

BETWEEN *the* TIDES

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

S e p t e m b e r 2 0 2 5

Cause of Sea Star Wasting Disease Found!!! —Can we believe it this time?

*Kathryn Barton, FFMR Volunteer Naturalist,
member, Between the Tides Editorial Board*

If you're like me, you were very excited to hear last month that we finally appear to have an answer to what causes Sea Star Wasting Disease (SSWD): A team of scientists based in British Columbia* announced they have identified the bacterium *V. pectenocida* (*V. pec* for short) as the cause. But then maybe you, also like me, had a sense of déjà vu—didn't we already read about scientists finding a virus that causes SSWD? Yes we did. And that turned out to be wrong. So why should we believe the findings this time?

Finding the cause of a disease is more difficult than you might think. For one thing, animals that are sickly due to infection by one agent are more easily colonized by other, unrelated bacteria and viruses. So it is difficult to know which of the bacteria and viruses present in diseased sea stars are the cause of SSWD and which are opportunists feasting on the sickened sea star. And the difficulty level is boosted an additional notch or two when your subjects are underwater creatures living in an ever changing ecosystem.

The key to success in this study (besides hard work, technical skill, ample funding and persistence) was the development of a reliable bioassay. The researchers used a syringe to remove fluid (coelomic fluid) from the internal spaces of diseased sea stars and healthy sea stars**. They injected those fluids into the coelomic space of healthy stars. Then they watched and waited to see if the injected stars developed SSWD. They didn't have to wait long. Sea stars that received fluid from the sick stars showed symptoms within as little as 3 days. They became limp and their arms curled and broke off. The disease progressed

quickly and they died, on average, in less than a week. In contrast, stars that received injections of fluid from the healthy stars remained healthy.

One thing that could easily have confounded the study is if some of the sea stars brought into the lab as healthy were actually in the early stages of the disease. Given the wide distribution of the SSWD epidemic this was a very real possibility. To minimize this possibility, stars harvested from the wild were collected in the spring, a time of year when disease is less rampant. To make sure such stars were in fact healthy and not in an early stage of the disease, sea stars brought in from the wild were quarantined for two weeks to make sure they did not show any signs of disease. The scientists were also able to breed and raise some of the sea stars under clean conditions in the lab. These lab raised sea stars would never have had a chance to be infected with SSWD.

Coelomic fluid is a complex mixture of sea star cells, bacteria, viruses, proteins and other biological gunk (to use a technical term). The workers could gain a few clues about the infectious agent by treating the infectious coelomic fluid in various ways before injecting it into healthy sea stars. Infectious coelomic fluid treated with heat was no longer infectious. That meant the suspect was likely biological. Infectious coelomic fluid passed through a filter that would allow viruses but not



Sunflower Star Photo:: Tom Niesen

Since the infectious agent could be removed with a filter, it must be larger than a virus and therefore was likely a bacterium

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Sea Star Wasting *continued from page 1*

bacteria through was also non-infectious. Since the infectious agent could be removed with a filter, it must be larger than a virus and therefore was likely a bacterium.

There are of course lots of different bacterial species present in the sea star coelomic fluid, many are harmless, others are opportunistic pathogens and yet others may even be beneficial. Which of the bacteria in this zoo are the SSWD-causing culprits? The researchers sequenced the DNA present in the coelomic fluids of healthy and sick sea stars and compared them. Ideally the scientists were looking for a bacterium whose DNA was present in fluid from sick animals and absent in healthy animals. Three bacterial species, all in the genus *Vibrio*, were the best candidates. Among these, DNA from the bacterium *V. pec* was present at the highest levels in sick sea stars. This was intriguing because *V. pec* was already known to cause disease in scallops.

The results were not entirely black and white though. The majority of healthy stars (about 60 percent) had a very small amount of bacterial *V. pec* DNA in their coelomic fluid. But the amount was low—an average of 23 hits in healthy star samples compared to an average of 93,000 hits in sick sea star samples. A critic might point to the fact that sick sea stars and healthy sea stars are different in many ways and perhaps *V. pec* bacteria simply flourish in the sickened animal. Again—we are faced with the difficulty of teasing apart correlation from cause.

This is a good place to pause and consider how the new reports of a bacterial cause for SSWD compare to the earlier reports of a viral cause for SSWD. Up until this point in the story, the results are largely parallel and in many ways the results are similar except they point to different villains.

Back in 2014, shortly after SSWD was discovered, a group of scientists based at Cornell University published a paper—also to much fanfare—that claimed a densovirus caused SSWD. Similar to the current work, these researchers injected healthy stars with fluid from sick sea stars and found that this caused disease. In conflict with the British Columbia team, when the Cornell team filtered the coelomic fluid through a fine filter it remained infectious. The ability of the infectious agent to pass through the fine filter led them to believe the cause was viral. Indeed, there was another reason to believe that the cause was viral—despite much looking at samples of sickened sea star samples under the microscope, no evidence of bacterial infection had been seen.

It isn't possible to know why the Cornell team got a different result in the filtration experiment than the British Columbia team got. Sample contamination is always a possibility. Or perhaps the healthy sea stars receiving the filtered inoculum were already infected with SSWD.

Also similar to the British Columbia group, the Cornell group sequenced the DNA in coelomic fluids from healthy and sick sea stars but they focused on viruses instead of bacteria. Densovirus was present in higher quantities in the fluid from sick stars than in the fluid from healthy stars. They found this pattern both in the lab and in the wild. They concluded that densovirus was the likely cause of SSWD and called the virus Sea Star associated Densovirus (SSaDV).

This is where the stories diverge.

The British Columbia based team grew pure cultures of *V. pec* in the lab, a feat in itself. If such pure cultures could cause SSWD then *V. pec* isn't just associated with SSWD, it can cause SSWD. The researchers divided ➡

The graph displayed across the page bottoms shows tides for 10/12/25 to 2/28/26 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:

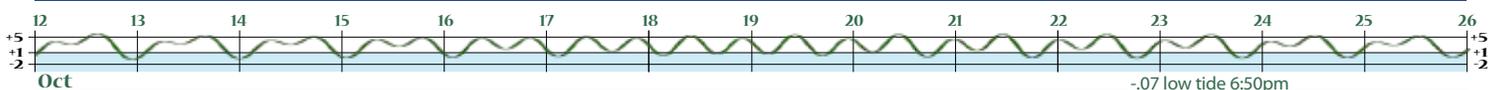
<https://fitzgeraldreserve.org/lowtides>

Good low springs/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:

-0.7	10/22	6:14pm	-1.79	1/2	4:10pm
-1.69	11/6	5:17pm	-.70	1/18	4:57pm
-.52	11/10	9:10pm	-1.36	1/31	3:57pm
-.54	11/20	4:57pm	-.45	2/15	3:53pm
-.30	11/23	6:52pm	-.78	2/28	2:54pm
-2.0	12/6	5:09pm			

King Tides: Dec 4-5 and Jan 2-3, 2026



➔ the cultured *V. pec* sample into two parts and heat-treated one part to kill the bacteria. These two samples were injected into healthy sea stars. The experiment worked beautifully. The live bacteria but not the heat-killed bacteria caused the healthy sea stars to develop symptoms of SSWD and die.

Meanwhile, in the years since the 2014 publication, several groups in different locations attempted to repeat the densovirus experiments. Results came back contradictory in many cases and the theory that a densovirus caused SSWD has fallen out of favor over the years.

This is a perfect example of how science works. Scientific results must be repeatable. And scientists must present their results in enough detail that someone else can repeat them. In this way, science is self-correcting—scientists sometimes get things wrong. It's inevitable. In the best cases, scientists work together and are not afraid of confronting errors. I note that the senior author on the 2014 densovirus paper, Drew Havell, is also a coauthor on the 2025 *V. pec* paper.

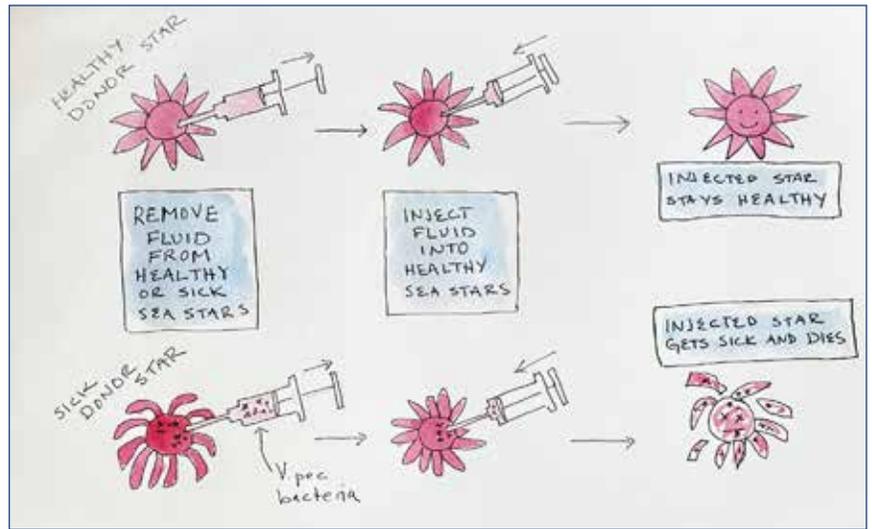
Will the new results on *V. pec* stand the test of time? Many groups will attempt to replicate them. In fact they are probably doing so now. So we will know soon I think whether *V. pec* is our tide pool villain. And if it is—perhaps some bright graduate students will invent ways to attenuate its virulence and bring the sunflower stars back.

*This work was a collaboration of the Hakai Institute, the University of British Columbia, the University of Washington, the US Geological Society, the University of Vermont, and Cornell University.

**The sea star used for these studies is the sunflower sea star, *Pycnopodia helianthoides*. The sunflower sea star is the species of sea star that is the most susceptible to SSWD. Because the sunflower is a threatened species, the scientists used as few specimens as possible to achieve statistically significant results.

References:

Hewson et al., 2025, Lessons learned from the sea star wasting disease investigation. Annual Review of Marine Science 17:257-279.



Sea Star Wasting Disease

Kathy Barton, FMR Volunteer Naturalist; member, *Between the Tides* Editorial Board

Since its appearance in 2013, Sea Star Wasting Disease (SSWD) has claimed billions of sea stars from Alaska to Mexico. Infected sea stars show arm curling, arm loss, lesions and appear to disintegrate. Some have called it the melting disease describing the stars as wasting away into piles of slime and ossicles.

Twenty different sea star species have been affected by this ocean plague but by far the worst affected has been the sunflower star, *Pycnopodia helianthoides*. Over 90 percent of sunflower stars are thought to have succumbed to the disease.

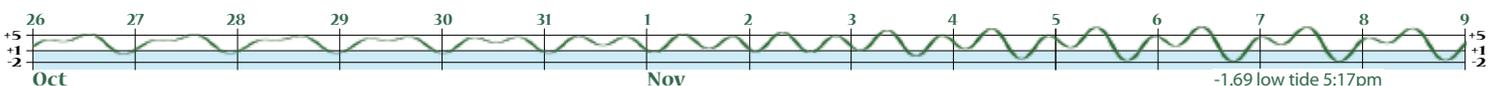
We have yet to see sunflower stars return to FMR so most of us currently volunteering at the reserve have not observed them in the wild. I urge you to read FMR Supervising Naturalist Bob Breen's lyrical account of the sunflower star written for *Between the Tides* in December of 2013, but published here for the first time, see page 9.

Loss of sea stars has had secondary consequences for the tide pools. Mussel beds have increased in size with the loss of sea stars. And perhaps most worrying, bull kelp forests have declined as sea urchin (also prey for sea stars) numbers have increased.

The website for the Multi-Agency Rocky Intertidal Network* reported in the fall of 2024 that observations of sunflower stars are still very few along the Oregon and California coastlines but are trending upward.

*Data from Multi-Agency Rocky Intertidal Network, pacificrocky-intertidal.org ♦

Prentice et al., 2025, *V. pec* strain FHCF-3 is a causative agent of sea star wasting disease. Nature Ecology and Evolution <https://doi.org/10.1038/s41559-025-02797-2> ♦



The 2025 FFMR Scholarships Recipients

We're delighted to announce the 2025 FFMR scholarships recipients. Below they share with us the childhood inspirations which led to further studies in Marine Ecology and Environmental Science at Half Moon Bay High. Congratulations to Nathan, Alex and Sophia—we can't wait to see what you achieve.

Nathan Gorman

1) I will be attending UC Santa Barbara.

2) I will be studying marine sciences.

3) After college, I would like to continue a career in the field and eventually get to some position where I can conduct research dives with other scientists.

4) When I was little my grandparents bought me an encyclopedia on the life of the deep. I really couldn't read that well at the time, but what I saw illustrated and photographed in the book instantly hooked me. Since that point, I have spent hours reading about every little detail of the ocean, mainly focusing on the animals because that's the part I love the most. I don't know what it is but there's something about how unique every little creature in the ocean is that immediately gets me curious.

Alex Sardella

I will be attending UC Santa Cruz in the fall and majoring in Marine Biology. Currently I am hoping to pursue a career in marine zoology and becoming a marine veterinarian with a focus in marine mammals. I loved growing up visiting Año Nuevo to see the elephant seals, or even just watching the Harbor Seals play in the

water. Learning about the many challenges they face made me want to pursue a field that would allow me to make significant differences in these creatures' population.

Sophia Riley

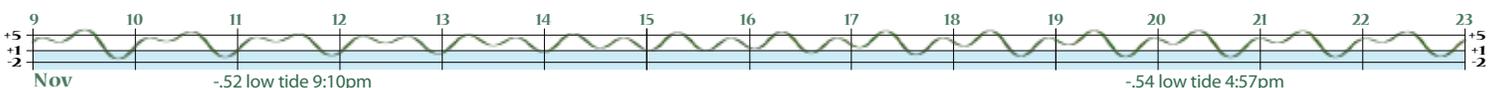
I'm attending UC Berkeley in the fall, majoring in Society and Environment at Rausser College of Natural Resources. Right now I'm hoping to use my undergraduate education as a pre-law track to go into environmental law. I hope to write public policy for environmental issues!

I've always been interested in the marine environment, thanks to the coast and the interests of my parents. I've had the immense luck of growing up watching for dolphin fins, curious seal heads, or whale spouts. I've always been encouraged to love our beaches and surrounding environment and to recognize their interconnection! Our local tide pools are teeming with diverse and fascinating life and I love to explore them. I love the ocean for its great unknown and that it's filled with so much we can learn from.

I'm extremely grateful to be receiving the Bob Breen Memorial Scholarship and equally excited to further my education to continue preservation of the natural world. ♦



Scholar Recipients Alex, Nathan and Sophia with FFMR President Ron Olson



Sea Foam–Ocean Foam–Beach Foam–Spume

by Linda Theroff, FFMR Volunteer Naturalist

I love exploring the tide pools. Sometimes there would be areas with quarter size rainbow bubbles lingering for hours from sea foam. I would take pictures of the beautiful rainbow bubbles and see my reflection repeating fifty or one hundred times in the bubbles. One memorable day on Ocean Beach in San Francisco the sea foam on the shore was over a foot deep, it was foggy and suddenly a horseback rider road through it down the beach, it was magical and surreal to me. Another interesting experience I had was driving on Highway 1 in Montara at night and big clusters of sea foam were blowing up onto the road as my headlights illuminated it.

I used to think sea foam was pollution, like scummy detergent. In a way it is: Sea foam is made up of dissolved salts, plankton (microscopic animals and plants), dead algae, bacteria, fungi, proteins, detergents, pollutants and fats. Decaying marine life release molecules including proteins and fats some of which act as surfactants. Surfactants in sea foam are chemical compounds like detergent that decrease surface tension between a liquid and gas or solid or another liquid. These light-weight molecules allow water and oil to mix. One end of the molecule is hydrophilic (attracting water) at the other hydrophobic (repelling water) one end faces the water the other faces the air and the least resistant shape that forms is a bubble. Sea foam results when these particles are agitated by wind and waves in the ocean. Large algal blooms decaying off shore wash in and are a source of thick sea foams. Most sea foam is not harmful to humans and is often an indication of a productive ocean ecosystem.

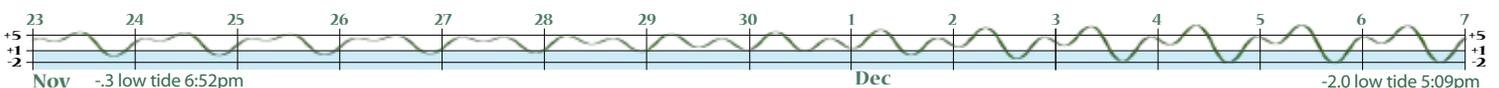
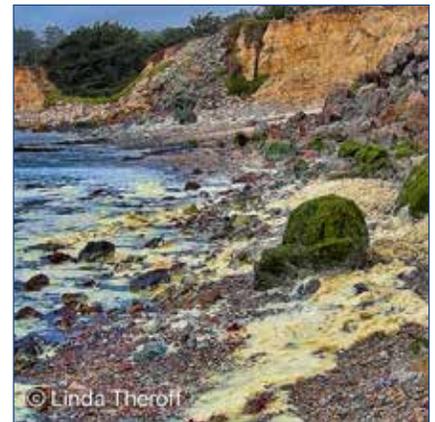
I was surprised to learn how an algae bloom of *Akashiwo sanguinea* in Monterey Bay killed a number of sea birds in 2007 and 2009. The birds were coated in sea foam containing a yellow green slime that had small sticky molecules which stripped the birds' waterproofing from their feathers. The dampened down feathers made it difficult for the birds to fly and also allowed the cold water to reach their skin causing them to freeze to death from hypothermia. With an increase of storms, wave action and more algae blooms, sea foam is an unfortunate occurrence that can have a negative impact on birds.

Algae blooms are a rapid increase in the density of algae. Some blooms are a natural phenomena some occur more often, last longer and vary in size. Excess nutrients create an imbalance in the water ecology from fertilizer (nitrogen and phosphorus), wastewater treatment plant discharge, farms, septic tanks and storm water runoff mixed with a lot of sunlight, warm temperatures, shallow and slow flowing water, making the foam look white or green, brownish and yellowish. Some species of algae grow in clumps with a gelatinous coating. The cells stick together creating large areas of surface scums in calm weather.

Karenia brevis is a single-celled organism belonging to a group of algae called dinoflagellates. *Karenia brevis* is the cause of Florida's Gulf Coast Red Tides. This bloom produces toxins that kill fish and make shellfish dangerous to eat. As the bloom bubbles pop, algal toxins can become airborne and cause eye irritation and some health risks for people with asthma or respiratory conditions.

Not all algal blooms are harmful. Most blooms, in fact, are beneficial because the tiny plants are food for animals in the ocean. In fact, they are the major source of energy that fuels the ocean food web.¹ ♦

¹ <https://oceanservice.noaa.gov/facts/redtide.html>



Junior Naturalist Camp 2025

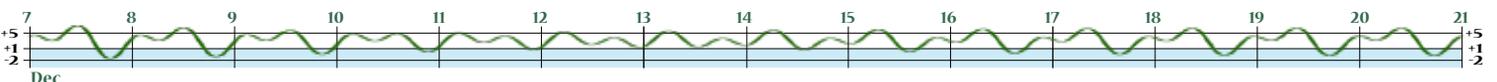
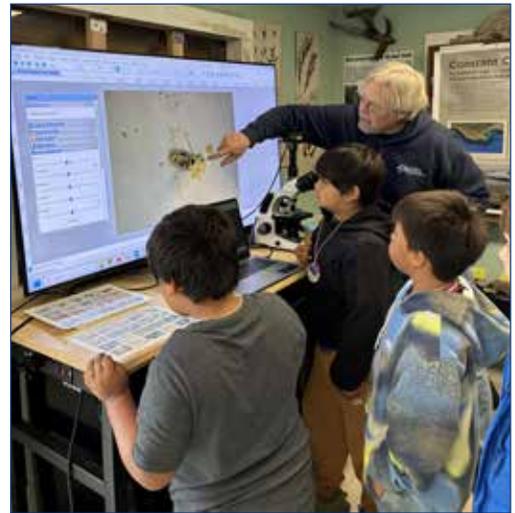
by Lauren Ford-Peterson, Park Ranger II, Interpretive Division,
San Mateo County Parks

This year we had two wonderful community-based organizations participate in the Junior Naturalist Camp: The Latchkey Alternative Center from Daly City and The Boys and Girls Club of the Coastsides from Half Moon Bay. Each group had around 20 youth ranging from 3rd–6th grade.

For each visit the groups spent a morning at the Seal Cove tide pools guided by our amazing FFMR docents and SMC Parks Interpretive team. Over the two-day camp we worked through the

Fitzgerald Marine Reserve Junior Ranger booklets enjoying activities like mindfulness meditation in the cypress forest, a scavenger hunt, and a variety of intertidal activities so that at the end of their visit each student received a Junior Ranger pin for completing their booklet.

One of the highlights of this year's camp was the dock critters station set up by a handful of dedicated volunteers who brought dock critters from Pillar Point harbor for the students to experience first-hand. ♦





Message from President Ron Olson

It's hard to believe that summer is over. It seems like it's hardly just begun. While most of the country suffered under

blistering heat, the west coast seemed blessed with a surplus of comfortable days. On most days, our parking lot was mostly full, with people looking for what nature had to offer. Even on days with unfavorable tides, we would find visitors picnicking, hiking or observing our harbor seals.

As summer winds down, FFMR has been preparing for our tidepool tours that start in the fall. We are continually looking for ways for our naturalist volunteers to be even more effective in improving the visitor experience.

One way to do this is by offering refresher courses, while another way is by updating training. FFMR recently hosted a lecture for naturalists about a frequent visitor to our park, the brown pelican. Participants learned fun facts about these amazing animals, as well as efforts being made to protect these coastal creatures.

We are also looking forward to an upcoming event put on by park experts that is focused on advanced interpretive techniques. The goal is to make every interaction between naturalists and visitors a memorable one.

Recent changes at our Visitor Center have brought on a need for updated training because many of our exhibits require special handling and protection. As a result, many items may be arranged or displayed differently and naturalists will need to become comfortable with the new set up. In addition, we will occasionally set up microscopes and screens to observe plankton and small sea creatures, which requires some expertise. More interest in marine algae has necessitated a demonstration on preserving and pressing algae samples. Since then, several naturalists attended a refresher class on marine algae at Seal Cove.

Our volunteers continue to be a vital part of FFMR success. Several naturalists have volunteered to set up mini Visitor Center displays at events such as Pelicanfest at Pacifica and

Summerfest at Coyote Point. Children were taught about tidepools in classrooms and at our summer camp at Fitzgerald Marine Reserve. Our gray whale skeleton continues to attract attention by the public and many of our naturalists are well prepared to answer any and all questions.

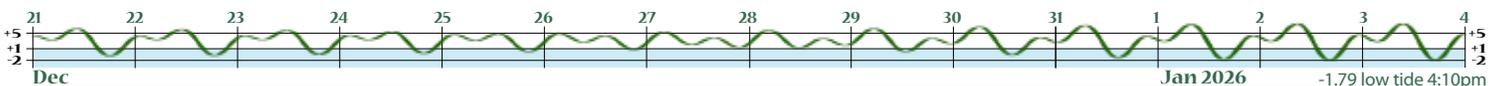
We anticipate physical changes to our park very soon. Improved walkways, more picnic tables and seating should make for a more pleasant experience for those arriving at the park.

Although fall may seem to be a quiet time on the coast, our hope is that our naturalists will make your visit a memorable one. Come share the park with us. ♦

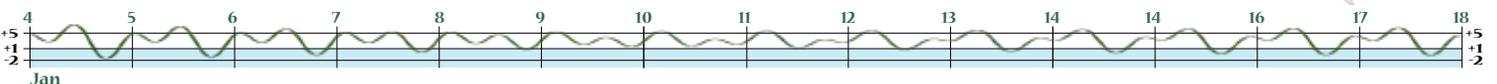
FFMR recently hosted a lecture for naturalists about a frequent visitor to our park, the brown pelican. Participants learned fun facts about these amazing animals, as well as efforts being made to protect these coastal creatures.



Engaging photos of brown pelicans. Credit: Rob Cala



Some Terrific FFMR Creatures Turned out for the 4th of July Parade!



Editor's Note: As we've discussed in the last several issues of *Between the Tides*, there are no sunflower sea stars remaining at Fitzgerald Marine Reserve due to the Sea Star Wasting Disease. So Bob's statement below opening this article is even sadder: that we had one of the largest found along the Pacific Coast right here in our intertidal. With the work currently underway at the Moss Landing Sunflower Star Laboratory* there is hope that they will return! (*See March 2025 issue, front page article)

Written by Bob Breen in 2013, but not published

Most Active Pacific Coast Starfish Multi-Rayed Sunflower Star Occasional Tidepool Guest

by Bob Breen, FMR Supervising Naturalist from 1969 to 2004

One of the largest sea stars found along the Pacific Coast occurs in the intertidal of Moss Beach. Ranging from the Aleutian Islands to San Diego the sunflower or sun star is usually found in the subtidal down to depths of more than 14000 feet. However, this more than two-foot in diameter star will occasionally wander into the intertidal as far up as the Mid Tide Zone or the 1.0 foot tide level.

A multi-rayed star that starts off life with a "normal" 5 arms, it can have as many as 24 arms once it attains adult size. A magnificent animal brilliantly colored, it is the largest, heaviest, and most active of all our Pacific Coast stars. When underway with a full head of steam with thousands of tube feet lashing about, it can travel more than a meter a minute. Its bright colors include hues of pink, purple, brown, red, yellow and orange

Will Subdue Rock Crabs and Swallow Sea Urchins

So active is this star that it has been observed to catch and subdue rock crabs and fish with its many tube feet. It is also a predator on sea urchins, swallowing them whole, spines and all, digesting the urchin internally. Other prey items include bivalves, chitons, hermit crabs, sea cucumbers and other sea stars.

When two sunflower stars meet they exhibit actions that could be interpreted as combative. Their vigorous arm movements are thought to influence the dispersion of the sun star populations. Bouts between the sunflower star and other sea star species such as the pink star, *Pisaster brevispinus* also occur for the possession of food.

Locomotion is by means of its numerous tube feet (they have more than 15,000). Movement by tube feet is one of the most specialized means of movement in the animal world. Sea water is drawn into the interior of the sea star via the

water vascular system and suction is applied by creating a vacuum when the water is pumped back out of the tube foot. The tube foot can be released from the substrate by then allowing water to return back into the tube foot. The tube feet also function as legs that can operate without this adhesive effect as they have been demonstrated to be able to walk on grease and sand where it is not possible to apply this kind of force. Tube feet not only help to give the animal a firm foothold when walking but in addition, allow the sea star to climb steep surfaces.

These star-shaped echinoderms belong to the class Asteroidea. Asteriods as a group are found in all of the seas of the world and number some 2,000 living species; and they have been found in the fossil record for 500 million years. Almost all live in the marine environment, although a few can tolerate brackish water. Most are predators with the exception of those few that are scavengers (the bat star) and a few more that are detritus feeders, feeding on drifting organic material. None of the sea stars inject poison into their prey as far as it is known, although there is one star that is venomous. The crown of thorns sea star has spines that are covered with cells that secrete a painful toxin into a wound created upon impact with the spines.

Sheds Arms When Handled Roughly

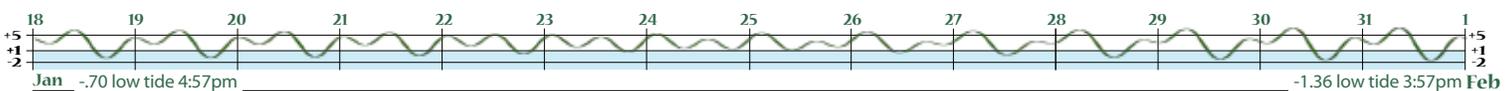
If handled roughly the sunflower star will readily shed its arms. However, as in all sea stars, these are regenerated within months. Only one star, the Linckia's of tropical seas, can regenerate an entire body from a fragmented arm.

To observe this splendid invertebrate a good minus tide is required. Unfortunately during most of the fall months, most minus tides fall during the middle of the night ... ♦



A multi-rayed star that starts off life with a "normal" 5 arms, it can have as many as 24 arms once it attains adult size.

When underway with a full head of steam with thousands of tube feet lashing about, it can travel more than a meter a minute.



The Friends of Fitzgerald Marine Reserve seeking new Editorial Team members for *Between the Tides*.



Do you look forward to receiving your copy of *Between the Tides* in your mailbox? Do you devour the articles on marine organisms, people, ecology, and more? Would you like to have a part in guiding *Between the Tides* through the coming years? You're in luck—we are seeking Volunteer Docents to join our editorial team to fill these critical and rewarding volunteer roles!

The *Between the Tides* Editorial Board consists of volunteers who work as a team. We each serve as Editor in Chief and Editor in Waiting (assistant editor) on a rotating basis throughout the year. This unique process keeps the overall time commitment for each Editorial Board member low, and ensures a diversity of leadership style, interests, and more! When each Editorial Board member serves as Editor in Chief, they act as the main contact point among Editorial Board members, authors, and as liaison with our newsletter Designer. All Editorial Board members draw upon the skills and interests of fellow Volunteer Naturalists, as well as external sources, to create each issue of *Between the Tides*.

Responsibilities of the Editorial Board include the following:

- Determining quarterly publication dates and setting article submission dates appropriately;
- Determining topics of interest for each issue;
- Soliciting writers for the articles, and providing them with the desired article length and deadlines;
- Soliciting and obtaining images for the articles and adding captions, should the author not provide them;

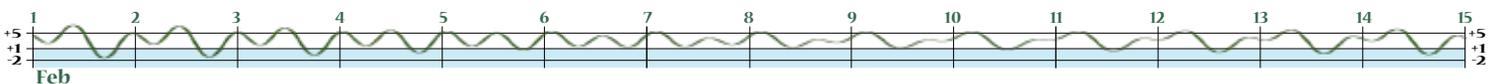
- Checking articles for scientific accuracy, sending articles to experts as needed;
- Proofreading for grammar, punctuation, spelling, sentence structure, etc.;
- Sending edited articles to our Designer for design and production;
- Working with the Designer to provide guidance on placement of articles and photos;
- Rechecking proofs returned from the Designer; sending any corrections to Designer; and approving final proof for printing

Ideally, members of the Editorial Board will meet one or more of the following qualifications:

- Excellent proof-reading and editing skills (prior editorial/publication experience is a plus!);
- Strong interest/experience in the marine environment and related sciences;
- Attention to detail;
- Flexibility and adaptability;
- Excellent communication skills;
- Ability to serve as Editor in Chief 1-2 times per year, and Editor in Waiting 1-2 times per year;
- Ability to maintain a sense of humor and have fun during the process!

If you are intrigued by this opportunity, please contact Miranda Holeton (miranda.holeton@gmail.com) for more information (note that inquiring is not the same as volunteering!). All inquiries are welcome.

Thanks, and see you on the reef!
Miranda Holeton
FFMR Board of Directors
miranda.holeton@gmail.com

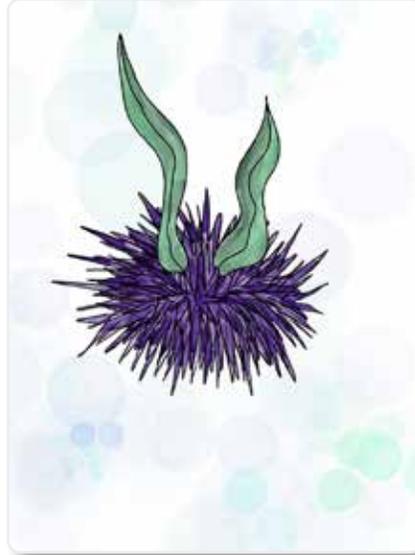
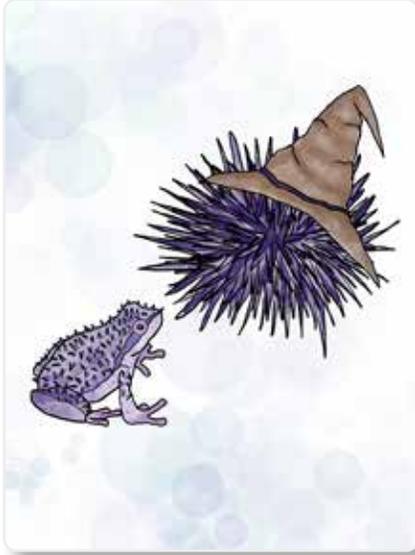


Why Sea Urchins in Hats?

It has been observed in nature that sea urchins use items such as shells, rocks, etc as protective and camouflage “headwear.”

This is my whimsical reimagining of this phenomenon

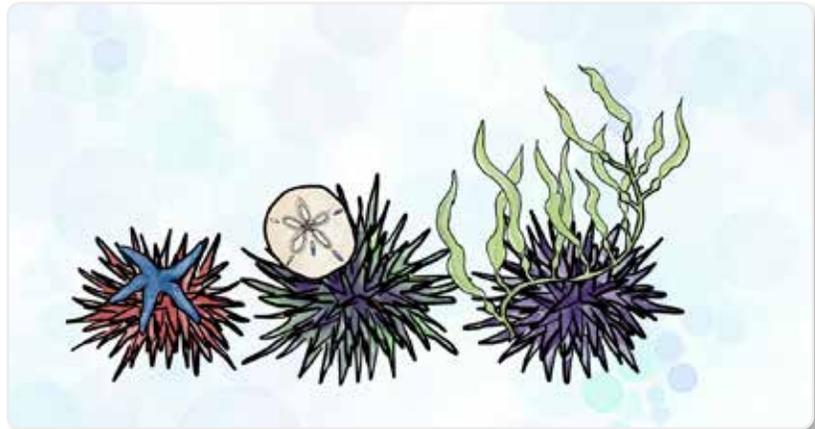
Art and Text by Soula Conte



It's also important to raise awareness about the ecological impact of the purple sea urchin.

In recent years, the purple sea urchin population has exploded in Northern California. This has caused ecological challenges and puts vital bull kelp and other native species at risk.

The most sustainable thing you can do is to eat more purple sea urchin!



Artist Bio: Soula is an artist who brings whimsical creatures to life through imaginative illustrations. When not dreaming up fantastical beings, she can be found exploring her glittering slice of the coast with her husband and two furry sidekicks, Yeti and Chunk.

Artist Statement: My art is a portal to a world where ordinary becomes whimsy and imagination becomes reality. I seek to capture the wonder of a universe where creatures of all shapes and sizes coexist in harmony and escape the mundane. Nature is my muse, and the rugged beauty of the coast infuses my work with a sense of adventure. Each piece is an invitation to step into a story - one filled with charm, curiosity, and a bit of mischief.

<https://sites.google.com/view/soulacontart/home>

Editor's Note: I saw Soula's art at Sage Bakehouse in Montara and was impressed with the cleverness of her art - combining whimsy with science.





More~
Sea Urchins
in Hats~

Art by
Soula Conte

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.

We want to hear from you.

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

Friends of Fitzgerald Marine Reserve

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

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