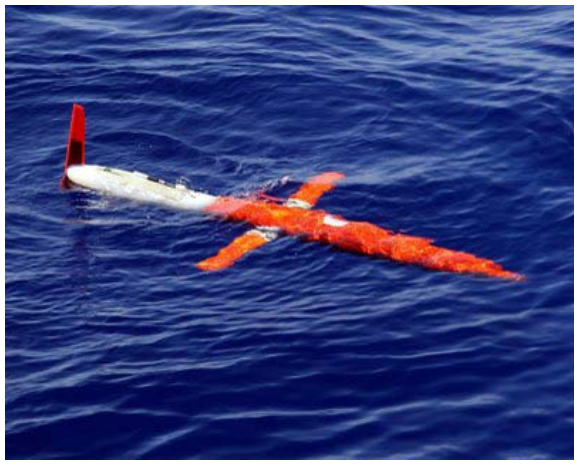
By Jeff Sherman

It's mid-morning on a clear January day, and a small inflatable boat heads out of Oceanside Harbor with what, many have remarked, looks like an odd version of a cruise missile strapped down in the back. In a ritual that has occurred every 3-4 months over the past six years, two people from a small lab at Scripps Institution of Oceanography (SIO) head a few miles off the coast, slide the 'missile' over the side, and watch it sink out of sight. They then call to say that it is in the water, get the position of the one they need to recover, and drive a short distance to that location. They pull the 110 lb. vehicle over the pontoon (depending upon the season, replete with its own set of barnacles after 100 days at sea), strap her down, and head back to port, thus completing the glider "turn-around" operation. This same procedure is repeated off of Santa Barbara and Monterey, also every 3-4 months.

This sleek-shaped vehicle is an underwater glider, which repeatedly dives to 500m depth and then returns to the surface to transmit scientific data via satellite. The instrument glides forward on both descent and ascent, enabling it to traverse the ocean. Equipped with a GPS and a compass, it steers a pre-determined course, and over the 100-120 day duration at sea it will log over 1000 miles by plodding along at about 0.5 knot. As the glider executes its see-saw pattern it collects information regarding the vertical structure of the ocean currents, temperature, salinity, chlorophyll concentration, and zooplankton distribution.

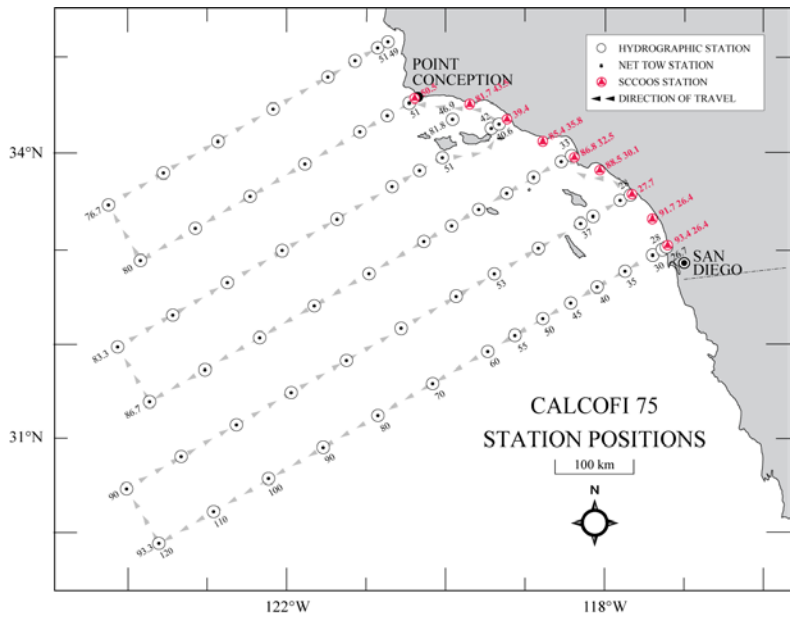
Jeff Sherman

The impetus to collect this data set is in part due to the lowly sardine; more accurately, to the collapse of the sardine population in the 1940's. In 1949 the California Cooperative Oceanic Fisheries Investigations (CalCOFI, www.calcofi.org) was formed to assess the mechanisms that affect the sardine population, and whether the fluctuations were due to over-fishing or natural causes. This collaboration between the California Fish and Game, SIO, and NOAA Fisheries continues to this day, harvesting perhaps one of the richest continual data sets for both physical and biological oceanographers. The focus is now on the whole eco-



The underwater glider, "Spray": 7' long, 8"diameter.

system of the California coastal region (extending a few hundred miles offshore). The primary work is done by NOAA and SIO research vessels, sampling the water column for a wide variety of properties at set stations along a serpentine pattern. These cruises require a dedicated team to handle the logistics, data collection, and analysis. The cost of the team added to the high cost of ship time, limits these operations to only once per season. To augment the ship data, underwater gliders continuously repeat three of the CalCOFI tracks, completing a round-trip typically every 6-8 weeks, with ~10 times improvement in horizontal resolution (but only measuring a small subset of water properties compared to ship operations).



CalCOFI cruise tracks. Spray is maintained on lines 80 and 90.

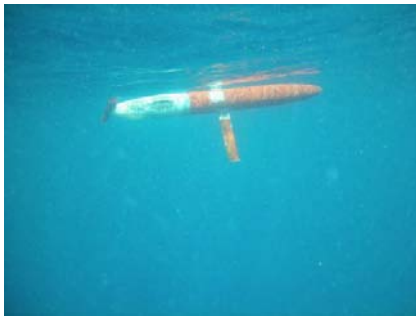
The orange-hull glider, named "Spray", was developed at SIO in a small lab (the Instrument Development Group), under the direction of Dr. Russ Davis. It is one of three underwater glider designs in the country that was developed in the late 1990's for multi-month oceanographic monitoring (the development was funded through the Office of Naval Research). They all operate using the same basic principle: Starting at the surface, the glider decreases its volume (thus losing buoyancy), and sinks to the desired depth. It then pumps oil into an external bladder, increasing its total volume (making it more buoyant), and rises to the surface. The glider uses its wings to convert some of the descent/ascent speed to forward motion. Think of a real glider released at high altitude on a still day; although there are no thermals to ride, it can still steer and glide. Likewise the underwater glider, by either being negatively or positively buoyant, can convert some of that buoyancy difference to forward velocity.

The Spray steers much like a hang-glider. It shifts its weight to control pitch and heading. Every 64 seconds small actuators adjust the movable batteries to shift its center of gravity, and thus its pitch and roll angles, allowing it to maintain the desired heading (measured by an internal compass). It is programmed with a set of waypoints and a route. At every surfacing it acquires its location from a GPS fix, computes a new heading for the next waypoint, sends its scientific data back via Iridium satellite, and heads off to do the next dive cycle. The Spray generally is on the surface for ten minutes before starting its next dive. Its antennas are in the wing tips, so, looking much like a sunfish, it rolls a wing vertical to perform the satellite communication, before rolling flat again to leave the surface. If you find yourself on the water and spot something orange with wings, don't pick it up! Most likely it will be on its way shortly, continuing its slow investigation of our waters.

During the months at sea, a "pilot" on-shore checks the Spray's progress and health every day, occasionally sending commands from shore when needed. For the CalCOFI gliders, commands are typically used to update the routeand maneuver it into the proper location for recovery. For gliders in other locations with stronger currents, more active piloting is required, for example sometimes steering a course perpendicular to the current to just get across it. For the Gulf Stream (or Japan's Kuroshio Current), the glider can be swept quite a distance downstream before getting all of the way across, so some planning ahead is required!

Dr. Dan Rudnick oversees the Instrument Development Group's Spray operations. With typically ten gliders in the water at a time, spread across the globe (from the Gulf of Mexico, to the West and South Pacific), and over thirty missions every year, gliders are constantly being refurbished and prepared for the next shipment. As of early 2012, Sprays have accumulated over forty years of data collection, which, plodding along at 0.5 knot, is equivalent to over six trips around the globe. This metric is a fitting tribute, given that the glider's namesake is the boat Spray, piloted by Joshua Slocum on the first single-handed sailing voyage around the world.

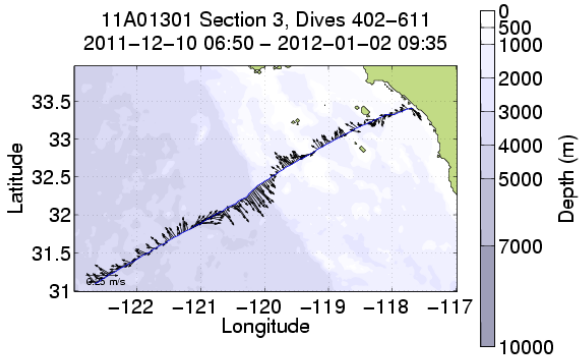
For the lab, the short drive from La Jolla to Oceanside makes this CalCOFI glider the easiest to maintain. From its Oceanside deployment, the Spray first heads for the south tip of Catalina, next to the north end of San Clemente Island, and then out to a point 300 miles off the coast. It then reverses its route, but modifies it slightly to come within 2 miles of Dana Point, before doing another full circuit, and then finally heading back to its recovery spot off Oceanside. Every mission produces four transects past Catalina, providing a rich data set of the currents and ocean properties around the island. The data are distributed to a number of agencies who then incorporate them into their own ocean models.



Underwater view of glider in wing-up position, sending data via satellite. Image provided by J. Sherman.

One of the glider's contributions is a better understanding of the effect and timing of the El Nino and La Nina cycles on the Southern California Bight system. The repetitive transects allow better resolution of the seasonal variations, and with it the ability to better discern the inter-annual variability, including the advection of nutrient-rich, or poor, water into the bight region, and thus the prospects for our local fisheries (including the sardine!).

Jeff Sherman is a Research Specialist for Scripps Institution of Oceanography■



Currents from Spray along line 90. Provided by J. Sherman from www.scoos.org

Kelp Forest Monitoring at Channel Islands National Park

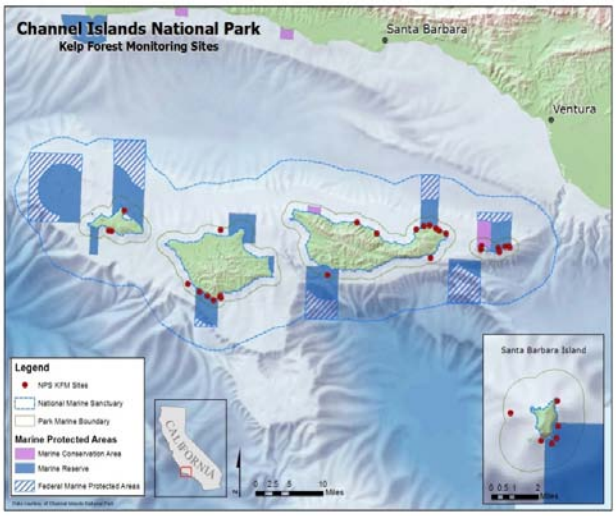
By Kelly Moore

Close to southern California's mainland coast, but worlds apart, Channel Islands National Park (CINP) includes the five northern-most Channel Islands – Santa Barbara, Anacapa, Santa Cruz, Santa Rosa, and San Miguel – and the waters that surround them. These islands have always been isolated from the mainland, allowing evolutionary processes to create unique plants and animals found no place else on earth. Often referred to as the Galapagos Islands of North America, the Channel Islands represent coastal southern California as it was long ago. The Channel Islands are influenced by two bio-geographical provinces which support an ecosystem with remarkable biodiversity. This is particularly evident in the one-half of CINP that is below the surface of the sea. Here, the cooler northern California Current merges with the warmer Southern California Countercurrent, resulting in unique sub-tidal communities comprised of both northern and southern species. For many cooler-water species such as blue rockfish and the sunflower sea star, the western-most islands – San Miguel and Santa Rosa – serve as the southern geographical range limit. Similarly, for many warmer water species such as lobster and California sheephead, the eastern-most islands – Santa Cruz, Anacapa, and Santa Barbara – serve as the northern range limit. This dynamic oceanographic system is also influenced by regional upwelling, driven primarily by wind events, which brings nutrient-rich water from the deep areas of the ocean towards the surface. These processes create the conditions necessary to support the abundant marine life that exists at the Channel Islands. Within these waters we find one of the most biologically diverse ecosystems in the world – the kelp forest. Giant kelp (*Macrocystis pyrifera*) can form a thick canopy at the ocean's surface with many understory layers, creating a stunning 3-dimensional environment almost like an underwater rainforest. Giant kelp thrives in the cool, nutrient-rich waters of this region and expansive kelp forests can be seen all along the coast of southern California. Kelp forests provide food, shelter and habitat for nearly 1,000 different marine species including sea birds, mammals, fish and invertebrates. Guided by the mission of the National Park Service, CINP strives to preserve and protect the natural and cultural resources at the islands and provide for the enjoyment of visitors. The waters surrounding the islands are managed through long-standing partnerships that successfully help to extend the benefits of marine management and conservation. CINP includes the waters and submerged lands within one nautical mile of the islands. The Channel Islands National Marine Sanctuary (CINMS) overlaps the subtidal portion of the park, and its boundary extends six nautical miles seaward from the islands. The State of California's Department of Fish and Game (CDF&G) has the primary role in enforcement of commercial and recreational fishing regulations that apply to the waters from the mean high tide line extending seaward to three nautical miles. Together, these state and federal agencies work to promote ocean stewardship and strengthen protection for the marine resources at the Channel Islands. The Channel Islands are situated less than 100 miles from millions of people who live in southern

Kelly Moore

California. These islands provide visitors with a place of recreation and a break from the congestion of urban life. However, close proximity to such a dense population threatens the health of many of the park's marine resources. These threats include pollution from the mainland, overfishing and the introduction of invasive species. The waters within CINP are responsible for about 15% of the State's coastal fishery harvests, yet it comprises less than 3% of California's coastal zone. Despite regulation efforts like seasonal closures, total catch and size limits, and restricted fishing or harvesting in some areas, we continue to see declines in some fisheries-targeted species. Additionally, other human activities in the channel such as petroleum extraction and cargo transportation could have negative impacts in the event of accidents. Resource managers are acutely aware of the potential effects these activities could have on marine resources and must employ innovative approaches to protecting this important ecosystem. The National Park Service (NPS) has a long-established Inventory and Monitoring (I&M) program that is designed to measure the health or "vital signs" of park ecosystems. These I&M programs are designed to collect data to assist with the development of appropriate management strategies that are as diverse and unique as the resources themselves. In 1982, CINP started the Kelp Forest Monitoring Program (KFMP) which has now become one of the most successful long-term I&M programs in the NPS. For 30 years, the KFMP has been collecting data on over 70 species of fish, algae and invertebrates at the Channel Islands. Originally, just 16 permanent sites were monitored on an annual basis, but over the years, additional sites have been added to the program. Now, with a total of 33 permanent sites around the five park islands, the KFMP provides one of the most extensive fishery-independent long-term datasets in the world. The objectives of the KFMP are: identify trends in ecosystem health; diagnose abnormal conditions; and, if necessary, suggest potential remedial treatments. To meet these objectives approximately ten different sampling techniques are conducted at each monitoring site. These techniques collect information on population abundance, distribution, age structure and recruitment of indicator species. The KFMP also documents each site with video transects. Long-term monitoring datasets like that produced by the KFMP provide substantial baseline information that is critical to understanding ecological change. The 30 years of data collected by the KFMP on kelp-forest habitat and associated species provides a more complete understanding of this complex ecosystem so we can detect and differentiate between natural variations and abnormal conditions. These data provide some of the most accurate information available on the status and trends of the kelp forests at the Channel Islands so appropriate management strategies can be developed. One example of how the KFMP dataset has been applied to resource management was in the closure of California's abalone fisheries in 1996 and 1997. Due to overfishing, disease, and other environmental factors, abalone populations declined to low levels throughout southern

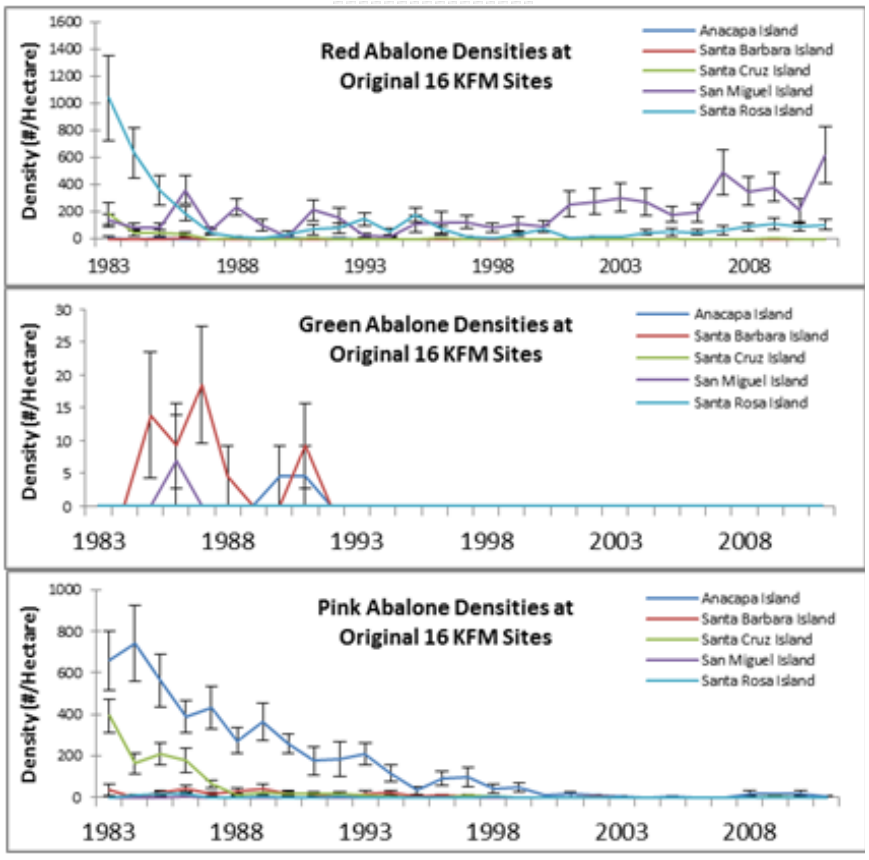
A NPS diver collecting data at one of the KFMP sites.



Monitoring sites and MPAs.

In 2003, CINP supported the establishment of a network of state Marine Protected Areas (MPAs) that now encompass 20% of the waters inside the park. These MPAs are designed to conserve marine life and habitat by limiting or prohibiting the extraction of marine resources within a designated area. In 2005, shortly following the establishment of these new MPAs, the KFMP installed 16 additional monitoring sites at the islands to assist the State in assessing the effectiveness of these new MPAs. The 16 sites were positioned both inside and adjacent to the MPAs so that baseline data could be collected for later evaluation.

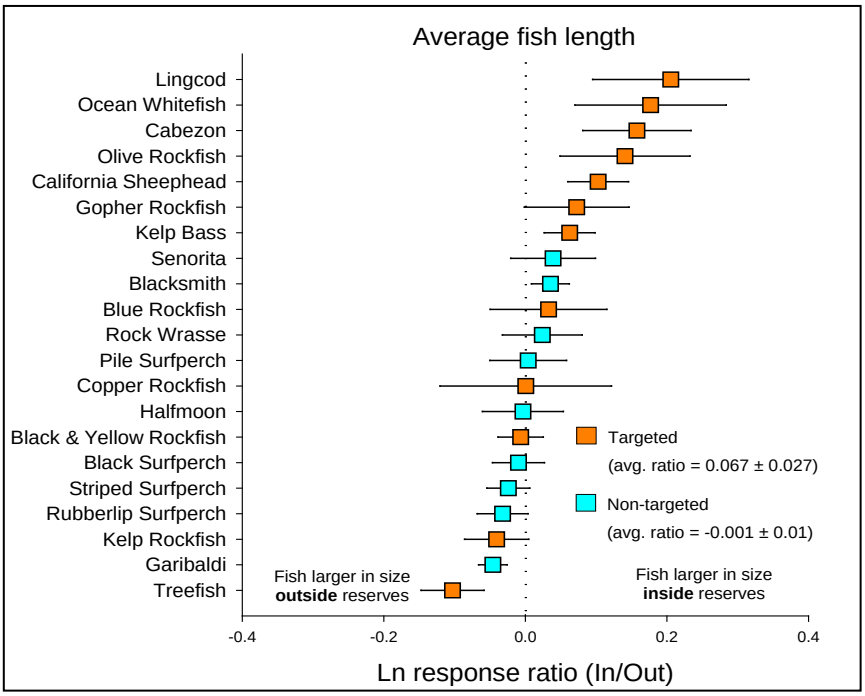
In 2008, Channel Islands National Park helped fund a 5-year review of the effectiveness of the new MPAs. Using data collected by the KFMP, analysis was completed on California, including the Channel Islands. Most of the biological information available on abalone until the 1980s was fishery-dependent data, which are not always reliable for detecting patterns in abundance. The KFMP dataset provided the State with a consistent fishery-independent data source showing that abalone populations had significantly declined. This information was critical in influencing the decision to close California's statewide commercial abalone fishery and southern California's recreational abalone fishery. Since these closures, abalone populations in southern California have been increasing, but they are nowhere near the abundances of the past. Today, the KFMP continues to provide fishery-independent data on abalone to assist California with abalone resource management strategies.



Decline of Abalone. Graph provided by K. Moore

population attributes and community structure of both targeted and non-targeted species inside and adjacent to the new MPAs. After five years of monitoring, the results showed that most fisheries-targeted fish species, like California sheephead, lingcod, kelp bass and rockfish, were larger and more abundant inside MPAs than in adjacent waters that are subject to fishing pressure.

Similarly, fisheries-targeted invertebrates such as lobster, scallops and sea cucumbers were more abundant inside than outside MPAs. This highlights the benefits of the Channel Islands MPAs as a fisheries management tool by offering a refuge for many depleted fisheries-targeted species.



MPA effects on targeted species. Provided by K. Moore

Kelp Forest Monitoring Program data and videos have recently become available online at www.pyrifera.marinemap.gov. This interactive webpage allows you to generate density graphs for over 70 different species, compare data collected from areas that are inside and outside MPAs, and watch videos of each site to observe how these areas have changed over time. This tool provides an opportunity for everyone to visualize the 30-year KFMP dataset to better understand the patterns and trends in species abundance in the kelp forests at the Channel Islands.

The Channel Islands National Park's Kelp Forest Monitoring Program has been essential to the park's success in managing its marine resources. It has also become a prototype for I&M programs at other national parks and agencies throughout the country. Such extensive baseline data presents managers with a more realistic perspective on the status and trends of ecosystems. Comprehensive long-term monitoring programs like these are critical in shaping management decisions and the future of resource conservation. For more information about Channel Islands National Park please visit: www.nps.gov/chis.

Kelly Moore grew up on Santa Catalina Island and has worked for the Channel Islands National Park's Kelp Forest Monitoring Program since 2005. David Kushner and Joshua Sprague from the National Park Service contributed to this article.■

CCD data available on web

Due to the efforts of volunteer Rhonda Jordan, data collected by the Catalina Conservancy Divers from 2004 to 2010 are now available online in Excel spreadsheets. Rhonda first created summary spreadsheets describing the hundreds of data sets. Next she converted the open-ocean measurements from a proprietary format to Excel. Ben Ruttenberg was kind enough to beta test the web site. People interested in obtaining the data are urged to contact the CMS.■

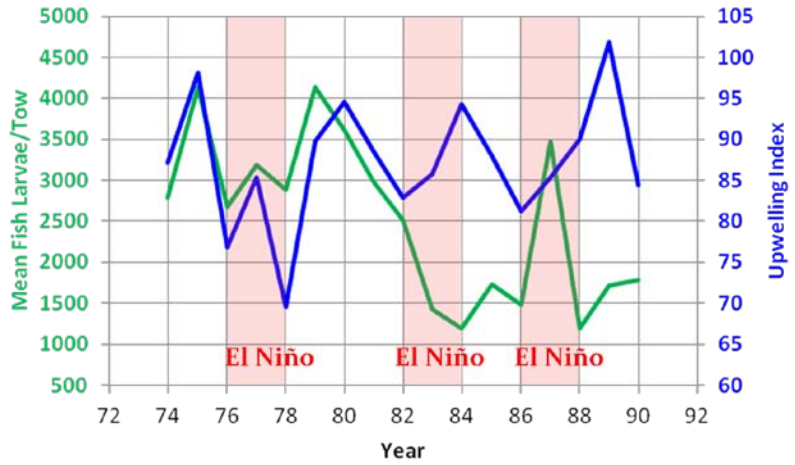
Vantuna Research Group: the Go-To Guys for Marine Monitoring

By Karen Norris

The Vantuna Research Group (VRG) is a non-profit research organization at Occidental College. They specialize in marine monitoring, especially as it relates to understanding life histories of nearshore marine fishes. Their claim to fame is the longest continual monitoring of rocky reefs in the world, having surveyed two sites, quarterly, since 1974. Their work addresses specific questions such as the impact of warm-water discharge on fish and to providing a baseline from which to measure future faunal changes in the Marine Protected Areas (MPAs) of southern California. VRG collaborates with other institutions with similar research interests including the California Department of Fish and Game, UC Santa Barbara, and the Santa Monica Bay Restoration Commission.

The VRG initiated in 1966; however, they acquired their name after the 1969 donation of the private fishing boat Vantuna, by owner Gilbert C. Van Camp III, the CEO of the Van Camp Seafood Company and makers of "Chicken of the Sea Tuna." Mr. Van Camp had attended Occidental College as an undergraduate. The Vantuna is no longer in service as a research vessel, but the rumor is that the boat is now a recreational sport fishing vessel. VRG has 5 full-time staff and an army of 20 or so undergraduate volunteers. The staff consists of AAUS-certified divers who conduct the surveys and the subsequent analyses.

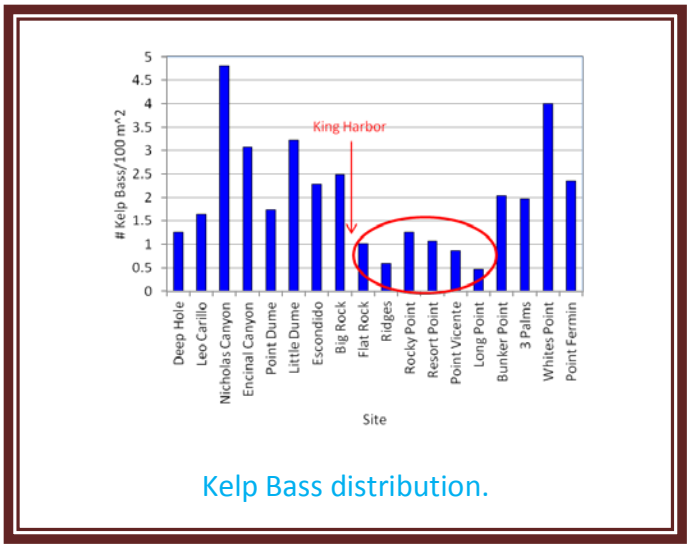
In addition to producing papers and reports, the VRG has also developed techniques in use by other groups. They refined the "belt" or "band" transect technique first developed in 1954 by V. E. Brock. The modified survey technique is now used as a statewide protocol for surveys supporting the (Marine Life Protection Act) MLPA assessments. A simplified version of the transect procedure is used by volunteers of Reef Check California. A recent technique being developed by a member of the VRG is the use of *Macrocystis pyrifera* sieve-tube sap (the sieve tubes are the tissue responsible for transporting sugar throughout the plant) to determine the influence of urban run-off. Analysis of sap from kelp near urban areas and in ports show higher concentrations of metals associated with pollution than that of sap far from urban areas, such as the Channel Islands.



Larvae, upwelling and El Nino

The group's hallmark research is a nearly 40-year monitoring of the Palos Verdes Rocky Point (PV) and Redondo Beach King Harbor (KH) sites. The study was initially designed to be a short-term project to determine the impact of warm-water discharge on fish. The water was warmed as it provided cooling for the Edison power plant in Redondo Beach. The PV site was the non-effluent contrast to the impacted KH site. However, several years into the study dramatic changes in the fish assemblages were measured, so the VRG decided to continue to survey the sites until the situation returned to the initial condition. Needless to say, they're still collecting data!

In addition to answering the discharge question, the surveys have provided the means for understanding the impact of episodic events like El Nino and long-duration events such as the Pacific Decadal Oscillation (PDO) on rocky-reef systems. As an example, the PV site had been kelp-free since 1958-59 until kelp returned in 1977. Kelp bass increased in abundance with the appearance of the kelp bed. For the most part though, the presence of kelp had little impact on the fish assemblage. However, the shift to a warm phase of the PDO and an El Nino at roughly the same time as the return of the kelp had dramatic effects. Not surprising, the abundance of fish with a preference for cool water, like rockfish, plummeted and the abundance of warm-water preferring fish, like the sheephead and Garibaldi, increased or at least remained the same as during the PDO cool-phase. Most recently the PDO has shifted to a cool phase and surveys at PV show the expected increase in abundance of fish with cool-water preferences and a decline in the numbers of warm-water fish.



Kelp Bass distribution.

The fish assemblage at KH shows the same response to the PDO shift and El Ninos. However, there is a striking and unexpected difference between the two sites. In an 18-year period, 73 species of fish were observed at PV. During the same period, 120 species were observed at KH! The man-made rocky structures at KH provide a large variety of habitat. However, one would think that the pollution of the harbor environment (would you swim there?) would offset any benefits of the harbor – refuge from storms and fishermen and access to the submarine canyon. A chart of the fish-larvae abundance and upwelling index clearly shows the correlation between the two quantities. There were El Ninos in 76-77 and 82-83. The upwelling index was low for the first El Nino and corresponding to that is low mean fish larval abundance. However in the second El Nino the low mean fish larval abundance is probably due to poor plankton availability even though the upwelling index is strong. During an El Nino, the source of upwelled water is warm and nutrient poor, resulting in lower levels of plankton production. The relationship between upwelling index and fish larval abundance ended in 1988 with severe damage to the outer breakwater and the subsequent repairs to the harbor, resulting in destruction to the fish habitat.

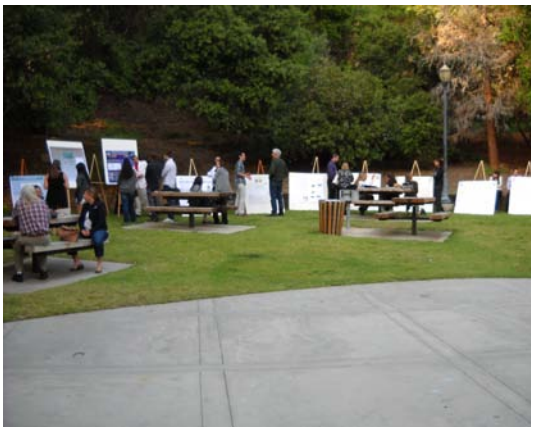
The PV and KH research established the VRG as experts in marine monitoring. As such, they have been vital to the assessments of the marine environment prior to the establishment of MPAs. They participated in a 2007-2008 survey of Southern California reef environments to establish baseline measurements. The study included a complete mapping of nearshore rocky reef habitats, measurement of habitat quality, and an

identification of the sources of reef degradation in Santa Monica Bay. They concluded that the primary causes of reef degradation are overfishing and sedimentation. Fishing pressure is stated as the reason for lower densities of kelp bass at sites adjacent to King Harbor, as seen in Figure X. The density is significantly lower in reefs adjacent to King Harbor. The complete report is interesting and easy reading. It can be found at http://departments.oxy.edu/vrg/live/Pondella%202009%20-%20SM%20Bay%20Reefs.pdf. In an interview with the Catalina Marine Society, Dan Pondella, director of the VRG, stressed that the research group is not an advocacy organization. They provide information so that whomever the consumer is (fishing group, environmentalists, marine managers) can make scientifically-informed decisions. Dan pointed out that it's easy to blame a single cause as the source of a problem, but it's usually a cascade of events. For example, the disappearance of Southern California abalone was due to a combination of the withering foot syndrome, a warming trend, and overfishing. One or two disturbances may not have wiped out the abalone, but the three culprits combined were too much for the gastropod. Dan suggests that if a single person wants to have a positive impact on the ocean environment, the primary action would be to reduce the pollution that ends up in the ocean. A simple step would be to not overwater one's yard. *Contributions by Chris Howell. Charts produced using data published by the Vantuna Research Group.*■

Society News

The Society held its annual meeting at the Aquarium of the Pacific in Long Beach on April 22, 2012. At that time, the Board elected the Society's officers who are: David Tsao, President; Craig Gelpi, Chief Financial Officer; and Karen Norris, Secretary. Craig also holds the Chief Scientist office, a vice-presidential position. We thank outgoing president Jonathan Davies for providing a guiding, stable hand over the last two years. Board members serve for two-year terms and the next board election will be in April, 2013. Board officers serve one-year terms.

At the 2012 meeting, the status of the Society and its projects were presented and discussed. The Society's expenditures and income are conforming to budget. Mike Doran discussed the scientific mooring at WIES and David Tsao the Continental Thermograph Array. Technical problems with the data quality at WIES were noted and possible solutions discussed. Also noted was that the Society was very active over the last year, with attendance and technical presentations made at scientific meetings, outreach presentations made to dive and



Poster Session at SCAS meeting

David and Jim at Diver Day

yacht clubs, and booths manned at exhibitions including Diver Day and the SCUBA Show.

Also discussed were possible collaborations with other institutions, the new data web sites, approaches for obtaining grants and increasing membership.

The meeting adjourned to clanking glasses of champagne and a social get-together where the directors were able to chat and catch up.■

Donors Sought

The CMS is seeking support to expand its data collections near Two Harbors by adding additional instrumentation to measure sea level, internal waves and currents. If interested please contact us.

Scientific Mooring Pilot Project continued

CMS is continuing its scientific mooring program at Wrigley Institute of Environmental Studies (WIES) near Two Harbors. The program was initially a pilot project funded for one year to understand the logistics and practicalities of maintaining a sophisticated set of instrumentation in the field for long time periods. The original package (sonde) measures chlorophyll, dissolved oxygen, conductivity and temperature. The major concerns were biofouling and certified diver support.

The sonde broke after the fourth deployment last year and was refurbished over the holidays and a pH sensor added. In addition, anti-fouling materials were applied. Michael Doran, organizing and leading the deployment/retrieval diving cycle, kicked the tempo up a notch so that the sonde is cleaned and recalibrated more often to limit the effects of biofouling. Tom Turney of the CCD was a tremendous help in responding to Mike in the latest retrieval when he happened to be in the area with his boat. Kelley Spafford has been instrumental in downloading the data preparing the sensor for the next deployment and Mike again had the instrument in the water within a week to begin its sixth deployment. Data from the fifth deployment was the best and most interesting we have measured so far.■

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 or Craig at craig@catalinamarinesociety.org.

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
15954 Leadwell Street
Lake Balboa, CA 91406

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