

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

S e p t e m b e r 2 0 2 3

Watching the Seagrass Grow

by M. Kathryn Barton, Ph.D., FFMR Volunteer Naturalist

All photos by the author unless otherwise noted

Watching grass grow is only a smidge more thrilling than watching paint dry. Grasses are ubiquitous in our modern landscape, often meant to be walked on, have tiny flowers, simple blades and no dramatic branches. They are arguably the most boring of plants. I imagine most of us pass right over the seagrass meadow at the marine reserve, barely looking down as we make our way out to more exciting things on the reef.

But seagrass is anything but boring. If they made superhero movies for plants, seagrass would be the first to wear the cape: Seagrass has carbon fixing superpowers and may help save the world from climate change disaster. It has an origin story that includes meteors and planet-wide extinction events. And it has an interesting sex life.

The last decade has seen an increased awareness of how important seagrasses are to mitigating global warming. Seagrass meadows are among the most efficient natural carbon sinks on earth and are found in coastal waters of all continents except Antarctica. These “blue” carbon ecosystems take carbon from the ocean and sequester it in sediments on the ocean floor where, if undisturbed, it can persist for thousands of years. Globally, seagrasses inhabit less than 0.1% of the ocean floor but sequester more than 10% of total carbon burial in the ocean.

It's not just about blue carbon. Seagrass meadows are the basis for complex ecosystems, sheltering and feeding animals that range from snails to manatees. Seagrass reduces wave action on nearby plants and animals and clarifies the water while promoting sedimentation of par-

ticulates. A visit to the seagrass meadow in August at Fitzgerald shows it growing lush green. When the tide is out, the grasses harbor much sea life, with their leaves shading the creatures and retaining precious moisture.

Before going any further, I have to come clean and tell you that seagrasses are not grasses at all, they just look like grasses. They belong to the order Alismatales which includes mostly tropical plants that grow in wet and marshy environments. Only 70 or so of the 4500 species that make up the Alismatales are seagrasses. Indeed, these 70 seagrasses are the only species that grow entirely submerged in salt water out of the more than 250,000 flowering plant species on earth. Marine growth is truly a rare superpower among the flowering plants.

Just like seals and whales evolved from land mammals to become sea dwellers, seagrass evolved from land plants to become marine plants. To understand how remarkable this transition from land to sea was for the seagrasses, we need to first understand the earlier and even more remarkable evolution of marine green algae into land plants. To survive on hostile dry land, land plants acquired features missing in the algae: roots to take up water and nutrients, a vascular system to transport water and nutrients up and down the plant, a waxy coating to prevent drying out, small pores to let oxygen and carbon dioxide in and out of the plant, stiff



Seagrass meadow at FMR as photographed in August 2023

To raise awareness for the importance of healthy seagrass to a healthy environment, the UN General Assembly proclaimed March 1st as World Seagrass Day. The first observance of World Seagrass Day was this spring, March 1, 2023.

continued on page 3

Friends of Fitzgerald Marine Reserve

P.O. Box 669
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www.fitzgeraldreserve.org

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Our Mission:

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



Summer

3rd in the series, Celebrating the Seasons at Fitzgerald Marine Reserve by photographer Brody Scotland (BrodyQ.com)

Brody Q Scotland is a local photographer who has recently completed a year-long photo project at the Fitzgerald Marine Reserve and has hopes for an eventual exhibition of the images. You can find selected photos from the project at <https://bit.ly/BQFitzgerald>, or her main website at BrodyQ.com

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We want to hear from you.

What do you like about the newsletter? What type of articles would you like to see in *Between the Tides*? What article could you write for us? Please contact the Editorial Board at: betweenthetides.editorialboard@gmail.com and we will be in touch. See you out on the reef!

Land Acknowledgment Statement

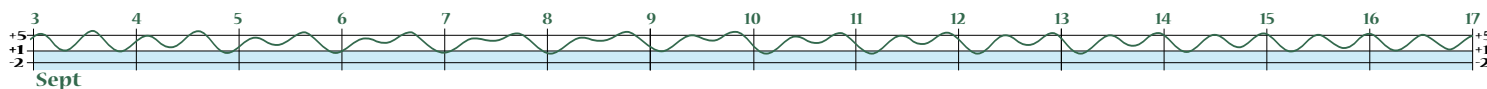
The Friends of Fitzgerald Marine Reserve acknowledges that the Reserve is located on the unceded ancestral homeland of the Ramaytush Ohlone Peoples. As guests, we recognize that we benefit from the beauty and diversity of this land and seashore. We wish to pay our respects by acknowledging the ancestors and relatives of the Ramaytush community and by affirming their sovereign rights as First Peoples to govern their communities and preserve their cultures. Finally, we seek to honor the Ramaytush community's sacred relationship with ocean and marine ecosystems by educating the Reserve's visitors and protecting the Reserve for future generations.

The graph displayed across the page bottoms shows tides for 9/3/23 to 1/21/24 at Princeton Harbor. Where the date appears is midnight. Reefs are accessible for exploring at low tides during hours when FMR is posted as "Open." Low tides at least +1 or below are best for tidepooling. See: <https://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:

.92	9/18	7:40pm	-1.17	12/14	6:00pm
-.43	9/27	3:38am	-1.31	12/26	4:42pm
-.35	10/1	7:08pm		2024	
-.12	10/18	8:09pm	-1.57	1/11	4:45pm
-1.01	10/28	6:04pm		3rd lowest tide of 2024	
-.89	11/15	6:10pm	-1.13	1/20	1:15pm
-1.32	11/27	4:53pm			



Seagrass *continued from page 1*

cell walls to hold the plant erect against gravity, sunscreens to protect from strong UV radiation, and showy flowers to attract insect pollinators.

Then, around 65 million years ago, a time pinpointed by recent DNA data, seagrasses' ancestors evolved to live back in the ocean. What prompted such a drastic evolutionary shift? Scientists' best guess is a huge asteroid up to 9 miles wide hitting the Yucatan peninsula. The resulting global ecological disaster, known as the Cretaceous-Tertiary (C-T) Extinction, caused the loss of 75% of the earth's species. Niches previously occupied by now extinct plants and animals became empty and free for exploitation. It is thought that seagrasses evolved to occupy such empty niches in the marine environment.

A return to the ocean meant seagrasses had to lose many of their fancy adaptations to land; some of these were unnecessary under sea water while others would be downright harmful. In order to take up nutrients directly from the water, seagrasses shed their thick waxy cuticle which was no longer needed to prevent desiccation. Pores, no longer needed for gas exchange, were only a potential liability that could let in harmful pathogens, and were jettisoned. Seagrass cell walls became more like those of algae—flexible so the plants don't break in the ocean waves. They evolved air spaces inside their stems and leaves to make themselves more buoyant. They reduced, but did not eliminate, their vascular transport systems substantially. Seagrasses use the remnant vascular system to transport carbon down to their roots—likely an important factor in their ability to store carbon in the sea floor. Their chloroplasts moved closer to the plant surface so they could pick up more sunlight when underwater.

Moving back under the sea surface also meant that seagrasses had to give up their insect pollinators. They dumped their showy petals which were no longer needed underwater. Up until very recently, it was thought that fertilization of seagrass flowers was simply the result of water currents carrying sperm from male flowers to female flowers. Then in 2016 scientists

working on the tropical seagrass *Thalassia* found that tiny invertebrates visit the flowers when they open at night. These animals visited both male and female flowers carrying sticky clumps of pollen with them. The discovery of such “sea bees” was a first, and now attuned to this possibility, scientists have found similar fertilization of algae by invertebrate sea animals.

We humans have belatedly begun to appreciate the importance of seagrasses to the environment. Unfortunately, human development, pollution and climate change have destroyed much seagrass habitat. Some estimates are as high as 29% loss since recordkeeping began in 1879, with losses accelerating in recent

decades. The first ever World Seagrass Day, proclaimed by the UN, was celebrated in the spring of 2023. Hopefully increased awareness and education will help us preserve seagrass habitats.

Next time you are out on the reef, take time to admire the seagrass meadow and its seasonal changes. Admire the delicate green blades of the seagrass. Ever so gently lift a blade or two to see what creatures are harbored beneath the canopy. Look for underwater flowers from May to July. Or maybe ... just take a moment and watch the grass grow. ♦

The carbon stored in sediments of coastal ecosystems such as seagrass meadows is called “blue” carbon.

Seagrasses take up only 0.1% of the ocean floor but sequester more than 10% of the organic carbon buried in the ocean.



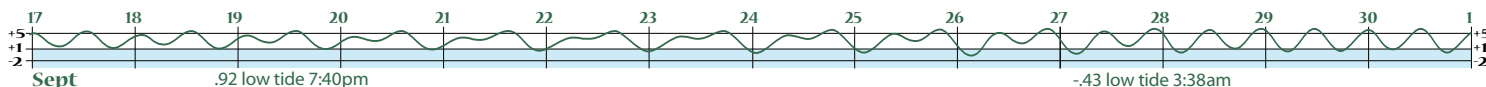
*Close up of Phyllospadix leaves with black turban snails.
FMR, August 2023*



*Close up of seagrass (Phyllospadix) showing roots attached to the rock.
FMR, August 2023*



*Phyllospadix flowering branch. Individual flowers lack petals and appear small and green. Male and female flowers are found on separate plants. Flowering occurs from May to July.
Photo by R.C. Phillips via Friday Harbor Lab website.*





AGGREGATING ANEMONE, SHOWING ITS ACRORHAGI
(Anthopleura elegantissima)



SAN DIEGO DORID
(Dianulula sandiegensis)



BROODING ANEMONE
(Halianthella annularis)



VEILED CHITON
(Placiphorella velata)



FLAME LINED CHITON
(Tonicella lokii)



MOSSY CHITON
(Mopalia muscosa)



OCHRE SEASTAR, FEEDING
(Pisaster ochraceus)

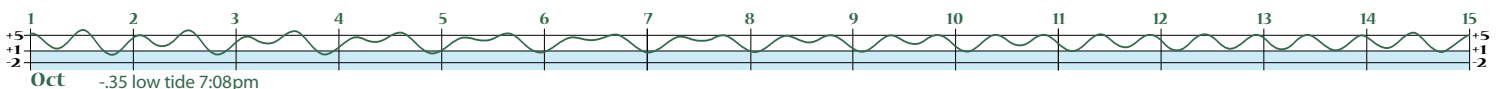


HERMIT CRAB, HITCHHIKING
(anomuran decapod crustaceans of the superfamily Paguroidea)

**Photographer:
Melody Ng Lee**

Melody is a physician and lives in San Francisco. Her whole family—husband, son and daughter—are all avid naturalists and they often go tidepooling as a family.

Melody is also an FFMR Volunteer Naturalist.



FFMR Awards scholarships to Half Moon Bay High School

by Ron Olson and Joseph Centoni

Board President Ron Olson says that it was both an honor and a pleasure to represent FFMR at this year's awards ceremony at Half Moon Bay High School. He added that it was great to see such a turn out at the end of a challenging school year. Scholarships and awards are such an important investment in our future.

The recipients of this year's Bob Breen Memorial Scholarships are Jasmine Tyler Standez, Brian Booher and Hannah De Leon. We asked them to tell us more about their plans for college and what they might do after college.

Jasmine grew up in HMB and has always been passionate about science and the outdoors. Her interest in our tidepools sparked a desire to pursue an education in environmental or field biology at Wake Forest University. She is really interested in botany and would love to be able to have a career that explores that in some way. Jasmine is also considering environmental engineering because she really wants to do something that helps the environment. Because of her environmental science class at the high school, she realized that any future career would have to be one with the environment in it. Jasmine says "The fact that we still know so little about the ocean and all its ecosystems make it that much more exciting to learn about. I just hope I am able to make a positive impact in some way."

Brian plans on attending UCLA next fall and will major in environmental science with a goal of a career in renewable energy and sustainability. He would like to find internships relating to environmental science during his time in college and hopefully work for them full time after his tenure at college is over. Brian would

love to study algae and seaweed as he sees great potential in their use as a biofuel. He is very captivated by the various wildlife in the ocean—especially marine mammals and sharks. Brian says "And I'd like to have a more in-depth understanding of coral reefs and do my best to slow coral bleaching and ocean acidification." (Brian's sister, Audrey, received our scholarship in the past!).

Hannah will attend Santa Barbara City College, majoring in environmental studies while minoring in education and business. Hannah is unsure of the future career pathway but knows that she wants to travel and do studies in the field, work with youth and educate them on the topic, and get involved with environmentally sustainable companies. Hannah says "Growing up on the coastside you see all of the negative effects pollution has on the ecosystem first hand. You grow such a love for this environment and all of the organisms within it. It makes you want to create a change to ensure this habitat will be there for future generations to witness and learn about."

On behalf of the FFMR, we wish them all the best in their future goals. ♦



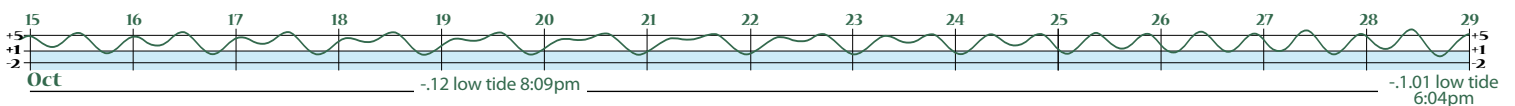
FFMR President Ron Olson, Hannah De Leon, Jasmine Tyler Standez and Brian Booher

Growing up on the coastside you see all of the negative effects pollution has on the ecosystem first hand... It makes you want to create a change to ensure this habitat will be there for future generations to witness and learn about.

FFMR Scholarship Students —Where Are They Now?

FFMR has been awarding scholarships to students at Half Moon Bay High School since 2000. Are you one of those students? Or a friend or family member? We'd like to connect with these students to find out how they used the scholarship and what they are

now doing. We hope to include some student stories in future editions of *Between The Tides*. If you're able to help us with contacts please email the Editorial Board at betweentides.editorialboard@gmail.com



Adventure and Discovery

by Marsha Cohen, FFMR Volunteer Naturalist

Sometimes we forget how inspiring and satisfying being a Volunteer Naturalist at Fitzgerald can be. The tidepool tour on June 9, 2023 at Fitzgerald with 65 Tri-Valley Seek and Save (TVSS) kids, young adults and their moms was a reminder of why we volunteer. This tour kicked off TVSS's summer adventure program and, for most participants, this was the first time they had seen a tidepool. In addition to myself, Volunteer Naturalists Mike Morgan, Chuck Halterman and Gregg Langlois were the guides for this adventure.

spotting, they got to see their first urchins, ochre stars, mussels and chitons. One mother said she never knew such a beautiful place existed—that made me smile.

Two harbor seals watched our group from a safe distance in the lagoon at Seal Cove. The kids were as curious about the harbor seals as the seals were with them.

This field trip was organized by Roland Ellingson, Executive Director of Tri-Valley Seek and Save, a faith-based non-profit in Livermore. TVSS organizes activities throughout the year for low-income kids and their single parents in the Livermore area.

Roland and his team of volunteers arranged for a variety of sponsors to provide food and transportation for this day:

- Alameda County Board of Supervisors, David Haubert – District 1. This was Supervisor Haubert's first trip to Fitzgerald.
- Chick-fil-A provided breakfast for 65 adventurers.
- White Castle Tours donated a luxury bus to bring the adventurers to Fitzgerald. Supervisor Haubert "purchased" the donation of the bus at a fundraiser.
- TVSS provided a picnic lunch for everyone after the tour.
- FFMR Board President Ron Olson baked his famous pumpkin bread, as seen in the photo. ➡



FFMR Volunteer Naturalist Chuck Halterman with his tour group



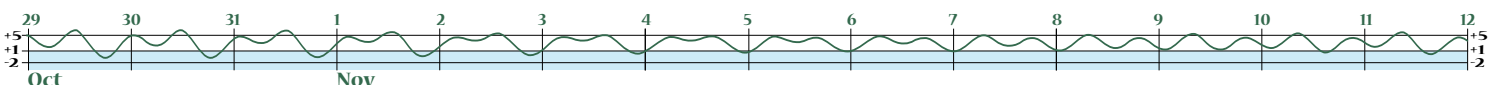
Supervisor Haubert with TVSS students



TVSS Director Ellingson at the picnic



TVSS group photo in front of their luxury bus



Letter to the Editors Re Paralytic Shellfish Poisoning

I was surprised to find out how dangerous eating mussels can be from your article “The History of Paralytic Shellfish Poisoning in California” in your June issue. Then the same week, this appeared in the *Half Moon Bay Review* Historic Headlines column:

“1939 County health officer issues warning: San Mateo County Health Officer Charles C. Gans urged Coastside resident to heed the ban on mussel harvesting. Several people reported becoming ill from eating local mussels and Gans pleads with locals to avoid the shellfish.”



Mussels, photo: Jenna Kinghorn

Wanting to know more, I checked the current San Mateo guidelines which include this warning: “When is it safe to eat recreationally harvested mussels in San Mateo County? Never assume mussels are safe to eat. While a quarantine on mussels takes effect annually from May 1st–October 31st as a safety precaution, the quarantine may become extended or take effect at any time of the year. Please call the biotoxin hotline at 1-800-553-4133 before including mussels or any shellfish on your menu.” <https://www.smchealth.org/general-information/shellfish-safety>

Then this arrived in my email making me realize that this is definitely an ongoing problem:

July 28, 2023
Shellfish Safety Notification: Sport-Harvested Bivalve Shellfish from San Mateo County
Dangerous levels of paralytic shellfish poisoning (PSP) toxins have been detected in mussels from San Mateo County. The naturally occurring PSP toxins can cause illness or death in humans. Cooking does not destroy the toxin.
The California Department of Public Health (CDPH) is advising consumers not to eat sport-harvested mussels, clams, or scallops from San Mateo County.

For the entire warning: <https://content.govdelivery.com/accounts/CNRA/bulletins/367d1d2?fclid=IwAR1eh3j2GbHMN6Egyr1a9Fa0cf0FVQFzGXm0f97OdzI2FTifJP-9nL9zo4>

Thank you, an avid *Between the Tides* reader

Never assume mussels are safe to eat. While a quarantine on mussels takes effect annually from May 1st–October 31st as a safety precaution, the quarantine may become extended or take effect at any time of the year.



➡ From beginning to end, the day was organized with precision. Starting at 6:45am (!) everyone enjoyed a breakfast before departing Livermore on the luxury bus for the trip to Moss Beach. For the tidepool tour, Director Ellingson assigned one older teen to each group. Each teen wore an orange vest to identify themselves and was responsible for ensuring the younger kids observed the rules and stayed with their Volunteer Naturalist. The kids were so fascinated by the tidepool critters they never strayed. Even the bus driver joined the tour.

After the tour, another team was assigned to set up the picnic area at FMR with tables, table cloths (!), food, condiments, garbage bags and drinks. Everyone helped with the cleanup. When they departed, not a scrap of garbage was left behind.

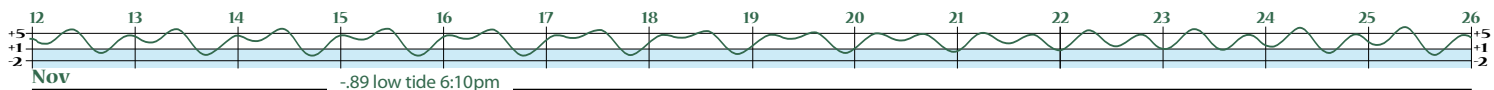
All the FFMR Volunteer Naturalists on this tour agreed that it was a fun day and a highlight of the FFMR tour year. Thanks to Roland Ellingson and Supervisor Haubert for supporting children and their families in getting out into nature and experiencing a new activity right in their own backyard.

Here is what the Tri-Valley Seek and Save families had to say:



FFMR Volunteer Naturalist Mike Morgan with his tour group

“Every person on this adventure had a terrific time—it will be a lifetime memory! Thanks!”



A Message from Board President Ron Olson

Not only would historically native plants have a better chance of surviving the unique environmental challenges that our coastal climate presents, but they could also provide an invaluable teaching opportunity.



FMR Improvements

As most of the country melts from excessive heat, most of the Bay Area has remained comfortable. Warmer days pushed our parking lot to capacity with guests visiting from the East Bay, central valley and beyond. On the quieter days, County work crews have been able to complete the task of removing tree stumps and crushed picnic tables caused by last winter's storms.

With more people reaching for the sunscreen, it is obvious that the picnic area is in need of some serious landscaping. Plans are being developed to find the best way to deal with this newly exposed area. Some would prefer replanting the cypress trees that fell. Others would prefer to see a more natural approach. Native plants that have both a historical and cultural past could be a better alternative. Not only would historically native plants have a better chance of surviving the unique environmental challenges that our coastal climate presents, but they could also provide an invaluable teaching opportunity.

Indigenous Peoples used plants in the making of tools, medicines as well as a source of food. Input from local tribal members who still call this area home would be welcomed and would present a valuable opportunity for collaboration. It would also be a great opportunity to learn how living with nature can provide a better way of life. No new planting will take place before the rainy season.

We should see minor improvements to the park fairly soon. More picnic tables should arrive and there are plans to improve the barrier that surrounds our gray whale exhibit. Any fencing on

the bluffs that needs repair or replacement will be fixed.

The project to replace the bridge that spans San Vicente Creek should be underway very soon. The good news is that a recent inspection showed that the abutments of the bridge are intact. The length of time it takes to complete the project will be determined by what damage is found once the span is removed. If, as anticipated, no damage is found we should have the new bridge in place by October. Keep your fingers crossed!

A Youthful Perspective

The FFMR Board recently added a new member to our Board meetings, Angel Tinetti, a current student at HMB High School. Some of you may have seen Angel volunteering as a seal sitter or just helping out around the Visitor Center. Her presence and thoughtful feedback will help us improve the experiences of young visitors. Please join us in welcoming Angel aboard!

Partners in Stewardship

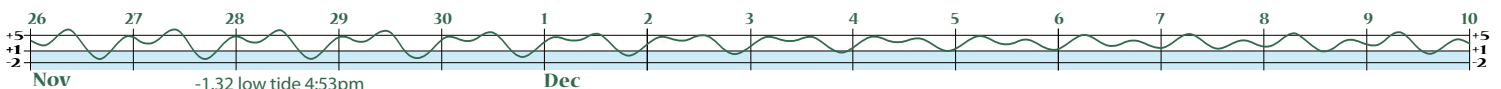
A few years ago, FFMR worked with naturalists in Marin County to develop their naturalist training program. Former Board member Marsha Cohen and I recently traveled up to Duxbury Reef for an orientation to their reef. We discussed similarities and differences in problems that each organization faces. While there, we observed some infractions: we came across a visitor carrying off a large whale bone, escorted by an off-leash dog. We educated the man about the importance of keeping his dog on a leash for safety reasons, as well as the need to keep protected specimens in place. The visitor complied and volunteered to return the item to its original place. It was a rewarding educational experience.

A Spirited Return

After a prolonged absence, FFMR has returned as a participant in the HMB Fourth of July Parade. The credit for the enthusiastic return goes to long-time Board member Jeanette Hyer. Her efforts proved contagious to our spirited group and a fun time was had by all. We are already planning for a return engagement in 2024. You can read more about our group and enjoy photographs of them at the parade elsewhere in this edition of *Between The Tides*. ♦



Ron Olson and Marsha Cohen shared their knowledge and experiences of Fitzgerald's Volunteer Naturalist Program with Duxbury Reef volunteers.





Corgi Star

Friends of FMR is back! –in the 4th of July Parade

by Jeanette Hyer

After a three-year hiatus, in 2023 we again joined up to participate in the “Half Moon Bay Ol’ Fashioned” 4th of July Parade. This is a 52-year tradition in HMB where many of the local civic, athletic, musical, and community groups participate, and there are classic cars and classy horses. Our group included: Marsha Cohen, Eric Bing, Melody Lee, Juliet Bolding, Tom and Linda Ciotti, Karen Kalumuck, Meghan Bowley, Paul Gater, Barbara Dye, Claire Tracy, and Victoria Knight. Accompanying and unsuspecting family members were given crab hats or giant kelps and pressed into service too, and we ended up being 25 persons strong. Tom and Linda Ciotti organized the 35 lbs of saltwater taffy that we tossed to the kids along the route. Without any prior plan-

ning, we were able to create an awesome Nudi Pool—6 nudibranchs strong! There were Jellyfish (umbrellas), a pod of whales, a DogStar, and a walking-talking tidepool rock, with all the associated critters along for the ride.

Part of the fun of being in the parade is seeing if the costumes are recognized by the spectators. Unfortunately, I was not recognized as the Sea Goddess (*Doriopsilla albopunctata*) that I was clearly channeling; many felt that I was more a Banana Slug. However, at least one person did recognize Eric Bing’s costume, and called out ‘Velella’ loud enough for us all to notice and happily wave.

Planning for 2024 is already underway: Marsha Cohen met up with docent-emeritus Betty Sills, who created Sealia (our wonderful life-sized seal) and had also created an amazing octopus, kelp crab, anemone, and chiton. All these pieces are going to get a glow-up in preparation for next July. We also need a music component, so start building the best sea-themed playlist ever!

There was no judging of participants this year, but I feel we would most definitely have won a first-place ribbon if there had been one! ♦

About the author: Jeanette Hyer has been with the FFMR group for at least 10 years, and doesn’t like all parades, just this one.



Jellyfish and tidepool friends



Downtown nudi pond



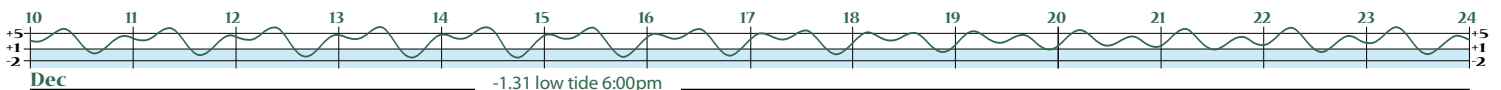
Little blue whales



Sealia rides again!



Velella and a cart of salt water taffy



Big News! \$9.5 million for scientists to explore and document Intertidal Biodiversity

by Daniel Gluesenkamp

The intertidal: This narrow strip of habitat stabilizes shorelines, purifies water, sequesters carbon, and enhances coastal resilience against sea level rise and climate change.

The DNA library will establish a comprehensive baseline assessment of California's intertidal, while delivering innovative technological infrastructure to enable powerful new tools for ongoing monitoring and evaluation.

California's intertidal zone comprises our most iconic places, including tidepools, steep rocky cliffs, sandy beaches, bays, and estuaries. Often just a few feet wide, and occupying only 5 to 10 square miles in total, the intertidal provides equitable access to the benefits of nature for 30 million Californians. This narrow strip of habitat stabilizes shorelines, purifies water, sequesters carbon, and enhances coastal resilience against sea level rise and climate change.

The intertidal also hosts tremendous biological diversity, including sponges, sea stars and sand dollars, limpets and abalone, bryozoans and holothurians, oysters and anemones, periwinkles and urchins and crustaceans and corals and most branches of Earth's ancient tree of life. Notwithstanding the known diversity, thousands of intertidal species remain undescribed by science. Publications list ~3,000 species, but the true wealth may be 10 times that. Many of these species are very small, or cryptic, and thus have been difficult to distinguish and describe using traditional techniques.

Unfortunately, the intertidal faces numerous and growing threats. Once-common animals such as black abalone are now rare, and the rate of loss is likely to accelerate. Climate change is increasing storm damage, and extreme weather and pollution are impacting intertidal communities. Rising air and water temperatures, depleted oxygen, carbon pollution and resultant acidification are projected to irreversibly impact wild intertidal communities. Sea level rise is already impacting the intertidal, and will increase in the years ahead. We need to act, to understand and to save our #IntertidalBiodiversity.

Once-common animals such as black abalone are now rare, and the rate of loss is likely to accelerate.

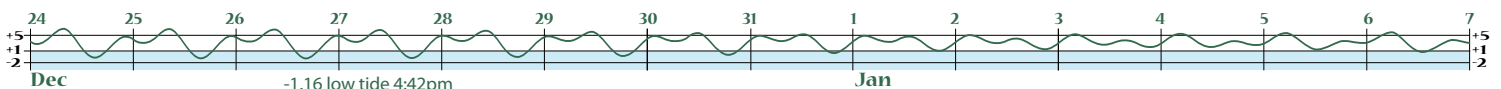
To address this urgent need, in 2021 the California Institute for Biodiversity (CIB) initiated conversations and convenings of California scientists and intertidal experts. Working with dozens of scientists, NGOs, museums and conservation practitioners, together we discussed challenges, identified needs, and ultimately mapped a set of ambitious and innovative solutions. The effort is modeled after current CIB projects developing DNA barcode libraries for insects, fungi, and soil biodiversity.

We then set out to educate legislators and decisionmakers! Assemblymember Ash Kalra of California's 27th Assembly District (San Jose) stepped forward to champion our recommendation, and after many months of ongoing advocacy, state legislators included our recommendation in their June 2023 California budget. San Mateo's own Senator Josh Becker was instrumental, as was San Francisco's Assemblymember Phil Ting. These leaders deserve our gratitude for their vision and dedication. Thanks to them, California will invest \$9.5 million to support scientists in this urgent and important work.

What is a DNA Barcode Library? It's a list of the unique IDs for every species in the intertidal. Made possible by recent advances in DNA sequencing, scientists now can inexpensively sequence DNA 'barcodes'—short sequences of DNA that make it possible to efficiently and quickly distinguish amongst cryptic species that all look similar. The approach focuses on individual specimens, obtained either via new field collecting in California's intertidal or drawn from existing natural history collections. DNA is obtained from individual specimens, barcode genes sequenced, and then those



Some intertidal creatures, image: California Institute for Biodiversity



Remembering Bob Breen

Fitzgerald Marine Reserve's first supervising naturalist
on the 10-year anniversary of his death



1990 Junior Ranger camp



Spring 2004, reflecting on his 35-year career



photo: Rob Cala



photo: Michael Wong



Bob presents HMB High student Joe Centoni with the Bob Breen Scholarship Award, Autumn 2001

A few highlights of Bob's career:

- November 1969 Bob Breen became the first supervising naturalist of Fitzgerald Marine Life Refuge.
 - 1971 Bob with Virginia Welch formed "Sea Shore Docents" to supervise the field trips
 - 1987 Bob started the summer Junior Ranger program
 - In 1995 Bob began an advanced placement class in biology and intertidal interpretation at HMBay High
 - 1999 friends and admirers established the Bob Breen Scholarship Award
 - 2001 Breen was recognized as Environmental Hero, a national award sponsored by the National Oceanographic Atmospheric Administration
 - Spring 2004 Bob retired after 35 years as the supervising naturalist at the Reserve
 - June 2007 Bob Breen named MPA Stakeholder Representative
- Bob Breen died of a heart attack on June 19, 2013 at the age of 73.



Buttons made for Bob's retirement celebration

➡ individual specimens are retained as vouchers for each specific barcode. The individual barcode voucher specimens are maintained in durable collections, permitting subsequent revisitation and analysis.

In coming years California will make important investments in coastal resilience and adaptation. These efforts can be designed to help the systems and species present at a site. Lack of information about intertidal biodiversity is a major impediment. This DNA library will change that by establishing a comprehensive baseline assessment of California's intertidal, while delivering innovative technological infrastructure to enable powerful new tools for ongoing monitoring and evaluation.

Soon, grants will begin funding museums and scientists, who will begin hiring field assistants and lab technicians. Together they will scour the coast to complete an inventory likely

to yield thousands of species new to science. Most important, in developing a voucher-based DNA Barcode Library we secure specimens of taxa that may well be lost in the years of change that lie ahead. Specimens and biodiversity samples stored in durable biorepositories will ensure that scientists of tomorrow can access the wealth of California's 21st century intertidal biodiversity. ♦

About the author: Daniel Gluesenkamp works for the California Institute for Biodiversity. He earned his PhD from UC Berkeley, directed Habitat Protection and Restoration for Audubon Canyon Ranch's 31 preserves, and ran Calflora and the California Native Plant Society before being promoted to all taxa advocacy. His recent work includes helping Gov Brown and Gov Newsom advance the ambitious California Biodiversity Initiative. Fun Fact: In 2009 Dan discovered a presumed-extinct Franciscan manzanita plant growing on a traffic island at the Golden Gate Bridge.

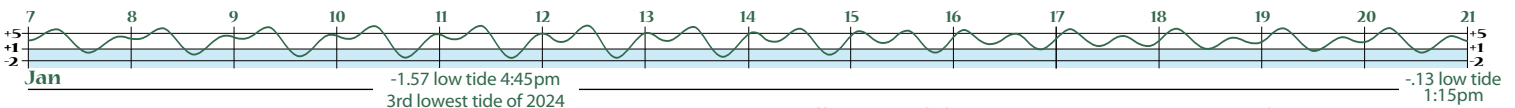


California Institute for Biodiversity

Our logo celebrates the circle of life, constant and continuous.

United but distinct, bands represent the powerful elements that create and sustain biodiversity: stardust, water, and the sky that connects us to a greater universe.

<https://calalive.org/>



FFMR Successful Fundraising through Coastside Gives

by Graham Brew, FFMR Board Member



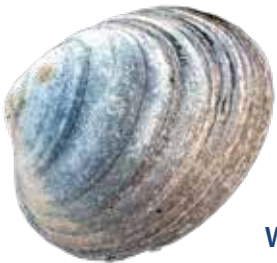
We were very successful, with 29 donations from individuals who had not previously contributed to FFMR

The Friends of Fitzgerald Marine Reserve was one of 65 non-profits that participated in this year's Coastside Gives fundraising drive on May 4th. Coastside Gives is a collective effort run by the Mavericks Community Foundation for non-profit organizations from Montara to Pescadero on the San Mateo County Coast. Total contributions across all organizations this year were nearly \$1.2 million!

The primary purpose for FFMR was to connect with new donors and fund the work of our mission via new sources. And in this we were very successful, with 29 donations from individuals who had not previously contributed to FFMR. In total, FFMR raised nearly \$3300 from the cam-

paign. This money will be used to fund the majority of a \$5000 scholarship for a designated Half Moon Bay High School student as assistance towards their collegiate studies in an environmentally aligned program.

The FFMR Board is extremely grateful to all donors—past, present, and future—who allow us to continue the work of the Friends. And the Board would like to thank all the community sponsors of Coastside Gives, and the Mavericks Community Foundation, for their generosity in making the appeal and associated prizes possible. FFMR intends to participate in Coastside Gives, in addition to our traditional end-of-year appeal, going forward. ♦



Some Tidepool Silliness

Why don't clams give to charity?
Because they're shellfish!

What did the carp say to his crush?
Don't play koi with me!

Where do shellfish go to borrow money?
The prawn broker.

What did the Ocean say to the shore?
Nothing. It just waved.

What is a blue whale's favorite James Bond Film?
Licence to Krill.

Where does seaweed look for a job?
In the kelp-wanted section.

What does seaweed say when it's stuck at the bottom of the sea?

"Kelp! Kelp!"

Why didn't the two algae ever have sex?
Because they had a planktonic relationship

What do baleen whales call a hook-up?
Netflix and krill.

What did the wise papa fish tell his son?
Keep your friends close and your anemones closer.

What did one tidepool say to the other tidepool?
Show me your mussels!

source: <https://thoughtcatalog.com/january-nelson/2018/04/35-funny-ocean-jokes-and-puns-that-will-make-you-snicker-more-than-just-a-little/>

Friends of Fitzgerald Marine Reserve

Donation Chair, P.O. Box 669, Moss Beach, CA 94038, or through our website: <https://www.fitzgeraldreserve.org/donations>

Contribution Levels:

- \$25 \$100 \$1000
 \$50 \$500 Other _____

I want to double the value of my gift through my employer's matching gift program (please enclose the matching gift forms).

Name _____

Address _____

City _____ State _____ Zip _____

Email _____