



CONTRIBUTED  
Whale ribs and vertebrae from the Purisima Formation on display at the Seymour Center at Long Marine Lab.

## Purisima: From clams to cetaceans

The Santa Cruz Mudstone, which extends north along the coast from West Cliff to Davenport and beyond, is pretty boring and monotonous as far as rocks go.

There's just not a lot to see in the mudstone, with the exception of some of the world's largest sandstone intrusions at Yellow Bank Beach. The Purisima Formation, on the other hand, from



GARY GRIGGS  
Our Ocean Background

Pleasure Point and continuing through Capitola and into the bay, has about as much as you could want in a local pile of rocks. For geologists, it's mostly all about how, where, and when did these rocks form. We spend our lives asking and then trying to answer what seem like relatively simple questions. And as many times as I've looked at the fossil beds and whale bones in the Purisima, the answers still aren't completely clear.

Geologists have worked from the principle of uniformitarianism, or the present is the key to the past, for perhaps 200 years. I think it might be the opposite for history, where the past hopefully provides some insight to the present. So if we see an outcrop of rocks, perhaps in a road cut or a sea cliff, and we notice the grain size and layering of the sediment looks the same as we might see in a modern sand dune, we can reasonably conclude that these ancient layers exposed in the road cut were deposited by wind in the past. The sand dunes of the present inform us about the ancient preserved dunes of the past.

The Purisima Formation contains a lot of clues about its history. The layers of clam shells exposed in the 70-foot cliffs of Depot Hill, and the scattered cetacean (whales in some cases) bones that are also commonly found in rocks that have fallen from the cliffs, provide some evidence. You may also recall several years ago when the skeleton of a small whale was found embedded in the bluff during the construction of the seawall along East Cliff near Pleasure Point.

Take a trip out to the Seymour Center at Long Marine Lab, and notice the three large slabs of Purisima bedrock right in front of the world's largest blue whale skeleton. Each contains vertebrae and ribs of a 7-million-year-old whale, or perhaps several whales. These boulders were collected below the cliffs at Depot Hill and give us some sense of what this area was like in the not too

SEE GRIGGS ON C3



DAN COVRO/SENTINEL

Santa Cruz High's Nick Doan fields a ground ball during a game in May 1998. Doan died of brain cancer last week.

NICK DOAN: 1979-2013

## Local baseball star loses battle with brain cancer

By SHANNA MCCORD  
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SANTA CRUZ — Nick Doan, a father of two young children and once a standout baseball player at Santa Cruz High School and Cabrillo College, lost his battle against brain cancer a day after turning 34.

The Santa Cruz native, who received the cancer diagnosis in May 2010, died Dec. 20. Doan, a 1998 Santa Cruz graduate, pitched for the Cardinals and Cabrillo College. He went to Cal Poly San Luis Obispo on a full scholarship in 2002-03.

Known for his old-school high leg kick while pitching for the Cardinals, Doan played after college with the Santa Cruz Mets in the San

SEE DOAN ON C3

### NICHOLAS DOAN

**BORN:** Dec. 19, 1979  
**DIED:** Dec. 20, 2013  
**EDUCATION:** Santa Cruz High School, Cabrillo College and Cal Poly San Luis Obispo  
**CAREER:** Family's construction business David Doan Construction  
**SURVIVED BY:** Mother Loree Doan; brother Ryan Doan; wife Kate Doan; children Call and Hudson  
**SERVICES:** Noon Jan. 4 at Holy Cross Catholic Church, 1265 High St., Santa Cruz; Celebration of life barbecue immediately follows the memorial service at Santa Cruz High School baseball field

MONTEREY BAY MARINE LIFE

# Seal Sampler

Ocean mammals provide scientific environmental map

By CAT FERGUSON  
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From basking sea lions to surfacing whales, no vacation to the Central Coast is complete without a sighting of a marine mammal.

But holiday snapshots are not the only pictures the charismatic ocean dwellers have to offer. Scientists are increasingly finding ocean mammals are valuable sources of information about diseases and toxins found in coastal waters.

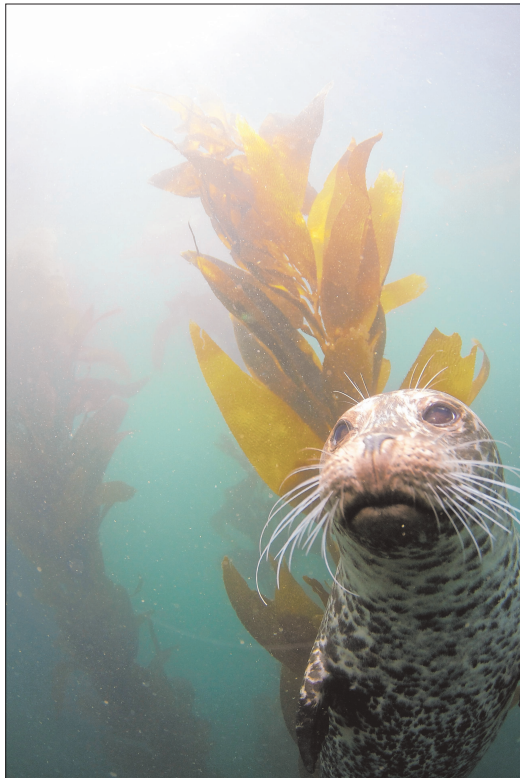
The most recent research has focused on harbor seals, who live from birth to death just off shore.

"I view them as samplers for the environment," said Stephanie Hughes, recent graduate of the Moss Landing Marine Labs and marine scientist who researches diseases in seals.

The seals, whose territory ranges from Alaska to Mexico, live close to humans and eat many of the same fish that people do, including sardines and salmon. They scoop up sediment full of human contaminants when they swoop to the seafloor for bottom-feeding fish.

"Seals do similar things that we do, in the same places. So if seals can get something, then people can," Well, what if I swim in the bay?" said Denise Greig, a marine scientist who studies chemical contamination in seals at Sausalito's Marine Mammal Center.

In a recent study of water from San Francisco to Monterey Bay, Greig and her colleagues found Monterey Bay seal blubber had high levels of pesticides and other agricultural chemicals. But San Francisco Bay seals were full of flame retardant chemicals and other industrial toxins.



SCOTT GABARA/CONTRIBUTED

SEE SEALS ON C3 A harbor seal swims under water off Pacific Grove in December 2010.

Jake Langdon helps rescue a lost Labrador retriever on Thursday in Ben Lomond.

CONTRIBUTED



BEN LOMOND

## Dog rescued by resident with hot dogs, waders

By CALVIN MEN  
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BEN LOMOND — A lost dog is back with its family thanks to residents in a Ben Lomond neighborhood.

On Thursday, residents in the near the 9000 block of Mill Street heard the dog crying for help around 6 a.m., said Todd Stosny, field services manager for animal services.

One resident found the source: a black Labrador retriever stranded on a small piece of land at the edge of the San Lorenzo River near the homes. The resident called the Santa Cruz County Animal Services and shelter officials arrived around 2 p.m.

"What we surmised happened is that there's a pathway that leads down to the river and the dog probably walked down to the river to get a drink or something and it must have fallen in," Stosny said.

There were few spots where the dog could escape the waters and so it likely just jumped onto the nearest piece of land it spotted, Stosny said.

The piece of land — about 2 feet by 3 feet — was surrounded by thorny bushes and was backed by a short but steep cliff.

That's when they decided to try and get the dog through the home above where the animal was. The

SEE DOG ON C3

## GRIGGS

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distant (geologically speaking) past. So playing detective, where would you look today to find an environment where huge numbers of clams lived and died, and also where whales might occasionally die and sink to the seafloor to be buried in the sediment? It was a marine environment, probably where water was not terribly deep, perhaps not that different than Monterey Bay today. We got clams and recently, lots of whales.

The other question to answer is why did so many clam shells end up in these particular layers, and why did the whales choose to die here? Well, good questions. Where might we find remains like these today? We do see lots of clamshells scattered along the beach at low tide along some Monterey Bay beaches, and also concentrations of shells along tidal channels in places like San Francisco Bay. But the whales? I'm open to ideas on this one.

If we look at the exposures or outcrops of the Purisima Formation today, this gives us some idea of the area that was occupied by the former Purisima Sea 7 million or so years ago. These rocks extend along the coast from the end of Swift Street on the west side to Aptos Seascapes to the southeast. They also extend 6 to 8 miles inland and underlie most of the watersheds of Soquel and Aptos Creeks.

It's the Purisima Formation, these fossil-rich sandstones and mudstones, which supply almost all of the water to the Soquel Creek Water District. Rainfall and stream flow, percolating down from the surface has been stored in the pore spaces between all of the sand grains of the rock for thousands of years.

Gary Griggs is director of the Institute of Marine Sciences and Long Marine Laboratory at UC Santa Cruz. Contact him at [griggs@ucsc.edu](mailto:griggs@ucsc.edu). Visit the Marine Discovery Center at Long Marine Lab website at <http://seymourcenter.org/>. For past Ocean Backyard columns visit <http://www2.ucsc.edu/seymourcenter/>.

## DOAN

Continued from C1

Jose men's league and he played softball in the Santa Cruz recreational league alongside his older brother Ryan Doan.

The brothers also spent the summer of 2001 playing semi-professional baseball in Karlskoga, Sweden. Doan helped the Cardinals win the Santa Cruz Coast Athletic League title in 1998 and helped the Cabrillo Seawawks take the Coast Conference North Division title

in 2001.

He returned to the area and coached at Scotts Valley High before returning to his alma mater to serve as an assistant coach.

"He had quite the accolades," Ryan Doan, 36, said. "He could basically do it all, hit or pitch. He had this amazing instinct on the baseball field."

Doan underwent surgery to remove an orange-sized tumor from his front lobe in June 2010 along with radiation and chemotherapy treatments. He resumed life thinking the cancer was gone for almost three years.

However, in April, Doan started having trouble with his speech and discovered the cancer had returned. This time the cancer attacked the center of his brain, which essentially made it non-operable, Ryan Doan said.

Doan spent the last several months undergoing aggressive radiation and chemotherapy in addition to vitamin C infusions to help fight the cancer.

Doan and his wife Kate have two young children, Cali, 5, and Hudson, who was born in March.

Scotts Valley resident Jordan Bergstrom became

close friends with Doan while teammates at Cabrillo. The two were also competitors as Bergstrom, a graduate of San Lorenzo Valley High School, played baseball at San Jose State, a Cal Poly opponent.

"He was one of my best friends right off the bat at Cabrillo," Bergstrom, 33, said. "We kept our friendship throughout, even when we played against each other."

"I feel like I lost a brother,"

Doan had worked for his father's construction business David Doan Construction. In a sad turn for the family, David Doan, 64, died from a heart attack in October.

"My family has been through the wringer this year," Ryan Doan said.

Follow Sentinel reporter Shanna McCord at [Twitter.com/scnews-mom](https://twitter.com/scnews-mom)

## STROLLING DOWNTOWN



SANTA CRUZ — A man and woman pass by a clutter of street signs as they walk along River Street in Downtown Santa Cruz on Thursday afternoon.

KEVIN JOHNSON/SENTINEL

## DOG

Continued from C1

home's owner, Jake Langdon, obliged the officers and let them onto his property.

Animal service officers tried to figure out how to rescue the animal and even contemplated using a boat.

"But the first thing we thought of was where are we going to get a boat," Stosuy said.

While they were thinking that, Langdon, 31, had a simple

idea: Put on waders and walk the dog into the river and back onto the shore.

Langdon, a fisherman, strapped on a pair of waders, walked into the waist-deep waters, armed with several hot dogs.

"Just to kind of maybe jinx the dog and see if she wasn't hungry or something. Make friends with him," Langdon said.

While the dog initially barked at Langdon, it relented after a few pieces of the hot dog, Langdon said. He put a leash on the dog and tried to lead it into

the water, to no avail. Langdon tugged the leash and the dog leapt into the water.

"She just jumped," Langdon said. "She was ready to get out of there."

The dog was taken to the animal shelter to be checked and, despite having spent hours exposed, the dog was cleared of hypothermia or any other injuries by a veterinarian, Stosuy said.

Had the animal had a dog tag or been microchipped, officers could have brought it immediately home. Luckily, the dog's

owners had called hours after the rescue asking about their dog, Stosuy said. But if they hadn't, it's likely the dog would have stayed in the shelter until it was adopted out.

"I can't stress enough how important it is to have a microchip or a tag on the dog," he said.

Follow Sentinel reporter Calvin Men at [Twitter.com/calvinmenetwork](https://twitter.com/calvinmenetwork)

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## SEALS

Continued from C1

## MAPS FOR DISEASE

To better track the local trends, the Marine Mammal Center plans to make "disease maps" for the California coast. Scientists are using the past 10 years' worth of data about diseases in stranded seals, sea lions and whales captured by mammal labs from San Diego to Sausalito.

The center's scientists are looking at health issues, including injury, illness and toxins from human contamination of the ocean.

"The idea is to track trends and find hot spots, both where and when. Then we can address why," said Frances Gulland, the center's head veterinarian.

Gulland hopes the disease map will serve as a model for similar projects around the world — perhaps in New England, where hundreds of harbor seals died of bird flu in 2012.

"We want to monitor so we don't reach that level of, 'Oh, jeez, we have this disaster, where did it come from?'" Hughes said. "These animals are sick, but we don't know why."

Another recent study highlighted how research on seal diseases can help protect the health of humans. A collaboration among Moss Landing Marine Labs, the Marine Mammal Center and UC Davis tested 500 seals for vibrio, a family of bacteria that includes cholera and food-poisoning bugs. Hughes, Craig and Gulland were co-authors on the paper. They collected samples from seals from California's North and Central Coasts in 2007, 2008, 2010 and 2011.

**DEADLY STRAIN OF VIBRIO**  
Many seals were infected with vibrio, some with strains that could be dangerous to humans. Depending on the type, said the U.S. Centers for Disease Control and Prevention, the bacte-



A harbor seal is seen underwater near Pacific Grove in December 2010.

SCOTT GABARA/CONTRIBUTED

ria can cause anything from mild food poisoning to sepsis and death — though none of the seals had the deadly strains.

A recent report by the CDC showed regulations banning raw oysters fished from the Gulf of Mexico from April to October every year has slowed vibrio infections in humans. The regulations even completely halted California cases of vibrio vulnificus, the most dangerous form of the bacterium, which recently killed people in Florida.

The vibrio study was "only four years. So it would be nice in the future to be able to have more of a sample and say, 'Is this increasing over time?'" said Sarah Peterson, a marine scientist at UC Santa Cruz's Long Marine Lab. "Is there something that's changing in the environment to cause it to be more prevalent?"

## LOOK AT SEA OTTERS, TOO

Marine scientists say it will take more than one spe-

cies to get a good picture of the coastal ecosystem. Another marine mammal they would like to focus on is the sea otter, which shares a similar place on the food chain as the harbor seal.

Sea otters have been dying of everything from drug-resistant staph, the bacteria that is terrorizing hospitals, to toxoplasmosis, the feline virus that makes it dangerous for pregnant women to change the litter box, Hughes said. Sea lions, who swim much farther out than seals, will eventually tell scientists about contamination in deeper water.

Researchers say as humans continue to adversely affect the seas through pollution and global-warming emissions that raise sea levels, they need all the help they can get.

"The environment is changing and we should be aware of those changes," Hughes said. "Then, if something happens, we'll have the data to know how we can mitigate it."

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