BETWEEN the TIDES

Friends of Fitzgerald Marine Reserve

March 2022

Our Retreating Coastline

by Janet Pelinka

As I walk along the local coastal bluffs and beaches, the effects of erosion are widely apparent—bridge closure, crumbling pavements, road collapse, landslides. Many forces of nature have been and continue to be at work here—tectonic plate subduction, wave action. winds, fault movement, and sea level rise. To understand the many natural processes that affect our coast, what is needed is a basic knowledge of its geologic features and sand dispersion events.

Geology, briefly

Underlying our coastal area is basement rock made of granodiorite, a type of plutonic igneous rock that was formed from magma that cooled more than 80 million years ago. It is made up of minerals like plagioclase, potassium feldspar, and quartz that give it its hardness and resistance to erosion. As Irina Kogan, Senior Landscape Conservation Manager at the Peninsula Open Space Trust explains, "Local granite (granodiorite to be precise) makes up Montara Mountain and is found in a number of places within the greater Santa Cruz Mountains west of the San Andreas Fault." It reaches the coast north of Moss Beach (see map at right) .

The Purisima Formation overlies much of the basement rock and was created in a later period (7 to 2.5 million years ago) by sedimentary layers deposited in a shallow sea. The many layers of the Purisima Formation consist of sandstone, siltstone and shale that have been compacted and cemented to create the formation The minerals quartz and feldspar are found in sandstone. These minerals make sandstone highly resistant to erosion. Siltstone is composed mainly of many small, silt-sized particles that have been compacted and cemented into rock. The fine silt makes this stone less resistant to erosion. The cliffs of the Purisima Formation are visible along the San Mateo County coastline.

Wave-cut platforms are a feature of the Purisima Formation. Many of the more resistant cliffs were eroded during high sea levels thousands of years ago. Destructive waves that hit against the raised cliffs and eroded their base caused cliffs to retreat, leaving behind a relatively flat, gently sloping wave-cut platform of rock that extended

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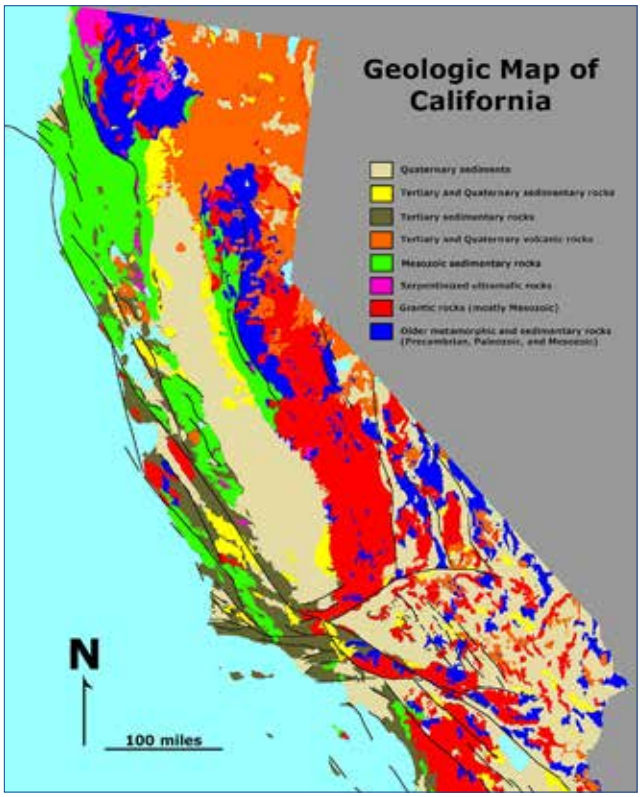


The Fitzgerald tidepool rocks are part of the Purisima Formation that was deposited in a marine environment similar to what exists offshore today. Photo: Irina Kogan

Friends of Fitzgerald Marine Reserve

P.O. Box 669
Moss Beach, CA 94038
Phone: 650.728.3584
www.fitzgeraldreserve.org

Our Mission:
To inspire the preservation of our unique intertidal environment through education and the support of research.

Newsletter Editors:
Janet Pelinka
Sasha Greenawalt

Design and Production:
Martie Bateson Sautter
Sautter Graphics and Print

Webmaster:
Galen Goyer

Banner photo:
Rob Cala

Message from President Ron Olson

So what do you get when you have a prolonged torrential rain, on top of king tides and a strong ocean surge? Oh, and on top of that add a tsunami for good measure. From that you get a very observable amount of coastal erosion. Historically, Fitzgerald Marine Reserve has always experienced erosion at the pace of about 18 inches a year. All of this storm damage requires a fair amount of repairs and upkeep that San Mateo County needs to perform on a regular basis. Some repairs have already started. Our easiest access to the beach runs directly west of the parking lot. The end of the "ramp" that juts out toward the beach experienced some significant damage. Powerful waves displaced large rocks and chunks of concrete. Some of this material was pushed upstream into San Vicente Creek. During the storms, the creek became a raging torrent. While the amount of water that travels down San Vicente Creek has decreased, hazards still persist.

It looks as though our aging cypress trees held up against the weather, but each tree will be inspected with appropriate actions taken. Furthermore, all of the fencing along the bluffs needs to be evaluated for safety. Over ten years ago, in a single day, an area just north of Cypress Point lost six feet of cliffs and the fencing that went along with it during a heavy storm.

As winter closes and the spring commences, we will see an end of our dramatic low tides that draw such crowds to our unique tidepools. With a little more rain we should see a new crop of wild flowers along with the migrating birds that enjoy the new growth.

As more time is spent enjoying a calm day on the beach, we will see more harbor seals clustering in the sand. Pupping season starts at Fitzgerald Marine Reserve in the early spring. With a lot of luck, the use of binoculars and always maintaining a 300-foot distance from harbor seals, you maybe able to witness the birth of a harbor seal pup. Harbor seals are unique among most pinnipeds, in that the pups already know how to swim at birth. They also obtain their diet of rich milk from their mothers for only about a month. After that, they are on their own. It is important to keep our distance from the pups because if the mother feels threatened, she may abandon her pup. About one third of all pups do not survive a full year due to disease, predation and abandonment.

Despite the fact that our spring low tides are not as spectacular as those in the winter, visitors who do try their hand at tidepooling can find the experience quite rewarding. Frequent visitors will also notice the slow but steady increase of algae on our rocky shore. As the days grow longer the algae grows thicker, providing hiding places for marine animals that were much more visible in winter.

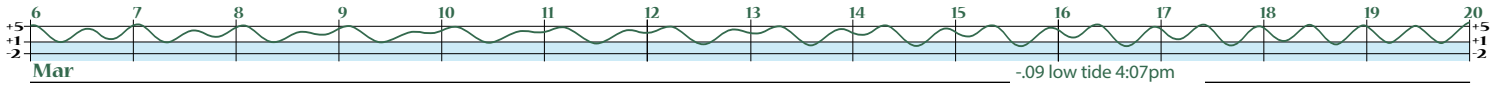
We are encouraged to see indications that things are slowly returning to normal at the reserve. More people have discovered how enjoyable it is to get out of the wind and sun by trekking through our cypress grove. Something else to look forward to is the reopening of our visitor center. Stop by to touch a soft sea otter pelt or see some of the exhibits of things that have been found along our coast. During your visit, ask a Naturalist or Park Ranger about activities in the park or along the coast that will make your visit a more rewarding one. Our goal as naturalists is to make your visit a more pleasant and memorable one. Welcome to Fitzgerald Marine Reserve. ◆

The graph displayed across the page bottoms shows tides for 3/06/22 to 7/24/22 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: fitzgeraldreserve.org/lowtides/

Good low spring/summer tides are in the early morning. They change to evening tides in September. 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:

-.09	3/15	4:07pm
-.49	3/27	2:09pm
-1.13	4/19	7:19am
8th lowest tide of 2022		
-.62	5/2	6:27am
-1.86	5/18	7:07am
2nd lowest tide of 2022		
-.88	5/31	6:08am
-2.08	6/15	6:04am
lowest tide of 2022		
-.76	6/29	5:52am
-1.84	7/14	5:51am
3rd lowest tide of 2022		



Retreating Coastline *continued from page 1*

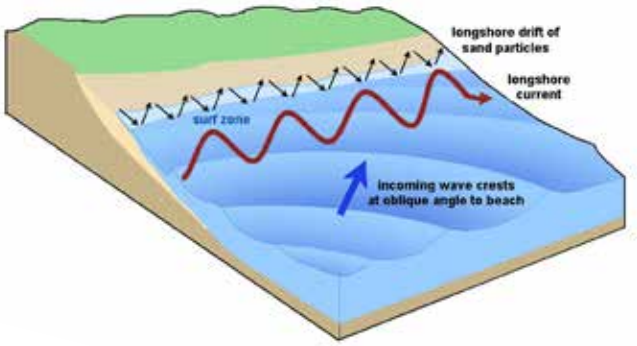
into the ocean. Usually buried under sand and rock, a wave-cut platform that forms the rocky tidepools at the Fitzgerald Marine Reserve can be seen at a very low tide.

And on top of these platforms are marine terraces. When tectonic movement raised wave-cut platforms high above sea level they were overlain by a marine terrace, a relatively flat area covered with sand and gravel and eventually grasses and plants. Marine terraces are found all along the coast. A good example can be seen on the cliffs south of Half Moon Bay (photo at right). The cliffs on the north side of Fitzgerald Marine Reserve are topped by marine terrace sand.

Sand on the move

Beach sand is created from hill and cliff erosion and is transported by creeks and storm drainage to the shore. But it doesn't remain there because a shoreline is not static. Coastlines are formed where water meets the land. Whatever sand the ocean can move it will move. This dynamic occurs more vigorously in the winter months when waves are high. Finely grained sand that has been rounded by exposure is transported to off-shore sand bars. Sand is returned more slowly in the summer months when wave energy is lower. Sand that comes from the granodiorite of Montara Mountain is of a more angular grain and is not as easily transported by wave action.

Most of our storms originate in the far Arctic north and approach our coast at a south-westerly direction creating a longshore current (an ocean current, created by wave action, that moves parallel to the shore and pushes water down the beach). The sediment moved by the longshore current is called longshore drift, also known as littoral drift. This current and sediment movement occurs within the surf zone. Wave action is constantly moving individual sand grains onto and off of the beach, pulling the sand grain out into the surf zone where it is picked up and carried along by the longshore current. Wave action then pushes this grain back onto the beach, but farther down the beach from where it started. The sand grain has moved in a zig-zag pattern.



Man versus Nature

Pillar Point Harbor

During 1959-1960 the construction of the Princeton breakwater by the Army Corps of Engineers was completed to protect the Princeton harbor and community. Two extensions were added in 1996, a 1000-foot dog-leg at the entrance to the harbor and a 110-foot concrete parapet covered with riprap at the west end of the breakwater.

Before construction the bay had a smooth, arc-shaped shoreline with a continuous sandy beach backed by a relatively stable sea cliff cut into a low terrace of loosely consolidated sand and gravel. Following the construction of the breakwater, coastal erosion increased dramatically. The construction disrupted the natural direction of the

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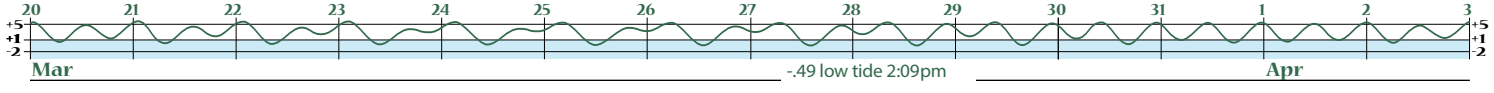
Pillar Point Harbor



Retreating Coastline *continued from page 3*

Sand deposited inside Pillar Point Harbor

Dramatic erosion south of the breakwater

Erosion southward to end of Miramar Beach

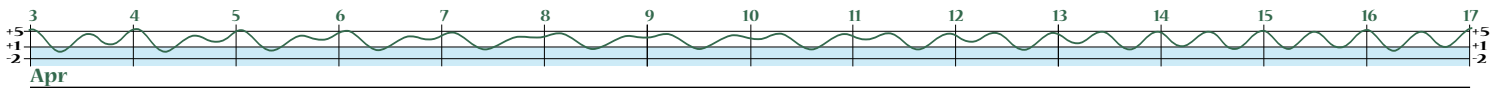
ocean waves and longshore current. When the longshore current rounds Pillar Point headlands it runs parallel to the shoreline there. But when this current meets a breakwater it curves into the breakwater opening, carrying sand that is then deposited by waves inside the breakwater boundary, minimizing the normal sand transport that had previously occurred along the coast. The result is seen immediately to the south at "Surfers Beach" which has narrowed significantly. Where beaches are wide and waves do not break against cliffs erosion is slowed. Waves there tend to hit the bluffs rather than break on the narrowed beach causing dramatic erosion. Those low bluffs have been supported by riprap in an attempt to thwart the erosion that threatens Highway 1.

The effect of the breakwater extends southward a distance of approximately one mile to the southern end of Miramar Beach. Farther south, where this effect has diminished, sand dunes have formed at Roosevelt and Dunes state beaches.

Riprap

Attempts to prevent nature from having its way exists all along our coast. There are few beaches and oceanfront cliffs that are not armored in some way. Riprap is commonly used to protect roads and structures built on ocean-facing cliffs. There are many problems with this type of armoring. Beaches are narrowed and high wave action undercuts the stones causing failure of the riprap and the need for maintenance. By far the worst effect is that the intended wave deflection frequently causes erosion on neighboring beaches and trails.

Surf crashing on Mirada Road.
Photo: Jack Sutton, http://wildbayarea.blogspot.com



What is to be Done?

Mirada Bridge replacement, a $12 millon endeavor

The Mirada bridge has been closed for many months and pedestrians must navigate around the creek on a detour that traverses along neighborhood streets and leads to Highway 1—not exactly a pleasant scenic walk. Recently, the cement arch that was under the bridge completely collapsed depositing large cement chunks on the beach and leaving the present bridge hanging in mid-air.

The County of San Mateo Public Works Department successfully obtained a Coastal Development Permit from the California Coastal Commission last May for the Mirada Road Bridge Replacement and Bluff Stabilization Project. Design modifications that the Commission required delayed progression until the bidding process began in February 2022. Completion is expected sometime this summer.

The $12 million cost of replacement will be funded by grants from various agencies with $1 million provided by the City of Half Moon Bay. The replacement bridge will be of an aluminum, single-span, light-weight construction that will require minimal maintenance. The project is located in the unincorporated community of Miramar and in the City of Half Moon Bay.

Collapsed trail south of Miramar

Prior to placement of the new bridge, extensive work will be necessary to stabilize the adjoining cliffs. Details of the approved project design were described to me by Krzysztof Lisaj, Senior Civil Engineer for the San Mateo County Department of Public Works, the project lead agency.

Mr. Lisaj explained that steel anchor nails will be drilled into the northern cliff to stabilize it. Initial diagrams show that nine of these nails will be drilled to a depth of up to 25 feet and spaced 5 feet apart. A steel mesh frame will attach to steel plates on the end of the anchor nails that will hold the shotcrete (a sprayed cement) in place. The shotcrete application is intended to imitate the color and contours of the cliff face much like what is seen along highway hills and cliffs.

Mirada Bridge, existing and simulation of possible future structure
Photo courtesy of Coastside Buzz

The new wall will extend up to 35 feet high. The cliff rock slope protection (RSP) will be placed at the bottom of the wall to prevent the erosion that could undercut the wall. This RSP is essentially riprap backed by an engineering fabric. Mr. Lisaj said that the RSP will be buried under sand during most conditions and will seldom be seen from the beach. Stabilization of the cliffs will reach from behind the bridge and extend to approximately 110 feet on the north side and 60 feet on south side. Railings will be placed at the top of the wall to prevent people from climbing down the wall.

A major factor in the building of the new bridge will be stabilization of the cliffs.

The anchor nails and shotcrete will be applied from the top of the cliff. To accommodate excavation equipment needed for sand removal and movement of existing riprap, a temporary gravel road is to be constructed at the cul-de-sac on the south side of the bridge where a steeply eroded path navigated by determined pedestrians presently exists. After removal of this access road, concrete stairs will be constructed that will lead to the beach below. There will also be a paved ocean overview area at the top.

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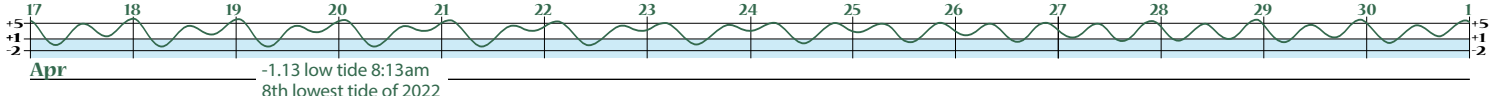


The road was undercut by a creek that flows there causing most of the road to collapse.

Other areas of Concern

The road leading to Roosevelt State Beach, from the ranger station to the parking area, has been closed. The road was undercut by a creek that flows there causing most of the road to collapse. I was told by a California State Ranger that plans are in the development stage to repair this road. No dates were given.

San Mateo County has evaluated its portion of Mirada Road immediately north of the proposed project area and it appears that a long-term project will be necessary to address coastal erosion along Mirada Road. However county funding has not been allocated to address these improvements. Based on a preliminary evaluation, this would likely require narrowing the roadway to accommodate one-way vehicular travel along Mirada Road, which would enhance access and safety for pedestrians and bicyclists.

Many other repairs along the Coastal Trail are needed. Making these repairs will be an ambitious and costly project and are most likely on the city and county projects for future consideration.

Be Aware

Walking along dirt paths created by walkers (and bikers) desiring a closer view of the ocean could be dangerous. Cracks visible on such trails can be a sign the cliff face has been undercut by wave action and is prone to failure. Also sitting on the beach next to the cliff face could expose one to cliff failure and a resulting landslide. ◆

The Reserve has a History of Erosion

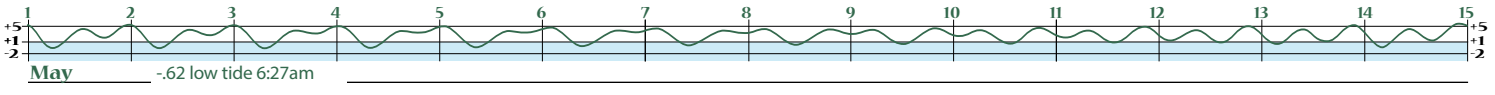
Landslide at the reserve, September 21, 2011
Source: facebook

Landslide at the reserve, March 26, 2011
From video by Rob Cala

The Reserve is also Vulnerable to Sea Level Rise

This study rates the vulnerability to sea level rise of the James V. Fitzgerald Marine Reserve as **high**.

To read the entire report, go to: https://seachangesmc.org/wp-content/uploads/2018/03/Final_AVP_04_Fitzgerald-MarineReserve_JN_MP_4.pdf



Spotlight on Ranger Darren Cummings

I am originally from Reno, Nevada, and for most of my young life I was surrounded by mountains, forests and desert. I graduated from the University of Nevada, Reno, with a Bachelor's in Education, and moved shortly after finishing my degree to San Francisco in 2003. I was looking to surround myself with more culture, to broader my horizons, as well as to be closer to the ocean. I caught the ocean bug while traveling through Central America. I spent the summer of 2002 SCUBA diving and exploring both the Pacific and Caribbean coasts. SCUBA diving opened my eyes to the remarkable world that exists underwater. I was infatuated with the unique creatures and habitats found merely feet below the surface. I was also fortunate to spend this time learning from a naturalist who expounded on the importance and fragility of our oceans and reefs. During my years in San Francisco, I spent much of my free time exploring the city, surfing, and hiking around Marin, San Francisco and San Mateo County.

Professionally during this time, I was following a previous passion of mine which was beer making. I worked at a few different local breweries as a brewer. I also met my wife, married and later started a family in beautiful Pacifica. After working as a head brewer for a number of years I decided to take a break from the industry and spend more time with my young daughter before she started preschool. We spent countless days together, me carrying her in a backpack while hiking San Pedro Mountain, Pillar Point Bluff, and visiting Fitzgerald Marine Reserve. It was during these adventures that I thought about how I could incorporate my interest in our incredible environment and the simple joy I found being outside into a career.

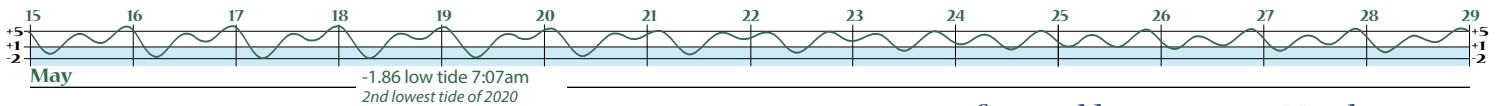
After some internet sleuthing, I came across an opening for a Park Aide Position with San Mateo County at Fitzgerald Marine Reserve. I jumped at the opportunity and was fortunate to get the job. The first few months were filled gleaning knowledge about the reserve from rangers and naturalists. I learned a lot those first few months but mostly I discovered just how much I did NOT know about the diverse and incredibly unique world of the intertidal. Even after years of living in the area and surfing local beaches, there was still so much to learn. Thankfully, I was given the opportunity to attend the Friends of Fitzgerald naturalist training course where I could better grasp the entire picture. The class was a deep dive into the natural history, geography, and wildlife of San Mateo County and more specifically FMR. The class uncovered so many secrets that many visitors unknowingly pass every day. It provided a detailed and comprehensive view of the full ecology of our coast and made me even more appreciative of the reserve and the efforts that go into protecting that fragile system.

Now, as a full-time ranger on the reef, I know firsthand that it is not only important to be able to answer visitors' questions, but also to explain and educate individuals as to why this special place must be protected, to teach them the importance of the rules and why we must enforce them so that this place can continue to thrive and be enjoyed for generations to come. Often our visitors are so awestruck and overwhelmed with the natural stimuli of the reserve that they can be unaware they may be breaking a rule. I have found it much more effective to educate a visitor on why their actions may be harmful rather than to chastise them. People are more open to learning from their mistakes through conversation, and then they too can become stewards of the land and spread the message to others.

My naturalist training has been crucial to other parts of my work as a ranger as well. It is very important to have knowledge of native species when maintaining trails as is having a keen eye for birds, insects and even rodents. Much of the spring and summer for a ranger is spent maintaining trails and parks for safety and fuel reduction. It can be grueling work but it has kept me in shape and forces me to take care of myself so I can stay strong, efficient and reduce injuries. The scope of projects is everchanging with each season which means no two days at "the office" are the same.

By far the most important discovery from my naturalist training was made while studying invasive species. After some serious introspection, I came to the harsh realization that humans are in fact the most invasive of all. We have the largest and most detrimental impact on this planet, and as a result we have the most important role to play in mitigating that impact and protecting the environment around us. I carry this lesson in responsibility, as well as many others learned in class, with me outside of work as well. I try to incorporate them in the choices I make at home, and, most importantly, I try to teach them to my children so that the next generation can work just as hard at restoring the natural balance. ◆

It was during these adventures (with my young daughter) that I thought about how I could incorporate my interest in our incredible environment and the simple joy I found being outside into a career.



Reef Roundup: FFMR Research Surveys, 2021

What we've learned and plans for 2022

by Karen Kalumuck

Warming oceans, changing climate, crazy weather patterns. Evidence abounds that our earth is not the seemingly predictable habitat of our great-grandparents. How do we know if ecosystems are being affected? How do species adapt to environmental stressors, (or can they)? What rhythms of nature are being altered, perhaps permanently?

It takes many scientific researchers, and many, many years, to establish what is "typical" for ecosystems: who are the usual residents, and when are they there? What role do they play in the food web; how do the animals, plants, fungi, protists and bacteria interact and influence each other? Abiotic factors, such as temperature, pH, wind, pollution, erosion, and more, can severely disrupt the balance of life. To be able to identify changes in ecosystems, for whatever the reason, there first must be an established "baseline" of biotic and abiotic factors. Collecting and analyzing these data, while rarely glamorous, is foundational to be able to recognize change in the ecosystem, and discover if an aberration is a "one off" situation or a continuing trend.

We needed a baseline.
• Are healthy stars returning to the reef?
• Are the sunburst anemones propagating to the detriment of the giant greens?
• Are there changes in the populations in different areas of the reef?
• Do the organisms look healthy?
• Are we finding any invasive species?

If you have been engaging with Fitzgerald Marine Reserve, its Rangers, Volunteer Naturalists, and fans, for any length of time, you have surely heard someone opine about how there used to be so many more sea stars (true, due to the sea star wasting syndrome), or nudibranchs, for example. One definitive observation is that the sighting of the sunburst anemones on the FMR reef used to be quite rare; but now they seem to dominate the reef. These anemones were found nearly exclusively in the waters off Southern California, but they have been migrating steadily north over the last dozen years or so. Most of us have a "gut level" understanding of this phenomenon. But without hard data, without a baseline of comparison, the observation is merely anecdotal.

We needed a baseline. Are healthy stars returning to the reef? Are the sunburst anemones propagating to the detriment of the giant greens? Are there changes in the populations in different areas of the reef? Do the organisms look healthy? Are we finding any invasive species?

FFMR Volunteer Naturalists are taking on some of these questions.

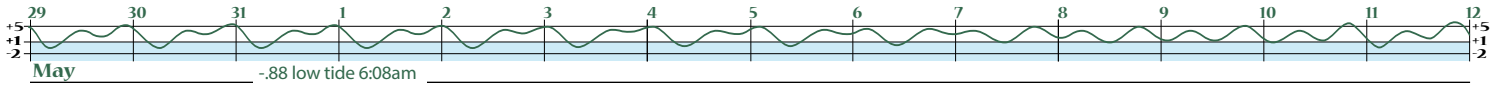
During four fantastic low tides in 2021, groups of FFMR Volunteer Naturalists combed defined sectors of the FMR reef, documenting the numbers of selected organisms: the giant green sea anemone, *Anthopleura xanthogrammica;* sunburst anemone, *Anthropleura sola*; all species of sea stars, and all species of nudibranchs. San Mateo County Parks Department granted us a permit to do this work, necessary since the FMR reef and tidepools were closed to the public daring our first survey.

You can read more about the rationale for establishing the surveys, the work that informed the Research Permit proposal and a summary of our third Research Survey, in the March 2021 and September 2021 issues of *Between the Tides.* You can download these issues on the FFMR website, at https://fitzgeraldreserve.org/between-the-tides-archive.

This first year of Research Surveys has been a year of refining our techniques for surveying our sectors, tweaking our list of organisms, and developing a system by which all participating naturalists will conduct the surveys in a consistent manner, so that data collected by different individuals can be compared across surveys.

When anemones are closed, as they generally are when out of the water at low tide, it can be nearly impossible to tell the difference between A. sola *and* A. xanthogrammica. *The distinctive stripes in the oral cavity of the sunburst anemone become invisible.*

For example, when anemones are closed, as they generally are when out of the water at low tide, it can be nearly impossible to tell the difference between *A. sola* and *A. xanthogrammica.* The distinctive stripes in the oral cavity of the sunburst anemone become invisible. After quite a bit of online



sleuthing and emailing experts, it was revealed that the pattern of bumps, or tubercles along the columns of the anemones are different. The giant green anemone has no distinct pattern to the distribution of tubercles; in fact, the column is reminiscent of the skin of an avocado. The column on the sunburst anemones, however, has distinct rows and columns of tubercles. Of course, if they have covered their columns with sand and shell, identification remains a bit tricky.

Another challenge with the anemones was identification of the smaller individuals. The two anemones that we include in the survey look an awful lot like aggregating anemones, or *Anthopleura elegantissima*. We solved that quandary by counting only individuals three inches or greater in diameter. *A. elegantissima* remains well under that size.

A Peek at Preliminary Data

We have two Research Sectors: Sector 1 *(trapezoidal),* is divided into north and south portions, while Sector 2 *(rectangular)*, which straddles a deep channel, is subdivided into east and west sections. Complicating some of our data gathering was occasional confusion about the beginning spot of Sector 2. Without an invasive metal marker drilled into the reef, we rely on visual cues to be consistent with our Research Sectors. With practice and GPS data, we are now secure in our identification of the boundaries of Sector 1. Plus, although we can't use this as a reliable marker, two live abalones have always been found at the beginning of this sector. It's at the junction of several channels, so the abalones likely wait for food to be brought to them.

Figure 3: *A red abalone at Sector 2. Well camouflaged, the characteristic respiratory holes give it away. Photo Karen Kalumuck*

Figures A1 and 1B

Giant green sea anemone, A. Xanthogrammica *has an avocado-like column. Photo: Elaine Reed*

Below, an open giant green sea anemone, photo: Dr. John Pearse–UC SantaCruz

Sunburst anemone, A. sola *shows off its rows of tubercles. Photo: Elaine Reade*

Below: an open sunburst anemone, photo: Steve Lonhart–NOAA –MBNMS

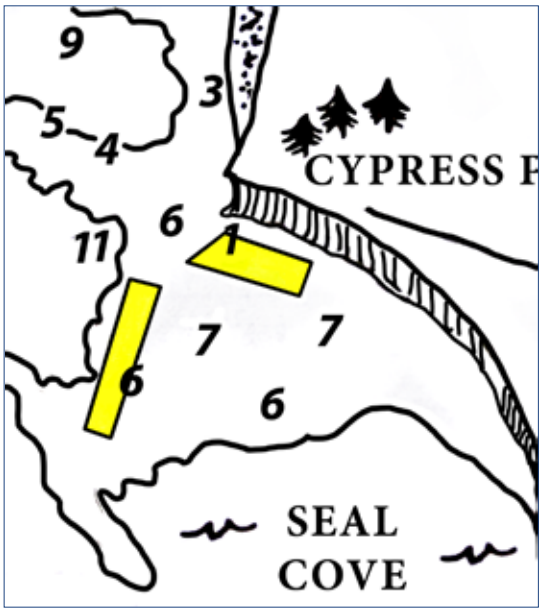


Figure 2: *FFMR Research Sectors at FMR. Sector 1 (trapezoidal) has a corner at Cypress Point; Sector 2 follows a main surge channel (illustration is not to scale).*

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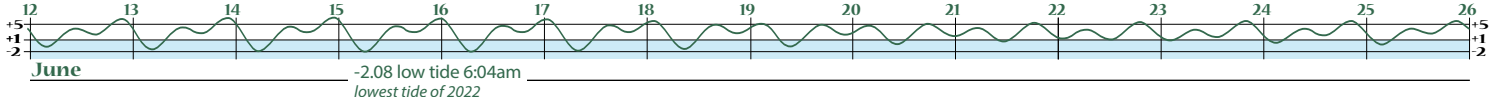


Reef Roundup *continued from page 9*

As an example of the type of data we can examine from the surveys, see Figure 4. (Thanks very much to Marisa Agarwal for creating the graph). Here one can see that FFMR volunteers surveyed three groups of organisms: sea stars, anemones, and nudibranchs. The graph reflects the total numbers of these organisms per each survey, in all Sectors. The total number of organisms in Survey 1 were much higher than other surveys, due to the likely inclusion of aggregating anemones, prior to our size cutoff protocol.

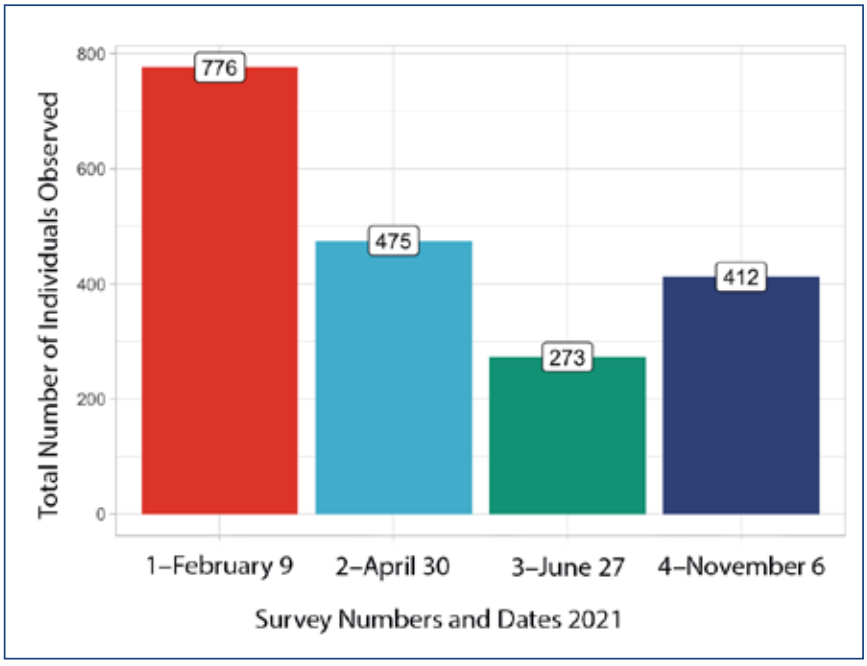
FFMR volunteers surveyed three groups of organisms: sea stars, anemones, and nudibranchs. The graph reflects the total numbers of these organisms per each survey, in all Sectors.

Other data are still being analyzed, but it is still too early to postulate any trends in the population numbers of the organisms. The "growing pains" of learning to refine our Survey process certainly puts some of the data into question; after Survey 4, we feel much more secure in our methods. We also need more data and more studies to be able to do statistical analysis to determine if any trends we observe are indeed significant. And indeed, we plan to compare the populations of anemones, keep tabs on the sea stars, and provide watchful eyes for invasive species or signs of illness on the reef.

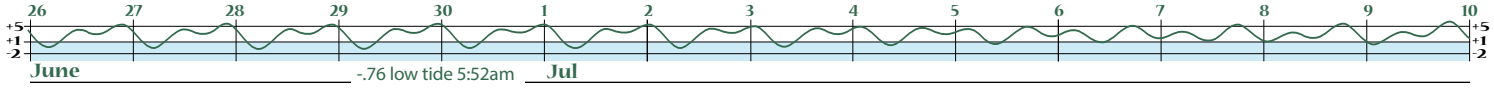
The "growing pains" of learning to refine our Survey process certainly puts some of the data into question; after Survey 4, we feel much more secure in our methods.

Four more Surveys are scheduled for 2022. Most seasoned participants anticipate being part of this again, and we are welcoming new Volunteer Naturalists to join us. We are primed, and with confidence only gained by experience, we look forward to engaging with our beloved reef again. ◆

Figure 4: Overall Intertidal Community



Thanks to all of the Volunteer Naturalists who participated in the 2021 Surveys: Linda Ciotti, Karen Madsen, Julie Walters, Tom Ciotti, Jeanette Hyer, Ron Olson, Elaine Reade, Marsha Cohen, Keith Mangold, Graham Brew, Scott Snow, Barbara Dye, Beth Roellig, Ed Milner, J. R. Blair, Skylar Hanford, and Marisa Agarwal. (Marisa is a 2021 graduate of Brown University with a degree in Marine Biology. She volunteered as a naturalist with FFMR from May-December 2021, and is now working as a coral restoration management assistant for the National Parks Service in Guam.)



The Kelp Crab

by Mary K. Wicksten

One of the most easily recognized seaweeds at the Fitzgerald Marine Reserve is the feather boa kelp, *Egregia menziesii.* Short side blades and olive-shaped gas floats line the sides of a leathery central blade. This kelp can serve as the unique habitat for a few species of isopods (crustaceans related to the garden pillbug) and limpets that rasp their way into the central blade. The "king of the kelp" is the northern kelp crab, *Pugettia producta.*

The kelp crab was one of the first crabs from the U.S. West coast to be scientifically described, in 1840 by John Randall. The type locality (the area from which the crab was collected for the first time) was given as "Upper California" (as opposed to Baja California, Mexico). It is particularly fond of boa kelp, although it also will climb up on giant kelp *(Macrocystis pyrifera)*. The sharp-tipped long legs give it a great grip on the swaying fronds of the kelp.

Kelp crabs tend to eat seaweeds instead of scavenging or eating various invertebrates (worms, starfishes, etc.) They prefer the soft growing edges of the blades which they tear off with their agile pincers and then munch away. The color of the crab comes from the pigments of the kelp it eats, so some of them may be light olive, others almost black. Small kelp crabs are most likely to fall victims to predators, including octopuses or larger crabs. Larger ones have fewer predators except for sea otters.

As in other crabs, you can determine the sex of the crab by the shape of the abdomen—the flap on the lower surface of the body. A female has a wide abdomen and slender pincers. A mature male has a triangular abdomen and enlarged pincers. The lower surfaces of the body and pincers in a mature male are red, easily seen in a crab trying to attract a mate or scaring off an intruder. Whether or not the crabs can see color is not known but the contrast in color is obvious.

After mating, the female carries a mass of eggs below her abdomen. The larvae develop eyes before hatching. The female drops her abdomen and shoves the larvae out into the water. The larvae have short spines that may deter some predators. The time spent as larvae is not known but probably is a few months. The abdomen is tucked under the body as the little crab settles down among the kelp. Like other crabs, kelp crabs will grow a new soft shell before molting—casting off the old shell and hardening a new one. During molting they also can regrow missing or damaged legs.

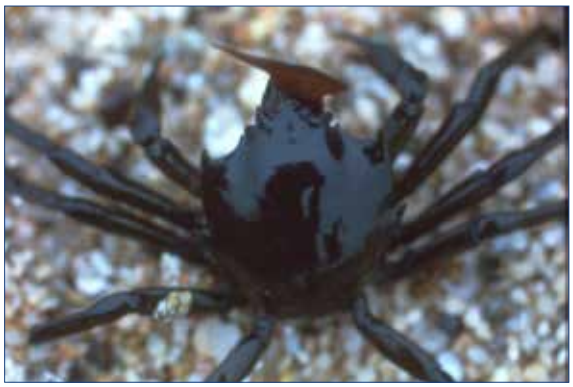
Male or female, kelp crabs have a finite life span, perhaps a few years. They slow down molting as they age but there are no obvious growth rings. After reaching maturity and mating, they no longer can molt or regenerate damaged legs. Some of them become almost coated with barnacles or algae; others lose their grip and are cast ashore.

If you find a kelp crab, even a little one, it will try its best to hang on to its home kelp. If you are foolish and try to grab one, it can pinch, dig the sharp ends of its legs into you, or jab you with its side spines. Use common sense in dealing with tidepool animals—look but don't touch! ◆

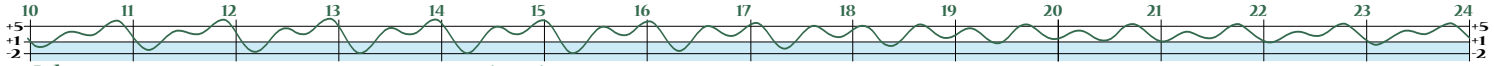
Feather boa kelp, Egregia menziesii, *photo: Mary Wicksten*

Kelp Crab, photo: University of Puget Sound

They prefer the soft growing edges of the feather boa kelp blades which they tear off with their agile pincers and then munch away. The color of the crab comes from the pigments of the kelp it eats, so some of them may be light olive, others almost black.



A black kelp crab, photo: Mary Wicksten



More Kelp Crab Facts and Info

Excerpted from

Back to Basics, Stay in One Place

*by Jenna Kinghorn**

Between the Tides, September 2004

Some patient visitors and I were delighted to see a small kelp crab like this one scuttle out from under the shelter of a clump of kelp.

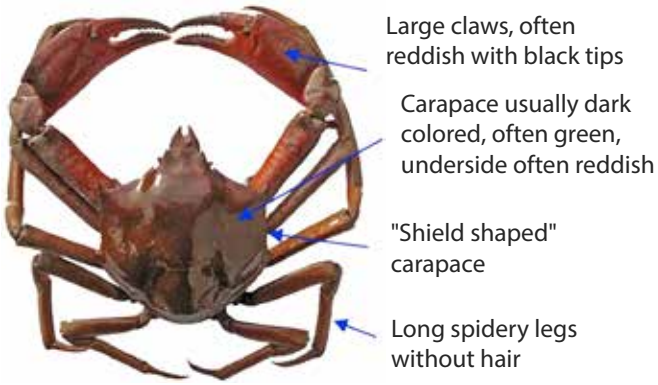
It's advice you read in every book or article about exploring tidepools, advice I've given to many visitors over the years I've been a volunteer naturalist at FMR: kneel down and hold still for a while in one spot, and you'll be amazed at the number of wonders that unfold before your eyes!

The highlight of my time holding the line for the harbor seals came when I noticed a clump of slender rockweed, an olive-green algae, shivering in an otherwise still pool. Crouching down, a few visitors and I watched the seaweed clump intently. What looked like a rockweed tendril straightened to reveal itself as a long, jointed, claw-tipped leg. One leg after another appeared. At last an olive-brown shield-shaped carapace less than two inches across emerged, revealing the identity of the seaweed skulker: a small kelp crab.

** Jenna was a volunteer naturalist with FMR for many years and also served as editor and often writer for* Between the Tides *from 2006 to 2011. Last heard from, she was continuing her tidepooling near Puget Sound in Washington.*

Oregon Coast Aquarium
"Did you know" 11/20/2020

Northern kelp crab (*Pugettia producta)*



Oregon Department of Fish and Wildlife

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