

# 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

June 2026

***Farewell Party Note:*** Carmel is just a little too far south to pop into FMR on a random Saturday or Sunday afternoon; and that means that we will see a lot less of Tom and Linda. We are going to selfishly miss their proximity, so we compelled them to come to Fitzgerald on an overcast Sunday afternoon so that we could visit and celebrate them, and remember all the history and fine times and people that make up the Friends. Even though they are trying to get rid of decades of papers and books and photos for this move, we assume that they now have space for one more book—an album we assembled of photos and memories of times spent at the reef. Thank you, Tom and Linda, for everything you have done for Fitzgerald—keep us in your hearts!

## ***Farewell to Tom and Linda Ciotti***

*by Paul Gater*

Editorial Board members Paul Gater and Kathy Barton met with Tom and Linda earlier this year at their house in Montara to learn more about their long history with the Friends of Fitzgerald Marine Reserve (FFMR). We sat around the long table that has been used by the Friends for almost 20 years for Board meetings, training class graduations, *Between the Tides* newsletter folding and so many other activities for FFMR.

They opened by saying, “It’s been a tremendous honor to be part of this organization. We’ve enjoyed our time and would do it again. We’ve made so many good friends through FFMR.”

Like many of us, Tom and Linda are transplants from other parts of the country. Tom came to the Bay Area from Michigan in 1964 and in 1989 bought the Montara house that would eventually become their home. Linda moved from Virginia in 1976, where “there were no tidepools!” Both worked in the legal profession and met through a law firm where Tom was a partner. They married in 1996 and ‘temporarily’ moved from a house in Los Altos Hills to the Montara house at the end of 2007. Tom retired in the same year and they never moved back!

We asked how they learned about the Reserve and the Friends organization. “I used to walk past the Reserve on the way to the Moss Beach Distillery,” said Tom. “I was already a donor to the Friends and had arranged for summer associates from the law firm to come over for tidepooling.” Linda had taken classes at Año Nuevo that were taught by FMR’s first Supervising Naturalist Bob Breen and then learned about the Reserve through Tom. “We had to show a lot of perseverance to get involved with the Friends,” said Linda. “We wanted to be volunteers and signed up for the 2001 training class which in those days was taught by Bob Breen. But he didn’t reply to our messages! In 2002 we tried again and went to the training location at the Coyote Point



*Linda Ciotti with Memory Album, Tom Ciotti, Julie Walters and Ranger Rob Cala.*



*A few of the many “fans” who dropped by to say thank you and farewell.*

Museum. Two women showed up to tell us the class had been canceled!” They were finally successful in taking the class in 2003 at the Museum. There were 13 weeks of lecture-style classes with occasional overhead projection presentations, and only one visit to the coast. “Bob was very strict on passing people. Our last class was to conduct a tour for third-graders and based on our performance Bob would decide if we would become volunteers” said Linda. (This turned out to be the last FFMR naturalist class that Bob taught.)

*continued on page 2*

# Friends of Fitzgerald Marine Reserve

P.O. Box 669  
Moss Beach, CA 94038  
[www.fitzgeraldreserve.org](http://www.fitzgeraldreserve.org)

### Board of Directors:

- Graham Brew
- Joseph Centoni
- Susan Evans
- Cynthia Giovannetti
- Roger Hoppes
- Jeanette Hyer, Ph.D., *Secretary*
- Karen Kalumuck, Ph.D., *President*
- Gregg Langlois, *Vice President*
- Elaine Reade
- Jean Replicon
- Scott Snow, *Chief Financial Officer*

### Our Mission:

The protection and preservation of the Fitzgerald Marine Reserve as a unique intertidal and coastal environment through the promotion of educational and experiential activities for students, visitors, and researchers.

### Between the Tides Editorial Board:

- Kathy Barton, Ph.D.
- Sarah Carter, *Editorial Board/FFMR Board Liaison*
- Paul Gater
- Martie Sautter
- Jody Stewart

### Design and Production:

Martie Bateson Sautter  
Sautter Graphics and Print

### Webmaster:

Galen Goyer

### Banner photo:

Rob Cala

## Farewell *continued from page 1*



2024 4th of July Parade—the taffy throwers



12-2024-Volunteer Luncheon: Linda was awarded The Virginia Welch Memorial Award



6-2021 Reopening after Covid



7-2019 FMR 50th anniversary

L: Linda and Tom watching the ceremonies. Mary DeLong offered accolades to them both, referring to Tom as *The Top Snail* and creating *The Top Mussel Award* for Linda.

R: Tom describes the geologic history of the reserve with visitors who were especially fascinated by the whale fossils.



*“Linda is still amazed that so many students who come to the reserve have never seen the ocean before.”*



2008 Volunteer Spotlight article

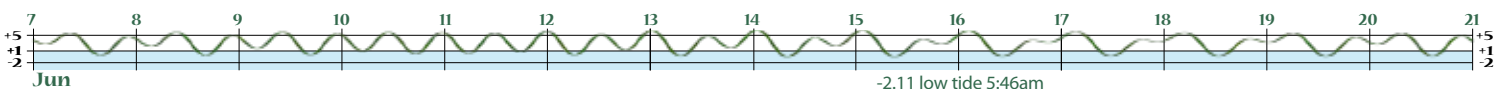
*Tom started visiting FMR and in 1989 became a member of FFMR. Tom says if he could have his wish, his “dream job” would have been to be the ranger at FMR!*

The graph displayed across the page bottoms shows tides for 6/7/26 to 10/24/26 at Pillar Point 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 Pillar Point Harbor:

-2.11	6/15	5:46am	-.57	9/8	3:21am
-.79	6/29	5:34am	.33	9/23	3:20am
-1.79	7/14	5:33am	.6	9/26	5:16pm
-.52	7/29	5:43am	-.27	9/30	8:26pm
-1.21	8/11	4:29am	-.17	10/11	6:08pm
-.13	8/26	4:36am			



**Farewell** *continued from page 2*

Linda “dove in headfirst” as a volunteer with the Friends. “I found the intertidal mesmerizing” she said. “There was much more critter activity than there is now and we saw everything we’d studied in the class and more. We were allowed to pick up bat stars and hermit crabs (which of course cannot be done now!).” Linda started leading tours and remembers having so much fun with the kids, especially if they had already studied about the tidepools. “One teacher in particular would assign each student an intertidal animal to study and write a report on before the field trip. It was then so great to tell the kids to let me know when we found their animal, and then ask that student to tell the others about it. I could just fill in some additional info but it made for a great way to keep the kids engaged, which sometimes could be more challenging!”

Tom joined the San Mateo County Parks (SMCP) Foundation Board and was their Treasurer for several years. “We didn’t like the Reserve signage and found many better examples in Oregon State Parks. We showed photos of these signs to the County Parks Department and even offered to pay for new signs at the Reserve. After several attempts to get the Parks Department them to accept a donation for new signage, they declined. Following that the Foundation got involved.” It wasn’t surprising for us to hear that new signs went up in the Reserve eventually.

We asked, with some trepidation, if Tom and Linda could give us a brief list of the activities and ‘things’ they’ve done for the Friends over the years. There isn’t enough space in this issue for the full list!

Linda and Tom joined the FFMR Board in late 2003. In the beginning, Linda was much more involved than Tom who was still working at the time. Nevertheless, Tom worked on the 2004 Fitzgerald Marine Reserve Master Plan with SMCP and consultants. They both attended every training class beginning in 2003 and Linda worked with Mary DeWolf for several years in managing the classes. “I took over the training classes from Mary in 2005 and organized them for the next 12-13 years. I got to know everyone and became sort of a the contact person for everything,” she says. “In 2008, I decided we needed a Volunteer Coordinator which the board approved and that person took over my duties. I dropped off the Board in 2024 and have really missed the contact I had with everyone.” Tom added that while Linda organized the work for setting up the training classes, “I was the muscle, moving stuff around

for the classes and navigating the many different locations we had to use.”

Both have been active Board members—Tom has held positions as both President and Vice-President for a number of years. He mentioned that one of his goals as President was more community engagement by the Friends, which led to our participation in the July 4th Parade and tabling at various events. Additionally he says “I’ve presented FFMR scholarships at the high school and conducted land tours for citizens who are not physically able to get onto the reef. I was also instrumental in the inception of the Marine Protected Areas Collaborative Network together with Marsha Cohen. This network is now Statewide. We’ve had countless meetings with County Parks staff on every issue imaginable. And we’ve enjoyed folding and mailing the *BTTs* with other willing volunteers for many years.” Many issues of *BTT* have included articles that were extensively researched and written by Tom. “I find things that are interesting and that I’m curious about. I do a lot of online research as well as listening to podcasts and reading scientific articles. It takes a lot of time but I love learning and researching.”

Tom and Linda have been incredible financial supporters of the science department at Half Moon Bay High School for the last 10 years. The Half Moon Bay Review published an article about their support in 2018. They said it would not have happened without connections made through the Friends. They also provide funding to the Cunha Intermediate School science department and plan to continue their support for both schools after they move to their chosen retirement community in Carmel Valley.

“We’re moving to a place that ticks a lot of boxes for us,” said Linda. “We will be close to the marine environment and want to continue volunteering outdoors—perhaps at Point Lobos or Point Sur Lighthouse. But not the Monterey Aquarium because we both want to be outside.” Tom added “Point Lobos has a Foundation and there’s a Carmel Valley Historical Society. We might also try to contact the local indigenous tribes.”

We’re sure we speak for the FFMR volunteer community in saying that we will miss Tom and Linda greatly. We wish them all the best for their new life in the Carmel Valley. ♦

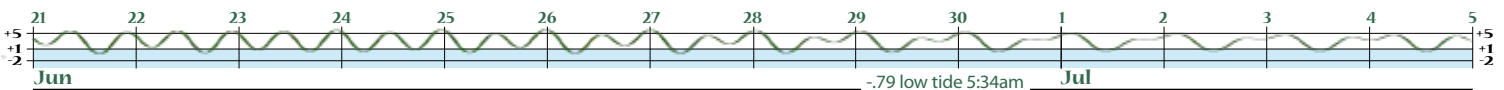


*Tom and Volunteer Naturalist Hope Suchsland*

---

*We’ve had countless meetings with County Parks staff on every issue imaginable. And we’ve enjoyed folding and mailing the *BTTs* with other willing volunteers for many years.*

---



# Penitella penita: The Common Piddock, or Boring Clam

story and photos by Sarah Comey Cluff, FFMR Volunteer Naturalist



One of the questions most-asked by visitors: "What makes these funny-face holes in the rock?"



The clam swivels its rough-edged shell back and forth around its anchoring foot to drill these holes in the rock.



The piddock's flat-tipped double siphon is seen here retracted into the rock, surrounded by encrusting coralline algae.



A broken piece of reef rock and its former resident clam perfectly demonstrate the piddock's erosive power.

Over 200 species of boring clams are located along the world's coastlines. Our most common local version, the common piddock, ranges along the west coast of North America from Alaska to Baja California. They can be found in the mid-intertidal zone to 22 meters deep water where they bore into shale and other rock. They can reach densities of up to 100 clams per square meter. For harbor building and maintenance, the impact of boring clams is taken seriously into account.

For the average tidepooler, common piddock are most obvious in the absence they leave in the rocks they once inhabited (known as adder or hag stones and highly valued for their shamanic powers.) Their living form can be less obvious and more difficult to spot. Only 2 cm across, their flat-tipped compound siphon can be easily missed when in a retracted state. During low tide when exposed to air, retracting their siphon into the rock keeps them safe from predators such as crabs, birds and predatory gastropods, as well as from dehydration.

When submerged during high tide, or when the rock they live within is covered with sand, piddock will extend their compound siphon upward into the water they depend on to feed and breathe from. The siphons can extend, expand, contract and retract as needed to actively control water flow. The larger intake siphon is lined with frilly extensions to block larger items from entering while allowing oxygen and plankton-rich water to flow inwards across their gills and into their stomach. The smaller siphon shoots waste and oxygen-depleted water back outwards.

Piddock are suspension filter feeders, primarily eating phytoplankton from the water that passes through their bodies, but as suspension feeders they are obligate omnivores. It is possible, even probable, that they eat their own piddock plankton offspring on occasion.

But how do they get into the rocks?!? Broadcast breeders, each piddock clam is either male or female and

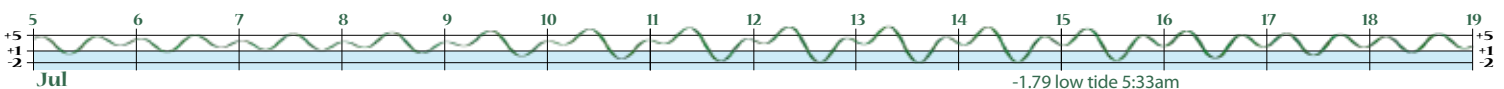
when they have reached their adult phase, they stop growing and eating. They then suck in their large anchoring foot, transform it, and dedicate the majority of their internal structure to gonads. This gives whole new meaning to playing footsies! When conditions are just right (some possible considerations are: water temperature, salinity, season, lunar cycle, tidal phase, chemical signaling), the adult gonadal piddocks release up to a million eggs or sperm each at a coordinated time to increase the chance at fertilization. Then the adult dies.

After a 3 week timeframe in which a common piddock changes its planktonic form from fertilized egg to trochophore (eating and propulsing) to veliger (swimming), the individual will 'smell' out a colony of its own kind. They like shale, sandstone or other soft rock and to be near other already established juveniles who have proven the area to be a success, confirming the aphorism "Location, location, location!" The piddock then undergoes an irreversible metamorphosis to the final pediveliger phase with creation of a foot that holds on to the rock and tastes the rock to confirm for suitable habitat before finally committing themselves and begin boring with their shell.

The anterior portion of their shell has rough ridges laid down at an angle. By use of 2 internal adductor muscles, the clam can swivel its shell back and forth around its anchoring foot and the shell acts as a drill into the rock. They drill, then stop to grow in two phases that cycle about every 15 days. They can live for 20 years or more, boring at about one cm per year, 20 cms deep or more over a lifetime. Once they die and leave their hole behind, it creates a new home for another creature such as tiny crabs, snails and bryozoans

Bonus Math Problem: If 100 clams living in a square meter live 20 years, how much rock will they erode?

200 liters of rock! This weakening of the substrate allows the pounding surf to break off large chunks of the reef, exposing the next layer of bedrock for future piddock generations. ♦



## Message from President Karen Kalumuck



The ancient Greek philosopher Heraclitus is credited with the idea that the only constant in life is change. He likened change to a flowing river, in that one cannot step in the same river twice. Likewise, the ebb and flow of the ocean at Fitzgerald Marine Reserve sets the stage for each and every visit to be an adventure with new and exotic organisms waiting to be discovered, like precious jewels among the rocks.

Like nature, change is a constant in our everyday lives and the Friends of Fitzgerald Marine Reserve is experiencing its share. At our March Board of Directors meeting Ron Olson stepped down as President and I was elected as his successor. We deeply thank Ron for his years of hard work and humor with our volunteers and County Parks Rangers partners. Gregg Langlois is the new Vice President of FFMR, Jeanette Hyer is continuing as Secretary, and Scott Snow remains our CFO.

As I write this, the 2026 FFMR Volunteer Naturalist class has graduated, adding twelve more enthusiastic volunteers to our ranks. Countering the addition of these naturalists, long time volunteers Linda and Tom Ciotti will soon relocate to Carmel. Tom spent many years as FFMR President as well as being a tour guide and champion of the FFMR Visitor Center. Linda filled innumerable roles including Volunteer Coordinator (itself a complex of dozens of “jobs”), tour guide, and liaison to local schools and other organizations. You can read more about the class graduates and the Ciottis in this issue of BTT.

As for myself, I am a proud member of the (Training) Class of 2015, and have been a member of the Board of Directors since 2019, the last 5 years serving as Vice President. I have had the honor of developing and introducing new information and experiences to our volunteers, readers of *BTT*, and FMR visitors, including creating *The Terrestrial Vegetation of Fitzgerald Marine Reserve* guide available for download on the FFMR website. I head up the Quarterly Research Surveys that were initiated six years ago, and with Gregg Langlois introduced the popular Plankton

and Dock Critter Paloozas held monthly at the Visitor Center. Along with Gregg, Marsha Cohen, and San Mateo County Parks personnel, we have reorganized the visitor center to make it more user-friendly and inviting for both Volunteer Naturalists and FMR visitors.

Despite my familiarity with FFMR, the departure of Linda and Tom, and Ron’s stepping down as President (thank goodness he is remaining a volunteer and available to answer all of my questions!), it feels a bit like the training wheels have been removed from my bike. They all have a deep wealth of knowledge of the history of FFMR, initiatives tried, relations with our San Mateo County Parks Rangers and administrators, and the wisdom that comes from experience. FFMR has archived materials regarding our history, but nothing can replace the counsel of the folks who lived the experiences. I will do my very best to honor their legacy at FFMR.

In the coming months, the Board of Directors and I hope to introduce opportunities that will strengthen our Volunteer Naturalist group. We strive to have more volunteer enhancement opportunities, such as the trip to the Marine Mammal Center mentioned in this issue, as well as other educational and social gatherings. Swapping stories from the reef and learning together will help us become a community dedicated to bringing awareness of the unique FFMR ecosystem to our audiences. We have initiated a long-term mentoring plan with the class of ’26 graduates in the hopes of improving volunteer satisfaction and retention. This summer, we will be taking a close look at our Training Class and introduce changes to better suit the needs of the participants and our mission. We will also embark on the creation of a 5-year Strategic Plan. The hope is that this plan will provide us with a guide for decision making that will balance our mission driven impact with our sustainability.

While change is as inevitable as the ebb and the flow of the tides, we are looking forward to embracing ours. Our work will continue to support the goals of our mission statement, “to protect and preserve FMR as a unique coastal environment, through the promotion of educational and experiential activities for students, visitors, and researchers.” ♦

---

*Despite my familiarity with FFMR, the departure of Linda and Tom, and Ron’s stepping down as President it feels a bit like the training wheels have been removed from my bike.*

---



Farewell to Spring  
*Clarkia amoena*  
Annual Herb  
Native

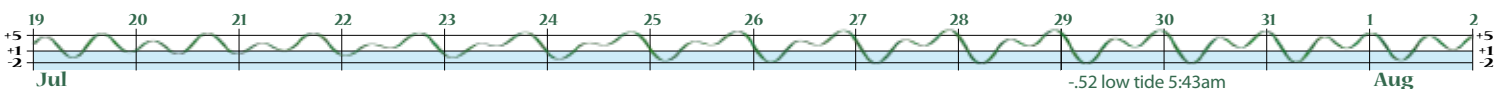
Native Americans used the seeds as food – dried, cooked into an “oatmeal”-like meal, or mixed with water as a beverage.

*from: The Terrestrial Vegetation of Fitzgerald Marine Reserve*

---

*The ebb and flow of the ocean at Fitzgerald Marine Reserve sets the stage for each and every visit to be an adventure with new and exotic organisms waiting to be discovered, like precious jewels among the rocks.*

---



# 2026 FFMR Volunteer Naturalist Training Class

by Susan Evans

## CONGRATULATIONS to the GRADUATES

**Sam Alcott**  
**Tracy Arines**  
**Lana Bebing**  
**Sarah Cluff**  
**Tommy Dachauer**  
**Aster Espinosa**

**Brandt Grotte**  
**Rachel Gulbraa**  
**Diana Kochieva-Oren**  
**Elisa Mora**  
**Lisa Nguyen**  
**Jacqui Ostermann**



Aster and Elisa



Rachel and Sam



Sarah and Tommy



Lana, Lisa and Brandt

This year's class was impressive with their previous accomplishments. Six had travelled/studied in foreign countries. Five spoke another language (some several). Our two graduate students attended Stanford and UC Berkeley. Six had been volunteer naturalists at other parks. Four were certified divers (in So. America, Baja, Panama, Borneo, Malaysia, and Fiji). And one worked at NOAA and had previously undertaken deep sea ocean expeditions in Honduras, Panama and Easter Island.

Thank you to all our many volunteers who helped with the class: Joseph Centoni who taught all major phylums this year and other speakers Bill Kennedy, Irina Kogan and Nicole Thometz. Thank you to Paul Gater for low tide sheets, Sarah Carter for assistance with notes, binder organization and exams, and Ron Olson for mentoring, jacket ordering and pastry delights. Thank you to Deborah, Karen and Tom who gave us our history/plant bluff experience. And, finally, thank you to Jeanette and Cynthia for a very lovely and delicious class party.

Two changes to the class this year. 1. Katherine Wright gave a lesson on Interpretive Techniques. 2. Students wrote and gave oral reports on their favorite marine animal. Great reports including: Velella Velella to Baleen Whales! See the Common Piddock report in this *BTT* issue on page 4!

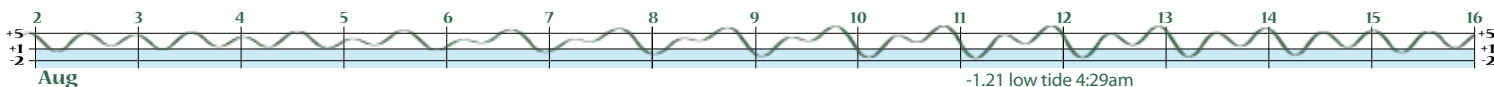
One week after the class ended there was glorious news! Brandt and Sarah had teamed up to lead a tour and from all accounts it was a resounding success!

As fate might have it, the next day at a "fair" I ran into Joseph Centoni's HMBHS teacher when Joseph was a senior. She told me Joseph once had suggested to her various "improvements" for HER class! She said she later tried them and he was correct!

Here's wishing the Class of 2026 many happy years of tidepooling and don't be afraid to make improvements where needed... 😊



Front: Diana, Tracy, Lisa, Brandt, Lana, Susan, Rachel; Back: Elisa, Jacqui, Aster, Ron, Sam





Rachel, Lana and Elisa at Pillar Point Harbor



Aster, Jacqui, Brandt and Lana

*This year's class had impressive previous accomplishments from travel to foreign countries to diving certification and deep sea experience.*



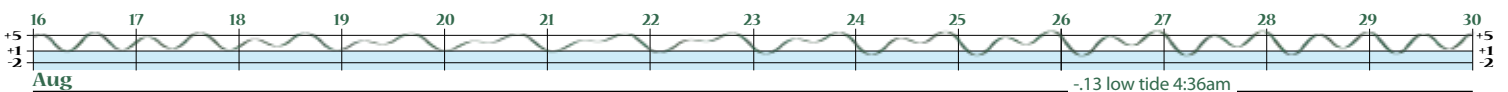
Front: Diana, Lana; Middle sitting: Tommy, Elisa, Pat, Jacqui; Back: Brandt, Rachel, Ron, Sarah, Aster, Tracy, Susan



Two exciting finds on their first day on the reefs: a Green-lined Shore Crab and an Octopus!



Front: Lana, Lisa, Jacqui; Back: Tommy, Sarah, Joseph, Irina, Brandt, Elisa, Susan, Diana, Aster



# First Flush

Clifton Herrmann (Water Quality Specialist) and Grace Allen (Water Quality Technician)  
of the San Mateo County, the Resource Conservation District  
interviewed by Sarah Carter, FFMR Volunteer Naturalist

---

*Since First Flush began in San Mateo County in 2003 it has helped build a long-term record that supports water quality protection and public education.*

---

*Click below for the entire 2025 First Flush Water Quality Results Report*  
<https://drive.google.com/file/d/17jmCXCL6x7xN3qb1iOjeMtf3d70U5aZV/edit>

---

First Flush is a community science program that looks at water quality after each year's first major rainstorm. This early storm washes pollutants accumulated on roads, rooftops, and other surfaces during the dry season into our waterways and the ocean. Sampling provides insight on how land-based activities affect coastal water quality.

The program relies on volunteers to collect samples from stormwater outfalls, creeks, and creek mouths throughout the region. First Flush is conducted across neighboring counties and is part of a coordinated program managed by the Monterey Bay National Marine Sanctuary. In San Mateo County, the Resource Conservation District (RCD) coordinates local monitoring efforts at 16 sites on the coast as part of this larger, multi-county program. One of them is at Fitzgerald Marine Reserve.

Since First Flush began in San Mateo County in 2003 it has helped build a long-term record that supports water quality protection and public education. Combining community participation with long-term monitoring, the First Flush program provides valuable information that helps guide stewardship efforts, supports informed decision-making, and increases public awareness of how our everyday activities influence coastal water.

Clifton Herrmann (Water Quality Specialist), Grace Allen (Water Quality Technician), and I discussed the program:

## Which pollutants does the First Flush program test for?

The first thing we test for is fecal indicator bacteria, specifically E. coli and enterococci. These bacteria are akin to beneficial gut bacteria, and what many find surprising is that they're not the ones that make you sick. The reason we call them "indicator bacteria" is because we know they come from the gut of warm-blooded animals - so they indicate the potential presence of pathogens associated with poop such as salmonella or norovirus. We test for metals, specifically copper, lead, and zinc, which can have various impacts on human or ecological health. We test for nutrients, specifically nitrate and orthophosphate, which can become an ecological concern if there's too much in the water.

And lastly, we test for total suspended solids. This is relevant because contaminants can bind to sediment particles and be transported that way.

## What did the water near Fitzgerald Marine Reserve tell us in 2025?

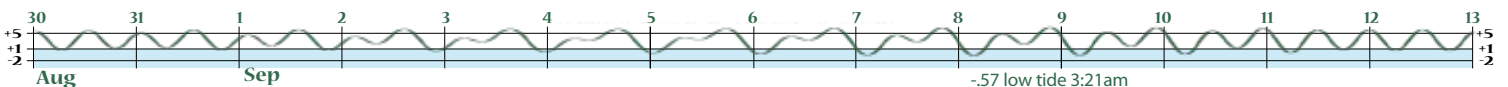
San Vicente Creek drains into Fitzgerald Marine Reserve and is recognized by the State as being impaired for bacteria. This is partly because there are regular occurrences of bacteria and partly because it happens to be a creek we know about because it is monitored. The RCD and our partners have been working for decades to try to solve this issue, and it really is a collaborative effort.

Bacteria levels at the creek mouth were still high in 2025, but that's common during First Flush. Sampling takes place when contaminants that have built up across the landscape throughout the summer are flushed out to the ocean with the first major rain. In fact, many samples have historically exceeded the bacteria test's detection limit, meaning concentrations were too high to measure precisely. What's encouraging is that in recent years, more of our results have fallen within the measurable range, and we've even had a few instances of meeting recreational standards. Of the eight times E. coli has been within recommended limits during First Flush since 2009, two occurred at San Vicente Creek. That suggests that ongoing efforts by the RCD, watershed partners, and land stewards may be helping reduce bacteria levels over time. And especially for an impaired watershed, the data look good compared to other sites.

San Vicente Creek was within recommended limits for all other parameters we tested. Copper and lead showed up in small amounts, while zinc, nitrate, and orthophosphate did not show up at all, and suspended solids were low. Overall, this gives us a positive picture.

## Did any of the results surprise you?

One thing that stood out to us early on is that nitrogen isn't as big of a concern on our coast as it can be for some neighboring counties with agriculture. Nutrients often get lumped together, but they don't always behave the same. Nitrate is a nutrient more commonly associated with agricultural



runoff, while phosphorus, another nutrient, tends to be linked to residential sources like wastewater. Along the San Mateo County coast, we generally don't see nitrogen as a major water quality issue during First Flush.

Over time, we also start to see patterns in the data. Some sites will show occasional spikes. For example, Montara Creek had elevated suspended solids in 2023 which corresponded with spikes in copper and zinc. But in the following years, conditions improved. Those one-time spikes can look alarming at first, but we are particularly interested in chronic problems. That's where we focus on the need to take action.

**What caused San Mateo County to test certain sites at first? How does the program decide where to expand?**

We began partnering with Surfrider and the equestrian facilities on San Vicente Creek in the early 2000s to support them in problem solving. From there we were invited to help with bacteria that were known to persist at a spot in Pillar Point Harbor. We pretty much continued to expand based on where people needed help and where we saw the most chronic inputs of pollution.

First Flush gives us a snapshot of what's being washed out, so where we sample matters. We focus on discharge points, where creeks and storm-water outfalls meet the ocean, since they provide a clear picture of what is or isn't coming out of the watershed.

Since the program has grown, the goal has been to expand coverage to include major outfalls along the coast from Pacifica to Half Moon Bay. That approach helps us build a more complete understanding of water quality and identify areas that may need closer attention over time.

**Do you have advice on how people should best engage with coastal water around these first rainfall events?**

It's best to avoid contact with coastal water for about 24 hours after these first rain events of the season, sometime between late September and early December. That said, we know the ocean beckons! If you do visit, try to stay at least 100 ft away from creek mouths and stormwater outfalls, where contamination is most concentrated.

The main health concern is accidentally ingesting water or exposing open wounds, so taking

a few precautions goes a long way. If you do get in the water, it's a good idea to shower as soon as you can afterward.

**How can people get involved and help with First Flush 2026? What does volunteering entail?**

First Flush is powered by volunteers, and we're always looking for more people to join. If you're interested, you can reach out at FirstFlush@sanmateorcd.org to get involved.

We will start with a virtual training on August 26th at 6:30pm, which covers the program and volunteer roles. After that, we will host a series of two or three in-person trainings where we walk through sampling methods and safety protocols.

*It's best to avoid contact with coastal water for about 24 hours after these first rain events of the season, sometime between late September and early December.*

**2025 First Flush Water Quality Results**

Analyte	Potential Sources	Effects
Fecal Indicator Bacteria (FIB) ( <i>E. coli</i> , enterococci)	Feces of warm-blooded animals (humans, dogs, horses, wildlife, etc.)	Pathogens that can harm human health could be present alongside the bacteria (the bacteria themselves are not harmful – hence "indicator").
Nutrients (nitrate and orthophosphate)	Fertilizers, pesticides, detergents	Ecosystem and recreation impacts. Excess nutrients can cause Harmful Algal Blooms (HABs) and/or oxygen depletion in waters.
Metals (copper, lead, zinc)	Gutters/roofs, brake pads, tires, industrial waste, treated lumber, paint, fires	Human health and environmental impacts from heavy metal toxicity (concentration-dependent), including reproductive effects and/or mortality of aquatic organisms.
Total Suspended Solids (TSS)	Construction, erosion, agricultural runoff, fires	Mobilization of contaminants, and aquatic organism impacts such as habitat sedimentation and respiratory inhibition.

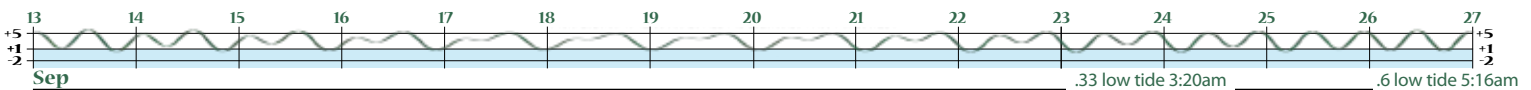
*Analytes tested in 2025*

It's also a great chance to meet your team before the season begins. Our virtual training will be recorded, and our hope is that all volunteers attend at least one of the in-person training, especially if you're new to the program.

Pacifica to Half Moon Bay is a large area, so having a strong volunteer network helps us cover the coast efficiently. Storms are unpredictable, so we don't know when the event will happen—but it typically occurs sometime between late September and early December. That means volunteers are on call during the wet season and flexibility is appreciated.

For many returning volunteers, one of the most rewarding parts is seeing how their sites work over time. Year after year, these field observations help build a clearer picture of coastal water quality, and that long-term perspective is what makes the program so valuable. ♦

*Year after year, these field observations help build a clearer picture of coastal water quality, and that long-term perspective is what makes the program so valuable.*



# Phytoplankton of the San Mateo Coast

## 4th in a series on Phytoplankton

by Gregg Langlois, FFMR Volunteer Naturalist and Board Member

The prevalence of filter-feeding invertebrates on the Fitzgerald Marine Reserve reef is testament to the abundance of food present in plankton. From secretive sponges and bryozoans to the more obvious bivalve molluscs and barnacles, plankton is the food of choice. FFMR began sharing this world with the public at the monthly “Plankton and Friends” pop-ups (learn about these FMR Visitor Center events and the experiences of one of our “Planktoneers” in the March 2024 and December 2025 *Between The Tides [BTT]*). Let’s explore this microscopic community along the San Mateo coast that sustains such an abundance of life.



Figure 1. The armored dinoflagellate *Alexandrium catenella* and the diatom *Pseudo-nitzschia*.

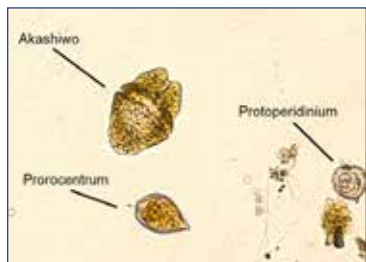


Figure 2. The unarmored dinoflagellate *Akashiwo sanguinea* and armored dinoflagellate *Protoperidinium*.



Figure 3. A calanoid copepod and the armored dinoflagellates *Tripos furca* and *Protoperidinium*.

‘Plankton’ includes any organism living in the water that cannot move against currents or wind (from the Greek *planktos*, meaning “drifter”). They range from microscopic (single-celled algae, bacteria, viruses) to large (jellyfish). Familiar groups include phytoplankton and zooplankton. Phytoplankton are the base of the marine food web, enabling the diversity of ocean life to exist. Most are photosynthetic, producing up to 50% of the earth’s oxygen. They use sunlight and dissolved carbon dioxide from the atmosphere to produce energy. Phytoplankton are also largely responsible for the ocean’s ability to absorb at least 30% of all CO<sub>2</sub> emissions, making them one of the world’s largest ‘carbon sinks.’ This capability is threatened by ocean acidification and ocean warming, which reduce their ability to absorb CO<sub>2</sub>.

The most common phytoplankton are diatoms and dinoflagellates. Diatoms are single-celled, photosynthetic algae. They are incredibly diverse (over 20,000 species),

accounting for the majority of the oceans’ phytoplankton biomass. Diatoms have silica cell walls (they live in glass houses!) and have a variety of shapes, typically round (centric) or elongated (pennate). Asexual reproduction allows many species to form colonies of numerous connected cells. Diatoms cannot swim, partially relying on buoyancy currents (e.g., upwelling) to keep them afloat. Many diatoms have silica spines that, like the colonies of linked cells, provide extensive surface area to avoid sinking and may also discourage grazers like zooplankton.

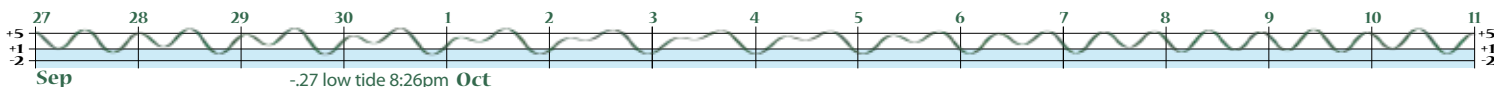
Dinoflagellates are not closely related to diatoms and are less diverse (~1700 species). They have two flagella for swimming and can be ‘armored’ (covered in cellulose plates, like *Alexandrium* in Figure 1), or ‘unarmored’ (a less protective plasma membrane covers the cell). Some photosynthesize (autotrophs), some eat other organisms (heterotrophs) including diatoms, and some combine these two strategies (mixotrophs). Dinoflagellates thrive in warmer water that occurs in the absence of upwelling.

Zooplankton are the primary grazers of phytoplankton and comprise a variety of organisms, some temporary (like free-swimming larval stages of many invertebrates and fish) and some permanent (for example, jellyfish and crustaceans like the copepod in Figure 2).

Some phytoplankton produce potent neurotoxins that can accumulate in various seafood species. The dinoflagellate *Alexandrium* (Figure 1) produces the paralytic shellfish poisoning (PSP) toxins that have historically caused many human illnesses and deaths, including 55 cases and 5 deaths in San Mateo County (see the June 2023 *BTT* for the mystery story of this toxin’s discovery in California). Some species of the diatom *Pseudo-nitzschia* (Figure 1) produce domoic acid (December 2023 *BTT*), a neurotoxin responsible for severe impacts to California’s marine mammals and seabirds and, potentially, humans. The California Department of Public Health’s (CDPH) Marine Biotxin Monitoring Program routinely monitors shellfish for these toxins. A novel addition to this monitoring effort was the development of a volunteer-based phytoplankton sampling program along the California coast.

Phytoplankton monitoring can provide early detection of toxic blooms, allowing focused seafood monitoring for improved human health protection. Data is also collected on the distribution and relative abundance of other common phytoplankton. Over time this information can reveal regional and seasonal changes in phytoplankton species composition and abundance, helping guide CDPH’s assessment of risk.

Let’s look more closely at the phytoplankton data for San Mateo County. The first volunteer samples were collected in 1993 at FMR by park aid (and future FFMR Board Member and President) Ellen Gartside; Bob Breen, the first Supervising



Naturalist at FMR, also collected samples. Since then, a variety of people and organizations have contributed to this sampling program, including numerous citizen volunteers, the San Mateo County Environmental Health Department, The Marine Mammal Center volunteers, the Greater Farallones National Marine Sanctuary, U.C. Santa Cruz (Año Nuevo), and the California Department of Fish and Wildlife.

This collective effort has produced a total of 2,370 San Mateo samples through 2025, comprising over 27,000 observations of 270 genus/species. Not surprisingly, diatoms accounted for 14 of the 20 most numerous phytoplankton observed. The most common diatoms were *Chaetoceros*, *Ditylum*, *Skeletonema*, *Thalassiosira*, and *Pseudo-nitzschia* (Figures 3, 4, and 1). The next three most common phytoplankton are all dinoflagellates: *Proroperidinium*, *Prorocentrum micans*, and *Tripos furca* (Figures 2 and 5).

When the frequency of ‘Abundant’ observations ( $\geq 50\%$  of all species present in a sample) is plotted over time, several patterns emerge (Figure 6). Diatoms dominate the spring assemblage when upwelling is typically strongest, declining through summer. For the most common diatoms, *Skeletonema* often increases in abundance earliest, disappearing from the assemblage by summer. *Chaetoceros* abundance increases as *Skeletonema* declines, shadowing its summer decline through the end of the year. *Pseudo-nitzschia* shows a typical spring increase, extending into summer before slowly declining. In contrast, *Thalassiosira* is seldom abundant but is often common (10-49%) between February and June and present in low numbers the remainder of the year. Many other diatoms are often present in low numbers, seldom increasing significantly in abundance.

Dinoflagellates tend to occur later in the year as diatoms decline. *Tripos* becomes more abundant in late summer, while *Prorocentrum* is often lurking in low numbers through spring and summer, being most abundant from September through November. The most frequently observed dinoflagellate, *Proroperidinium* (not plotted), is never abundant but is often present in low numbers.

Returning to the intertidal reef, let’s consider how these seasonal differences in phytoplankton composition and abundance may affect the filter-feeders. Research into the nutrition of phytoplankton shows that diatoms and dinoflagellates produce the polyunsaturated fatty acids considered important for human (and animal) health, the omega-3 and omega-6 compounds found in fish oil. Because diatoms are much more diverse and productive than dinoflagellates, they are therefore a more significant food source for filter-feeding invertebrates. The planktonic larvae of the reef’s marine invertebrates also benefit from these nutritious diatom blooms. It is no surprise, then, that reproduction in many marine invertebrates is synchronized with diatom blooms, ensuring an ample food supply for their offspring. This grazing pressure is a threat to the survival of the diatom community, however, and there is evidence that compounds produced

by at least some diatoms can interfere with the reproductive success of some grazers, like copepods (Figure 3).

The next time you visit FMR to enjoy the abundance of life on the reef, take a moment to contemplate the ocean’s microscopic ecosystem that helps sustain this ecological diversity. You can also visit our planktonic friends ‘in person’ by joining FFMR volunteer naturalists at the next “Plankton and Friends” pop-up. Check the San Mateo County or FFMR web sites and Facebook pages for the date and time of the next event!

### Acknowledgements and References:

Photos and data courtesy of the California Department of Public Health’s Marine Biot toxin Monitoring Program: <https://www.cdph.ca.gov/Programs/CEH/DRSEM/Pages/EMB/Shellfish/Marine-Biot toxin-Monitoring-Program.aspx> ♦



Figure 4. The diatoms *Chaetoceros* and *Thalassiosira*.



Figure 5. The diatoms *Ditylum* and *Skeletonema*.



Figure 6. The armored dinoflagellates *Prorocentrum micans* and *Tripos furca*.

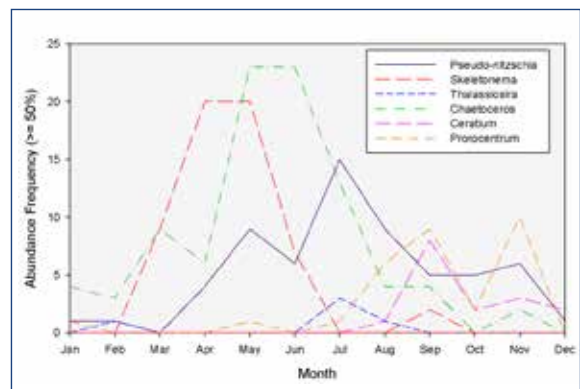
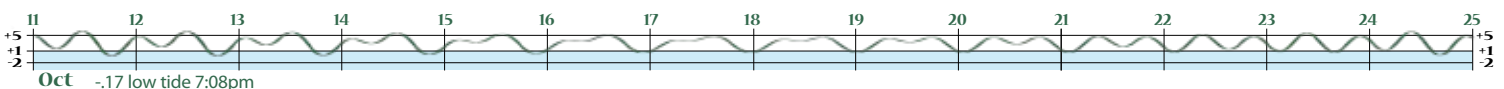


Figure 7. Frequency of percent composition  $\geq 50\%$  for the most common diatoms and dinoflagellates in San Mateo phytoplankton samples (1992–2005).





*Ghostly Halloween*



*Frightened*

**More Funny-Face  
"Boring" Clam Stones**  
see article on page 4  
from FFMR's Facebook page

**Create your own names for this bunch!**



*Happy Valentine's Day!*



*Egyptian Mummy with Snail*



*Clueless*

**Farewell to Tom and Linda Ciotti**

see front page



*Linda Ciotti and Tom Niesen examine a critter found on the floating docks of Pillar Point Harbor in the 2010 training class.*



*Tom and Linda with Ranger Rob Cala who worked closely with them during many of the years when they were active with FFMR.*

*Accepting accolades at their Farewell Party 2026*



**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**

Donation Chair, P.O. Box 669, Moss Beach, CA 94038, or through our website: <https://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 \_\_\_\_\_