

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

M a r c h 2 0 1 8

Fitzgerald at California Academy of Sciences

by Marsha Cohen

Fitzgerald Marine Reserve was invited to host an informational table at The California Academy of Sciences Night Life event on Thursday, January 25. The event theme was “Surf Zone Central—Celebrating Mavericks Surf Season.” The focus of the event, despite its title, was to give Night Life visitors a chance to see and learn about the importance of California’s fragile coastal ecosystem and to highlight the work that many organizations like FFMR do to safeguard it for future generations. The other organizations that were invited to host tables included:

Golden Gate Audubon Society
Greater Farallones Association
Marine Mammal Center
Pacifica Beach Coalition
Sustainable Surf

FMR Rangers Rob Cala and Miranda HOLETON brought a table full of specimens from the FMR Visitors Center to display. Ranger Rob set up a laptop to display some of his recent vid-



Leatherback turtle skull

eos of surfers at Mavericks, which impressed many visitors to our table. I had a busy evening explaining the role of the Friends of Fitzgerald Marine Reserve and showing off the specimens. One of the more popular curiosities was the leatherback turtle skull. Years ago, a leatherback turtle washed up at FMR. The skull and shell were preserved and are on display in the Visitors Center.

If the goal of the event was to inspire and educate about the coastal marine environment, then the evening was a success. One visitor to the table was a young man who grew up along the San Mateo County coast. His father was a former ranger at Año Nuevo and he remembers spending time exploring tidepools and learning about the coastal ecosystem. He said he had a deep respect for the work of volunteers like the Friends of Fitzgerald

and added that while we may not see the lasting impression we have on young students, he assured me that we do. He knows because he was one of those students. ♦



Friends of Fitzgerald Marine Reserve

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www.fitzgeraldreserve.org

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Our Mission:

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

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Interviews at the Reef

by Julie Walters

In mid-February I spent the afternoon at Fitzgerald Marine Reserve interviewing tidepoolers, asking them about their favorite animals.

Joseph Centoni's Marine Biology class from Half Moon Bay High School was there exploring the tidepools and surveying algae on the reef.



From left to right: Jill Smith (high school librarian), Dawson Campbell, Joseph Centoni, Carly Hilvert, Alex Smith, Dario Flores, and Makenna Colucci.

Remarks from the class members:
Dawson, age 18 - My favorite marine animal is the octopus because it so elusive and can adapt to any situation.

Dario, age 17 - My favorite tide-pool animal is the bat star.

Makenna, age 17 - The most interesting thing I saw today was the live abalone out of water.

Chase, age 18 (not in photo) - My favorite marine animal is the sea lion because its barking reminds me of my dog.



These three children were visiting with their family from Chile.

Andy age 3 - My favorite animal is the sea anemone because it's squishy.

Tommy age 5 - My favorite animal is a fish, the sculpin.

Franny age 8 - My favorite animal is the sea anemone because it's nice and squishy and round.

Two little girls were visiting with their parents and their grandparents from Michigan. Mary Madeleine, age 10 and Madeleine Claire, age 8 said their favorite animals are the barnacles and hermit crabs.



Melanie, age 7, enjoyed the tidepools with her dad and her grandparents who are visiting from Germany. She was especially fashionable with her polkadot raincoat and polkadot boots.

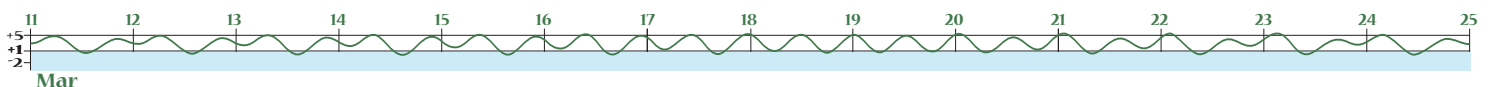
What was the coolest thing you saw today at the tidepools? "The purple sea urchins."

The graph displayed across the page bottoms shows tides for 3/11/18 to 7/28/18. Where the date appears is midnight. The reefs are accessible for exploring during low tides—at least +1 or below. This area is shaded light blue. See: <http://www.fitzgeraldreserve.org/newffmrsite/lowtides/> for a more detailed tide chart.

The winter afternoon low tides change to morning low tides in April. There are almost equally low tides several days before and several days after the noted low tide dates.

The lowest tides this period are:

-0.39	3/27	2:34 pm	-0.84	5/30	6:01 am
-0.76	4/19	7:50 am	-1.80	6/15	6:33 am
-0.59	5/01	6:20 am	Lowest tide of 2018		
-1.49	5/17	6:47 am	-0.71	6/28	5:43am
5th lowest tide of 2018			-1.64	7/13	5:30am
			3rd lowest tide of 2018		



New Beginnings

Spring is officially here* and as I write this, the sun is shining, the skies are clear and the wildflowers are in bloom. Spring signifies a time for new beginnings, and here at Fitzgerald Marine Reserve we are excited with all that is new for us this year.

New Parks Director

Jonathan Gervais began his tenure in November 2017 as the new San Mateo County Parks Director. Jonathan replaces the fabulous Sarah Birkeland who served us well as Interim Parks Director. Thank you Sarah for always being present at our monthly board meetings and for listening and acting upon issues and initiatives that are important to us. And welcome Jonathan! We look forward to working with you.

New Naturalist Training Class

February 3rd marked the beginning of our 2018 Naturalist Training Class. The education and training for our naturalists takes place over the span of ten Saturdays, plus an additional six hours spent at the reserve with a mentor. Naturalist and FFMR board member Susan Evans put together a great training schedule for our new recruits. I still fondly remember my naturalist training and how amazed I was with the wealth of information imparted to me during those classes. Thank you Susan and all the others who make this training possible.

New and Improved Seal Sitting

Seal sitting has long been one of my favorite volunteer activities at the reserve. It's always fun to set up the cones, pop open the spotting scope, and engage with tourists and locals alike as they take a peek from a safe distance at our adorable harbor seal population. The Friends group recently purchased new spotting scopes to facilitate better viewing. Naturalist Kris Liang will be hosting a new seal sitting training class on March 10th from 10:00-12:00.

New Life

February through April is pupping season at the reserve. It is a time I refer to as "cuteness overload" as we welcome the newest members to our resident harbor seal population.



Cuteness overload indeed!

Baby harbor seals are white and fluffy when born and can swim immediately. They stay close to their mom in the water and rest on her back when tired. Please keep in mind that mother seals will leave their babies on shore while they search for food. If you see a pup on her own, please do not approach it. More than likely, the mother is on her way back to the pup to provide much-needed food but will not return if a human is present.

The members of the FFMR Board of Directors and I look forward to launching many new initiatives this year and we celebrate with you the renewed chance to enjoy the beauty of Fitzgerald Marine Reserve together.

See you "on the rocks,"

Kathleen Hayes

Please report any disturbance of harbor seals to park rangers.

To report sick or abandoned pups please

contact:

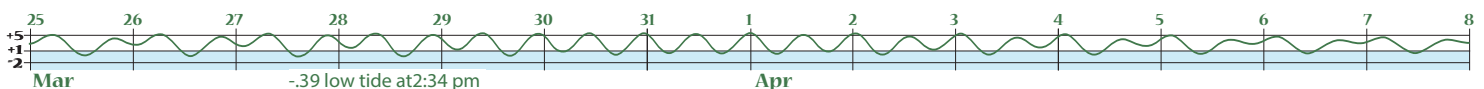
*Park Rangers
650-728-3584*

*Marine Mammal
Center
415-289-7350*

* First Day of Spring?

By the astronomical calendar (based on the Earth's rotational axis), Spring starts on March 20 and runs through until June 21.

The meteorological calendar splits the year into four three month seasons: Spring (March, April, May), Summer (June, July, August), Autumn (September, October, November) and Winter (December, January, February), making the first day of Spring March 1.



Anne-Ly Crump-Garay



First, today I am still in my grieving season. My darling David died in February 2016. Living without my partner, best friend, father to Christopher is a strange life, lonely even when family and friends are with me—a deep sense of spiritual missing.

I am emotionally supported living by this great Pacific Ocean with good friends from Fitzgerald Marine Reserve—like minds who love the tidepools and their critters: nudibranchs, snails, sea stars, anemones and more. Welcoming schoolchildren to the tidepools; searching for marine mammals; long coastal hikes repeating my mantra, “grateful, grateful, grateful”; quiet reflective conversations all add meaning to my life.

As I write, I am on the Sea of Cortez with five FMR friends, having spent several days on the Pacific side of Baja at the St. Ignacio Lagoon with mother grey whales and their adorable calves. Many of the 140 whales there entertained and awed us. Now we are exploring the Sea of Cortez side where the beaches are covered with bivalve shells many feet thick—incredible and beautiful.

My love of the oceans comes from my parents, each born on one of Estonia’s large islands. They escaped Russia’s invasion in 1943 on a small motor boat captained by my father to cross the Baltic Sea to Sweden. They were only 18 and 25 at the time and hoped to return to Estonia in a few weeks. They would not see Estonia again for 50 years!

I was born in a displaced person’s camp in Sweden at the end of World War II. My parents and I soon emigrated to Argentina for more opportunities and a warmer climate. but the political currents in the Peron Era did not suit them. Unable to return to Estonia, we then emigrated to Niagara Falls, Canada, and finally to Toronto, a city filled with immigrants from around the world, just like us, ready to work hard and prosper.

Toronto was an ideal place to grow up. As a kid, I loved science and math and decided in grade four to be a dentist. Excellent grade schools and a tuition of about \$1200 a year at the University of Toronto allowed me to realize my dream profession. Toronto was my place of educational opportunity.

However, a peripatetic life was in store for me, and in 1971 I emigrated again, this time to Palo Alto, California. I spent a year at UCSF and the Oro-facial Anomalies Department and then set up my own dental practice in Sunnyvale. Relating to my patients one on one, teaching them about preventative dentistry and the “new” approaches in dentistry with bonding techniques helped me love my profession. After 43 satisfying years, I retired.

Soon, I discovered the joys of being a naturalist volunteer. Such a fine program the board of FMR has created to teach us volunteers about the complex interface between land and sea. It is a pleasure to see the kids’ faces as they approach the ocean’s edge. I love hearing: “Is this always here?” or “Is this free?” Yes, the ocean is always here and it is free to all! Children love to learn about protecting our ocean resources and treasure hunting at the tidepools.

David and I were fortunate to travel the world together. We lived for months in Perugia, Italy, and then returned to Argentina where I had lived as a child. Together we saw the Iguazu Falls, rounded the Cape Horn, walked the Great Wall in China, marveled at the Xian Warriors, touched the pyramids in Giza, gazed open-mouthed at the geology of Cappadocia, Turkey, sent offering candles into the Ganges River. Travel with a like-minded partner is a gift, and my memories are a treasure.

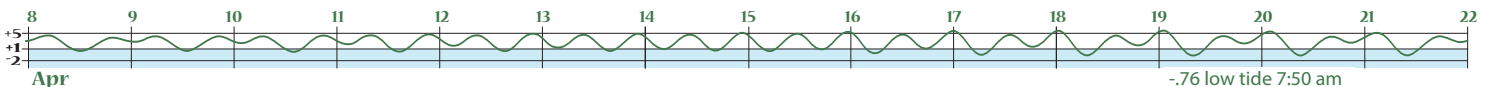
One of our last purchases together was the Rainbow Ranch in Ojai. We grow organic avocados, Kishu and pixie tangerines, CCOF certified. Our son Christopher and his family manage our ranch in Ojai. He is constantly adding new crops to the avocados and tangerines—organic turmeric, garlic, pumpkin, squash, and other fruit trees.

He graduated from UCLA with a degree in Geography, but this land called to him and he loves creating a unique, “grounded” environment for his three little daughters. No TV, limited online time and lots of outdoor exploration with hands in the fertile soil. They just love scooping up the rich earth and seeing the worms and other organisms. And with the Kishu tangerine trees being only about five feet tall, I love having the girls run out to get me some tangerines! This past December Ojai was spared the tragic wildfires, but we lived in trepidation for a month.

David and I did consider relocating to Ojai, but our old adage proved true. After returning to Montara from any trip we would say, “home again and it’s the best (for us).”

In September I sailed the Northwest Passage from Kugluktuk Nunavut to Greenland, 18 days of glaciers, fjords, polar bears, beluga whales, bowhead whales, muskox, caribou and the Aurora Borealis. The Inuit, who have inhabited this area of Northern Canada and Greenland for thousands of years, are remarkably courageous, hardy and enterprising. We stopped in their tiny towns to listen to their stories, watch their dancing to drumming and feats of physical skills—resilience at its best.

And so I continue, walking the coastal trails with my mantra to help me remember the gratitude I feel even in my grieving season. I sit in the late afternoon with a glass of wine and watch the sunset into the Pacific from my living room as David and I used to do. And I give thanks. ♦





Leafy hornmouth (*Cerastoma foliatum*)
◆ JULIE WALTERS



Leafy hornmouth eggs (*Cerastoma foliatum*)
◆ JULIE WALTERS



Yellow-edged cadlina (*Cadlina luteomarginata*) ◆ JANET PELINKA



Brooding anemone (*Epiactis prolifera*)
◆ JANET PELINKA



Red urchin (*Mesocentrotus franciscanus*)
◆ JULIE WALTERS



Knobby sea star (*Protoreaster nodosus*)
◆ JULIE WALTERS

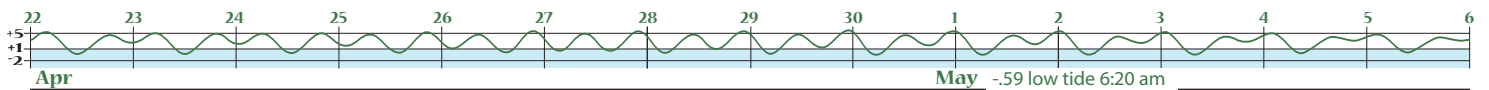
The top six photos were taken at Frenchman's Reef. The bottom two were taken in Mulege in the Sea of Cortez.



Diamedes sapsucker (*Elysia diomedea*)
◆ JULIE WALTERS



Sedna sea goddess (*Glossodoris sedna*)
◆ JANET PELINKA



Heading North

Look for these 3 southern species which have moved into our area

by Julie Walters

I recently attended a lecture at the Monterey Whalefest by John Pearse, Professor Emeritus of Marine Biology at the University of California Santa Cruz. He gave the following three species as :



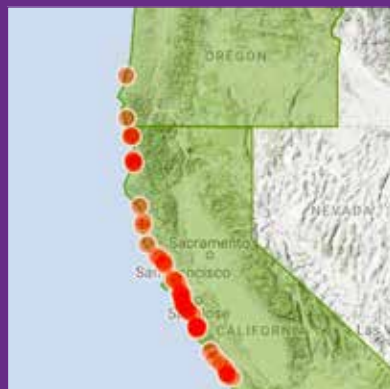
Hopkins Rose nudibranch (*Okenia rosacea*)

We first started seeing the bright pink nudibranch at Fitzgerald and Pillar Point in 2013. In fact, during one of our nudibranch counts, we saw over 600, far outnumbering any other species observed.



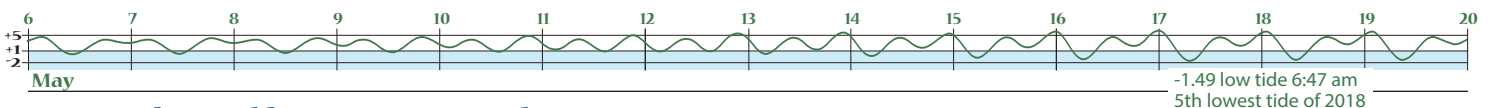
Pink volcano barnacle (*Tetraclita rubescens*)

Not to be confused with the white or pink striped barnacles, I have yet to personally observe this animal in our area but this photo was taken at Pillar Point by Liam O'Brien. If you see one, please photograph it and upload your observation to iNaturalist.org.



Sunburst anemone (*Anthopleura sola*)

A very common sight in our tidepools, often outnumbering our native giant green anemone, this beautiful anemone comes in a range of colors from neon green to blue, to almost white. These photos show the range of colors observed at Pillar Point and in Fitzgerald over the last several years. Take a look at the map from iNaturalist and you can see how this species has moved north and is well established in our area.



The Monarch Butterfly – Our Extraordinary Visitor

by Janet Pelinka

When I moved to Half Moon Bay it was to be near the ocean, the tidepools, and the marine life I love so much. What a sweet surprise it was to see a monarch butterfly flitting around my garden. Then while walking through a grove of eucalyptus trees on my trek to the beach I was rewarded with a view of several monarchs swirling around the low-growing vegetation next to the grove. I soon learned that this area is a home base for these creatures, and that the non-native, blue gum eucalyptus trees growing here provide ideal conditions for our wintering monarchs. The trees are tall and dense, providing adequate wind protection. Their canopy is open to allow enough filtered sunlight to keep the monarchs' bodies warm. And they grow near the coast where dew and fog provide the ideal amount of moisture.



I was lucky to be there at the right time and in the right place. Monarchs seem to be extremely picky about when they fly. If you arrive too early, you are likely to lose patience before they start to fly. Get there too late and they will be gone for the day. In general, you can expect them to start flying during the warmest part of the day, between noon and 3:00 p.m. And they won't fly at all if the temperature is less than 57°F. They also don't fly on cloudy days. Timing depends on the density of the trees where they sleep—where the trees are close together it takes longer for monarchs to warm up.

I was under the impression that all monarchs flew great distances to winter in Mexico. But those that do that are from areas east of the Rocky Mountains where winter is much colder. Monarchs from west of the Rockies fly to the California coast where the temperature is moderate. Our local colonies are here for the winter, arriving as early as October and staying through February. They mate here, getting

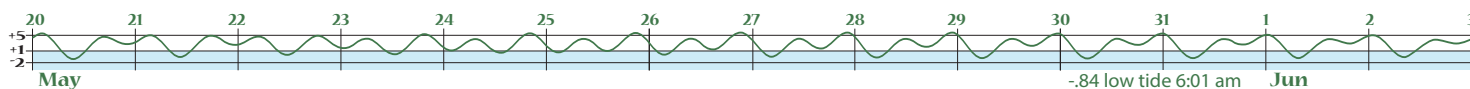
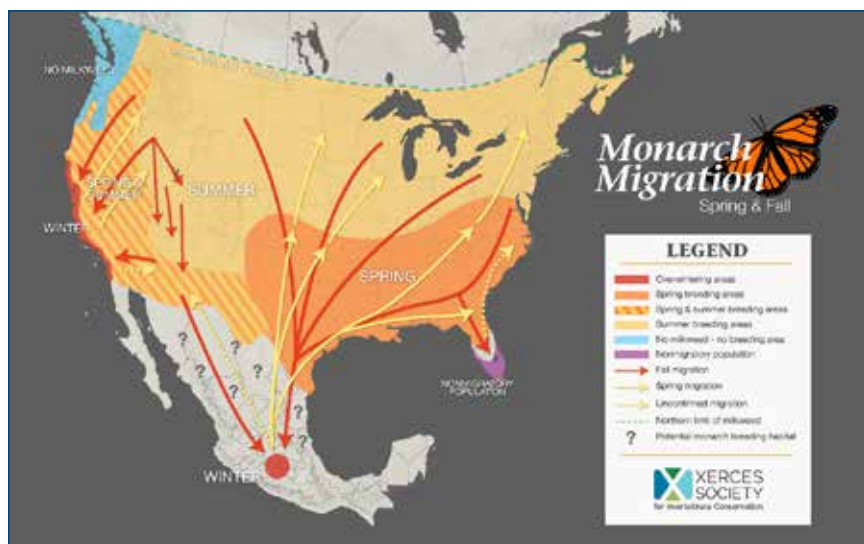
their cue from increased temperatures, and that is when you may see them doing spiral mating flights.

By the end of February or early March, they fly away to begin their migration cycle. Their journey is long, but they don't travel fast. Females head inland to lay their eggs on the underside of leaves found on milkweed plants in the mountain foothills. (Milkweed is the only thing the larvae can eat and contains a toxin that, when ingested by the caterpillar, makes it toxic to other animals. This toxin remains in the butterfly as well, providing protection from predators that would otherwise eat the monarchs.) After laying their eggs, they die. This pattern typically cycles through four generations. In their short lives (two to four weeks) members of each of the first three generations disperse successively farther in a westerly and northwesterly direction—to Oregon, Nevada or Arizona and occasionally parts of Washington and other states in the west-- in search of milkweed and warmer temperatures.

continued on page 9

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Limpets

by Sasha Greenawalt

Can you distinguish a rough limpet from a ribbed limpet? A shield limpet from a plate limpet? It can be difficult; in fact, sometimes it might require molecular analysis. A limpet is a marine mollusk with a shallow conical shell and a broad muscular foot. They are usually found clinging tightly to a rocky substrate, although young ones often live on mussel shells or on the opercular plates of gooseneck barnacles. In both of those cases, the coloring of the shell varies from that of the rock-based form and provides camouflage for the creature. The following are some characteristics of limpets commonly seen at FMR.



Ribbed limpet (*Lottia digitalis*) •
Rosaricco Beach Marine Laboratory

Ribbed limpet: *Lottia digitalis*.

Prominent ribs radiate from the top of the ribbed limpet's elliptical shell; the edge of the shell is somewhat wavy. The overall color is gray with greenish brown bands, and it is found in rocky areas in the spray zone to the high intertidal zone, often on vertical rocks or in the shade. The shell is up to one inch long. This limpet creates a home scar in the rock where it lives which

exactly matches the shape of the outer edge of its shell and helps protect it from removal by predators and from desiccation. A study showed that the greatest distance a ribbed limpet typically wandered from its territory was only three feet.



Rough limpet (*Lottia scabra*) •
California blog

Rough limpet: *Lottia scabra*.

Looking quite like the ribbed limpet, this animal's shell also has strong radiating ribs and a scalloped edge. The color, again similar to the ribbed limpet, varies from greenish to brown and is often eroded. The two species do coexist, in fact, but each occupies a slightly different habitat. The ribbed limpet tends to occupy vertical rock faces or overhangs and certain horizontal ones clothed by algae and barnacles. The rough limpet tends to clump more, to prefer wave-exposed shores, to be found higher up the shore than the ribbed limpet and is seldom seen in rocky pools. The rough limpet also creates a home scar, which it returns to at each low tide. Its shell can be up to 1 1/8 inches long.

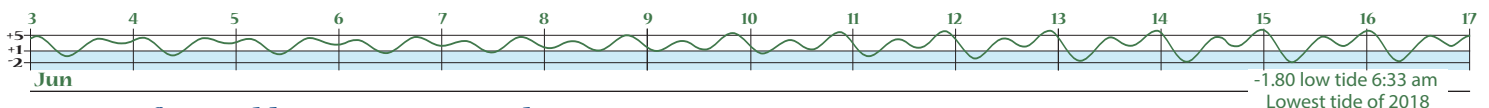
Dunce cap limpet: *Acmaea mitra*. Looking much like the paper hat that was once worn by students as punishment for slow learning, this



Dunce cap limpet (*Acmaea mitra*) • Sound
Water Stewards

limpet's shell is cone-shaped and white (or pink if covered with pink encrusting coralline algae). It is one of the two animals that can digest that calcereous algae. The shell's height can be up to one inch; its interior has a horseshoe-shaped muscle scar. The limpet is found on rocky beaches, in low intertidal to shallow subtidal zones.

When the tide is low and the mussel beds accessible, the tidepooler should look closely at the areas devoid of mussels. What may look like bare rock can possibly be the garden of the **giant owl limpet, *Lottia gigantea***. The largest of limpets, up to 3.5 inches long, this animal creates distinct grazing territories by scraping rocks free of algae and leaving a trail of mucus that stimulates algal growth. The "farmers" are typically females that have transitioned from males and dominate their territory by bulldozing intruders off. This behavior maintains the biodiversity of the area by not allowing any one species to take over. Owl limpets can live for 20 years and sometimes occupy the same farms for at least four years. When confronted with a predator like the sea star *Pisaster ochraceus* this limpet responds with a behavior known as "mushrooming," which consists of raising its shell up and rocking it in a menacing manner, and later bringing the anterior end of the shell down on the foot of the predator.





Owl limpet (*Lottia gigantea*) • *Cabrillo National Monument Park Service Field Notes*

A more serious predator is man: humans eat owl limpets and preferentially take the largest limpets in a population for consumption. The



Shield limpet (*Lottia pelta*) • *Friends of Skagit Beaches*

inside of the owl's shell is a shiny silver-blue, with markings that some say look like a Horned Owl, giving the animal its name.

Shield limpet: *Lottia pelta*. This species exhibits a fair amount of variation in shell pattern and coloration, depending on the substrate it inhabits. Individuals on rocks are brown to brownish-green and often have ribs. Limpets on

kelp are smooth and uniformly dark or variegated in color. Those on mussels are uniformly dark. Studies show that if an animal goes to a new substrate, the colors of the new growth on its shell tend to change to match those of limpets already there. The shield limpet's defense against sea stars is to lift its shell off the substrate and to "run" by crawling away as fast as possible.

Rough keyhole limpet: *Diodora aspera*.

This is the oldest (least evolved) limpet species. Its color varies from light brown to gray, often



Rough keyhole limpet (*Diodora aspera*) • *theoutershores*

with color banding. Ridges radiate from the top of the shell and concentric lines cross the ridges at right angles. There is a circular hole at the apex of the shell. The rough keyhole limpet has a large number of teeth on its radula for grazing on algae attached to rock. To protect itself from predators such as the purple sea star, it can erect its mantle to cover its shell. It is found on rocky beaches in the low intertidal to subtidal zones. ◆

*When confronted with a predator like the sea star *Pisaster ochraceus* this [owl] limpet responds with a behavior known as "mushrooming," which consists of raising its shell up and rocking it in a menacing manner... and later bringing the anterior end of the shell down on the foot of the predator.*

Monarch Butterfly *continued from page 7*

The fourth generation lives longer, up to nine months. Remarkably, this last generation migrates all the way back to the same groves of trees that its ancestors inhabited, and the cycle starts anew. So those monarchs we see here are the great, great grandchildren of those observed the previous year.

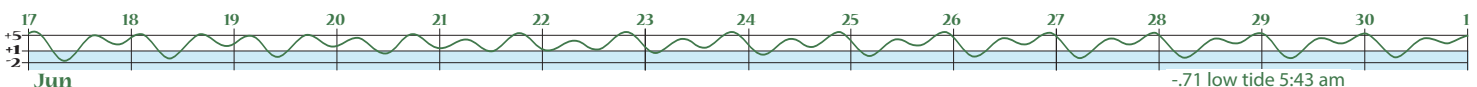
Unfortunately, the monarch population is declining due to many factors, one of which is the increasingly limited access to milkweed, the only larval food source of the monarch caterpillar. In areas over-developed and over-landscaped these critically important *Asclepias* plants are becoming a less common occurrence. If you decide to plant milkweed in your garden, it is extremely important to plant the right species. Mexican milkweed (*Ascle-*

pias curassavica) is easy to find in garden centers and around the Bay Area. Unfortunately, science now reveals that this exotic milkweed has the potential to harm the monarch population of California. The Xerces Society website <https://xerces.org> provides helpful information and planting tips.

Monarchs also love puddling, which is basically hanging out in damp sand or mud where they drink a little water. You can create specific puddling spots for the butterflies by filling shallow dishes or pans with sand and a bit of water and placing them in sunny spots in your yard.

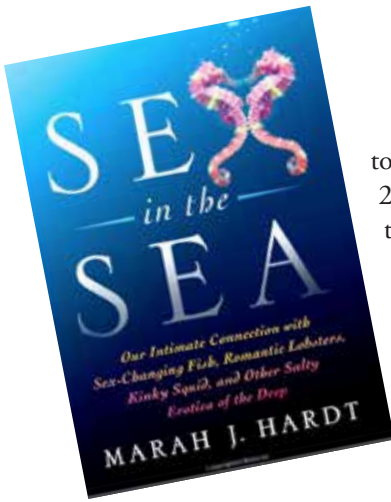
So they are gone for now, but be on the look-out next fall when, to our delight, that fourth generation returns to its ancestral beginnings. ◆

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Sex in the Sea

by Marah Justine Hardt, reviewed by Tom Ciotti



Marah Hardt received a BA in the History of Science from Harvard University in 2000 and a PhD in Marine Biology from the Scripps Institution of Oceanography in 2007. In 2008 she founded Oceanlink, a marine ecology consulting company. She is also the Director of Research at Future of Fish, a nonprofit that works with industry, technologists, and NGOs to create business solutions to ocean challenges.

In 2016 Dr. Hardt published *Sex in the Sea* which she describes as a “popular science book exploring the link between sexual strategies of marine life and sustainable management of ocean resources.” The key word in that description is “popular,” because this book absolutely interprets an amazing and not entirely understood area of marine science in a manner that is entertaining and comprehensible to a broad audience of readers.

I came across *Sex in the Sea* by happenstance. One day in the spring of 2017 Ranger Rob Cala and I were out in the FMR tide pools and happened upon several pairs of mating kelp crabs. It caused us to ponder whether kelp crab mating occurred only at certain times of the year and more generally when mating/spawning happened in the other marine species we regularly see at FMR. I had not seen a chronological mating/spawning list for marine animals in my marine biology books and thought such a list would be handy information for FFMR docents to have—to spice up our tour patter when the need or opportunity arose. So I told Rob that I was going to go online when I got home to see what was available. I did that and found zilch. So I emailed Dr. Tom Niesen, FFMR Board member and retired Professor of Marine Biology, to see if he knew of a source for this information. A couple of days later he emailed me that he had searched and queried colleagues and came up with nothing. So I gave up on this quest.

But then, one day in late fall in 2017, I was perusing National Geographic articles on my iPad and came upon one about dolphin mating and the challenges of having sexual intercourse in a liquid medium. The end of the article stated it was an excerpt from a book named *Sex in the Sea*. My quest was revived! I went online to Amazon Books, found it, and ordered it. When it arrived I immediately started reading it. While it didn’t provide the list I’d hoped for, it was thoroughly entertaining, highly informative, and thought-provoking. A heck of a read—so much so that I ordered a second copy and gave it to Joseph Centoni, FFMR Board member who teaches Marine Biology at Half Moon Bay High School. After all, what high school student who is seriously interested in marine biology wouldn’t want to know about this book??

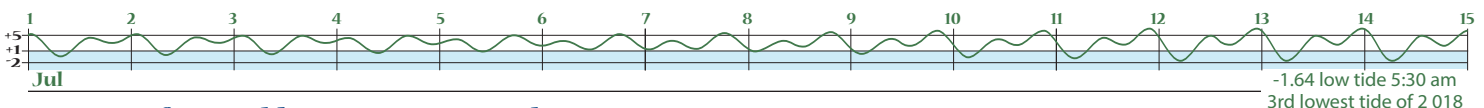
Sex in the Sea is organized into eight chapters. The first three are categorized under the heading “Dating Games” and discuss how various marine animals find and attract mates. The next four chapters fall under the heading “Sealing the Deal.” The first two cover reproductive strategies involving internal fertilization and the latter two strategies using external or broadcast fertilization. The final chapter is labeled “Post-Climax” and deals with what humans can do to encourage sex in the sea that benefits the environment and mankind and avoids having marine species included on an endangered species list.

The book is written in an almost colloquial style and is loaded with analogies to human sexual behavior and sex nomenclature and idiomatic expressions that are undoubtedly familiar to the current procreating segment of the human population and even some of us old timers who yearn to be hip. That’s what helps make this book “popular science.” Each chapter begins with a few “Sex-Sea Trivia,” a “Sex-Sea Soundtrack” listing a few songs apropos to the chapter’s subject, and a fictionalized short vignette that almost encapsu-

“Even within the confines of the average home aquarium, a male copepod swimming around randomly is likely to bump into a female copepod about once per year, yet individuals may live only a few months and some only a few weeks.”

So how do copepods get together in the vastness of the sea?... they go to singles bars.

The book is ...loaded with analogies to human sexual behavior and sex nomenclature and idiomatic expressions that are undoubtedly familiar to the current procreating segment of the human population and even some of us old timers who yearn to be hip.



lates the subject in a setting to which humans can relate. These chapter openings definitely lighten the tone of the book and entice the reader to read on.

...this book absolutely interprets an amazing and not entirely understood area of marine science in a manner that is entertaining and comprehensible to a broad audience of readers.

I personally found the first three chapters to be the most fascinating. They reveal that Mother Nature is truly the all-time master at fashioning *cherchez la femme* strategies. One such strategy that was particularly interesting to me (because it involves fluid flow dynamics which makes my chemical engineer heart go pitter patter) is used by copepods which fuel the ocean's food web. As described by Dr. Hardt these creatures are so small that "Even within the confines of the average home aquarium, a male copepod swimming around randomly is likely to bump into a female copepod about once per year, yet individuals may live only a few months and some only a few weeks." So how do copepods get together in the vastness of the sea? She explains that they go to singles bars. Male copepods are able to track females by the fluid flow pattern the female generates as she swims through the water. The duration over which the fluid flow trail left by a swimming female is discernible to a male depends on the turbulence of the water—the more quiescent the water, the longer the trail is discernible. So it behooves copepods to congregate in ocean spots where the water is still. While it is common to think of the ocean as a homogeneous body it is actually structured like a layer cake, with the layers being defined by differences in temperature, salinity, or other characteristics. At the boundaries between these layers are thin sections of quiescent water. These sections are copepod singles bars where the likelihood that a male can find a female by following her fluid flow footprints and hook up with her is enhanced.

Sex in the Sea is chock full of humorous accounts of the sex lives of marine animals. As an example, Dr. Hardt describes the sexual fate of salmon as follows:

"Just imagine spending your entire adult life in the big city, meeting tons of attractive fellow singles day in and day out, year after year, but having to wait until just before you kick the bucket to have sex. And if that is not torture enough, when you finally get to do it, your only option is to go back to your hometown and lose your virginity with someone from your high school.

That's a salmon's sex life in a nutshell."

In the foreword to the last chapter in the book the author states the truism:

"We affect the fate of the sea, just as the fate of the sea affects us....Generating recoveries for depleted species and ecosystems and preventing future declines ultimately depends on understanding how our salty cousins of the sea reproduce. The more we learn, the better the chance we have to adjust our own behaviors and find accommodation between marine life and ourselves."

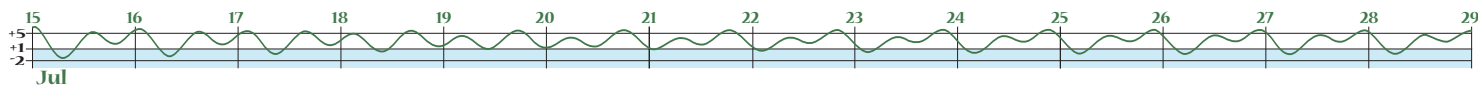
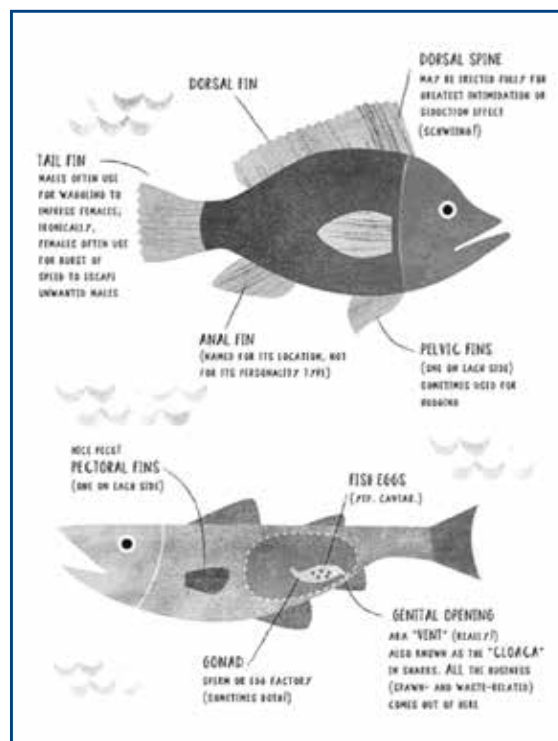
In the last chapter Dr. Hardt suggests some behaviors that will promote successful sex in the sea. Among them is one with the heading "GIVE THEM SOME PRIVACY: THE RISE OF LARGE-SCALE MARINE PROTECTED AREAS." We should all give thanks that such behavior has been permanently adopted at FMR and that our beloved reserve is part of a Marine Protected Area.

In closing I can only say that I hope you have enjoyed reading this review and can't wait to read *Sex in the Sea* yourself. Oh yes, and it is only coincidental that I finished writing this review on Valentine's Day, when love is in the air and, of course, the sea too. ♦

The Art of Salty Seduction



Illustrations:
Missy Chimovitz,
Sex in the Sea



If you arrive too early, you are likely to lose patience before they start to fly. Get there too late and they will be gone for the day. In general, you can expect them to start flying during the warmest part of the day, between noon and 3:00 p.m.



Monarch Butterflies, page 7

In September I sailed the Northwest Passage from Kugluktuk Nunavut to Greenland, 18 days of glaciers, fjords, polar bears, beluga whales, bowhead whales, muskox, caribou and the Aurora Borealis. The Inuit, who have inhabited this area of Northern Canada and Greenland for thousands of years, are remarkably courageous, hardy and enterprising.

Volunteer Spotlight, Anne-Ly Crump-Garay. page 4

Sex in the Sea, page 10

“Just imagine spending your entire adult life in the big city, meeting tons of attractive fellow singles day in and day out, year after year, but having to wait until just before you kick the bucket to have sex. And if that is not torture enough, when you finally get to do it, your only option is to go back to your hometown and lose your virginity with someone from your high school. That’s a salmon’s sex life in a nutshell.”

December Nudibranch Count

by Julie Walters

The nudibranch count was enjoyable if not a bit disappointing. We didn't see a lot of nudibranchs due to the high surf and cloudy water but were able to explore some of the protected surge channels.

We saw a total of 47 nudibranchs; *Triopha catalina* was the most common one seen followed by the *Triopha maculata*.

Join us on May 19 at 8:30 a.m. for the next count when a good low tide of -1.28 occurs. More information will follow as the date nears.

Thanks to all who participated. I look forward to seeing you again in May. ♦



“Neither snow nor rain nor heat nor gloom of night” stays these intrepid nudi-hunters.



We didn't see as many Hopkins Rose nudibranchs as usual. See more about this beauty on page 6.



Spotted triopha, *Triopha maculata*
• Scott Snow



Sea clown triopha, *Triopha catalinae*

Friends of Fitzgerald Marine Reserve

Membership Secretary, P.O. Box 669, Moss Beach, CA 94038, or through our website: www.fitzgeraldreserve.org

Contribution Levels:

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