

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

GREATER FARALLONES NATIONAL MARINE SANCTUARY



Superintendent's Quarterly Report

October - December, 2020

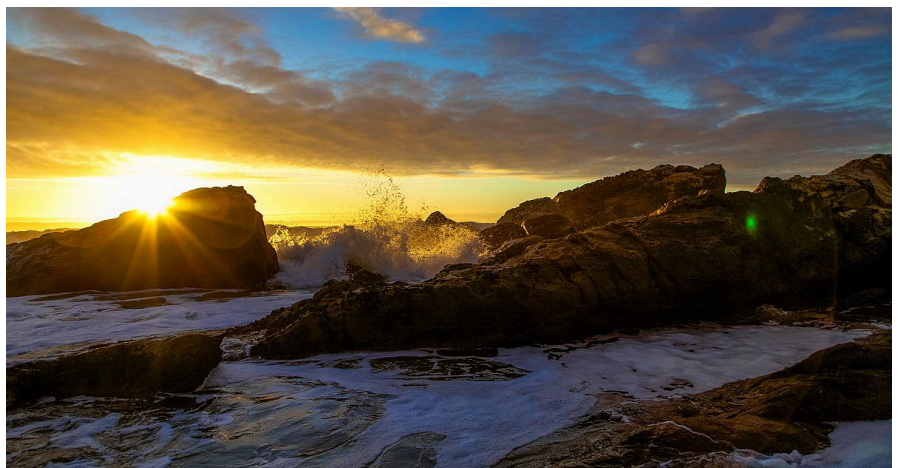
New year, new era, new hope

Fall signals change: of season, of colors, of length of day. We segue into winter, but at its end we emerge into spring, with all the promise it holds. Recent events have conspired to create a darker winter than we could ever have imagined, but we are confident that this will resolve into a season of reinvigoration, where light and positivism prevail, and Greater Farallones National Marine Sanctuary will continue our work under a brighter sun.

Despite pandemic restrictions, our work has continued apace. Greater Farallones, the leader among sanctuaries in the area of ocean climate, has advanced nature-based adaptation to sea level rise across the region through development of our Coastal Resilience Sediment Plan and establishment of the North-central California Coastal Sediment Coordination Committee. This fall at a national conference our work was singled out as a model to emulate. And, with the new Administration's pledge to prioritize climate change, we look forward to sharing our expertise even more widely, and to learn from others' ideas and achievements.

The COVID-related cancellation of research cruises on the sanctuaries' small vessel R/V *Fulmar* regrettably created a gap in our thrice-yearly offshore bird and mammal surveys. However, partnering in deep sea investigations using Ocean Exploration Trust's 211 ft. E/V *Nautilus*, our scientists conducted surveys of Pioneer Canyon, to our south, from their home offices, using an onboard skeleton crew and remotely operated vehicles (ROVs).

In 2021 we continue into a new decade, more confident than ever that, with your support and involvement, we will achieve our mission of ocean conservation.



Schooner Gulch at sunset.
Photo: Matt McIntosh/NOAA

MANAGEMENT

Sanctuary Advisory Council

Greater Farallones National Marine Sanctuary's Advisory Council consults with the sanctuary superintendent, working with various experts and community representatives to provide recommendations for management strategies.

Greater Farallones council meets on permits, enforcement, expansion

The Greater Farallones National Marine Sanctuary (GNFMS) Advisory Council (SAC) held its virtual meeting on November 19th via Google Meet. In addition to regular sanctuary updates, the SAC heard from GNFMS staff, Office of Law Enforcement, and US Coast Guard representatives on enforcement activities in the sanctuary. They received a demonstration of and provided input on the new GNFMS Permit Dashboard, a tool created to visualize locations of permitted actions issued within the sanctuary; and a presentation from Nancy Foster Scholar Samara Haver on her research monitoring the acoustic soundscape of the sanctuaries. Finally, the SAC's San Francisco-Pacific Exclusion Area (SFPEA) Subcommittee reported their findings and recommendations to the SAC. Following a lengthy virtual discussion, the SAC passed a resolution recommending the SFPEA (an area of unprotected ocean adjacent to GNFMS) be incorporated into the jurisdiction of GNFMS non-contiguously.

CONSERVATION SCIENCE

Monitoring to Understand Long-Term Trends

Beach Watch

Beach Watch, a citizen science, public-private partnership between the Greater Farallones

Association and sanctuary provides quality and legally defensible data for management and enhances stewardship and understanding of the sanctuaries.

Beach Watch monitors meet online to share data from 1,990 surveys in 2019

Greater Farallones conservation science staff provided its annual review - its first virtual version - of Beach Watch (BW) findings to the project team and management. This year, over 70 volunteers attended the virtual event, shared stories about their beaches, and learned how their data paints a broad picture of our coastal ecosystem health. Last year BW surveyed 65 beaches from southern Mendocino County through San Mateo County. Surveyors safely completed 1,990 surveys, covering 8,674 km.

In 2019, surveyors observed lower than average dead bird deposition, most likely due to lower productivity on the breeding colonies. Surveyors also observed higher than average dead Guadalupe fur seals, harbor seals, and gray whales. The dead gray whales were notably underweight and many were entangled in fishing gear.

Sanctuary Ecosystem Assessment Surveys (SEAS)

Sanctuary scientists, partners explore deep-sea communities, test for pollutants

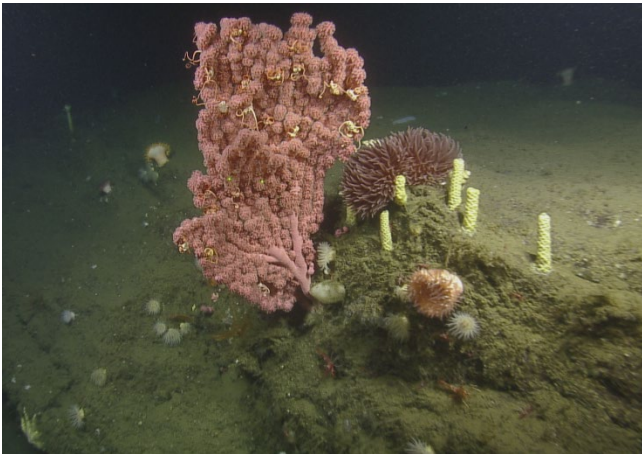
In October, conservation science staff at Greater Farallones and Monterey Bay national marine sanctuaries conducted a deep-sea research cruise in Monterey Bay National Marine Sanctuary aboard the E/V *Nautilus* with Ocean Exploration Trust, U.S. Geological Survey, California Academy of Sciences, and the Greater Farallones Association.

Through telepresence, most scientists worked from shore. A small on-board team used remotely operated vehicles to document the marine life of the slopes of Pioneer Canyon in Monterey Bay National Marine Sanctuary (under Greater Farallones management) and areas further south, including Davidson

Seamount's famed "octopus' garden." See <https://nautiluslive.org/video/2020/10/17/descending-cascading-walls-pioneer-canyon>. They continued on to Davidson Seamount's "octopus' garden" and areas of the Monterey Submarine Canyon.

The team conducted at least 26 transects in various habitats to verify biota and habitat models and collected multiple biota samples for taxonomy, aging, climatology, and microplastics, and water samples to analyze for ocean acidification, environmental DNA, and microplastics.

Seafloor research requires collaboration among public and private science institutions to address resource management issues, restore and maintain a healthy coastal environment, and enhance stewardship and understanding of the sanctuaries.



Bubblegum coral colony with yellow egg towers and anemones. Photo: OET/NOAA



Greater Farallones Research Coordinator Jan Roletto conducts research from home office via E/V *Nautilus*' telepresence technology. Photo: J. DeFiore

Applied California Current Ecosystem Studies – ACCESS

ACCESS is a long-term partnership project between Cordell Bank and Greater Farallones national marine sanctuaries and Point Blue Conservation Science for ecosystem monitoring in the sanctuaries. The ACCESS data set dating back to 2004 helps sanctuaries understand the status and trends of ecosystem conditions and informs management issues such as ship strike reduction, entanglement, changes from climate impacts, and ocean acidification. This season, COVID-19 forced cancellation of all three scheduled cruises aboard the R/V *Shearwater*.

RESOURCE PROTECTION

Protecting Natural Habitats

Greater Farallones scientist addresses coastal resilience at national conference

On October 16, Greater Farallones National Marine Sanctuary staff presented at the American Shore and Beach Preservation Association's National Conference. The presentation shared how the sanctuary is leading efforts to advance nature-based adaptation to sea level rise across the region through development of its Coastal Resilience Sediment Plan and the first year of its new North-central California Coastal Sediment Coordination Committee. After the presentation the session moderator from the U.S. Army Corps of Engineers commended the work as a model of regional collaboration for coastal resilience.

Sharing data and insights from sanctuary efforts can encourage agencies and coastal managers nationwide to adopt natural solutions to sea level rise that benefit and protect coastal habitats, a goal of the sanctuary.



A slide from the presentation advances in coastal resilience and sediment management.

Farallones sanctuary recognized as model for coastal resilience

Adapting to the impacts of sea level rise is one of the greatest challenges facing our coast. Greater Farallones National Marine Sanctuary was highlighted in the Summer 2020 issue of the journal *Shore and Beach* for taking leadership and action on the California coast. A paper in the issue lays out coastal management challenges facing California and points to the sanctuary's [North-central California Sediment Coordination Committee](#) and its efforts to increase coastal resiliency as a model for applying regional-scale sea level rise adaptation in the state.

Receiving recognition in the primary peer-reviewed journal for coastal decision-making and coastal issues increases the awareness of the sanctuary, and invites others to consider taking similar measures in their approaches to coastal conservation.



Beach and dune habitat on Doran Beach (foreground) protects wetlands and a major harbor but faces erosion from impacts of sea level rise. Photo: California Coastal Records Project

Sanctuary and partners aerially map key recovery sites for kelp restoration

In the Fall of 2020, the Greater Farallones Kelp Recovery Program led a collaborative kelp canopy mapping project along the Sonoma coastline and teamed up with partners to map over 4,000 acres of coastal ocean habitat using uncrewed aerial vehicles (UAVs) in Sonoma and Mendocino counties. Partners included NOAA's Greater Farallones National Marine Sanctuary, NOAA's Center for Coastal and Marine Ecosystems Program, The Nature Conservancy, Greater Farallones Association, and several academic institutions. This is the second year of mapping kelp recovery sites in the Bull Kelp Recovery Plan and will contribute to a west coast kelp assessment study supported by the National Marine Sanctuary Foundation. Sites were mapped using high resolution RGB (red/green/blue) cameras and multispectral sensors. Kelp canopy is in the process of being classified and quantified for each site.

The Greater Farallones Kelp Recovery Program is a partnership between the Greater Farallones Association and Greater Farallones National Marine Sanctuary, and seeks to implement strategies outlined in the Sonoma-Mendocino Bull Kelp Recovery Plan to address the severe loss of kelp forests in Northern California.

Farallones Kelp Recovery Network increases engagement opportunities

In 2019 and 2020, the Greater Farallones Kelp Recovery Program has led a network of researchers, nonprofits, industry, fishermen, managers, tribal nations, and other stakeholders over the past 18 months to share information and discuss topics surrounding kelp recovery, restoration, research, monitoring, and community engagement along the west coast.

This Kelp Ecosystem Landscape Partnership for Research on Resilience (KELPRR), grew by 50% in 2020 and currently includes 96 participants representing 44 organizations and groups from throughout California and the Puget Sound. In early 2021, we will be launching a newsletter and webinar series, as well as hosting specialized discussions surrounding kelp recovery, to

continue and advance engagement with partners.

Kelp recovery program hosts session at naturalist society virtual conference

The Greater Farallones Kelp Recovery Program hosted a special session at the Western Society of Naturalists annual conference on November 7, 2020, in partnership with Reef Check California. The session was titled, "Socioecological perspective on kelp forest recovery" and focused on exploring human dynamics with kelp forest ecosystems. The session had 250 registered participants and featured 11 speakers from California, Washington, British Columbia, Australia, and Ireland with talks that focused on restoration, community engagement, and management of kelp forests.

Greater Farallones conducts tidal range mapping to aid kelp restoration efforts

On November 16, 2020, staff with the Greater Farallones Kelp Recovery Program mapped kelp canopy near the Sea Ranch in Sonoma County during the king (extremely high) tides to estimate the influence of tides and currents on kelp canopy cover. Six flights were conducted over six hours, with a tidal range of +6.5 feet to -1.5 feet, using an uncrewed aerial vehicle (UAV), or drone. The purpose of the test was to evaluate how tidal height influences the amount of kelp canopy cover visible in drone imagery.

This study will help to determine the extent to which tide height is a significant consideration when planning bull kelp mapping missions, and what type of adjustment for tide should be considered when calculating kelp coverage. This information will inform future mission planning and data analysis of kelp canopy mapping efforts in Greater Farallones National Marine Sanctuary.

Farallones staff attend global kelp restoration workshop

On November 2, 2020, staff from the Greater Farallones Kelp Recovery Program attended

the North America section of the Global Kelp Restoration Workshop. The workshop is a joint effort with The Nature Conservancy and the University of New South Wales to create a publication titled *Guidebook on Kelp Restoration*, an effort to outline global case studies of kelp loss and provide guidance for kelp restoration efforts. The workshop included ocean managers and nonprofits involved in kelp research and restoration in North America, primarily along the West Coast. Farallones staff is contributing information about the development of the Kelp Recovery Program and the Sonoma-Mendocino Bull Kelp Recovery Plan in the guidebook.



Divers among kelp and urchins at Del Mar Landing, Sonoma County. Photo: NOAA

Responding to Vessel Groundings

Recreational vessel grounds in northern Greater Farallones sanctuary

A small motorboat (est. 18-foot long) fiberglass Starcraft with a single outboard engine capsized in high seas and grounded south of Doran Beach between Pinnacle Gulch and Short Tail Gulch in Sonoma County. United States Coast Guard Station Bodega Bay responded and rescued all four persons onboard. Greater Farallones National Marine Sanctuary resource protection staff worked with the responsible party and Sonoma County Regional Parks to recover a five-gallon gas tank and engine, and subsequently removed the remainder of the vessel.

This vessel consisted of plastic, foam, and fiberglass materials with two small fuel tanks

onboard. The removal of the vessel prevented it from further breaking up and producing additional marine debris, and damaging sanctuary resources.

Protecting Marine Mammals

NOAA has prioritized reducing the threat of whale deaths from anthropogenic causes such as ship strike and whale entanglement. Greater Farallones National Marine Sanctuary works actively to address these and other whale conservation issues through several programs.

Vessel speed reduction programs' 2020 season concludes

The 2020 Protecting Blue Whales and Blue Skies Incentive-Based Vessel Speed Reduction (VSR) Program, and the NOAA-USCG's 2020 Voluntary Speed Reduction request to reduce the risk of fatal ship strikes on endangered whales concluded in the San Francisco region on November 15, 2020. Data and final results on cooperation levels from the 2020 VSR season are being finalized and will be completed in early February, 2021.

Mid-season 2020 (May 15 to August 30) data analyses recorded an increase in cooperation from vessels operated by 16 enrolled container and car carrier companies in the Protecting Blue Whales and Blue Skies incentive-based program (to 59% in 2020, from 55% in 2019), and mid-season analyses recorded an increase in cooperation from all large vessel traffic with NOAA's voluntary VSR slow speed request (to 64% in 2020, from 58% in 2019) in the San Francisco Bay region.

These efforts demonstrate NOAA and ONMS commitment to conservation and the blue economy by providing mariners with information and recognition for actions that promote the protection of endangered whales.



Blue whale in path of oncoming ship. Photo: John Calambokidis/ Cascadia Research Collective

Protecting Seabird Colonies

[The Seabird Protection Network](#) is a multi-organization collaborative whose mission is to reduce human disturbance to seabirds and other marine wildlife along the California coast, and whose founding chapter is managed by Greater Farallones National Marine Sanctuary.

Seabird Protection Network reveals “secret” sanctuary to record audience

The Farallones' Seabird Protection Network co-hosted a webinar on September 24 with the Federal Aviation Administration's Safety Team that drew an audience of over 400 recreational aircraft pilots. Titled "Ten Secret Sights Only Pilots Can See from the Air," the lively presentation highlighted fun facts and quizzed attendees on how to safely view Greater Farallones, Monterey Bay, and Channel Islands national marine sanctuaries' coastal geology and marine wildlife, while abiding by NOAA Regulated Overflight Zones and avoiding disturbance to marine wildlife.

Framing the safety topic as a “virtual flightseeing tour” drew a statewide audience of pilots who are difficult to reach with outreach on seabirds. Co-hosting with the FAA Safety Team amplifies sanctuaries' efforts to protect sensitive wildlife, increases the likelihood of compliance with NOAA Regulated Overflight Zones, and deepens our partnership with a key agency.



Matt Pickett, Wendy Kordesch, and Paul Hobi reveal “secret” sanctuary sights to the 400 pilots in attendance. Photo: NOAA

Seabird Protection Network presents to Western Sea Kayakers club

On October 7, Seabird Protection Network staff gave a virtual presentation to members of Western Sea Kayakers, a sea kayaking club in the San Francisco Bay Area that frequently organizes open ocean paddles to remote coastal locations. The presentation showed how paddlers can be partners in seabird and marine mammal conservation by keeping their distance. It also provided an overview of special closures around particularly sensitive seabird colonies.

Building partnerships with influential kayaking organizations allows for increased opportunities for outreach to California paddlers, and increases the likelihood that they will avoid disturbing sensitive wildlife – one of the key goals of national marine sanctuaries.

EDUCATION

Inspiring an Ocean Conservation Ethic

Get into Your Sanctuary: Recreation and Tourism

NOAA's Office of National Marine Sanctuaries (ONMS) Recreation and Tourism Strategy identifies “travel and tourism” as a driver for coastal economies and encourages sites to “increase visibility and responsible

visitation to the system and partner institutions.”

Public Events

Virtual Sharktoberfest reaches thousands of shark enthusiasts across the globe

On September 26, over 1,206 live views (devices/one or more persons) in 10 countries, from Indonesia to Croatia to New Zealand, experienced the sanctuary's first Virtual Sharktoberfest™ – an annual event to celebrate the white sharks of Greater Farallones. At least 2,000 more, and rising, viewed the program since. This event featured the latest shark research, award winning conservation films, and an “Awesome and Jawsome” shark experts’ panel discussion.



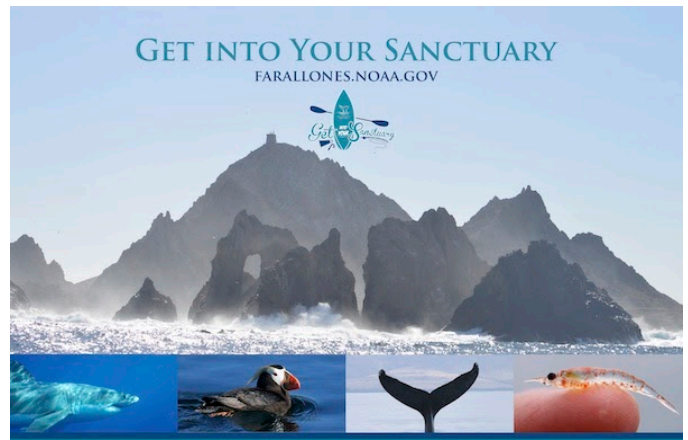
White shark pops up precisely where they weren't looking! (It happens.) Photo: Matt McIntosh/NOAA

Trivia and quizzes entertained and educated all ages. The event's dozen partners included NOAA Fisheries, Aquarium of the Bay, Mote Marine Laboratory, International Ocean Film Festival, and Marine Science Institute. Sharktoberfest™ was co-sponsored by the Greater Farallones Association and Shark Stewards. Normally held at the sanctuary's San Francisco campus, this event fostered appreciation of elasmobranchs in marine ecosystems everywhere.

Sharktoberfest helps educate and inspire stewardship for what once was “the fish you love to hate” — the shark — all over the world. Understanding its value and vulnerabilities helps keep conservation in the public eye at a time when populations are threatened, some in danger of extinction.



“Awesome & Jawsome” panelist, endangered shark researcher Jasmin Graham. Photo: Chelle Blais/Mote Marine Laboratory



Naturalist-led virtual cruise highlights the extraordinary array of wildlife in Greater Farallones National Marine Sanctuary. Photomontage: NOAA/GFA

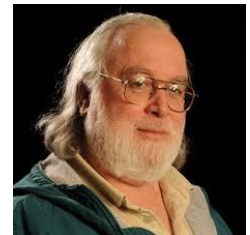
Adventurers experience virtual cruise into Greater Farallones sanctuary

Greater Farallones naturalists offered two one-hour virtual Sanctuary Explorations programs on October 21 and 24 to a combined 45 participants. From the comfort of their homes, "passengers" departed from San Francisco, traveled under the Golden Gate Bridge, and out to sea for the 27 mile journey to the intriguing Farallon Islands. Wildlife such as humpback and blue whales, seals, sea lions, porpoises, sharks, seabirds such as the tufted puffin and common murre, and other ocean wildlife were seen along the way! Maritime heritage and research in the sanctuary were also highlighted. Viewers learned about the National Marine Sanctuary System and the wildlife, habitats, and cultural resources that Greater Farallones National Marine Sanctuary protects as one of the most diverse and bountiful marine environments in the world.

Virtual programs provide an opportunity to maintain connections with the Sanctuary Explorations community. They also connect new audiences outside the San Francisco Bay Area, who could not normally participate in field excursions when they take place in person.

SETI researcher electrifies audience at Greater Farallones “Humpback Soirée”

On November 14, 2020, hundreds of real-time attendees took part in an electrifying evening of science and culture when Greater Farallones National Marine Sanctuary and the Greater Farallones Association education team produced a virtual Humpback Whale Soirée, featuring astrophysicist and animal communications expert Laurance Doyle, PhD. Dr. Doyle is Principal Investigator for the Search for Extraterrestrial Intelligence (SETI) Institute’s Whale Project, applying the mathematics of Information Theory to humpback whales’ song to measure the complexity of their vocalizations, and as a proxy for an ETI signal, to inform SETI’s search for exoplanetary intelligent life. The event drew over 550 real-time attendees, and an added 175 since then. Find the full program [here](#).



The multimedia evening included beautiful imagery and whale song, and highlighted our national marine sanctuaries’ whale disentanglement and ship strike prevention initiatives, plus special fun for Trekkies!



Humpback whales with youngster. Photo: Ed Lyman/NOAA Fisheries Permit #14682-38079



Echinoderms such as sea stars play key roles in intertidal communities. Photo: Joe Heath

Using the combined allure of humpback whales and extraterrestrials, the program reached a diverse group of now over 852 adults, encouraging their involvement in protecting marine life and coastal ecosystems.

Sanctuary Exploration Series

Sanctuary Exploration Series programs are monthly opportunities to explore habitats and experience wildlife; field programs resumed in virtual format while COVID-19 restrictions continue to be in effect.

Greater Farallones guides families in end-of-year tide pool exploration

Greater Farallones education staff offered a one-hour "distance" family workshop on December 21 to a total of 38 participants. The Farallones naturalist and instructors led a virtual tour of the rocky intertidal, highlighting local sites in the sanctuary and proper tide pool etiquette. The workshop focused on four groups of animals (crustaceans, mollusks, sea anemones, and echinoderms) and seaweeds commonly found in the four zones of the intertidal area.

The instructors used videos, interactive polls, and live artifacts to demonstrate relevant points. Lastly, participants were sent a hand-drawn template of the intertidal zones and encouraged to draw organisms they observed during the workshop to create their own guide to take on their next tide pooling trip.

Visitor Center

Closed until further notice. Greater Farallones National Marine Sanctuary Visitor Center serves ocean enthusiasts of all ages, from the San Francisco Bay Area and all over the world. It is located in San Francisco's Presidio National Park in the Golden Gate National Recreation Area and welcomes drop-in visitors, offers structured programs for various ages and interests, and hosts special events. School programs include plankton netting for view under a microscope, searching for shore crabs, and activities in the visitor center to learn about animal adaptations. Ordinarily, students would take part in indoor as well as outdoor activities on the adjacent Crissy Field Beach.

Visitor Center Programs

Visitor center-based programs have gone virtual, and are in high demand. They are key and far-reaching methods for promoting ocean and climate literacy during distance learning experiences. Supporting teachers and professors during this time is important for maintaining and creating new partnerships between sanctuaries and universities.

Greater Farallones plankton program featured at nature journaling conference

On October 11, Janai Southworth of Pacific Plankton and Greater Farallones National Marine Sanctuary interpretive volunteer

presented a virtual "micro-expedition" for 759 international participants for the Wild Wonder Nature Journaling Conference: A Global Online Gathering. Southworth regularly conducts plankton tows from the sanctuary facilities, collecting, displaying, and interpreting these fascinating organisms for visitor center patrons. For the presentation, Southworth invited GFNMS educators to introduce the National Marine Sanctuary System, spotlighting Greater Farallones' dynamic oceanographic conditions that support thriving plankton populations. In turn, these sustain an extraordinary abundance and diversity of marine life, including apex level planktivores such as giant blue whales. See (<https://www.flow.page/pacificplankton>)

This virtual workshop reached a broad audience of ocean enthusiasts that may not be aware of sanctuaries and the role they play in protecting these living resources. With visitor centers closed, staff and volunteers are innovating new opportunities and platforms through which to educate and inspire the public.



Journal sketches and identifying notes on plankton from GFNMS Pier on San Francisco Bay. Photo: Janai Southworth/Pacific Plankton

Visitor Center Field Trips

GFNMS staff, working with our partner the Greater Farallones Association, will continue

to offer Visitor Center Field Trip programs virtually to promote ocean literacy and provide standards-based interactive programs for kindergarten through high school. Students “tour” the visitor center, watch the animals being fed, and interact with sanctuary education staff.

Partner-Visitor Center Programs

Youths explore ocean depths with new deep-sea curriculum

Greater Farallones educators provided virtual deep-sea science programs to eight different classes serving 127 3rd-5th graders in San Francisco from October 19-23. These programs showcased the latest video highlights and discoveries from this year's E/V *Nautilus* research cruise including an octopus nursery, a baleen whale fall, and fascinating, little-studied marine life in Pioneer Canyon and Davidson Seamount in Monterey Bay National Marine Sanctuary.

Virtual programs are in demand and essential for promoting ocean and climate literacy during distance learning. These programs bring the latest science from this year's E/V *Nautilus* research cruise to youth from low-income communities in partnership with YMCA of San Francisco, Bay Area Community Resources, and San Francisco Unified School District.

Delivering ocean science to 2,416 students, 70 classes, in just three months

The Greater Farallones education team expanded their K-12 virtual marine science programs to eight different engaging and dynamic “virtual classrooms” to ensure continuity of science education within the communities served. Sanctuary educators coordinated and conducted one-hour ocean science programs for 70 classes serving 2,416 students between October 1 and December 16, 2020. Program elements included virtual sanctuary tours, salmon dissections, student participation in crab “dances,” ocean acidification demonstrations, transects of sanctuary deep-sea coral communities, interactive quizzes, marine mammal soundscapes, and live-streaming of plankton

samples. Classes ranged from kindergarten to high school level and communities served ranged from rural schools along the sanctuary boundary to urban schools in San Francisco.

As teachers continue with virtual programming, there is a huge need for high quality, standards-based virtual science programming. This initiative fulfills Objective 3.2 of the ONMS Strategic Plan 2017-22: "Develop a virtual classroom that increases the accessibility of science-based learning for sanctuary communities."

Weekend Family Workshops

Weekend Family Workshops are normally offered twice a month through the Greater Farallones National Marine Sanctuary Visitor Center. These programs foster connections within the sanctuary community and provide multi-generational environmental science education to children and adults.

During COVID shelter-in-place, family workshops are held virtually once a month until the Greater Farallones National Marine Sanctuary Visitor Center reopens to maintain our existing connections with the sanctuary community and build new ones. This quarter, 44 people participated online.

Families share discoveries of ancient oceans and fossils, in interactive workshops

Greater Farallones sanctuary education staff offered two, one-hour virtual family workshops on September 18 to a total of 44 participants. The Farallones naturalist and two instructors led participants on a virtual tour of local spots in the sanctuary with important geological history. The workshop focused on three groups of animals (sharks, whales, and cephalopods) that have variously experienced little change over time and great change over time. The instructors used videos, interactive polls, and fossil artifacts to demonstrate relevant points. Lastly, participants were encouraged to follow along at home with an art activity involving clay and

shells they have, to understand fossil imprinting.



Ammonite fossil from ancient sea creature similar to modern cuttlefish and nautilus. Photo: USGS

At Your School Programs

On hiatus until classrooms reopen. At Your School (AYS) programs serve schools throughout the San Francisco Bay area and beyond, primarily during the school term. AYS has reached tens of thousands of students with programs such as the Crab Cab, Seabird Shuttle, Sharkmobile, and Ocean Acidification. AYS is an outreach program of Greater Farallones National Marine Sanctuary and Greater Farallones Association designed to promote environmental literacy and increase students' awareness and knowledge of coastal and marine life. It includes standards-based interactive classroom programs for kindergarten through 12th grade.

Fisherman in the Classroom

On hiatus until classrooms reopen. The Fisherman in The Classroom program promotes the principles of ocean literacy, sustainable fishing practices, and the value of commercial fishing in sanctuary waters to students in their classrooms.

Oceans after School

Using the endless appeal of our local marine wildlife and habitats, the sanctuary education team offers 18 hours of fun, hands-on, lively marine science learning through Oceans after School programs that cover topics such as

sharks, salmon, seabirds, whales, squid, and plankton. These enrichment programs are dynamic, interactive, and integrated into state standards. Sanctuary marine science educators deliver the programs during a nine-week window and primarily serve students from low-income, under-served communities.

Sanctuary educates 155 students in virtual ocean science programs

Pivoting from in-person, hands-on after-school programming to a virtual format, the sanctuary education team offered nine hours of engaging and interactive programs that covered topics such as sharks, salmon, seabirds, whales, squid, and plankton. Oceans After School (OAS) enrichment programs are dynamic and integrated into state standards. Sanctuary marine science educators delivered the programs to eight schools over nine weeks between October and early December to primarily students from low-income, under-served communities. One hundred fifty-five students completed the program this quarter.

Oceans After School is a partnership between the sanctuary and the City of San Francisco's Department of Children, Youth, and Their Families. The city provides funding for after school programs throughout San Francisco, and sanctuary educators provide students from low income communities with engaging, high-quality marine science programming that promotes sanctuary awareness as well as ocean and climate literacy. The program was retooled this year for distance learning to provide essential science enrichment to students and maintain our after school partnerships with YMCA of San Francisco, Bay Area Community Resources, and the San Francisco Unified School District.

LiMPETS – Long-Term Monitoring Program & Experiential Training for Students

The Long-Term Monitoring Program and Experiential Training for Students – LiMPETS – is a statewide national marine

sanctuary program managed by the association that trains teachers and students to become involved in real scientific investigations and become ocean stewards. This citizen science program monitors the coastal ecosystems of California and helps youth develop a scientific understanding of the ocean. LiMPETS monitors the biology in rocky intertidal and sandy beach ecosystems and aims to provide publicly accessible, scientifically sound, long-term data to inform marine resource management and the scientific community.

The LiMPETS Network typically reaches over 6,000 students annually, statewide. Engaging online allows LiMPETS staff and students to connect students to their national marine sanctuaries while sheltering in place.

This quarter, the program served 516 students through 29 virtual programs.

LiMPETS Coordinator honored by Western Society of Naturalists

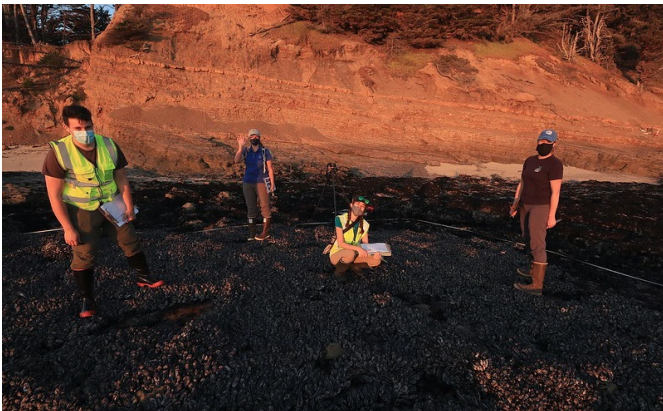
Greater Farallones [LiMPETS](#) Coordinator affiliate, Rosemary Romero, was honored at the 101st [Western Society of Naturalists \(WSN\) Annual Meeting](#) Nov. 5 to 7, 2020. Rosemary was awarded the prestigious Naturalist of the Year Award (2020) for her efforts to “define our future by inspiring young people with the wonders and sheer joy of natural history.” Rosemary is a dedicated researcher and educator, working with students and educators, to expand their horizons so they have a better understanding of natural history, community-based science, and long term monitoring. She has expanded the LiMPETS program by contributing to a database that is shared with West Coast rocky intertidal monitoring efforts such as [PISCO](#) and [MARINe](#) and prepares data for regional managers to better understand the sandy beach ecosystem.

The Western Society of Naturalists is a scientific society whose focus is on natural history, ecology, evolution, and marine biology with members throughout North America. The LiMPETS Network connects students to their national marine sanctuaries by engaging them in

the natural history of sandy beach and rocky intertidal ecosystems.

LiMPETS Network monitors for marine protected area long term program

LiMPETS completed fall data collection on November 16, 2020 under California's [Marine protected area monitoring program 2019-2021](#) funded by the Ocean Protection Council in collaboration with researchers at the University of California Santa Cruz. Following local public health and safety recommendations, staff surveyed 10 sites, from San Pedro to Moss Beach. LiMPETS continues to engage students online during the pandemic, teaching them how students like themselves contribute to collaborative conservation efforts. Data will be reported to the Multi-Agency Rocky Intertidal Network (MARINe) for inclusion in their database and incorporated in California's 10-year Marine Protected Area monitoring network report.



Members of the Greater Farallones Association conservation science team collecting intertidal data for the LiMPETS program. Photo: Rob Cala

LiMPETS students present at California Academy of Sciences student showcase

[Careers in Science](#) (CiS) interns presented data collected by LiMPETS at a student showcase hosted by the California Academy of Sciences on December 8, 2020. With the help of LiMPETS staff, CiS interns analyzed student-collected Pacific mole crab data from 2017 to 2020 surveys conducted at Ocean Beach in San Francisco, California. Interns shared what they learned about living shorelines, current coastal management

projects, and recommendations for using LiMPETS data with their peers during the online showcase. The work completed by these interns will be shared with ecologists at Golden Gate National Recreation Area for use in informing baseline environmental impact assessments.

LiMPETS teacher focus group provides feedback on virtual field trips

LiMPETS hosted a focus group with teachers participating in Fall 2020 distance learning programs. The LiMPETS Network closed out fall 2020 having served 1,044 students, 388 of which attend seven Title 1 schools bringing online field trips to the virtual classrooms of 18 teachers throughout California. The [Bay Watershed Education and Training \(BWET\)](#) funded focus group will improve the network's ability to connect students to nature through the collective actions of community science programs like LiMPETS during shelter-in-place.

Partner Events

Farallones staffer model for diversity in geoscience among college students

On October 20, Greater Farallones staff member Dr. Wendy Kordesch, at the invitation of the University of California, Santa Cruz, gave a guest lecture to 32 junior and senior college students in an Earth and Planetary Sciences Mentorship class. She shared stories about her day-to-day work as a Geological Oceanographer at the sanctuary, the career journey that brought her here, and her experience as a woman of color, under-represented in the geoscience workplace.

Sharing career insights from underrepresented groups can encourage a more diverse next generation of marine scientists, managers, and educators. The presentation also raised awareness and appreciation about the sanctuary, and strengthened the sanctuary's bond with a key scientific institution.

COVID-19 restrictions.

Sanctuary Exploration Series

Year-round, the Greater Farallones Sanctuary Explorations Series provides monthly opportunities to connect with and experience the sanctuary and surrounding waters. Excursions include whale and wildlife cruises, bioluminescence paddling, coastal hikes, and tide pooling. Join one of our *virtual* seasonal programs pending our return to site-based offerings! Visit <http://farallones.noaa.gov/visit/exploration-program.html> for updates.

Greater Farallones Visitor Center

Closed Until Further Notice: The visitor center in the San Francisco Presidio offers exhibits and docents for drop-in visitors. It also conducts special Weekend Family Workshops about sharks, squid, salmon, octopuses, plankton, ROVs, and sea otters! These programs can also be booked for your exclusive birthday parties or special event. To book programs for individuals, or special events, contact Justin.Holl@noaa.gov.

Sanctuary Soirées

Now virtual during COVID shelter-in-place. Sanctuary soirées, held twice yearly, are sophisticated evening celebrations of science, art, and culture. They feature top-of-the-line scientist presentations blended with arts, music, and crafts for an adult (16+ yrs.) audience. These events are held each spring and late fall. Keep posted through our website at <http://farallones.noaa.gov/> and our nonprofit association at <http://farallones.org>.



Dr. Wendy Kordesch discusses her career path from a former "slug" at the University of California, Santa Cruz, to working at the sanctuary.



2021 Calendar Updates

Note: all public activities are subject to COVID-19 restrictions in effect for the place and time.

February

18 Advisory Council meeting (virtual).

NOTE: Future sanctuary advisory council meeting information will be updated on the GFNMS website, <https://farallones.noaa.gov/manage/sac.html>

April

-- Sanctuary Soirée – has been rescheduled for fall.

May

20 Advisory Council meeting (virtual).

August

25 Advisory Council meeting (virtual)

December

1 Advisory Council meeting (TBD)

Ongoing Public Programs

Note: all public activities are subject to

Get Involved, Stay Informed

Visit the Greater Farallones Association website for updates, details, and registration for sanctuary expeditions: www.farallones.org, as well as the Association Facebook page. The Greater Farallones sanctuary Facebook is up and running at www.facebook.com/GFNMS/

To learn how you can become involved in the sanctuary visit: <http://Farallones.noaa.gov>.

To subscribe to *Upwelling*, the Greater Farallones Association newsletter, visit <http://www.Farallones.org> or see <https://twitter.com/GFNMS>

Learn about our Sanctuary Advisory Council: [http://Farallones.noaa.gov/manage/Sanctuary Advisory Council.htm](http://Farallones.noaa.gov/manage/Sanctuary_Advisory_Council.htm) or contact Alayne Chappell at alayne.chappell@noaa.gov to subscribe to the SAC list serve.



Rockfish caught off guard by a hungry sea star. Photo: NOAA/OET E/V Nautilus cruise



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Social media: follow us at:

[Greater Farallones National Marine Sanctuary:](#)



And our ONMS *Earth is
Blue Campaign* at:



Greater Farallones NMS Superintendent's Quarterly Report

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