

BETWEEN the TIDES

F r i e n d s o f F i t z g e r a l d M a r i n e R e s e r v e

March 2019

The Birth of the Fitzgerald's Curse

by Tom Ciotti, President, Friends of Fitzgerald Marine Reserve

Everyone knows about Pele's Curse, right? Pele, the Hawaiian goddess of volcanoes, puts a curse of excruciatingly bad luck on anyone who takes rocks or sand from Hawaii. Widespread belief in Pele's Curse causes thousands of people to return rocks and sand pilfered from Hawaii back to Hawaii each year, hoping that Pele will forgive and remove her curse. But did you know there is a similar Fitzgerald's Curse that applies to taking things from the Fitzgerald Marine Reserve? I know there is because of the following incident.

My wife, Linda, regularly picks up mail addressed to the Friends of Fitzgerald at the Moss Beach Post Office. One day in mid-December 2018 she went to pick up the Friends' mail and found a yellow slip in the box indicating there was a something to be picked up at the post office's counter. She went to the counter and presented the slip to the postmaster. He took the slip, went into the office interior, and returned with a large box, exclaiming, "This box is really heavy," as he placed the box on the counter. Linda slid the box across the counter and as she picked it up she realized it was indeed quite heavy. She lugged the box out to her car and brought it back to our home in Montara.

The exterior of the box showed that it was mailed from Hawaii and cost almost \$20 to mail. This was very curious because the Friends rarely receive boxes in the mail let alone heavy boxes from Hawaii. What could possibly be in it? With great curiosity we opened it carefully. In it were two items individually wrapped in bubble wrap, a package of toffee-covered maca-

damia nuts, and a note. The note said that the two wrapped items were rocks that had been taken from the Fitzgerald Marine Reserve in the early 1980s, that the sender regretted taking them, and that the sender hoped they would be rightfully returned to their natural habitat. We unwrapped the two items. One of them was a large rock with lots of holes in it—just like the rocks we see at the reserve. The second was a large weird green glob, a portion of which looked like shiny greenish brown glass or resin. It resembled a rock but didn't look like anything either of us had ever seen at the reserve. The nuts were clearly an offering to the gods of Fitzgerald to forgive the sender for taking the rock and the green glob from the reserve.

We rewrapped the rocks, put them, the package of nuts, and the note back in the box, and took the box to the ranger's office at the reserve. Ranger Rob Cala was at the office when we got there. Showing him the box we said, "Rob, you've got to see this." He cautiously opened the box, read the note, and asked, "Is this a joke?" We assured him it wasn't and he proceeded to unwrap the two rocks. He, too, was unsure about the nature of the green glob, but not about the ultimate destination of the toffee-covered macadamia nuts. He was absolutely sure the rangers were the appropriate messengers to convey the offering to the gods of Fitzgerald. After talking about how similar this was to returning volcanic rocks to Hawaii and that the sender, a Hawaii resident, must have known about Pele's Curse and thought



Perhaps FMR could borrow Virginia Beach's Neptune statue to curse any who dare to take items from the Fitzgerald tidepools. Neptune was commonly characterized in myth as a violent, ill-tempered character. In this way, he represents the tempestuous nature of the ocean waters, and, like the sea, often displays a destructive nature.

King Neptune statue by sculptor Paul DiPasquale; photo by Lisa Redig-Osterkamp

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Friends of Fitzgerald Marine Reserve

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Fitzgerald's Curse, continued from page 1

there was a similar curse attached to the Fitzgerald rocks of enough concern to warrant \$20 in postage, we decided this event had to be written up for the Friends' newsletter.

When we returned home from the reserve I sent an email about the rocks to Keith Mangold, an FFMR Volunteer and expert rock-ologist, knowing he would immediately go to the reserve to inspect the rocks. Sure enough, I shortly received an email from Keith opining that the rock with the holes was the real thing but the green glob was not a rock but dried solidified resinous paint. How the green glob got into the reserve remains a mystery.

Before beginning to write this article I researched Pele's Curse on the internet—the font of information both true and false. Interestingly, it is reported that Pele's Curse is not part of a Hawaiian legend, but rather is a “modern legend” (how's that for an oxymoron) “attributed to a disgruntled park ranger in Hawaii who was sick of people carting off rocks on his watch.” I thought wow, this sounds just like FMR and that we should tout our own “modern legend”—Fitzgerald's Curse. What better way to influence young minds of unbounded imagination to not take anything from the reserve lest they be cursed with bad, awful, horrible luck? Neptune will have his revenge. ♄

Nudibranch Survey at Pillar Point

At the end of last November Julie Walters, along with 12 volunteers, conducted a nudibranch count at the Pillar Point tidepools. It turned out to be a gorgeous day despite the high surf.

In spite of the wave surge and cloudy water that limited the volunteers' ability to access all areas, they spotted 85 nudibranchs. Here is a summary of nudibranchs observed that day:

- 66 *Triopha maculata*
- 12 Monterey dorid—*Doris montereyensis*
- 1 San Diego dorid—*Dialula sandiegensis*
- 1 Sea lemon—*Anisodoris nobilis*
- 2 *Acanthodoris rhodoceras*
- 1 *Hermisenda crassicornis*
- 1 Red dorid—*Rostanga pulchra*
- 1 Hilton's aeolid—*Phidiana hiltoni*

A low tide of -1.1 occurred at 5:36 pm shortly after our count ended at 5 pm.

Julie gave kudos to Ariel Bauman and her husband for spotting 39 of the 85 nudibranchs.

Julie deserves kudos herself for continuing to organize these important surveys.

Mark your calendar for the next nudibranch count the weekend of June 5/6 early in the morning. I'll send out a reminder as the date gets closer.

See you out on the reef!



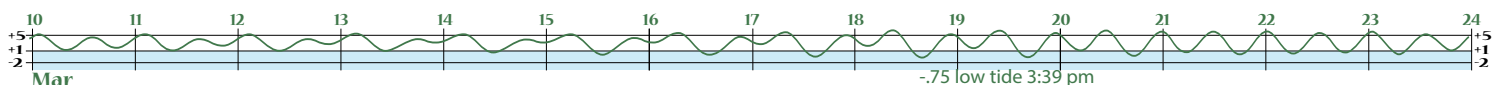
Best photo of the day goes to Kathleen Hayes for her photo of the *Triopha maculata*.

The graph displayed across the page bottoms shows tides for 3/10/19 to 7/28/19 at Princeton Harbor. Where the date appears is midnight. The reefs are accessible for exploring during low tides—at least +1 or below. This area is shaded light blue. See: <http://fitzgeraldreserve.org/resources> and click on “Tides” for a more detailed tide chart.

The winter afternoon low tides change to morning low tides in March/April. There are almost equally low tides several days before and several days after the noted low tide dates.

The lowest tides this period at Princeton Harbor are:

-0.75	3/18	3:39 pm	-1.45	6/5	6:51 am
-0.32	4/14	1:24 pm	3rd lowest tide of 2019		
-0.83	4/21	6:46 am	-1.16	6/17	5:32 am
-0.95	5/8	7:51 am	-1.54	7/4	6:36 am
-1.22	5/20	6:28 am	2nd lowest tide of 2019		
			-0.78	7/16	5:16 am



The Wonderful Diversity of Fitzgerald Marine Reserve



Six-rayed star (*Leptasterias hexactis*) ♦ KAREN MADSEN



Sunburst anemone (*Anthopleura sola*)
♦ KAREN MADSEN



Dwarf mottled star (*Henricia pumila*) ♦ KAREN MADSEN



Red abalone (*Haliotis rufescens*) ♦ KAREN MADSEN



White-spotted sea goddess (*Doriopsilla albopunctata*)
♦ DAVE COLLINS



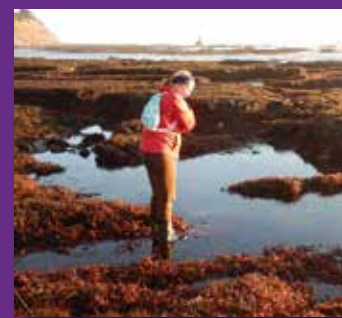
Heath's chiton (*Stenoplax heathiana*) ♦ KAREN MADSEN



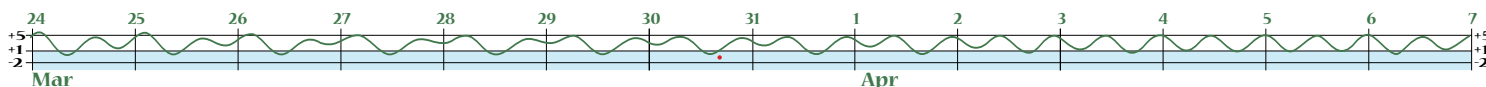
Painted anemone (*Urticina crassicornis*) ♦ KAREN MADSEN



Spanish shawl (*Flabellinopsis iodinea*)
♦ SUSAN EVANS



Fitzgerald Marine Reserve at a -1.6 tide
♦ KAREN MADSEN



The 50th anniversary of FMR seems an appropriate time to remember Bob Breen who worked tirelessly for over 40 years on behalf of the reserve before his untimely death at age 73. Here is one of the many articles he wrote for Between The Tides.



One person had 42 ochre stars he planned to boil, hang out to dry, and put on family room walls.

Even as late as 1969, Montara mountain was a barrier isolating Moss Beach, giving it the look of present day Pescadero with its open fields, dotted with thick clumps of bushes and cypress trees.

(Ed. 1994: On November 1 of this year the Fitzgerald Marine Reserve will have been in operation 25 years. Bob Breen, supervising naturalist at the reserve, became its first county naturalist. In this article Bob looks back to that time and reports what it was like then as compared to the busy place it is today.)

When driving the gravel roads of Moss Beach in early 1969, one was always struck by the thought of how rural the area was, a few houses along Nevada and Virginia streets and more down California on the way to the beach and tidepools. Even as late as 1969, Montara mountain was a barrier isolating Moss Beach, giving it the look of present day Pescadero with its open fields, dotted with thick clumps of bushes and cypress trees. Although some of the homes were post-war dwellings, many were built in the 20s and 30s, bestowing a feeling of benign neglect and quietude.

The tidepools at Moss Beach were well known by teachers and scientists and other aficionados who would come down to enjoy the beach and reef. Most came to pick abalone (abalone were still easy to get), to fish or pole for eel. Others collected for food or curios, as they had for nearly seventy years. During the early months of 1969 there were no laws in existence that protected life in the tidepools. The very idea of protecting snails and seastars had a long way to go before it could gain popular acceptance. There were, therefore, more than a few astonished looks when it became known that in a few months we would begin to protect the things that occurred in the tidepools.

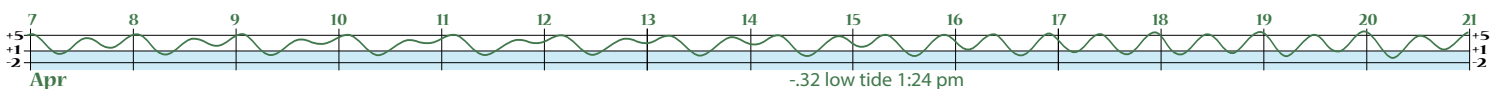
To motorcyclists from all over the Bay Area this hill [above the Marine Reserve] was known as "the jumps."

The advisory sign which had been in place that year until it was replaced on November first was, in many instances, ignored. At that time Moss Beach was a focal point for those collecting tidepool life for food. Limpets, chitons, sea urchins, turban snails and even sea anemones were common items found in cardboard boxes, burlap sacks and plastic garbage bags being carried off the reef.

By the time that November 1 rolled around we had a pretty good idea that from that day forward we were to have our work cut out for us. For the rest of the year, and through 1970, there were more than 800 incidents of persons illegally removing intertidal life for food, aquarium specimens, or curios. One person had 42 ochre stars he planned to boil, hang out to dry, and put on family room walls.

Aside from the illegal collecting problems, the pace of existence at the Marine Reserve was much slower then. On weekdays there were very few visitors, while on weekends only a few hundred each day. Children on classroom field trips numbered fewer than 11,000, versus more than 29,000 in 1993.

A major annoyance on weekends at that time was the presence of numerous motorcycles on the hill above the Marine Reserve parking lot. To motorcyclists from all over the Bay Area this hill was known as "the jumps." Each one of the four levels, originally planned to be homesites, provided for a motorcycle jump. In addition, from time to time, the beach itself also provided recreation for motorcycle enthusiasts who rode at low tide as the sand on ➡



Happy 50th Birthday FMR!



photo:
Rob Cala,
robcala
media.com

In 2019 we will celebrate Fitzgerald Marine Reserve's 50th anniversary. "50 Years of Stewardship" is the slogan chosen for this big event. The San Mateo County Parks Department and the Friends of Fitzgerald Marine Reserve have been hard at work planning the celebrations.

Rather than have a single event we are planning a year-long celebration. We are having 50th Anniversary banners made to hang at the FMR entrances and 50th Anniversary pins made to give to young visitors throughout the year.

On **March 16, 2019**, Parks and the Friends will host a **History Day** at the reserve from 12 to 3 pm. In addition to having history displays at the Visitor Center there will be a history walk beginning at the Visitor Center and proceeding to a series of lecture stations at the main entrance, along the Bluff Trail, and at Seal Cove beach. Rangers and FMR docents will be at each station to discuss

the geological, natural, and human history of the reserve and to answer questions.

On **May 11, 2019**, there will be a **Gathering of Stewards** at the reserve at which entities that have fostered stewardship, education, and research at the reserve over the past 50 years will give presentations to the public. Food, refreshments, and lots of memories will be available.

Finally, at a date to be determined in the **Fall of 2019**, there will be an event to remember, honor, and thank **the Ohlone**, the original stewards of the site now known as the Fitzgerald Marine Reserve.

This will be a year not only to look back but to look forward to continuing to protect and preserve this wonderful place for future generations to enjoy and marvel. ♦



Join us at the Reserve to Celebrate!

➡ the lower side of the beach was fine and tightly packed.

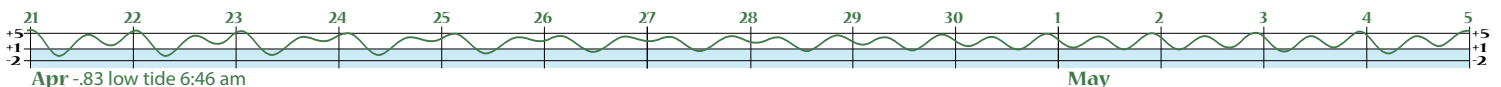
Without the assistance of wardens from the State Department of Fish and Game, and the San Mateo County Sheriff's office, control of these problems would have been an almost impossible task for one person. Fortunately, both organizations eventually provided just enough enforcement to make a visit to the reserve a pleasant experience for most people and their families.

The problems of managing a marine life refuge are much different today than they were 25 years ago. Even though most visitors today are aware of the necessity of protecting biodiversity and habitat systems locally and worldwide, the great increase in visitors has had an even more detrimental effect than

previously thought; budget cuts threaten to cut staff, and both factors combine to threaten the integrity of the reserve.

However, if we face these problems with the same resolve that we addressed the challenges of a quarter of a century ago, there is no reason to believe that we cannot continue to protect Moss Beach and still provide for the education of future generations. ♦

Bob especially loved teaching children about the tidepools. Top photo from 2007; bottom photo: Rob Cala 2013, robcalamedia.com



Sperm Whales: “Leviathans” and Living Legends

by Mary Jane Schramm / NOAA Greater Farallones National Marine Sanctuary

S.O.S.!

The call came in that a whale had stranded at the edge of the marshes behind the U.S. Post Office Distribution Center in Richmond, in San Francisco Bay. Immediately, the

ishing harvests, as whale stocks plummeted. The Moss Landing enterprise closed after just seven years. Along the coast, station after station shut down.

In 1946 the International Whaling Commission was established to regulate, revive and keep the whaling fishery viable. Many ports had closed, but Point Molate in San Francisco Bay continued to function. With the Marine Mammal Protection Act of 1972, American whaling was banned outright.



Sperm whale with distinctive head, narrow toothed jaw; credit: NOAA Fisheries

Marine Mammal Center dispatched a team of medical staff and volunteers. Dark had fallen, and as our eyes adapted, we were awestruck: it was a newborn sperm whale, *Physeter macrocephalus*, its fetal folds still evident. We stabilized it as the veterinarian administered B vitamins and steroids, and took blood and tissue samples. Unable to render further help, we gently floated it towards the open water, hoping its mother might be nearby to reclaim it. A few days later it washed up dead, beneath the Bay Bridge. The initial necropsy revealed severe scoliosis, a spinal malformation. Although sperm whales live in California waters year-round, they prefer very deep offshore waters, so rarely do nearshore sightings such as this occur. It was the only recorded instance of a living sperm whale entering San Francisco Bay—a tragic distinction.

In the 20th century the development of plastics, the petroleum industry, and other whale product replacements made whaling increasingly unprofitable. However, the mid-20th Century gave rise to nuclear weapons and a burgeoning pet food industry. In December 1971, the Kal Kan pet food company commissioned a final hunt into the Gulf of the Farallones off San Francisco, killing a sperm whale—the last whale to be hunted commercially under the U.S. flag. The products became Fido’s dinner, chicken feed, and bone meal. The precious spermaceti oil was sold to the nuclear industry for weapons and electricity production.

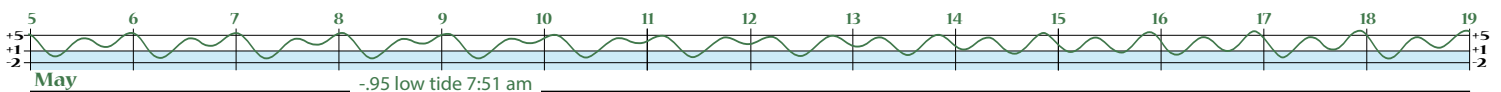
Leviathan!

Legendary in sailor’s tales and immortalized in Melville’s *Moby Dick*, sperm whales are superlative creatures. They are the largest toothed predator on the planet. Males can reach a length of 62 feet, weighing upwards of 50 tons. They dive to over 7,300 ft., deeper and longer than any other whale except the Cuvier’s beaked whale. Their huge, distinctive “boxcar” head contains the largest brain on Earth, although much of it goes to the processing of sounds such as echolocation and vocalizations. Large (even giant) squid, octopus, sharks, and other fish comprise their diet. The California/Oregon/Washington sperm whale stock is found in highest numbers from April through mid-November, coinciding with peak prey abundance.

The Hunt

Sperm whales have long been prized for their high-quality blubber and spermaceti for oil, their ambergris for pharmaceuticals and perfumes. When the world whaling capital shifted from New Bedford and Honolulu to San Francisco around 1880, fast, steam-powered boats with mounted explosive harpoons intensified the hunt. In 1919 there were gray, humpback and sperm whales sufficient for entrepreneurs to open a whaling station at Moss Landing where the deep Monterey Submarine Canyon cuts closest to shore. The hunt continued, with dimin-

In 1919 there were gray, humpback and sperm whales sufficient for entrepreneurs to open a whaling station at Moss Landing... The hunt continued, with diminishing harvests, as whale stocks plummeted. The Moss Landing enterprise closed after just seven years.



A Whale Of Distinction

Like most toothed whales, sperm whales have complex, highly structured societies in which individuals play specific roles. New mothers are attended by “aunties” who share care-giving of young calves, and who remain at the surface while Mom dives deep to hunt and replenish her energy stores; she has nursed her calf with incredibly fat-rich milk. Cows give birth at four-to ten-year intervals, sometimes caring for calves for a decade. After mating with the females, who live in groups with immature males in temperate and tropical latitudes, sperm whale bulls retire to high-latitude waters. They are a cosmopolitan species, found worldwide.

Survival!

Killer whales are their only natural enemies. To combat these intelligent predators, besieged sperm whales will use their big heads as battering rams, wielding their flukes as weapons. Groups will surround their young or weak in a “marguerite” or rosette formation at the surface: heads-inward, and powerful flukes pointing outwards toward the attackers. These clashes may represent the most formidable battles of might, ferocity and wits ever to take place among creatures of the sea.

Known conservation threats include vessel strikes, entanglement in fishing gear, human-generated noise, and bioaccumulation of pollutants. Climate change could affect prey availability and migration, especially within arctic and subarctic ecosystems. The good news is that their extremely wide range—perhaps the greatest of any species—renders them more resilient than those with narrower habitat preferences.

Conservation

NOAA Fisheries and our national marine sanctuaries work to reduce these threats through protective legislation and other conservation measures on behalf of these whales and their habitats. Learn more about sperm whale biology, society, ecology and conservation at: <https://www.fisheries.noaa.gov/species/sperm-whale>

An account of killer whales attacking sperm whales can be seen at <https://www.theguardian.com/environment/gallery/2017/mar/29/sex-death-sperm-whales-orcas-indian-ocean-in-pictures>

Mary Jane (MJ) Schramm is Media & Public Outreach Specialist for NOAA's Greater Farallones National Marine Sanctuary. She is also part of NOAA's Large Whale Entanglement Response Network. ♦

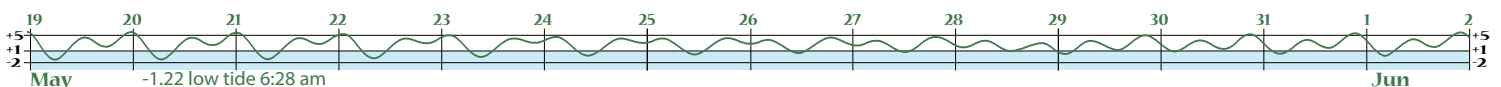
From top:

Whale cow and calf;
credit: NOAA

Very young calf with mom
and “auntie”; photo:Christin
Khan/NOAA

Marguerite defensive
formation; credit: Tumblr

Squid and sperm whale do
battle; credit: Wikimedia
Commons



Gee Whiz Tidepool Quiz

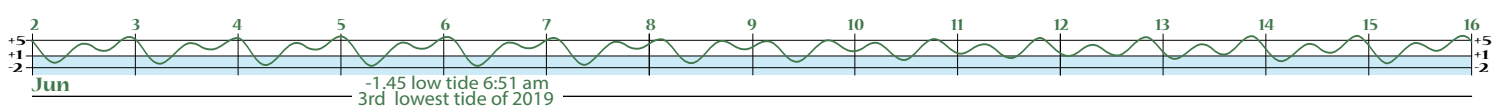
(The information for the questions listed below have appeared in previous issues of the Tides. Fill in the blank spaces or circle your answers. Note: there may be more than one answer. Then check your answers with those at the bottom of the page.)

- The closest living relative of the whale is the _____. (Circle One)
 - manatee
 - hippopotamus
 - rhinoceros
 - fur seal
- T or F Kelp forests north of the Bay Area to the Oregon border have increased in size by more than 15% since 2008.
- Two animals that have profited from Sea Star Wasting Disease (SSWD) are:
 - mussels and barnacles
 - kelp and snails
 - mussels and urchins
 - chitons and oyster catchers
 - scallops and burrowing clams
- The alga Laver is used to make _____.
- T or F The leafy hornmouth snail will land with its aperture downwards if dropped in water.
- What snail can survive two or three months without being submerged in water?
 - the blue top snail
 - black turban snail
 - angular unicorn snail
 - dire whelk
 - eroded periwinkle
- Mussel beds in Monterey Bay were about ____% larger in 2017 than they were in 2014.
10%, 15%, 25%, 75 %, 150%
- T or F All monarch butterflies winter in Mexico.
- Which of the following produce oxygen?
 - whales
 - phytoplankton
 - seagulls
 - algae
 - anemones
- The nudibranch is a _____ without a shell.
- When harbor seals are present, you must remain _____ feet from them.
- How many shell plates does a chiton have?
4, 5, 8, 9
- Name the whale that finds its food in the ocean floor sediment.
 - blue whale
 - gray whale
 - humpback whale
 - right whale
 - moby dick
- Blue, jelly-like animals that are sometimes found on beaches in great numbers are called:
 - sea jellies
 - Verella vellella
 - blue-finned squid
 - by-the-wave sailors
 - none of the above



Answers to Quiz

- hippopotamus
- F
- mussels and urchins
- sushi
- T
- eroded periwinkle
- 10%
- F
- algae
- snail
- 300
- 8
- gray whale
- Verella vellella and By-the-wave sailors



Elaine Reade



Responsibility for my first visit to the reserve belongs to my daughter's wonderful nursery school teacher, Dinny Zinckgraf, who brought a bunch of five-year olds and their parents to explore.

There are many things I am enjoying about my re-entry into the FFMR fold: the camaraderie among the naturalists, the training and continuing education, Ranger Rob and his photos, Steve Slomka's "Items of Interest" emails, this publication's informative articles, the annual pewter pins, and the organization and leadership that makes our tours possible.

I always enjoy reading about my fellow docents in this "Spotlight" column so I am honored to have been asked to tell my own story. Turnabout is fair play!

I live in San Carlos with my husband, Dave, and our dog, Sasha. We have two adult daughters who live nearby, one in Berkeley, and one in Foster City.

I've always loved the ocean. One of my favorite photos from my childhood, taken at Cayucos, is of me looking out at the ocean through binoculars, my dad crouched behind me holding me steady. Maybe that was my first look at a whale. Who knows?

I grew up in Southern California, not near the sea, but in Whittier, a suburb of Los Angeles. Luckily, my Aunt Carol lived about an hour away in Dana Point which, at that time, was a sleepy little beachside community with a lovely little sandy cove and some nice tidepools. Aunt Carol was much more of an amateur naturalist than my parents were, and I credit her with introducing me to the wonders of sea life, poking, literally, around the little tidepools while my baby cousin sucked on salty rocks nearby. Ah, the feeling of sticky sea anemone tentacles wrapped around my finger. (Oh horrors! I promise I don't do that anymore.)

Looking back, I can see several experiences that may have led to my interest in becoming a naturalist at FMR. One summer during college I took an oceanography class to make up some credits (long story) and ended up on a field trip to Catalina Island. Unfortunately, I was so worried about getting seasick that I took Dramamine and slept through most of it! But the class was interesting and was my first exposure to "real" oceanography. Back at UC Santa Cruz where I went to college, I took a circuitous route to being a biology major. I was focused on human biology but many of my friends, including my future husband, were involved in marine pursuits. My husband even has stories of helping a fellow student tag elephant seals at Año Nuevo using bottles of hair dye (under official direction, I assure you).

Responsibility for my first visit to the reserve belongs to my daughter's wonderful nursery school teacher, Dinny Zinckgraf, who brought a bunch of five-year olds and their parents to explore. I don't

remember seeing much aside from hermit crabs, but a seed must have been planted, both in me and one of my daughters.

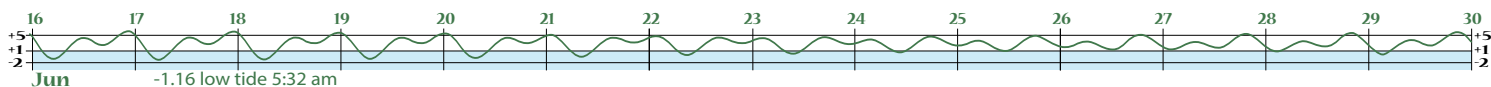
I am a boomerang naturalist. My first go around was in the fall of 2000, when I happened upon a notice for the "Seashore Docent Class" taught by Ranger Bob Breen held at the Coyote Point Museum in San Mateo on Thursday mornings. Our daughters were in elementary school at the time so this worked out perfectly for me. Bob was a wonderful teacher both in the classroom and out on the reef. I loved it! I led tours for several years following the class but I became busier, and frankly, some of the tours became too large and less enjoyable for me; my participation trailed off. My love of tidepooling did not diminish however, and I have happy memories of getting up at the crack of dawn and heading over to the coast on good low-tide mornings to explore.

Meanwhile, the younger of our two daughters moved home after college and took a job at the Marine Science Institute in Redwood City. She regaled us with stories of marine life out on the Bay and at the coast. This coincided with the banner years of humpback whales feeding close to shore in Monterey Bay and up through the San Mateo coast. Whale watching became my favorite pastime. Whether from shore or from a boat those lunging humpbacks are a thrill to see in action.

The result of all this immersion in marine life led me back to the reserve for my second go around. I naively assumed I could pick up where I left off many years prior as a naturalist, maybe with some brushing up on the details. But Susan Evans runs a tight ship and I was welcomed into the spring 2017 naturalist training class instead. I am very glad it worked out that way since the class was excellent and it allowed me to meet many wonderful classmates.

There are many things I am enjoying about my re-entry into the FFMR fold: the camaraderie among the naturalists, the training and continuing education, Ranger Rob and his photos, Steve Slomka's "Items of Interest" emails, this publication's informative articles, the annual pewter pins, and the organization and leadership that makes our tours possible.

It takes a village: Cheers to all of you and cheers to the reef! ♦



Cascading Effects of a Warming Ocean

by Steve Slomka, Board Member, Friends of Fitzgerald Marine Reserve

The following is a discussion about a local marine phenomenon that illustrates some of the effects of global warming. It involves basically four species that interact within the Northern California Coastal Region. Their environments have been modified due to ocean warming and their futures are largely uncertain.



The interrelationship between/among kelp forests, purple sea urchins, urchin-eating sea stars and red abalone is a source of concern to many marine biologists. They have formed task forces and study groups to examine the situation and propose solutions.

In 2014 and 2015, El Niño conditions warmed the oceans and had a very deleterious effect on kelp forests. Aerial photos show

marked differences in sea kelp populations from 2008 to 2016. Scientists estimate that the kelp forests decreased by 93% in that time. As a result, animals that feed on kelp or depend on it for protection—abalone and, interestingly, urchins—were affected.

Red abalone populations that have never been overly robust have thinned to the point that the fishery has been closed until 2021. In August and September of last year, divers surveyed the ten most popular diving sites in Mendocino and Sonoma counties and found abalone at an average of .15 animals per square meter, which is considered half the bare minimum and which initiated the closure. The density has dropped 65 percent since they conducted a previous survey in 2017.

During that time, kelp-eating purple ur-

chin (*Strongylocentrotus purpuratus*) populations have increased as much as 100 times normal. You wouldn't know it to look at them in their dugout homes in the soft rock of the Fitzgerald tidepool, but they are voracious eaters who can devour kelp: holdfasts, stipes or fronds. They're not fussy. The urchins have an unusual arrangement of five mouthparts that mow through the algae like a lawnmower through grass after a rain. And unfortunately, the purple urchins have no commercial value at this time. Larger red urchins are harvested for their gonads which become uni sushi, and although uni has become more popular for gourmet chefs, demand for red urchins does not seem to carry over to purple varieties.

So, who are urchin predators? The two major eaters of purple urchins are sea stars and sea otters. As we know, a wasting disease has decimated the sea star population along the Northern California coast. Although some species, like ochre stars, appear to be resurging, some of the larger sea stars, like the sunflower star, have yet to recover. The sunflower star was the greatest consumer of the urchins, but that star's population has basically vanished.

"What we think is that the warm water anomalies made these starfish more susceptible to the disease that was already out there," says Joe Gaydos, the science director at the University of California, Davis' SeaDoc Society and one author of a study in the journal *Science Advances*.

And the same data also confirm a previous finding: the mass die-off of sea stars is triggering a cascade of other ecosystem changes. The sea urchins that sea stars usually eat are proliferating with abandon. Whole rocks that were once covered in sea stars are now covered in urchins. And the urchins eat kelp. "We see these big urchin barrens where the urchins have gone through and eaten all the kelp," Gaydos says. Kelp forests, like tree forests, are a place where lots of different species live and feed. "We have higher biodiversity when we have more kelp. So

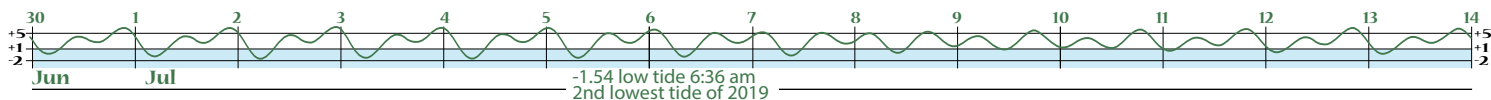
...the mass die-off of sea stars is triggering a cascade of other ecosystem changes. The sea urchins that sea stars usually eat are proliferating with abandon.

Top down:

Urchins-and-kelp;
KQED

Sea urchins; photo:
Patrick Webster,
Monterey County Weekly

Abalone-climbing-
stalk: Unusual foraging
behavior near Elk in
Mendocino County:
a large red abalone
climbing a bare kelp
stalk trying to reach
fronds that are not there.



it's setting off a cascade," he adds. "If you looked on land, it would almost be akin to clear-cutting a forest."

The other main predator, California's sea otter, kept urchin populations in check until the number of urchins dramatically increased. Joe Tomoleoni, an otter biologist with the U.S. Geological Survey says, "It's not that the sea otters aren't doing their job. They're doing it very well; there's just much more to the story than otters and urchins." Tomoleoni stresses that urchins have always been a major prey item for sea otters in California, and in fact, recent observations show more urchins being consumed now than in the past.

So, what are we going to do? Commercial fishers in Sonoma county are taking great steps to get rid of as many purple urchins as possible. Using a piece of gear like a vacuum cleaner, divers breathe air from a hookah tube and suck up as many little sea porcupines as they can. Each diver can clear around 1,500 square feet a day of urchins from the sea floors. 15,000 urchins are an average four-hour collection load in 20-30 feet of water. Earlier this year, the Fish and Game Commission changed the rules to allow recreational divers to take up to 20 gallons of purple sea urchins a day from the waters off of Sonoma



California's sea otter kept urchin populations in check until the number of urchins dramatically increased.

and Mendocino, to see if that would aid in the recovery of the bull kelp and abalone.

Scientists want to see if they can create a few kelp "oases." Bull kelp is an annual plant that depends on spores released by the previous year's kelp to grow. The hope is that a few small thriving kelp forests will create enough spores to encourage growth elsewhere on the coast.

In the meantime, locals are looking into ways to commercialize these purple pests: perhaps grind them up for fertilizer or soil amendment. Sonoma county will be happy to accept any ideas. ♦

Earlier this year, the Fish and Game Commission changed the rules to allow recreational divers to take up to 20 gallons of purple sea urchins a day from the waters off of Sonoma and Mendocino...

From Tidepools to Trenches: A Short Biography of Mary Wicksten

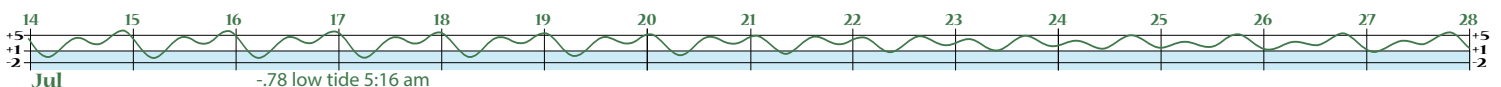
(Mary Wicksten has a long association with FFMR. A recent note sent with her yearly donation mentioned the interesting work in which she participates. That prompted a request for more information and she was kind enough to send the following in response.)

Back in the 1960s, I served as a part-time naturalist at what would become the Fitzgerald Marine Reserve. I was born in San Francisco but my family moved to East Palo Alto, back in the days when San Mateo County was noted for raising flowers! I lived a short bike ride from San Francisco Bay and earned my first scientific research award for keeping track of molting in yellow shore crabs (*Hemigrapsus oregonensis*). I graduated from Ravenswood High School and

received a scholarship from the Lions Club to help with my freshman year at Humboldt State (as it was called then), majoring in general biology with an oceanography minor. I applied for work as a summer naturalist in the San Mateo County Parks and worked at Huddart and Memorial Parks, leading guided walks and car-pooling with delighted visitors over to the coast. Maryann Danielson, my supervisor, had hoped that I could be stationed at the marine reserve but I had to borrow my mom's car and couldn't work out a schedule. I filled in as needed, enjoyed the tidepool life and studied porcelain crabs (*Petrolisthes cinctipes*) ➡



Mary and the Bug



Tidepools to Trenches *continued*



Yellow shore crab
(*Hemigrapsus oregonensis*);
photo: Dr. Thomas Niesen



Flat Porcelain Crab (*Petrolisthes cincipes*) Photo: Dr. Thomas Niesen

as part of my later M.A. at Humboldt. I helped Bob Breen later with studies on movement of rock crabs.

I received a graduate assistantship to the University of Southern California, studying behavior of crabs with John Garth, THE expert on the group. My dissertation was on decorator crabs—crabs that attach camouflaging material to their bodies. After graduating, with a Ph.D. in Biology, I sent a draft of my studies to *Scientific American*. They liked it, recruited an illustrator and published it. I had part-time positions as a post-doctoral student at USC and lecturer at California State Universities at Los Angeles and Northridge, and hoped to go full time. No luck. After a big state tax cut, those jobs were cancelled. I could stay in San Pedro and hope that something would turn up, or take a position at Texas A&M University, a big place with lots of opportunities but 150 miles inland. Off I went to Texas.

I finished publishing my work on new records and new species from my studies at USC (and now have over 40 species of crustaceans and a gastrotrich, a tiny sand-dwelling “critter,” to my credit). I had hoped with John Garth to publish an up-to-date work on all the crabs, shrimps and lobsters of California, but it took until 2012 to publish the 306-page monograph. In the meantime, my training in scuba diving and ability to

identify “critters” got me into expeditions to remote seamounts off Baja California, the Caribbean, western Pacific, and even unspoiled and gorgeous coral reefs north of New Guinea. I had some lovely diving on the oil platforms in the Gulf of Mexico and found out that there was no guide to the life on the platforms. This led to my book *Vertical Reefs* (TAMU Press).

TAMU has a really good collection of deep-sea specimens. I had worked on a deep-sea study while at USC and refreshed my memory by helping to curate those specimens. I participated in the four-year “Deep Gulf of Mexico Benthos” study (including a month-long cruise all around the Gulf). I later participated in a deep-sea mid-water cruise off Hawaii. Lately I joined a team to receive a hook-up by satellite feed to the ship *Okeanos Explorer*. This ship has a remotely operated vehicle operating down as deep as 4000 m. I’m currently working with video and still footage from the central Pacific, and have some really exciting evidence of symbioses between shrimps and deep sponges and squat lobsters with deep corals.

With over 130 publications to my name, I have tenure and eventually was promoted to professor at TAMU, where I now have three graduate students and teach Marine Biology, Invertebrate Zoology and an undergraduate seminar on deep-sea biology. Yes, I still receive *Between the Tides* and have visited the reserve from time to time, once even filling in as a last-minute guide for some interested children. ♦

Photos from Ranger Rob Cala



White Egrets
–high steppin’



Pup stare



Oyster Catcher
–success