BETWEEN the TIDES

Friends of Fitzgerald Marine Reserve

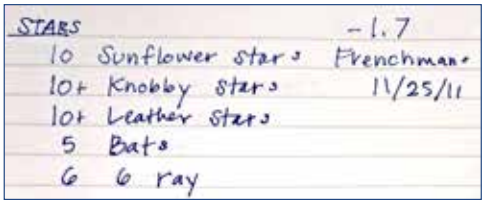
March 2025

Sunflower Star Lab in Moss Landing

by Julie Walters, FFMR Volunteer Naturalist

Starting in 2013, sunflower sea stars *(Pyncnopodia helianthoides)* started disappearing all along the West Coast of North America. Sea Star wasting disease, or SSWD, began not only wiping out these stars but also ochre stars, bat stars, leather stars, knobby stars and pink bay stars.

The sunflower stars, huge 24-inch animals which we used to see cruising through the tide pools at Fitzgerald, were especially hard hit. I noted in my tide pool diary (see below) that during the afternoon of November 25, 2011, I saw a whopping ten sunflower stars in the Frenchman's Reef portion of Fitzgerald.


STARS -1.7
10 Sunflower stars Frenchmans
10+ Knobby stars 11/25/11
10+ Leather stars
5 Bats
6 6 ray

Sunflower stars are now absent from our area and have not been seen locally since 2015.* The population has plummeted so much in their southern range that they are at the point of "functional extinction."

To deal with this issue, the Birch Aquarium in San Diego successfully spawned and cross-fertilized sperm and eggs from a male and a female, resulting, on Valentine's Day of 2024, in fertile embryos that will be raised to bolster populations in human care. The project was dubbed the "Cupid Cohort." Embryos were distributed to 8 different institutions, one of which was in Moss Landing** and is called the Sunflower Star Lab. It is located across the street from Phil's Restaurant and is open to the public.

The Sunflower Star Lab "aims to develop methods and mobilize resources to grow sunflower stars at the scale need for recovery."

I recently visited the lab and met Melissa who is an Intern Aquarist with a group called Minorities in Aquaculture (mianpo.org). She told me about the genesis of the lab in Moss Landing and introduced me to the baby sunflower stars that were about the size of a quarter or 50 cent piece. It takes about 3 years for a sunflower star to reach sexual maturity and it is then about the size of a dinner plate.

Instrumental in the lab's creation was Vince Christian who actually started the lab in his garage before it was moved to its current space in Moss Landing. John Greg who owns the current building provided the space where the lab has a 3-year lease.

Vince Christian said that when he was a diver, he barely noticed the sunflower stars since they were everywhere. After the Sea Star Wasting Disease, they were gone.

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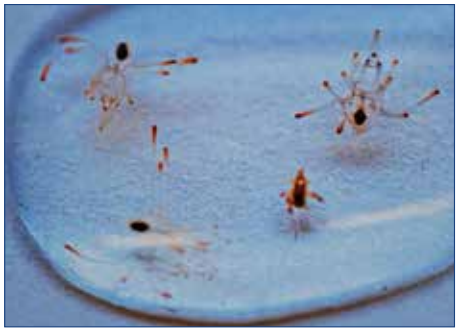

Sunflower star larvae

Olive, an 8-month-old juvenile sunflower star measuring 3 inches in diameter being raised in Moss Landing

Friends of Fitzgerald Marine Reserve

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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.

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Sunflower Stars are a Key Pillar of Kelp Forest Life

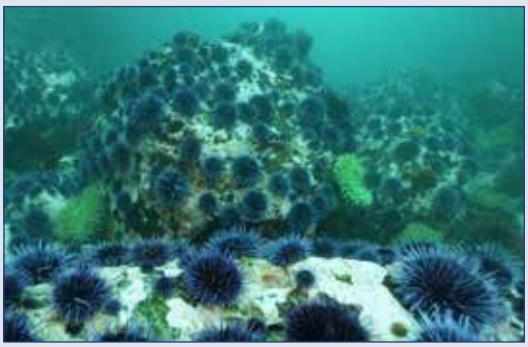
https://www.sunflowerstarlab.org/why-the-sunflower-star
photos: screen shots from video by SeaTrees***

Kelp Forests Are Vital to Our Planet

Kelp forests provide a home for over a thousand different species of marine organisms, from the tiniest of nudibranchs to charismatic rafts of otters and sea lions. They feed abalone, juvenile smelt and herring, and other commercially important species. Kelp forests capture and store carbon, reduce coastal erosion, delight divers, and attract residents and tourists to the Pacific Coast.

Urchin Overgrazing Decimates Kelp Forests

When kelp is plentiful, urchins passively graze on drift kelp and live mostly in rock crevices. When kelp is scarce, purple urchins change their behavior to active foraging, becoming generalist foragers using their strong jaws to scrape any and all algae and invertebrates off the rock. More than 96% of Northern California's kelp forests have disappeared in the last 10 years, in large part due to urchin overgrazing.



Sunflower Stars Prey on Urchins

Purple urchins are one of sunflower stars' main source of prey. In a healthy kelp forest ecosystem, sunflower stars can help regulate urchin populations, preventing urchin overgrazing. Even the presence of a sunflower star may prevent urchin incursion into the kelp forest, because when they encounter a predator, urchins initiate escape behavior and send chemical signals alerting others nearby.

Land Acknowledgment Statement

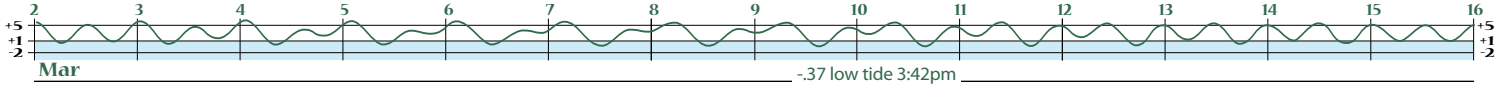
The Friends of Fitzgerald Marine Reserve acknowledges that the Reserve is located on the unceded ancestral homeland of the Ramaytush Ohlone Peoples. As guests, we recognize that we benefit from the beauty and diversity of this land and seashore. We wish to pay our respects by acknowledging the ancestors 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 3/7/25 to 7/22/25 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:
Note that 3 of the lowest tides of the year are in this period!

-.37	3/10	3:42pm	-2.06	5/27	5:43am
-.96	4/1	7:50am	*lowest tide of 2025*		
-1.77	4/29	6:44am	-.95	6/12	6:33am
4th lowest tide of 2025			-1.91	6/25	5:35am
-.70	5/14	6:48am	*3rd lowest tide of 2025*		
-.49	5/24	3:15am	-.94	7/11	6:12am



Sunflower Stars *continued from page 1*

Currently the lab has 36 juvenile sunflower stars: each in its own container of 55-degree highly filtered and monitored water. They are fed frozen brine shrimp and mussels. It is important that all the food be from controlled sources in order to avoid introducing any pathogens, viruses, or bacteria from the ocean which may trigger sea star wasting disease.

Above: Juvenile sunflower stars: each in its own container of 55-degree highly filtered and monitored water. Right: Juvenile sunflower star being fed brine shrimp

If you're interested in visiting the Sunflower Star Lab, they are typically open 4 hours on Saturdays. Often on the weekend, they have an outreach table and if available, can provide tours to the public.

Go to https://www.sunflowerstarlab.org/ where you can learn more, donate, fill out a volunteer interest form or buy sunflower star merchandise. ◆

Sunflower Star Laboratory in Moss Landing

For the latest update on Seastar wasting disease, go to https://marine.ucsc.edu/data-products/sea-star-wasting/index.html

Photos from https://www.sunflowerstarlab.org/ unless otherwise noted

*According to iNaturalist, the last documented sighting of a sunflower star in the Fitzgerald/Pillar Point area was on June 7, 2015, by Donna Pomeroy.

** https://www.facebook.com/SunflowerStarLab/about/
Along with the Moss Landing Lab, these are other institutions that are raising juvenile sunflower stars:

Friday Harbor Laboratory, University of Washington
California Academy of Sciences
Moss Landing Marine Lab
Monterey Bay Aquarium
Aquarium of the Pacific
Scripps
San Diego Zoo Wildlife Alliance

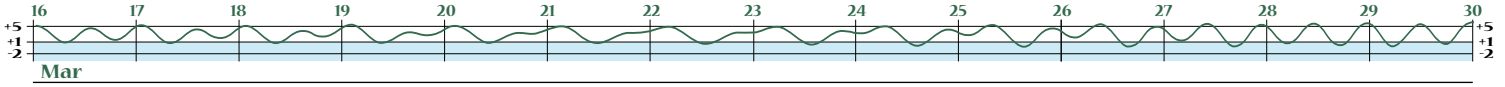
***https://seatrees.org/pages/sunflower-star-labs-kelp-restoration-project-page

For a comprehensive and amazing video about Sunflower Sea Stars, go to: **seatrees.org/pages/sunflower-star-labs-kelp-restoration-project-page**

*Sunflower stars are now absent from our area and have not been seen locally since 2015.**

More than 96% of Northern California's kelp forests have disappeared in the last 10 years, in large part due to urchin overgrazing.

*Sunflower Star with Sea Star Wasting Disease; screen shots from video by SeaTrees****



The Wreck of the Rydal Hall

by Keith Mangold, FFMR Volunteer Naturalist

The Anchor (Half Moon Bay Brewing Company)—The two ton anchor salvaged at the wreck site in 1971. An identical anchor lies with the wreck amid the iron plates and coal.

You may have seen the large anchor outside of the Half Moon Bay Brewing Company and wondered where it came from. It was salvaged in 1971 from a ship, the Rydal Hall, that sank off near what is now FMR in 1876.

The Rydal Hall was an iron hulled, "fully rigged" sailing ship built by Evans R. & J. & Co. of Liverpool in 1874. It was owned by Robert Alexander of the Sun Shipping Co., and operated in the Hall Line. The ship was a transport weighing 186 tons. Its dimensions were 260 feet by 42 feet.

The maiden voyage from Liverpool to San Francisco was interrupted when the ship was dismasted in a gale and collision with the Kanagawa, a Dutch ship, in the Celtic Sea near the Islands of Scilly (off Southern England).

The photo below shows the iron three-masted sailing ship Rydal Hall under tow by the Queen of Bay paddle tug on April 20, 1875 to the Islands of Scilly. The ship has only the lower main and fore masts standing, having lost the rest of the rig in a gale.

The photo of the dismasted ship is apparently the only existing photo of the Rydal Hall, but the Mistley Hall, which was a sister ship constructed immediately after the Rydal Hall, has a photograph at dockside in Australia.

The Mistley Hall had the same builder, owner, and dimensions but weighed three tons more, possibly due to mast reinforcement.

Following repairs, the Rydal Hall arrived in San Francisco as documented by the newspaper Alta California, which listed 125 cases of "McEwans Edinburgh Ale from Liverpool" for sale from the Rydal Hall cargo on August 13, 1875. (The McEwan's brand still exists).

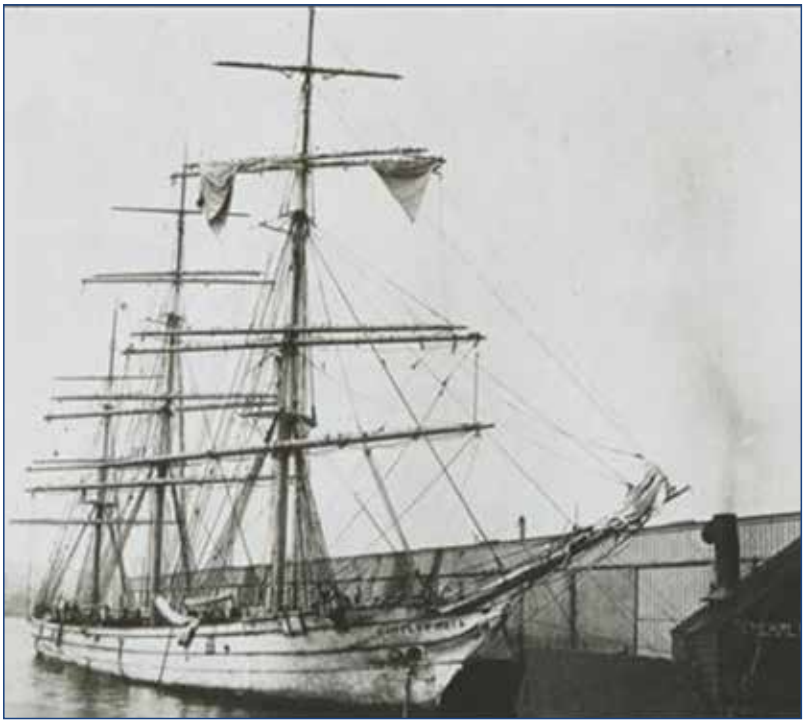
On October 17th, 1876, the Rydal Hall was carrying "steam coal" from Cardiff, Wales when it ran aground on the tip of what is now named Frenchman's Reef off the Coast of San Mateo County within the current boundaries of the Fitzgerald Marine Reserve. The coal was anthracite ("hard coal"), valued for use in fireplaces, passenger steamers and railroads due to its high heat and low smoke emissions.

Ten crewmen died attempting to leave the ship during the gale, after it grounded. The captain and remaining crew were rescued the following day, reportedly by whalers stationed inside Frenchman's Reef in an area named Whaleman's Harbor.

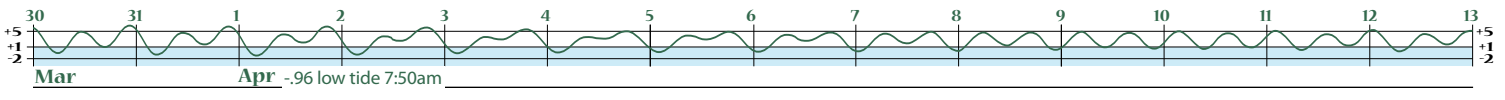
The wreck was forgotten for many years until it was rediscovered in 1971. Abalone Diver Roy Lee discovered the wreck while diving for abalone near Frenchman's Reef. John and Ernie Koepf were diving inside Whalemen's Harbor at the time, and the three planned the salvage operation that raised the artifacts. Roy Lee got the anchor as discoverer and John Koepf received the cannon and ship's bell which identified the Rydal Hall and its 1874 date.

Today the ship's anchor is located at the Half Moon Bay Brewing Company and the cannon is on display at the San Mateo County History Museum.

The mastless Rydal Hall, April 20, 1875



The Mistley Hall, sister ship to the Rydal Hall



Contemporaneous Reports

"The crew of the wrecked ship "Rydal Hall" arrived in town last evening, and in a conversation with the chief officer we gleaned the following facts: The ship was running along with a light breeze, and in a thick fog, up to 7PM, of the 17th instant, when she hove to, the Captain, thinking himself about 20 miles from the Farallones. At 8 PM she struck. The men whom were lost were drowned in attempting to land in the gig and lifeboat. No fog-whistle was heard until about four o'clock on the morning of the 18th. The men state this fact positively, and it is but a continuation of reports of the same kind that have often been made off this point in regard to this whistle, and it is about time that some attention was paid to it. The ship will be a total loss, as she is already breaking up. *— Daily Alta California, Volume 28, 20 October 1876*

"The wreck of the "Rydal Hall," recently cast away on the Southern Coast, was sold in the Exchange yesterday; ship and cargo for $850, to Breeze & Loughran, for the divers, Loogee Brothers, who have already gone down to wreck her. If we have fine weather they will realize a good profit on their investment, by saving spars, sails, rigging, anchors chains and provisions, etc.' *—Daily Alta California, Volume 28, 21 October 1876*

"Rydal Hall, from Cardiff for this port, went ashore off Spanishtown, October 17th and became a total loss. The vessel was valued at $135,000 and insured; cargo $10,000, and insured for $10,000; wreck sold for $850.' *—Daily Alta California, Volume 29, 2 January 1877*

"A Court of Inquiry was convened to obtain testimony and investigate the circumstances attending the stranding of the ship Rydal Hall, on our Southern Coast, on the 17th instant. After the testimony of the Captain of the wrecked vessel and officers and crew had been taken, the Court decided as follows:

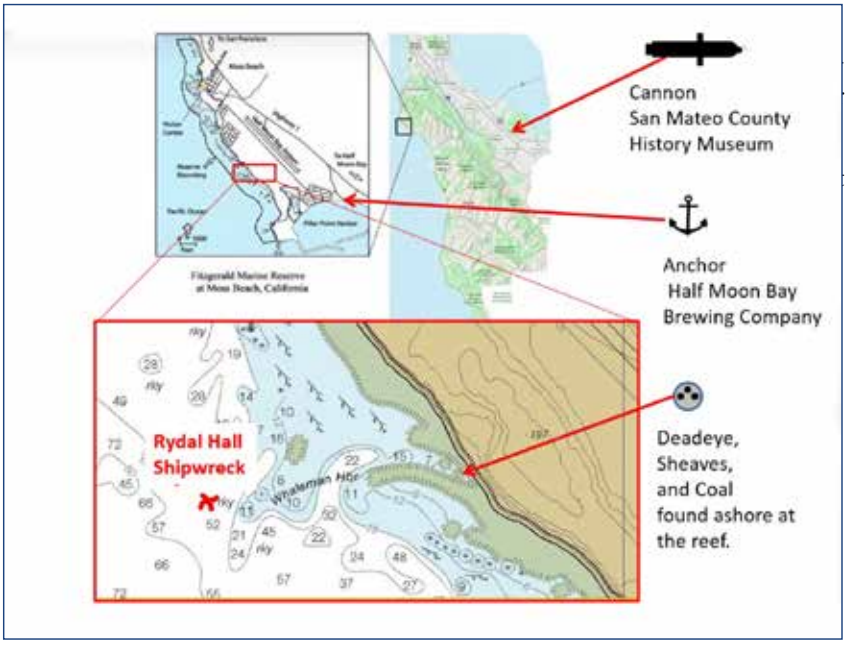
The Court considers Captain Foster guilty of a grave error in relying on his chronometers in face of the long interval since he had verified them off Cape Horn: also , of a great error in judgement in steering to the Eastward after dark, without a cast of the lead, and various other facts which show a lack of good judgment, as the exercise of ordinary prudence would have caused the ship at 8 P.M. to have been headed westward (off shore).

The Court acquits the master of any blame in connection with loss of life, and believes everything was done possible to save life.

The Court, having taken into consideration the high character of the Master, and the confidence posed in him by present and former employers, and his immunity from previous disaster, feels compelled to suspend his certificate for twelve months, and it is suspended accordingly. The Court also adjudges the expenses of the Court of Inquiry to be borne by the Master,

(signed) H.B.M. Consul Wm. L. Booker, President; Caleb Brown, Master of the ship Belfast, and J.J. Garden, Master of the ship Northern Monarch. - October 26th, 1876

John Koepf, center, and John Alimo hoist a deck cannon from the Rydal Hall while Roy Lee holds the ship's bell.



The Cannon (San Mateo County History Museum)

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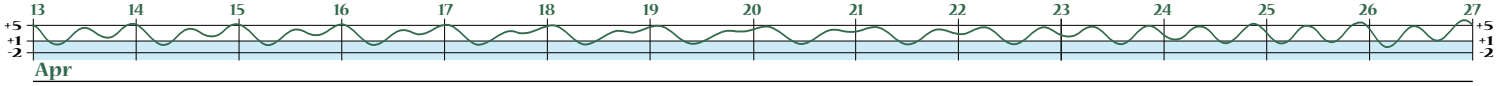
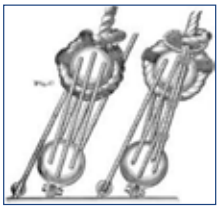


Deadeye from the Rydal Hall – Fitzgerald Marine Reserve Visitor Center



Deadeye: A rounded wood block encircled by a rope or an iron band and having holes to receive the lanyard that is used to set up shrouds and stays. The Rydal Hall deadeye is believed to have been made of lignum vitae, an extremely hard tropical wood that is 1.23 times heavier than water. Its hardness and weight contributed to its longevity at the shipwreck site.

Coal and sheaves from the Rydal Hall

Bell Of 1874 Ship Found

HALF MOON BAY, Calif. (AP) — Scuba divers Roy Lee and John Koepf have recovered a bronze ship's bell, a brass porthole and a piece of brass scrollwork after finding traces of wreckage off the coast here.

Working carefully, they chipped the encrustation from the bell, exposing the letters: "Rydal Hall, 1874."

Maritime records indicate the Rydal Hall, built in Liverpool, England, in 1874, grounded and sank in a dense fog off Half Moon Bay two years later en route to San Francisco with a load of coal from Cardiff, Wales.

Nine of her 33 crewmen were lost, along with the load of coal and all the ship's papers.

Lee and Koepf said Monday the coal had formed a crust over the ship's bow and a winch with a thousand pounds of pull broke when they tried to pull the bell out. They finally pried it loose with a crowbar.

Napa Valley Register, Volume 111, 19 September 1972

Festive Critter Garland Trim for the Visitor Center

by Deborah Pierce, FFMR Volunteer Naturalist

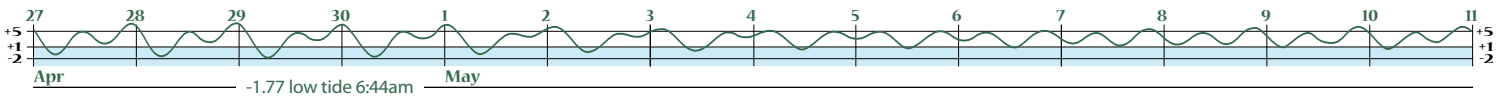
At the November 2024 quarterly FFMR/Interpretive Division meeting the idea of decorating the Visitor Center with ocean-themed holiday garland was discussed. To bring that idea to life it was proposed to approach a local elementary school to have their students make drawings of their favorite ocean animals, have the drawings laminated to weatherproof them and hang the laminated drawings at the Visitor Center. FFMR and the Interpretive Division had already done Ocean Week presentations at several local elementary schools during 2024 and it was decided to ask one of them, the Sea Crest School in Half Moon Bay, if they would be willing to make the drawings.

I had been involved in the Ocean Week presentation at the Sea Crest School and I contacted Kate Dickey, Director of Marine Coastal Science and Environmental Sustainability at Sea Crest School about having the drawings made. And, voila, thirty Sea Crest School second graders produced colorful drawings of their favorite ocean critters with accompanying written fun facts about their critter.

During the second week of December my husband and I carefully strung and hung the laminated drawings along the eaves at the front of the Visitor Center. The hand drawn and carefully colored depictions of hermit crabs, sea stars, octopus and other favorite critters fluttered back and forth in the wind, reminiscent of the waves on the ocean and rocks below. Despite the stormy and windy December weather the garland remained intact along the Visitor Center's eaves.

FMR visitors have enjoyed and marveled at the garland. Tom Ciotti was at the Visitor Center when a local family which included a Sea Crest School first grader stopped by. The first grader was very aware and proud of who had made the drawings and is very much looking forward to making a drawing when he is a second grader. His parents said that asking the students to make the drawings is wonderful. The garland has been so popular that the Interpretive Division has decided to leave it up until Spring. ◆

See more photos on page 12



Working Together

by Roger Hoppes, FFMR Board Member

The Friends of Fitzgerald Marine Reserve (FFMR) has demonstrated a commitment to environmental education and stewardship for over fifty years. More recently FFMR has developed additional partnerships and collaborations to expand the impact of the long-established mission. Not just an independent nonprofit organization with a concentration on one section of coastline, FFMR has widened its engagement by working with others.

One alliance typifies the growing awareness that stewardship goes beyond the local level and conservation is one of managed resources. Participation in the San Mateo County Marine Protected Area Collaborative (MPA) allows FFMR to join other groups, such as the California Academy of Sciences, California State Parks, and the Marine Mammal Center, to create projects and programs supporting a list of mutual interests. The phrase "stronger together" is an apt description.

Similarly, cooperative working relationships with government agencies have also been strengthened. The most longstanding and obvious collaboration is with San Mateo County (SMC) Parks. Park rangers oversee operations, facility care, rules enforcement, and protection of natural features at Fitzgerald Marine Reserve (FMR). They also have public education as part of their job description. In several parks, including FMR, this primary education goal is shared by the local nonprofit organization.

In 2014, SMC Parks established an interpretive department to promote this feature of the visitor experience. Engagement with the guests to the reserve has taken on a new point of emphasis through programs, signage, web communication, and similar tools to connect both adults and children to the natural landscape. The interpretive staff has also built a very productive relationship with the various "Friends" organizations.

Mutual planning and communication have become hallmarks of these associations. A project was initiated in 2021 by SMC Parks to craft a new county-wide interpretive strategic initiative. Several members of FFMR met with park personnel to discuss the plan and provided feedback on early drafts. The final document was adopted by the Board of Supervisors in 2022. In addition, five parks, including FMR, were selected to be the focus of the first round of facility-specific interpretive plans based on the goals and objectives of the strategic initiative. Several FFMR board members again participated in these discussions. One goal of the completed plan recommended the interpretive department conduct quarterly meetings with the individual Friends' groups. It also suggested holding periodic joint gatherings of all the nonprofit organizations supporting SMC Parks to discuss shared developments and issues in common. These efforts are now in place.

Two goals were recommended: conduct quarterly meetings with the individual Friends' groups and hold periodic joint gatherings of all the nonprofit organizations supporting SMC Parks to discuss shared developments and issues in common.

Working with the San Mateo Office of Education (SMCOE) is another example of government engagement benefiting local environmental organizations. In this case, the SMCOE Office of Environmental Literacy and Sustainability Initiative (ELSI). Since 2017, ELSI has created multiple key projects over a relatively short period. (https://www.smcoe.org/for-families/environmental-literacy.html). In addition to concentrating on formal education with teacher support and targeted student programs, the group has also created links to the informal environmental education community, including FFMR. With over thirty organizations, the Commu-nity-Based Environmental Education Part-

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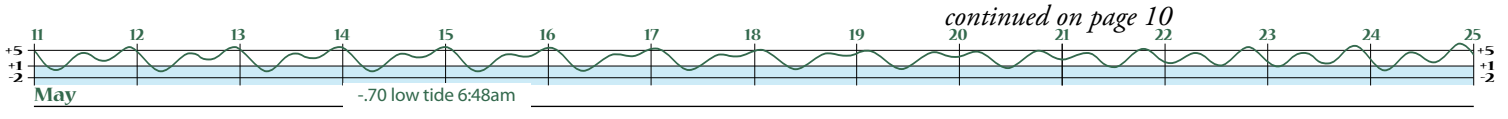


nership (CBEEP) facilitates discussions, conveys timely updates, and seeks to create a stronger relationship between the classroom and field experiences for local students. CBEEP's visionary goal is to provide every student in San Mateo County with a meaningful environmental education experience every year. Overarching in concept, it is the centerpiece of the effort to create uniquely memorable experiences beyond the classroom.

Widening the net further, FFMR is also a member of the California Environmental Literacy Initiative (CAELI). With over 350 organizations, CAELI serves as an information portal and a venue for advertising environmental education opportunities to teachers throughout California (https://partnerportal.ca-eli.org/browse/programs). To assist educators, CAELI encourages members to define their experiences as they apply to specific state-wide science education standards. In addition, CAELI, working with partners such as Ten Strands, is becoming a primary curriculum resource for teachers responding to the new California initiative requiring instruction on climate change for all K-12 classrooms.

Not just an independent nonprofit organization with a concentration on one section of coastline, FFMR has widened its engagement by working with others.

How is FFMR performing as a partner? Knowing more about the audience turned out to be revealing. The general visitor to the reserve has the opportunity for self-discovery. In some cases, these individuals benefit from available interpretive tools and by engaging with a naturalist on the reef. Beyond the public guest, the primary opportunity to connect with a defined audience centers on the groups receiving a guided tour. What did the tour statistics reveal? A review from 2015-20 discovered only about 15% of the classes came from public schools in San Mateo County. The majority were either public schools from elsewhere or from private institutions. The tour ratio did not support the goals of ELSI for students in San Mateo County.

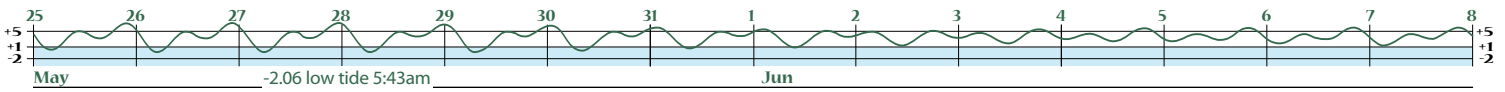
Changes have occurred over the last few years to alter this dynamic. While the number of students served per year has remained approximately the same, the ratio of tours to public schools in San Mateo County has increased most recently to approximately 50%. Several factors have contributed to this change. SMC Parks initiated a new tour reservation system. The program created an opportunity for instructors at the beginning of the school year to request a tour date. Public schools in San Mateo County were given priority during the first week of tour enrollment. Emails were also sent by FFMR and SMC Park's interpretive team to teachers and principals in San Mateo County. These communications advertised the field trip opportunity for the upcoming school year. The change in participation ratio from 15% to 50% is most directly a result of these combined developments in program administration. As a result, FFMR has enhanced its role in CBEEP's effort to provide that one meaningful outdoor experience per student per year for those students in San Mateo County.

The new reservation system also creates a priority in the initial request period for schools with Title 1 status. A Title 1 school has, by definition, 40% or more students coming from families below a defined income threshold. Title 1 schools receive a federal stipend to grow their budget and provide enhanced experiences (including, potentially, a field trip to FMR). A recent review of the statistics for all 23 districts in San Mateo County (over 170 schools) revealed there is some measure of correspondence between Title 1 schools (low-income families) and the school's level of spending per student. Encouraging participation by Title 1 schools has become an important consideration to engage students who might otherwise not benefit from the knowledge and inspiration of an FFMR naturalist. In 2023-24, 48% of the public schools from San Mateo County reserving a tour were Title 1 facilities.

Reducing the challenges teachers face and giving them better resources are central goals. In one case, transportation costs can be a major hurdle, especially for schools with lower operating budgets. FFMR is proud of its relationship with the San Mateo County Parks Foundation and supportive of its bus scholarship program. Through this opportunity, qualifying schools may find a field trip to the marine reserve has become an added benefit for their students they may well consider.

In summary, establishing collaborative relationships over the last decade has been an important goal for the Friends of Fitzgerald Marine Reserve. The partnerships range from local and state education departments, nonprofits such as the San Mateo County MPA Collaborative, the San Mateo County Parks Foundation, and most importantly, the management team from San Mateo County Parks. Together, they jointly provide the network for FFMR to serve a most important partner, the teachers and their students.

Several years ago, FFMR published an online curriculum document. The initial goal was to present teachers with marine-based resources they could use either before or after a field trip to enhance the learning experience. (https://fitzgeraldreserve.org/wp-content/uploads/2024/07/FFMR_Resources_July_2024.pdf). More recently, during the pandemic period, teachers in California and beyond were seeking additional lesson plans for their students. The resource was significantly expanded to include many new listings with a view well beyond Fitzgerald Marine Reserve. While the document continues to serve the initial goal of assisting local teachers with their FMR field trip, it now has become a tool for educators in any locale who may find it helpful for their in-class curriculum. Hopefully, they will also view FFMR as a partner as their students gain an awareness of the coastal habitat and the ocean beyond. ◆



Message from President Ron Olson

Meeting with Supervisor Ray Mueller and our Winter Storms

Sometimes it's best not to bargain with Mother Nature. For more than a year Friends of Fitzgerald Marine Reserve (FFMR) had been trying to meet with Supervisor Ray Mueller, but unfortunately local tragedies and natural disasters were responsible for several cancellations.

As a recently-elected supervisor, we didn't know how familiar Mueller was with FMR and initially thought of our plans to get together as a meet and greet. As storms did a number on FMR, we felt it was important to acknowledge all the efforts made to make our park whole again. We wanted him to be aware of how the damaged bridge impacted our work at the park and how it hampered the publics' ability to access all that the park had to offer. We also made him aware of how the loss of trees has changed the entrance to the park.

Finally in December, our meeting came into fruition, but due to a horizontal rainstorm, our visit was limited to our Visitor Center where we showed him some of our latest efforts in preserving our many specimens. (We were very fortunate to have the storm not hit on a King Tide, which could have caused further damage to our beach accesses.)

I was disappointed that we couldn't descend to the tidepools that day. At that point I was a little "fed-up" with the poor weather so I prayed to Mother Nature for "good" weather. Since then we have had good weather with a rare rainy day. Warm, sunny afternoons have brought out visitors to share our beloved park. Access to the beach by the ramp was easy due to a calm San Vicente Creek.

Even on weekend days with poor low tides, visitors packed the parking lot to appreciate nature. Other than a windy day or two, our naturalist trainees have yet to experience the challenges of navigating our tide pools during stormy weather.

Lately, however, I've been reconsidering my "prayer" and thinking about finding a way to take it back. It's great that no more trees have fallen and coastal erosion has temporarily slowed but there is always a price to pay. Some of our landscaping plans have been delayed due to the lack of rain. Some marine animals may change their feeding and resting requirements due to an abnormal environment. Let's hope my celestial pleas wear off soon ,and we return to a normal weather pattern. And no drought!

County Parks staff and FFMR volunteers working together

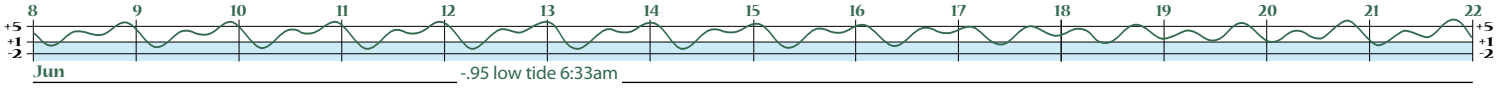
Over the years, FFMR and County Parks have worked hard to make our working relationship ever more productive while balancing the roles of each at the reserve. Smooth coordination of jobs could be seen in a recent event at Fitzgerald Marine Reserve. After one of our County Park Rangers opened up the ramp area for beach access, she discovered a sea lion in distress. She quickly closed the beach to protect the animal. On her way to call for assistance from the Marine Mammal Center an FFMR Volunteer naturalist at the Visitor Center was informed of the situation. The naturalist informed visitors of the reason for closing that access and directed visitors to the Seal Cove access. Another naturalist stationed herself there to interact with the public.

By mid afternoon the rescue team had arrived from the Marine Mammal Center. Two FMR volunteer seal sitters watched the activity through their spotting scopes and explained the actions of the rescue team to the many curious visitors who watched from the perfect vantage point. The team left with the distressed animal so that it could get the care that it needed. The park staff did a fantastic job coordinating the actions of the various groups.

The love and caring for nature could be seen that day in the faces of our staff, our volunteers and our many visitors. Come to our park and experience it for yourself.

On another note: I'm sad to report that Janet Pelinka, former editor of *Between the Tides* passed away recently. We honored Janet when she retired from her editorship in 2022, thanking her for her tireless dedication and the love she poured into each issue for so many years. She was a dear friend to the Reserve and to the members of the Friends of Fitzgerald. ◆

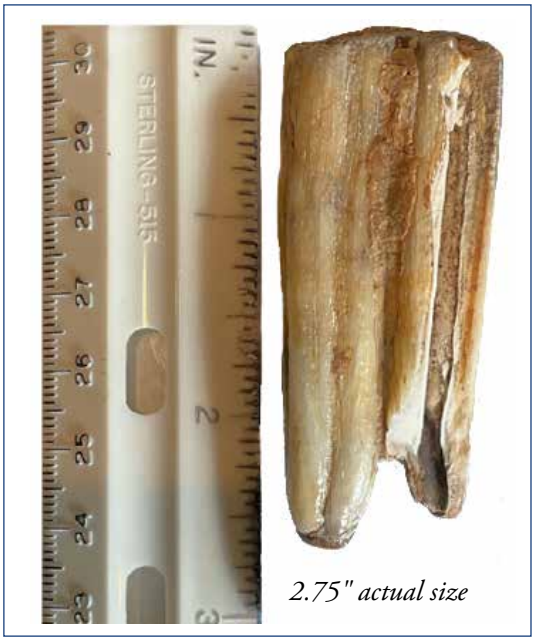
Supervisor Ray Mueller took office in January 2023 representing District 3 on the San Mateo County Board of Supervisors. He has visited the coastside many times, especially regarding our heavy storms and power outages. He has been instrumental in launching the Coastside Resilient Infrastructure Strategic Plan (CRISP) that today lists over 100 projects to strengthen coastal protections.



What's at the Visitor Center? Part 4: Hagerman Horse Fossil??

by Tom Ciotti, FFMR Volunteer Naturalist

"There were certain relatives the Creator sent that specifically are designed to help us on our journey spiritually, to help strengthen us. One is the horse." Yvette Running Horse Collin, PhD, member of the Oglala Lakota Nation.*



2.75" actual size

Hagerman horse fossil...or not.

About 15 years ago Ranger Sarah Lenz and I were standing together on the beach at FMR just north of the mouth of San Vicente Creek when a woman approached us with something she had found on the beach and asked us what it was. The article was generally oblong in cross-section and about 2 1/2 inches long and about 1 inch wide. It was cream colored and had deep longitudinal striations. We both guessed it was a fossil but had no idea what animal it was from. Sarah took the suspected fossil and sent it to the California Academy of Sciences for identification. The answer we got back was surprising. We were told it was a fossilized Hagerman horse molar. And since then visitors to FMR have been told it is a Hagerman horse fossil. But is it?

What is (was) a Hagerman horse?

While the evolution of horses began about 50 million years ago in North America, the evolutionary lineage of all modern equines begins about 4 million years ago with an equine whose scientific name is *Equus simplicidens* and whose common name is Hagerman horse. Herds of this ancient horse once roamed the open grasslands of what is now the western United States and Mexico. They were about the size of modern zebras and are believed to have been at least partially striped like zebras. Indeed the species is often referred to as the American zebra. Fossil records indicate the Hagerman horse first migrated from North America westward across Beringia into Eurasia about 2 to 3 million years ago, eventually spreading into Africa. These migrants ultimately evolved into modern horses, donkeys and zebras.

It is widely believed that the Hagerman horse along with about 10 other North American *Equus* species (and many other large megafauna) went extinct in North America in the late Pleistocene (the Pleistocene era was roughly from 2.6 million to 12,000 years ago). That belief is mainly based on the absence of any horse remains being found in North America that are younger than about 12,000 years and older than when the first European explorers arrived and the reported absence of horses in the New World by early European explorers and colonists. It should be noted that such extinction is disputed in Yvette Running Horse Collin's PhD thesis.** She maintains North American horses did not go extinct and, as evidenced by the quote at the beginning of this article, were always an important part of the lives and cultures of various indigenous peoples of North America.

Whether or not the Hagerman horse went extinct, it and humans coexisted on the continent for some period of time since humans are known to have inhabited North America well before 12,000 years ago and butchered remains of those horses have been found in Idaho. European explorers and colonists introduced modern horses from Europe into North America beginning with the second voyage of Christopher Columbus to the Caribbean and those horses became widespread throughout North and South America.

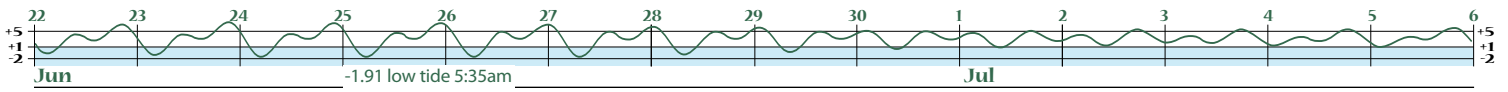
An artist's reconstruction of the Hagerman horse, its ancient migration from North America to Eurasia and Africa and the relatively recent introduction of modern horses from Europe to the Americas are depicted in Figure 1 at left.

The Hagerman horse got its common name from a large deposit of its fossils which was discovered in 1928 near the town of Hagerman, Idaho. Fossil remains of over 200 horses were found at that site which is now known as the Hagerman Fossil Beds National Monument. The Hagerman horse is the official state fossil of Idaho.

Were Hagerman horses known to be present in the San Francisco Bay Area during the Pleistocene era?

During the late Pleistocene the San Francisco Bay Area was geographically and ecologically much different than it is today. According to a 2006 paper by E. Brock Parkman, Senior State Archeologist California State Parks.***

"There was no San Francisco Bay 15,000 years ago. Instead what is now bay was then a grassy valley teeming with exotic wildlife. There were herds of mammoth and mastodon, camel and horse…To the west, where we normally expect to see the Pacific Ocean, there was a broad coastal prairie covered with grasses and tree-



lined streams. And there was ample wildlife there too. From the Golden Gate the beach was far too distant to see as the coast was then about 30-35 km west of San Francisco.

What we would have seen in the San Francisco Bay Area during the Pleistocene was grander than anything imaginable. The closest comparison might be the famous Serengetti [sic] Plain of East Africa as described in early historic times…But in truth, the African Serengetti pales in comparison to the Bay Area at 15,000 years before present. The California Serengetti as I have come to think of the Bay Area during the late Pleistocene, was one of the greatest natural phenomena of all time."

The paper proposes that these large mammals of the California Serengeti made seasonal migrations from the interior valley (where the bay now is) through natural passages (like the current Pilarcitos Creek/Highway 92 corridor) in the coastal hills to the grassy coastal prairie (most of which is now submerged under the Pacific Ocean). The paper speculates they did this to escape the summer heat and to graze on the lush summer vegetation resulting from the increased precipitation from fog.

The paper reports that horse (species not identified) fossils have been found at numerous sites along the current Bay Area coastline from San Francisco to Año Nuevo. So according to that paper some ancient *Equus* species were present in this vicinity. In this regard in my literature search I was unable to find any report of Hagerman horse fossils being found in the Bay Area. I also corresponded with Robert Boessenecker, PhD about this. He is a paleontologist who specializes in studying mammalian fossil remains from coastal sites and has done research on the San Mateo coast. He advised that research on Pleistocene horse teeth over the last decade has shown that it is extremely difficult to identify teeth to the species level and to distinguish teeth of modern extant species from those of ancient extinct species.

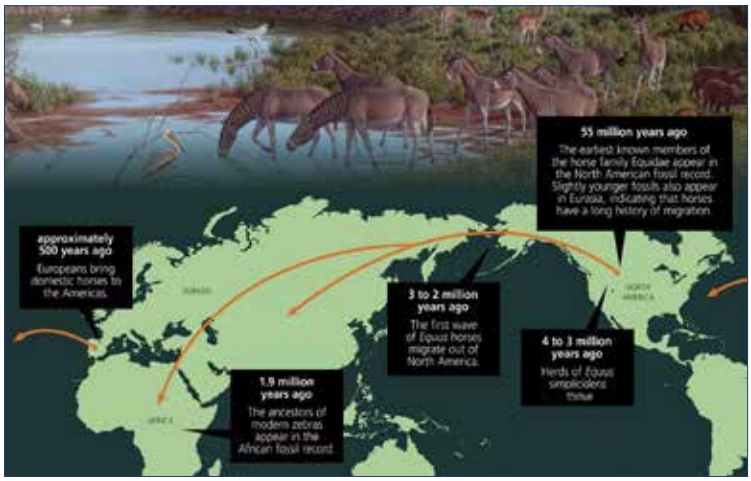
Assuming our molar is from a Pleistocene horse, it would have eroded from one of the two geologic formations at FMR: the Purisima rock or the overlying marine terrace. I asked Dr. Boessenecker about this and he opined it would not have come from the Purisima rock since fossils from that formation are always very dark in color. He also was unaware of any reports of Pleistocene terrestrial mammal remains being collected from the marine terrace formation at FMR although there were reports of such non-equine remains being collected from marine terrace deposits located both to the north and south of the Reserve. Indeed Dr. Boessenecker felt our molar probably came from a modern horse that died in the vicinity sometime over the past 200 years rather than from a Pleistocene horse.

In conclusion, mystery now surrounds the horse molar at the Visitor Center:

Is it from a Hagerman horse? Highly unlikely.

Is it from some other Pleistocene horse species? Possible but doubtful. This might be determined by subjecting it to expensive radiometric analysis.

If it is from a Pleistocene horse, it is likely that horse died during a late Pleistocene summer on the grassy coastal prairie of the California Serengeti. Because the molar was found on the beach near the mouth of a creek it is impossible to know where on that prairie the molar was originally deposited and buried. It could have come from a westerly location and been washed up on the current beach by storms or waves, or it could have come from an easterly location and been washed down to the current beach by the creek, or it could have eroded out of the marine terrace bluff at the beach

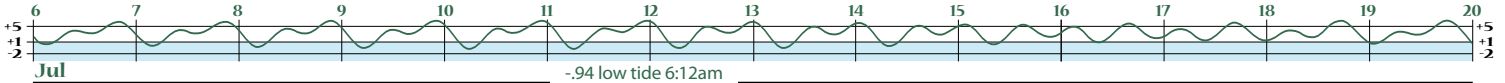


If this article has piqued your interest in ancient horses, stop by the FMR Visitor Center, see the mystery horse molar, then hike up to the bluff top and imagine yourself gazing over not the Pacific Ocean but the vast coastal prairie of the California Serengeti filled with herds of horses, mammoths and mastodons. ◆

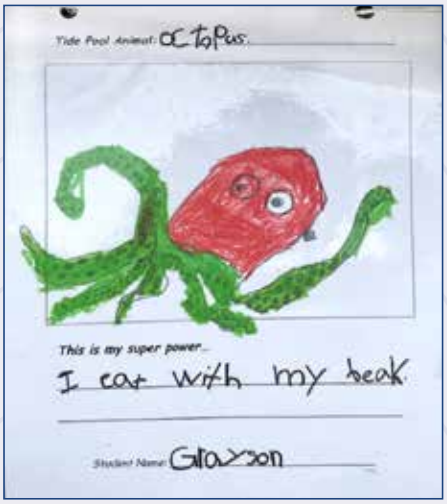
* https://www.yesmagazine.org/environment/2020/04/27/native-horses-indigenous-history?fbclid=IwY2xjawIl2ftleHRuA2FlbQIxMQABHVoJs9t0sHruq1UgNnOv5l-Skv5SWkVhvOGvKlDLPhsydZlSrimS7edd8LQ_aem_BOJRCDYfZpyTrpv-GhZ6wA

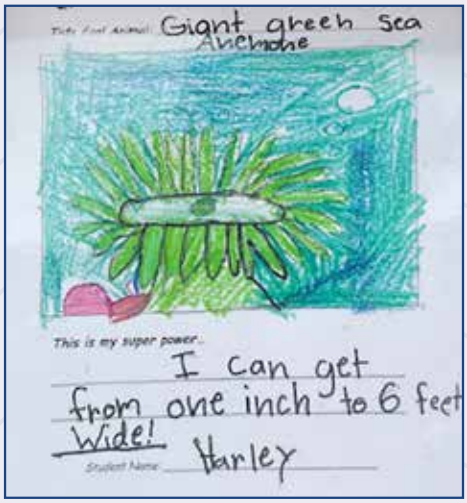
** https://scholarworks.alaska.edu/handle/11122/7592

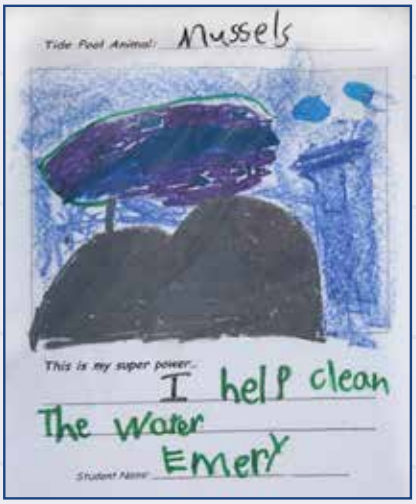
*** https://www.parks.ca.gov/pages/22491/files/the_california_serengetti_pleistocene_paleoecology_of_san_francisco_bay.pdf

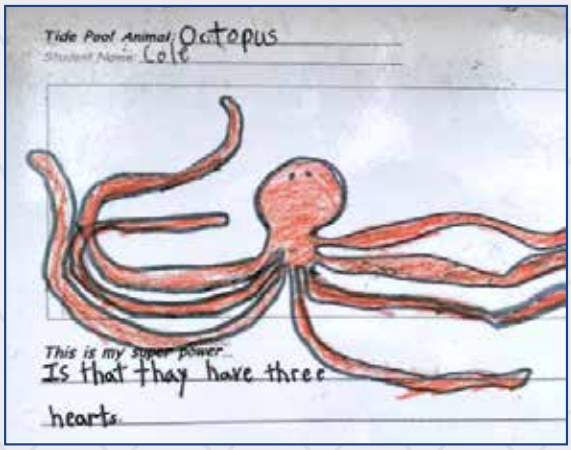


Festive Critter Garland Trim for the Visitor Center *continued from page 6*









Friends of Fitzgerald Marine Reserve

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