

The

EXPLORER

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Newsletter of
Cabrillo National Monument and
Cabrillo National Monument Foundation

“Forensic Science”

fo·ren·sic, adj. 3. Relating to the use of science or technology in the investigation and establishment of facts or evidence in a court of law: a forensic laboratory.

The American Heritage® Dictionary of the English Language, Fourth Edition, Copyright © 2000 by Houghton Mifflin Company.

P

icture Isaac Newton scrutinizing the apple. Visualize Benjamin Franklin flying his kite. Imagine Bonnie Becker analyzing California Mussels. Envision Stephanie Glenn measuring and weighing side-blotched lizards.

How do we know what we know? How do we go about finding answers? How do we even find the questions in the first place? How do we know we're heading in the right direction? In this edition of the *Explorer* we'll take a look at how scientists establish the facts, analyze, ask questions, find answers, and make plans based on scientific conclusions. As you will see, the mysteries abound, the clues can be perplexing, yet the scientists are tenacious.

Patricia Heusner,
Editor



From the superintendent

by Terry DiMattio

A lot has been happening at Cabrillo NM these past several months. We recently held the 42nd Annual Cabrillo Festival, attended by over 5,000 people, including Dr. Pedro Catarino, Portuguese Ambassador to the United States. The first week in October, Independent Energy Solutions, Inc. installed a 15kW photovoltaic system on the roof of the lower maintenance building. Once it is operational we should be producing 25-40% of our electricity from solar energy. On Saturday, October 22, we hosted our second National Parks American Tour, sponsored by Wal-Mart and Unilever, at which over 60 members of the community joined park staff and Volunteers-In-Parks (VIPs) to trim vegetation, pull weeds around the lighthouse, and plant native vegetation while fostering the spirit of volunteerism and improving the health and appearance of the park.

I would like to bring you up to date on several projects that will make a difference in the resources under our care and in our visitors' enjoyment of the park. The first is the rehabilitation of the Coast View and Sea Cove scenic overlooks along Gatchell Road. For the past year or so, we have been working with the National Park Service's Denver Service

Center (DSC) and Psomas Engineering to redesign these overlooks to improve their appearance, make it easier for motorists to enter and leave them, and to incorporate architectural features and materials—tan-colored curbs and walks with red brick edges—similar to those found at the visitor center so that our visitors will realize they are at Cabrillo NM. At the end of September we received funds for this project, and a contract has been awarded to Hal Hays Construction, Inc. of Riverside. Work will begin in the spring after the low-tide and rainy seasons.

Work will begin in mid-November on the lantern of the Old Point Loma Lighthouse. Chief of Maintenance Charles Schultheis was in the lantern last year while it was raining and noticed that water was coming in through the holes for the bolts and along some of the seams between the roof plates. Joseph Murphy Contracting from the San Francisco Bay Area will remove the copper roof, install gaskets around the bolts, seal the seams between each roof plate, and put it back together. The contractor will also dismantle the captain's walk, remove all the rust and scale from the deck plates and rails, prime and paint them, and put everything back together. While this is going on, we may have to close the lighthouse for the safety of our



Work will begin in mid-November on the lantern of the Old Point Loma Lighthouse.

visitors and so that the contractor can complete the job quickly and efficiently. We hope, though, to keep the lighthouse open as much as possible, especially on the weekends.

Another project that we hope will be completed this winter and spring is the construction of the resource management office southeast of the administration building. This project was proposed in the park's 1996 general management plan (GMP) and will be paid for with funds collected at the entrance station. The office has been designed to look similar to the other buildings in the visitor center complex and will give us 800 sq. ft. of much-needed meeting and work space. It will contain a secure storage area for our weapons and evidence, a general storage room, and a



There are numerous good and worthwhile projects and activities that are keeping the staff busy learning and growing, and that will make this unit of the national park system an even better, more enriching place to visit.

meeting and training area where our staff and VIPs can participate in the National Park Service's satellite-based training program. There will be space for our rangers to meet with visitors who want a special use permit to get married, to re-enlist or retire from the military, hold a memorial service, or to engage in commercial filming. There will also be an area where we can provide first-aid treatment for injured visitors. Once the office is built, we will be able to bring the resource science staff over to the administration building from the space we are renting from the Navy in Battery Ashburn. We have been working with the State Historic Preservation Officer to mitigate the effect building this office may have on the Mission 66-era visitor center that one day may be eligible for placement on the National Register of Historic Places. As soon as that is done, we can proceed with awarding a contract to have it built. If all goes well, our rangers will be able to move in by the beginning of next summer.

The last project is one that is just getting started. It too was

proposed in the GMP and will be paid for with entrance fee revenue. We recently began working with DSC to replace the whale overlook with a new interpretive shelter. It will be located about 25 yards north of the current shelter, closer to the edge of the bluff so it will blend in better with the topography of the park. It will be designed in the same architectural style as the visitor center and will incorporate similar materials: round wood columns, tan-colored walks with red brick edge, and will provide about 60 feet of viewing space. The first step will be to select a firm to prepare the preliminary design and construction estimate so we can present this project to the NPS Development Advisory Board (DAB) for its review and approval. Once we get the endorsement of the DAB and the approval of NPS Director Fran Mainella, we can complete the design and proceed with construction.

As you can see, the pace of

life and work has not slowed down at Cabrillo NM. There are numerous other good and worthwhile projects and activities that are keeping the staff busy learning and growing, and that will make this unit of the national park system an even better, more enriching place to visit. To all the staff, VIPs, and Cabrillo National Monument Foundation employees and members of the Board of Trustees who have in ways large and small contributed to our success, thank you for your hard work, devotion and support. And to all of you who have visited the park and brightened our days by your presence, thank you and please come back often.

My mussel detective story

by **Bonnie J. Becker**
Marine Biologist, CNM

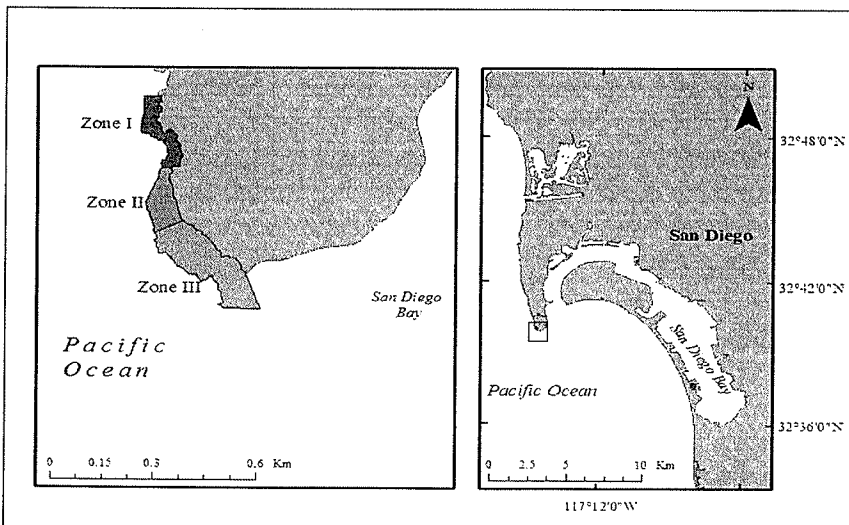
I love TV mystery shows. At first they present a scene with a few limited clues as to what happened, usually exposing something sufficiently peculiar just before the credits to keep you interested through the commercial break. Then the hardworking and observant detectives, with their encyclopedic knowledgebase of chemical compounds and invertebrate natural history and uncanny ability to read human motivations, get to work. There is always a musical montage of these impossibly smart folks doing painstaking work, going through countless samples collected from the trash, using shiny clean analytical machines that spit out complicated names of chemicals, and collecting fingerprints from tiny pieces of dust that are then run through that central database of all known criminals in the world. They do this part in montage format, because watching them do the work in real time would be, well, not so interesting. At the end, they always get the answer—the jealous husband, the NBA star gone bad, or the crooked doctor gets caught, usually confesses, and all is right again. I don't love these shows for the attractive cast or the snappy music, or even for their celebration of the geek as TV star. I watch because I am secretly jealous of them. As a scientist I feel a certain kinship with their work, and I live for that "aha!" moment at the end even though my life is actually the stuff that happens during the two-minute work montage. And I live it in real time.

My mystery story started in the early 1990s, although I didn't join the cast until 1998. The victims are the mussels of Cabrillo National Monument (CABR) that have been experiencing an unexplained decline since the beginning of the park monitoring program in 1990. When Jack Engle (UCSB) and Gary Davis (NPS) started this program, the average mussel plot in the park was about 40% covered with mussels. By spring 1995, only 5% were covered with mussels, and ten years later (spring 2005) they had only recovered to 14%. But this decline had a peculiar geographic pattern. The tidepool area of CABR is divided into three Zones. There is a single public entry point to the tidepool

area, located towards the north of the park in the middle of Zone I; since it is the most accessible, all of the tens of thousands of visitors we receive will spend time in this area. In order to access Zone II, people must amble through a rugged boulder field; therefore, fewer visitors venture into this area. The furthest site, Zone III, has traditionally received the least visitation, and has been closed to all visitors since November of 1996. Here is the strange thing: the decline of mussels occurred in Zones II and III, not the high-use area. In fact, by 1995 mussel cover in both Zones II and III fell from around 50% to less than 1% and currently has not recovered. Mussels in Zone I, on the other hand, expanded from around 10% cover in 1995 to around 35% in 1999. That's the hook, the one strange detail that thickens this plot before the montage begins. Why did mussels decline in the areas without direct human disturbance, but not in the area that receives the highest amount of visitation?

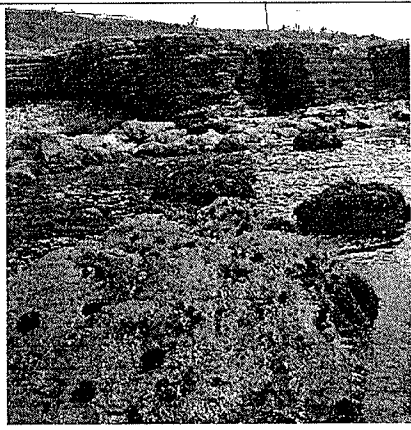
I came on the scene as the park Marine Biologist in 1998, after the mussel decline had already occurred. Since then, I have been acting as a forensic ecologist, trying to collect as much evidence as possible, weeding through all of the red herrings and misleading leads, to try to determine what killed our mussels—and why they aren't coming back. Cue the montage music...

In order to narrow down the reason or reasons for this decline, my first step was to define the list of possibilities. All crimes in detective stories fall into four major categories—greed, passion, coverup, and accident—and these alternatives are inherently considered in each case. Although ecological problems are a little more complicated, it was possible to create a list of suspected mechanisms that have been





Zone II circa 1962
photo by Gary Davis (NPS)



Zone II in April 2005
photo by Bonnie Becker (NPS)

culprits in other cases:

- 1 Overharvesting/Poaching
- 2 Visitation effects
- 3 Shoreline alteration
- 4 Regional mussel declines
- 5 Climate change
- 6 Disease
- 7 Natural variation
- 8 Pollution or poor water quality
- 9 Predation
- 10 Food limitation
- 11 Recruitment failure

On TV, the crime lab seems to have unlimited resources to explore every different option completely. In this real story, there is just one person—me! So I have to use the information I have to choose the most likely mechanism for further study. For example, causes 1, 2, and 3 are not likely to be important here at Cabrillo. Harvest of marine invertebrates is prohibited in the park, and is well-enforced by our committed TPERP Volunteers. Compared to most populations in southern California, our mussels are very unlikely to be harvested by people. Additionally, since the decline is most pronounced where there are fewest people, it is unlikely that direct human disturbances such as Harvesting or Visitation Effects are the cause. Habitat Alteration is also quite limited in this National Park area,

and is therefore probably not our criminal mechanism.

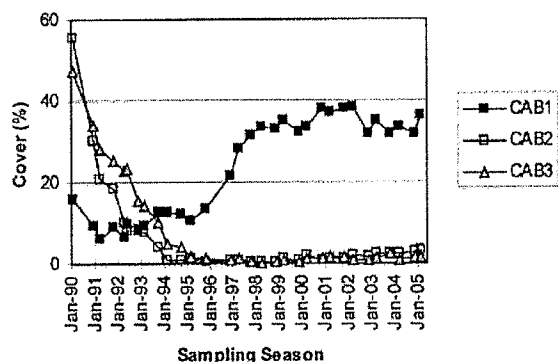
In order to explore the relative likelihood of guilt for the next three suspects—Regional Declines, Climate Change, and Disease—it is useful to look at mussel populations outside of the park. Thankfully, I have my own fancy central database, not of fingerprints but of mussel cover! Our monitoring program is part of a large collaborative group, the Multi-Agency Rocky Intertidal Monitoring Network (MARINe),

comprised of governmental, academic, and private agencies that use the same protocol to monitor the intertidal areas of sites from San Luis Obispo to San Diego. Recently, MARINe has compiled all of the data from these different groups into a single database, which includes mussel cover information from 452 photoplots at 49 sites. Using this new tool, I was able to do a spatial analysis and examine regional trends to look for evidence of my large-scale mechanisms working on mussels. Lucky for suspects 4 through 6, I didn't find an indication that mussels throughout the region were experiencing a similar problem to those at Cabrillo. It is unlikely that global climate change or a deadly molluscan disease would only affect the mussels in our little park. Still no smoking gun, but from this exercise we now know to focus on local processes.

It is possible that this decline in mussel cover is part of a longer natural cycle in mussel abundance. The guilt of this suspect is one of the hardest to prove or disprove, and certainly my anecdotal analysis of this one wouldn't stand up in court. I looked at mussel cover data from other sites in the MARINe database that had experienced declines, and found many cases where plots recovered in as few as 2-4 years. I saw no other sites that had experienced an unexplained and total decline without recovery for ten years. This suspect shouldn't leave town, but I decided to move on to some of those guilty-looking mechanisms lower on this list.

Every crime story has the one suspect whom the audience is meant to think is the guilty one. In our mystery, the clear villain is Pollution. Remember that mussels declined in Zones II and III, the two closest to San Diego Bay. The Bay is known on the street for having some water quality problems, including elevated pollution levels in some places. What isn't known is the amount of association between the Bad Boy Bay and our southern neighborhoods; in other words, how far north does Bay water travel into the park? In order to answer this question, we sent out some undercover caged mussels that we recruited from Scripps Pier. Mussels were raised on and harvested from the pier, measured, weighed, marked, and placed in plastic cages at sites around Point Loma and in the Bay for three months. Over four seasons we collected the mussels, remeasured and reweighed them, and then sent their soft parts to the City of San Diego for chemical analysis (our own version of the shiny machines). The field part of this study was just completed in September 2005, so our results are still preliminary. What we are looking for are Bay markers: chemicals that were higher

Average Mussel Cover in Mussel Plots



in Bay samples and gradually decreased with distance from the Bay.

So far, we have gotten some unsurprising results. Lead, copper, and PCBs were highest in mussels outplanted in the Bay and were present, although at lower concentrations, in mussels from Point Loma. It does appear as if the Bay influence was present in the park. But I was surprised by what we observed in growth rates: mussels in the Bay and from Scripps pier grew in length and put on weight, but those on Point Loma barely grew at all. The mussels taken from Scripps pier and forced to grow in Point Loma were pale, watery, and thin-shelled after three months; the ones we let grow in cages on the pier were robust and orange. So it appears as if our killer is still out there, and perhaps continues to limit the recovery of mussels. In these preliminary results, pollution did not seem to directly correlate with poor mussel health. We will continue to analyze data as it is released, but for now we need to release Pollution on bail for lack of sufficient evidence.

As often happens in detective stories, by pursuing one suspect (Pollution), we cleared the name of another suspect (Predation, #9) and became aware of another suspect (Food Limitation, #10). Although there are a number of predators that could have led to the decline of mussels, including

some that are more abundant in Zone III such as birds and lobsters, the dramatic decline in health of our outplanted mussels was independent of these other players. The caging experiment excluded predators, suspects #9, and mussels still fared poorly. From this outplanting experiment, it appeared as if the

mussels from Point Loma were starving, although we do not know why. We are just beginning our investigation of Food Limitation, who might need to get a lawyer.

When considering the decline in adult mussels, it is important to think about what led to the decline as well as what is limiting the recovery of the population. As part of my research, I monitored the number of juvenile mussels in Cabrillo compared to sites further north in La Jolla and Cardiff-by-the-Sea. I consistently found many more new individuals in the northern populations than I did in the park. From at least 2000-2003, Cabrillo's mussels have experienced a failure to recruit new individuals. Mussels reproduce like many other marine invertebrates, by releasing eggs and sperm into the water where fertilization takes place, forming a microscopic larva that floats at the whim of the currents for a few weeks before finding its way back to tidepools, perhaps some distance away from where they were spawned. The juvenile mussels in the park could have parents from a number of different sites along the coast. I developed a technique to track larvae from site to site in this area using their shell chemistry, and determined that most juvenile California mussels throughout San Diego County were spawned in the northern part of the region.

Basically, our populations are starved of new individuals; the reason is unknown but is not a lack of larvae in the area, since the healthier northern populations could easily restock our population. Recruitment Failure, you have the right to remain silent...

In the end, I still have not had my "aha!" moment, although I've had a number of "hmmm..." plot twists to keep the story going. Large-scale processes do not seem to play a role, while local mechanisms seem more important. Pollution is a problem in this area, but the direct evidence that it caused the decline is still lacking. What we have learned is that our adult mussels are not healthy and that few juvenile mussels are coming into the park. Two of our suspects, food limitation and recruitment, are in some pretty hot water. This is where my crime analogy starts to fail, because the guilty party cannot inexplicably decide to confess, thus dispelling any doubt that we caught the right culprit. Nor is there a jury to weigh this evidence and make a final determination. So as I come to the end of this article, I continue to live in the two-minute musical montage, chipping away at the Mystery of the Missing Mussels.

INTERESTED IN LEARNING MORE?

The best way is to VOLUNTEER for tidepool monitoring, this year from November 15-17 (contact bonnie_becker@nps.gov for more information)

To learn more about MARINE: www.marine.gov

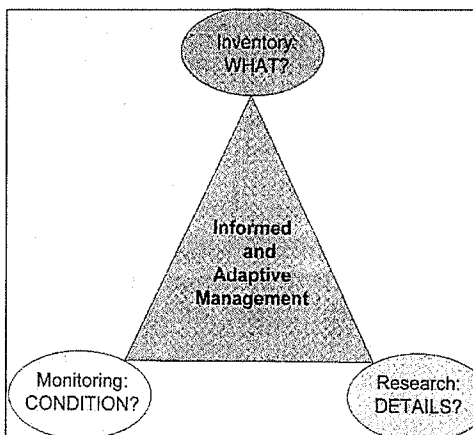
To learn more about my specific mussel studies, see my PhD Dissertation: *The regional population variability and larval connectivity of mytilid mussels: conserving the populations of Cabrillo National Monument (San Diego, California)*

Solving resource questions at Cabrillo...or at least trying to

by Andrea Compton

I don't usually like to start my writing by quoting legislation, but this is important legislation, so stay with me here for a few lines. In 1916, the Organic Act legislation was signed which created the National Park Service to "...conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Hmmm. That was intriguing. Let me repeat it with a few words in bold for some emphasis. "...conserve the **scenery** and the **natural** and **historic** objects and the **wildlife** therein and to provide for the enjoyment of the same in such manner and by such means as will leave them **unimpaired for the enjoyment of future generations.**" Translated, NPS staff is tasked with conserving all natural and cultural resources so that in five, ten, or fifty years, people can come back and enjoy them the same way they are now. At Cabrillo National Monument, park visitors in 2105 should be able to see coastal sage scrub, go down to the tidepools to explore the marine habitats there, learn about the defense of the harbor up through World War II, and visit the lighthouse. "Well," you may say to yourself, "that doesn't seem so hard. Just leave the stuff there and watch it; it's not going anywhere." If it were just that easy, this would be the end of this paragraph, the end of this story, and National Park units

everywhere would just need one or two people at each entrance to say, "Come on in, have a look, and thanks for visiting." Instead, meeting the mission of the NPS is a complex and involved process of learning all we can about the resources, and then managing to



maintain those resources to the best of our abilities, given the knowledge that we've gained.

Whether the resources are cultural or natural, there is a similar process that we go through to maintain these items. First, we do an inventory: "What is here and what is its condition?" Second, once we know what we have, we monitor those resources: "Is that resource changing over time, and if so, how?" As a component of that, we include results of research and in-depth studies focusing on very specific questions related to that item or community: "Since the population of species X is decreasing, how has genetic variability changed within that species, and will that variability affect the population's

ability to continue on the peninsula?" Lastly, we use all of those things together—inventory, monitoring, and research—to manage the resource for its long-term maintenance. What follows are just two examples of natural resource inventories that have been completed, monitoring being conducted, current questions that we have, and how we are resolving those questions in order to assist with the management of those resources. Be forewarned: we don't have all of the answers yet.

Reptiles on the peninsula

Reptiles are considered a key indicator of the health of the coastal sage scrub habitats. The diversity of herpetofauna on the peninsula—ranging from small salamanders, to medium-sized lizards such as orange-throated whiptails, to bigger predatory alligator lizards, to a variety of sizes of snakes, including rattlesnakes—is indicative of the status of the native community. Are all members of the community still present? If not, what effects are those losses having on the remaining populations? Are the natural systems in balance? From historical records through the 1930s, a variety of museums and researchers have reported 18 species of reptiles and one amphibian on the peninsula. Since that period of time, seven of those have been extirpated and are no longer found here. The peninsula is now an "island" of vegetation bordered by an urban area directly to the

north; the peninsula is fragmented from other large patches of similar vegetation. Drs. Robert Fisher (now with U.S. Geological Survey) and Ted Case (UCSD) started an inventory of reptiles through 17 pitfall arrays scattered in a variety of habitat types around the peninsula. The NPS accepted responsibility and began monitoring these species in 2002. Two of the remaining species of snakes—the ring-necked and the night snakes—have not been regularly caught in the arrays. Are these two species currently dying out on the peninsula? Is this expected, given the peninsula has been relatively recently islanded? Will other species disappear? What can we do to minimize additional loss of species (e.g., education about slowing down while driving)? If we reintroduce species, what are the potential effects of the introduced organisms on existing species (e.g., diseases, parasites brought to the peninsula as a result)? Is the peninsula really large enough to sustain the reintroduction or will the population continue to be too small to be viably sustained?

Fire and the interaction with plants on the Point Loma peninsula.

Fire is a component of the native Mediterranean climate ecosystem; many plants rely on widely spaced but regular fires to stimulate seed growth or sprouting of young plants. However, fire has been suppressed on the peninsula for many decades, starting in the 1850s when the lighthouse was built and continuing through today, including military use of the peninsula. Any fires that start are immediately suppressed to avoid impacting buildings and facilities. How has suppressing fires affected the communities of the peninsula? Beginning in 1994, Dr. Kathryn McEachern (U.S. Geological Survey) developed a species



Fire is a component of the native Mediterranean climate ecosystem and many plants rely on widely spaced but regular fires to stimulate seed growth or sprouting of young plants.

list indicating which plant species are present on the peninsula. NPS staff continues to add species to that list for a current documentation of which species are present. At the same time, Dr. McEachern also started a long-term monitoring program for the plant communities within the park. The goal of this monitoring is to track changes in the community structures over time. This monitoring was repeated by NPS staff in 1998 and 2003, and will be repeated some time in the next one to three years (after a rain season of extra precipitation). To focus on the fire component, Kevin Cummins researched and wrote a report on the "Vegetation History of Cabrillo National Monument" (1995) which focused on fire history on the peninsula, and the status of several plant species which depend on fire to reproduce. Only one small fire has occurred since the 1930s, so the majority of the peninsula has not burned in at least 80 years. The estimated fire frequency for the peninsula is 80-120 years, so the peninsula may be approaching or be beyond that time period. Mr. Cummins extended his research and conducted a seed bank study where he used soil samples to see which

species might be present in the seed bank which are no longer present as adult plants. Eight new species were grown after fire was artificially applied to those soil samples. The National Park Service and the Navy are jointly developing a fire management plan to incorporate prevention measures, and to prepare for and anticipate reactions if a fire should be accidentally ignited. One alternative being investigated is whether any small (less than ¼ acre) controlled burns could be included. Should fire be reintroduced on a broader scale beyond Cummins's soil samples to restore some other potential species that might currently only be in the seed bank? Would controlled fire mimic the natural conditions that would be needed to demonstrate what would happen to the native communities with fire? Should the peninsula specifically be maintained without fire because it is one of the last remaining coastal areas without fire within the past 100 years and thus has some very unique species that are not present elsewhere (including some lichen species)? What would be the impacts on those species or could they potentially be lost if fire were to be reintroduced?

As you can see, often getting a few answers as a result of inventories, monitoring, and research leads to even broader questions. However, all of this information is needed to guide the NPS decisions with the encompassing mission of conserving the resources for the future. If you have a few minutes, or an hour, or four, give me a call—there are plenty of unsolved mysteries for the natural resources of the park and I'd be glad to discuss more of our questions and how we are proceeding to get answers. I'm sure the cultural resources staff would extend the same offer.

The Birds of Cabrillo National Monument

by Claude G. Edwards
Volunteer, CNM

The rose-breasted grosbeak

The rose-breasted grosbeak (*Pheucticus ludovicianus*) is a beautiful "eastern" songbird that travels a long way to reach Point Loma. It is categorized as "Mo" on the Point Loma bird list, which refers to its being "a regular seasonal migrant" that is "occasional—in-frequently encountered but of regular occurrence." Individual birds are certain to be expected during fall migration, lingering for one or a few days. They are of rare but regular occurrence during spring migration, and individuals have been discovered in our area during the summer. Exceptionally, a male grosbeak spent the entire winter of 2004-2005 at the Fort Rosecrans National Cemetery, feasting on annual ryegrass seeds scattered on newly disturbed ground.



Typically, they occupy a spring-and-summer breeding season that extends from the southern Appalachian Mountains north to Nova Scotia, westward to the Great Plains and the Great Lakes, and northwestward into central Canada. Their winter range includes central Mexico south to northern South America. They are close relatives of their western-ranging counterpart, the black-headed grosbeak (*P. melanocephalus*).

The adult male rose-breasted grosbeak is aptly named and easily identified. It is a medium-sized bird, generally 7 to 8.5 inches in length, with a distinctive chunky or husky build. Its plumage is striking black-and-white with a unique triangle-shaped patch of rosy red on its chest. This color is also present on its underwings, only seen when the bird is in flight. Its head, back,

wings, and tail are black, with patches and bars of white on its wings and tail. The rump and under-parts are mostly white. It has a relatively large head and an unusually large, pale-colored, beak.

Females resemble large finches, with bold brown-and-white stripes on their heads. They are generally brown in color with narrow brown streaking on the back and under-parts, and a reduced number of pale bars and patches on the wings and tail as compared to the male. Winter-season males generally resemble females, with patches of beige and tan feathers obscuring some of the summer-season features.

While they are encountered on Point Loma, rose-breasted grosbeaks generally give short call-notes that sound like a querulous "quick?" or a short and squeaky "wheek?" Their rich and fluty, robin-like, whistled song is rarely heard by San Diego-area bird watchers.

This species is well illustrated in all commonly-used bird field guides, such as *The Audubon Master Guide To Birding*, Volume 3, by John Farrand, Jr. (1983); *A Field Guide To Western Birds*, by Roger Tory Peterson (1990), and the National Audubon Society's *Sibley Guide To Birds*, by David Allen Sibley (2000). A thorough account of its occurrence in our area is provided in the *San Diego County Bird Atlas*, by Philip Unitt (2004).

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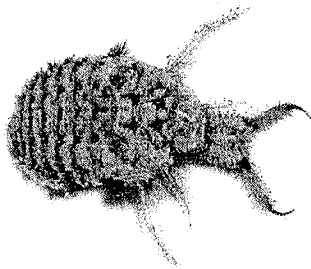
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Wildlife at Cabrillo

by Stephanie Glenn
Biological Technician

A short tale of Antlions (*Myrmeleon* sp.) and their Pits of Doom



Antlions are peculiar-looking insects that can be found here at Cabrillo National Monument. As adults they look much like damselflies, but are nocturnal. However, as larvae (see illustration above), they have large mandibles that make them look ferocious (if I were an ant, I would be terrified).

Antlions in the genus *Myrmeleon* build conical pits in loose sandy soil to help them capture ants and other ground-dwelling arthropod prey. *Myrmeleon* larvae can only move backwards and create their pits by rotating in circles and flicking soil away using their large

mandibles. Then they sit at the bottom of the pit, under the soil and wait for an unsuspecting ant to meander on by. When the ant steps into the pit, the sand avalanches and the ant falls to its doom. The antlion, which was waiting ever so still and patient, readily seizes the opportunity and flicks soil at the ant to knock it further into the pit. It quickly grasps the ant and pierces the abdomen with its large mandibles. The antlion's mandibles are hollow, so it can inject digestive enzymes into the ant and then suck out the internal fluids. Once the antlion is done feeding, it tosses the empty carcass out of the pit and again hides under the soil. It waits there patiently, sometimes for days without food, for the next unsuspecting ant to fall into its pit of doom.

Native vs. non- native species: Get clued in!

We often hear about introduced or invasive species, but have you ever wondered how biologists know which species are native to an area? How do we know that the Argentine ants so common here in California were originally found only in Argentina? Or that the California condor also inhabited Arizona thousands of years ago? What evidence do scientists use to estimate a species' native range? Although these may seem like simple questions, the process of answering them can be rather complex. Biologists must piece together clues about the species' past in order to determine its native range.

So what does natural or native range mean? Natural or native range refers to the area over which a species is naturally distributed and dispersed. Physical barriers, such as a mountain range, or biological requirements, such as body temperature, naturally limit the



*How do we know
that the Argentine
ants so common
here in
California were
originally found
only in Argentina?*

distribution of a species.

Sometimes competition with other local species can limit how far a species disperses. What makes it so difficult, then, to determine a species' native range? The simplified answer is: people. Many species have been artificially dispersed through human mediation, both intentionally and unintentionally. People of the ancient Maya civilization altered forest flora composition in favor of fruiting plants. European explorers brought exotic livestock to new lands. Colonial American farmers cleared out large areas to plant non-native crops that would flourish and provide food. Even today the transportation of goods and materials for trade can transport biological hitchhikers to new environments. Thus, over thousands of years of

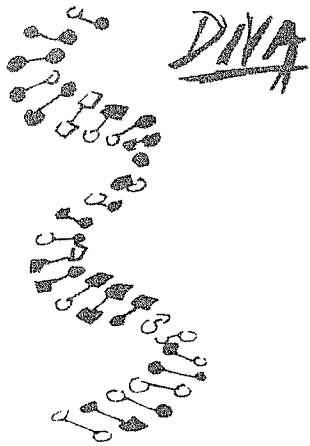
anthropogenic migration and alteration, many species have been spread far beyond their native range. Biologists really have their work cut out for them when trying to determine the origin of a species.

The most common clues biologists use to estimate the native range of an organism are historical records and inventory efforts. Here on Point Loma, we use the descriptions in ship journals of such early explorers as Juan Rodríguez Cabrillo and Sebastián Vizcaino to understand what native species may have been here in the 1500s and 1600s. As early as the 1800s, naturalists began exploring areas all over the world specifically to catalogue the species they encountered, and assemble vast collections of unique and new species. For example, Lewis and Clark's exploration of the northern United States in the early 1800s, or Darwin's famous expeditions on the *Beagle* in the 1830s. Alfred Wallace gave thorough accounts of species in the Malay Archipelago during his travels in the 1840s, and John Muir spent much of his life exploring the flora and fauna of Alaska and North America in the 1860s. After the invention of the camera, photographs provided important clues biologists could use to determine the historical distributions of a

species. The records, photographs, and voucher specimens from these and other pioneers' travels are stored in natural history museums and archival collections located all over the world.

This type of inventorying still continues today. Here at Cabrillo an archival museum of species found on the peninsula and in the surrounding waters is underway. The small mammals, herpetofauna (reptiles and one amphibian), marine and terrestrial invertebrates, and fish that we enjoy here today will be identified and documented for future biological research.

Biologists and paleontologists will also look at fossil records for clues about historical species distribution. California condors nearly went extinct in the early 1980s due to lead poisoning, collision with wires, and shootings. Previously these birds had been sighted in northern Arizona. But it was unclear whether this bird's native range included Arizona and areas of the Grand Canyon or if it had been artificially dispersed there with the introduction of cattle ranching. By looking at fossil records, paleontologists were able to confirm its existence in Northern Arizona thousands of years ago and a captive breeding program has successfully



By looking at the genetic structure of the population, biologists can determine if the species has been in the area for a long time.

released several mating pairs on the Paria Plateau of the Vermilion Cliffs just north of Grand Canyon National Park.

In recent years, biologists have started to use genetic analysis for clues about a species' origin. By looking at the genetic structure of the population, biologists can determine if the species has been in the area for a long time. Native populations typically have a large gene pool which has a high level of diversity. On the other hand, introduced species

often have low levels of genetic diversity within the population due to the genetic bottlenecking of the gene pool when a small subset of the native population is relocated in a new environment. Biologists are using genetic clues more and more regularly to determine which species are non-native in areas where little historical information is available. For example, biologists used genetic analysis of cut-throat trout populations in Glacier National Park to determine which lakes contained native populations.

such as invertebrates and many plants. Historical records can also be misleading if a species is misidentified and no voucher specimen is preserved. With an estimated 30 million species on Earth, it will take a lot of collecting and cataloguing for archival collections to be complete and accurate. Genetic analysis can also be misleading if an introduced species has been in a new region for a very long time. Thus, biologists make the best estimates of a species' native range given the clues they have.

Often, biologists need to piece together several of these clues to estimate a species' natural range. And even then much debate and controversy can be had. Many historical and fossil records are incomplete, especially for less conspicuous organisms,



Cabrillo People

Arrivals...

by Patricia Heusner



Stephanie Glenn

Natural Resource Science Biotechnician

Origin: Bay Area of Northern California

Enjoys: softball, biking, caring for animals,

As an undergraduate, Stephanie studied abroad in Costa Rica for 3 months. There she explored the tropical flora and fauna in several of the country's biological reserves. Her favorite hikes were at night, looking for lizards, frogs, snakes and insects with nothing but a headlamp and snake hook. Stephanie completed her Master's degree at UCSD in March 2005, focusing her research on antlions. See her article on antlions on Page 10.

Jerry Baker

Maintenance division

Origin: San Diego (attended Ocean Beach Elementary, Dana Middle School, and Point Loma High)

Enjoys: blues music, playing acoustic guitar, surfing, tinkering with cars

Jerry is retired from Federal Industrial Supply Center (FISC) where he worked at the La Playa fuel pier. Now that he's working at the top of the hill, he especially enjoys the view of the harbor from CNM.



Rodolfo Gabriel

Maintenance Division,

Origin: Philippines (also lived in Hawaii and Japan during his duty in the U.S. Navy)

Enjoys: playing tennis, fishing, biking

Rodolfo is happily married to Cora, his wife of 24 years, and they have two children. He loves to look out from the lighthouse area of the monument at the expanse of blue water, taking in the quiet, pure atmosphere.

Paul Wise

Maintenance division

Origin: National City

Enjoys: Hot Rods, car shows, painting cars, playing football at the park, snorkeling

Hot Rods in Paul's family include a 1933 Dodge, 1936 Ford, 1931 Ford truck, and 1936 Chevy. At Cabrillo National Monument, Paul especially enjoys visiting the tidepools.



Cori Robinette

CNMF Bookstore

Origin: Ocean Beach (born at San Diego Naval Hospital)

Enjoys: Gardening, walking with her dog, Mick, and keeping up with her middle school and high school children's busy schedules

We happily welcome Cori back to the CNMF bookstore. The peace and quiet, the plants and their aromas, the people she works with brought her back to work at Cabrillo. You may recognize her smile and enthusiasm if you've been a long-time customer!

**Glenn Fye**

CNMF Bookstore

Origin: New Mexico

Enjoys: Visiting museums and parks, photography, and walking with his wife Sandy.

Glenn has a degree in Art History from the University of Hawaii, and has done curatorial work in several museums. While working at Cabrillo National Monument he enjoys the opportunity to talk to people of different backgrounds and appreciates the friendly, open atmosphere created by the monument's staff and volunteers.

Ellen Ortega

CNMF Bookstore

Origin: Southern California

Enjoys: Spending time with the love of her life (her husband Jerry) as well as her six grandchildren

Ellen is a real Southern California Coastal fan, and is eager to explore more of Cabrillo National Monument's Coastal Mediterranean Ecosystem. She especially likes the hawks and other birds of the monument.

**Tony McNamara**

CNMF Bookstore

Origin: Tucson, Arizona

Enjoys: The Beach, Camping, Hiking, Fishing

Tony is happy to be living near the water after being in the desert for many years. He has developed an interest in bird watching at Cabrillo National Monument; his favorite is the Cooper's hawk that hunts near the visitor center

...and departures

Tiffany Luas-Duffield

Tiffany, our former Biological Technician, has made a move into the field of information technology. She is furthering her education by taking courses from IBM in databases, and putting her knowledge into practice by working part time building databases for the United States Geological Survey (USGS). We wish her the best in her new career as she combines her knowledge of biology, ecology, and databases!

**Carol Martin**

Carol, a former maintenance worker, interpreter, and fee collector at Cabrillo National Monument, has moved to Virginia to accompany her husband in his job assignment. The coastal sage scrub plants miss her TLC! The next time you visit the Cabrillo statue, you'll enjoy the native plant garden she created, including a plant that blooms each month of the year. Thanks, Carol, for your wholehearted contributions to the preservation of the natural and cultural resources at Cabrillo National Monument.



Cabrillo National Monument Foundation

**Cabrillo National Monument
Foundation and Cabrillo
National Monument
say goodbye to two friends**

F. ROSS HOLLAND JR., 78, passed away at his home in Mason, New Hampshire, September 16, 2005, of Alzheimer's Disease. Mr. Holland joined the National Park Service in the late 1940s and served over thirty years. From 1959 to 1964 he was park historian at Cabrillo National Monument. While at Cabrillo, he laid the foundation for the park's interpretive program, created the library, and established the museum collection. His research and writings on Juan Rodriguez Cabrillo and the Old Point Loma Lighthouse, together with the reference material he acquired and the artifacts he accessioned, are still in use today. Cabrillo National Monument Foundation is in the process of redesigning and reprinting the book *The Old Point Loma Lighthouse*, which was authored by Mr. Holland.

PAULINE des GRANGES, 90, passed away October 20, 2005, at Sharp Memorial Hospital in Kearny Mesa after suffering a massive stroke. Ms des Granges was director of the Park and Recreation Department for the city of San Diego for ten years, during which time the number of park and recreation centers increased from 5 to 27; she served two terms on the state Park and Recreation Commission, and became the first woman president of the California Park and Recreation Society. She was among the 21 founders of the San Diego Foundation and was involved in countless other civic and cultural organizations, including Cabrillo National Monument Foundation as a trustee from 1998 to 2001.

Make a Lasting Legacy

The CNMF Endowment Fund, established in 1997 with the San Diego Foundation, is another way you can support the endeavors of Cabrillo National Monument. Interested donors can contact us at (619) 222-4747 or by e-mail at CNMFKaren@aol.com

Calendar

BIRD WALKS WITH CLAUDE EDWARDS
3rd Saturday of every month except December
9:30am CNM Visitor Center Area

• **NOVEMBER 13, 2005**

150th Anniversary celebration of first lighting of
the Old Point Loma Lighthouse
10:00am to 4:30pm

Lighthouse tower will be open

• **JANUARY 28 & 29, 2006**

Whale Watch Weekend & Intertidal Life Festival

New Members

We welcome the following new Cabrillo
National Monument Foundation members:

Lawrence Bame
Jeff and Laurie Berman
Leonard Bernstein, MD
Linda Canada
Donald Carey
Karen Crawford
Lesley Dodson
William Doyle
Mrs. Joanna George
Orval Glynn
Glenn Haddick
Leslie Hovey
Regina Morin
Claudia and Lou Obertries
Mike O'Connell
Edna and Chuck Patrick
Allen and Maxine Reyburn
Deanne Shearn
Robert Smith
John Thiele
Mr. & Mrs. Jerry Thomas



The holidays are just around
the corner— CNMF
memberships make great
gifts.



Please visit our website:
www.CNMF.org



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