Superintendent's Quarterly Report
April through June, 2018

TOP STORY

Springtime brings whales; tragedy, too

This spring, onshore winds and currents, strong and persistent, may have caused the unusual cluster of beachcast whales found on the shores of Greater Farallones National Marine Sanctuary and adjacent waters. The cause of death in five out of seven whales, from early May to mid-June, was collision with ships. Normally, dead whales would have remained floating offshore until they sank, never to be detected. Though sudden and unexpected, this spring's tragic event did not necessarily reflect an increase in ship strike rate; more likely, it reflected an increase in detection rate due to sea and weather conditions. Nonetheless, it was a grim reminder that our efforts to reduce this major cause of whale deaths must continue: three of the five were endangered blue and fin whales.

Despite laws such as the Marine Mammal Protection Act, the Endangered Species Act, sanctuary regulations and shipping lane changes, several local species have yet to recover from the hunting that continued in our sanctuary until the early 1970s. Even now, their return to pre-whaling population sizes and health is not absolutely assured, since new threats like fast-moving ships, debilitating ocean noise, pollution and other impacts have emerged.

Blue whale in path of oncoming ship. J. Calambokidis/Cascadia Research

In a spirit of "share the road," since 2014, Greater Farallones and Cordell Bank national marine sanctuaries have enlisted the shipping industry's voluntary help in preventing these deadly collisions by slowing ships to 10 knots (about 11.5 mph) or slower while transiting the busy vessel traffic lanes outside the Golden Gate during the May through November feeding season. This collaboration between NOAA's Office of National Marine Sanctuaries, industry, the Bay Area Air Quality Management District, and local NGOs builds on decades of research by scientists and conservation groups who study the whales' distribution patterns during the whales' foraging seasons, and vessel traffic patterns. Slowing may provide a few additional seconds, enough to take evasive action; or, if a collision does occur, at slower speeds it is less likely to be fatal. Not only do whales benefit, we do, too: ships run more efficiently at slower speeds, which results in reduced greenhouse gas and particulate emissions, and thus improves air quality for all Bay Area residents.

These tragic events serve to strengthen our resolve that this one factor, under human control, can be reduced. To date, shipping industry cooperation levels have been encouraging, and we hope other industries will follow suit, and build into their corporate ethic sustainability, not just for our own species, but others as well. Commerce and conservation. A workable solution.

MANAGEMENT

Advisory council focus on seagrass habitat conservation

On May 9, 2018, the Greater Farallones National Marine Sanctuary (GFNMS) Advisory Council held its quarterly meeting at the Point Reyes Red Barn Classroom in Point Reyes Station. The council received presentations from NOAA General Counsel Enforcement Section and NOAA West Coast Enforcement Division. The council also received an update on the Pacific Fishery Management Council Groundfish Essential Fish Habitat Conservation Area Process and supported gathering more data in the expanded area of the sanctuary. Researchers from University of California Davis and the Farallon Institute shared their research on eelgrass in Tomales Bay, California and the need to understand temporal and spatial dynamics of eelgrass for its continued management into the future. The council passed a resolution recommending that the sanctuary work with the State of California to develop and promote standardized mapping of seagrasses statewide.

The Sanctuary Advisory Council acts as an advising body to the sanctuary superintendent, and works with research partners to provide recommendations for management strategies.

CONSERVATION SCIENCE

Monitoring To Understand Long-Term Trends

Beach Watch

Beach Watch is a collaborative partnership of Greater Farallones National Marine Sanctuary and Greater Farallones Association, which provides ecosystem information for management about shoreline wildlife and human use activities.

Farallones seabird data used in paper published in major wildlife journal

Research results from the beached bird data collected through the Beach Watch project were published in the journal Biological Conservation (Volume 217, 2018, pages 407-418), by Ainley et al., titled *Population dynamics of Brandt's cormorants in the central California Current: a victory for ecosystem-based management*. This paper reviewed the status of Brandt's Cormorants, how this species responds within an eastern boundary upwelling system, and their responses to "boom and bust" prey availability. Variations of the central California Brandt's Cormorant populations are driven naturally by forage fish availability. With management protection of breeding sites and a shift towards ecosystem-based fisheries management in the 1990s, this species is now increasing in our region sustaining large mortality events when prey availability is low.

Sanctuary research demonstrates the importance of sustaining long-term monitoring to determine the success of management actions.

Brandt's Cormorant display. Cr: Chad King, MBNMS/NOAA

Greater Farallones scientists collaborate with park service on IUCN Snowy Plover document

Greater Farallones conservation science staff provided to the National Park Service a summary of 12-years of banded bird data collected during Beach Watch surveys. Point Reyes National Seashore is preparing a document for the International Union of Concerned Scientists (IUCN) on federally listed species, in particular the Western Snowy Plover (*Charadrius nivosus nivosus*), which is currently listed as Threatened. The data will be used to assess

seasonality and movements of the regional plover population.

The Western Snowy Plover suffers from disturbance on beaches, and habitat loss. Credit: US Fish & Wildlife Service

Sanctuary Ecosystem Assessment Surveys (SEAS, ACCESS Surveys)

ACCESS is a collaborative effort of Cordell Bank National Marine Sanctuary (CBNMS), GFNMS, Point Blue Conservation Science, and Greater Farallones Association for ongoing data collection to understand status and trends of sanctuary resources, ecosystem health, and response to climate change.

Sanctuaries complete first ecosystem studies cruise of 2018

From May 25-29, 2018 conservation science staff from Greater Farallones and Cordell Bank sanctuaries, Point Blue Conservation Science, and Greater Farallones Association began the 15th field sampling season with the first of three cruises in 2018 sampling offshore and nearshore ecosystem as part of Applied California Current Ecosystem Studies (ACCESS). Spring upwelling conditions made for rough seas but good ocean productivity indicated by abundant plankton and whales. Most notable were blue and fin whales foraging over the continental shelf. Scientists collected seabird and marine mammal data, oceanographic measurements, and sampled for prey availability along predetermined transect lines. Updates were posted daily about the research mission at www.facebook.com/ACCESS.Partnership.

Farallones scientists gear up for ecosystem cruise on NOAA Ship *Bell M. Shimada*

Farallones Conservation Science staff prepared for an extended research cruise on board the NOAA ship *Bell M. Shimada,* set for July 1 through 10. This cruise is part of the ACCESS project (Applied California Current Ecosystem Studies), to evaluate impacts from ocean acidification, changes in oceanographic processes that impacts forage fish, seabirds and marine mammals, and identifies resources at risk from ship strikes and entanglements. Our next cruise will be nearly twice as long as our typical ACCESS cruises because we will be operating from NOAA ship *Bell M. Shimada*, sampling along predetermined transects further north and south than our usual sampling area. The team will post daily about the research mission at www.facebook.com/ACCESS.Partnership.

Scientists prepare for summer-long deep-sea research and assessments

Conservation Science staff prepared for two cruises to characterize deep-sea biota in the northern portion of Monterey Bay sanctuary and the northern portion of Greater Farallones sanctuary. These cruises combine Resource Protection efforts to determine impacts from benthic hazards, such as vessel sinkings and bottom trawling. Using remotely operated vehicles, they will investigate conditions on the seabed in Point Arena Biogenic Area South and Pioneer Canyon.

GFNMS research programs integrate information needs of our research protection, education and outreach programs, highlighting status and trends of sanctuary resources, ecosystem health, and response to climate change.

Regional meeting to coordinate deep sea research, technologies

This spring conservation science staff participated in the 2018 Western Region Deep Sea Coral Research and Technology Program's West Coast Initiative Science Priorities Workshop at the University of

California, Santa Barbara. The workshop was held to engage experts across the West Coast region to help identify research needs and data gaps related deep-sea coral and sponge ecosystems. Staff presented our science and resource protection priorities for the next several years, including analysis of ROV data sets, additional multibeam and backscatter mapping in many areas of GFNMS that may be slated for potential opening under the Pacific Fisheries Management Council recommendations. It also identified areas where additional data is needed on substrate type and benthic characterization over the next decade. Data collection techniques include sampling using remotely operated vessels to include collection of specimens for taxonomy, and autonomous underwater vessels for long-term monitoring of impacted and recovering habitats.

Emergency preparedness with HAZWOPR training

Greater Farallones National Marine Sanctuary staff and Beach Watch volunteers completed Hazardous Waste Operations and Emergency Response (HAZWOPER) eight-hour training. This training meets minimum OSHA training requirements for public sector responders to conduct oil spill clean-ups or emergency response operations. The course reviews methods of identifying various hazardous substances and associated risks; basic hazard risk assessment techniques; personal protection equipment; basic oil spill hazardous substance terminology; and basic decontamination procedures. The course was sponsored and taught by the US Coast Guard Pacific Strike Team.

Staff participation in these trainings allows GFNMS to directly support the National Ocean Service (NOS) priority for emergency response preparedness and to provide trained staff with the capability to respond to and interact with federal structures and processes in place to support incident response.

Above: Farallones Beach Watch volunteers, in HAZMAT gear, document Rodeo Beach damage during 2007 *Cosco Busan* oil spill. GFNMS photo.

Young scientists benefit from Farallones researcher's expertise, insights

Farallones conservation science staff judged middle and high school students' science projects at the 64th San Francisco Bay Area Science, Technology, Engineering and Mathematics (STEM) Science Fair. The fair allows 7th through 12th grade students from eight Bay Area counties to present their science projects. This regional fair is the third and final step towards the STEM International Science Fair. The Grand Prize winners in biology, physics and engineering represent the San Francisco Bay Area at this nationwide science fair.

Collaboration with local schools introduces students to NOAA and national marine sanctuaries, thus increasing public awareness of sanctuaries, creating positive environmental behavior change, and instilling a marine conservation ethic for future generations.

RESOURCE PROTECTION

New Essential Fish Habitat Designations to further protect seafloor habitats

In future, Greater Farallones sanctuary will be more protected from impacts to the seafloor through the designation of Groundfish Essential Fish Habitat no-trawl designations. A total of seven new areas are closed to bottom trawling throughout the sanctuary in locations with known higher densities of corals, sponges, sea pens and whips in soft, mixed hard, rocky, and high-relief habitats, totaling 177.78 sq. miles. There was also a reopening of two areas at Point Arena Reef South totaling 94.61 sq. miles, in an area that is data-poor and believed to contain only soft habitat.

The closures focused on areas where data collected by NOAA helped inform decisions and were bolstered by support from stakeholders, including fishermen. Closures include areas like Rittenburg Bank, known among researches as "sponge heaven;" Cochrane Bank, which hosts a 100-year-old Christmas tree coral; and a newly discovered coral species at an area known as "The Football."

Protecting Breeding Seabird Colonies

Farallones, FAA partner in seabird conservation seminar

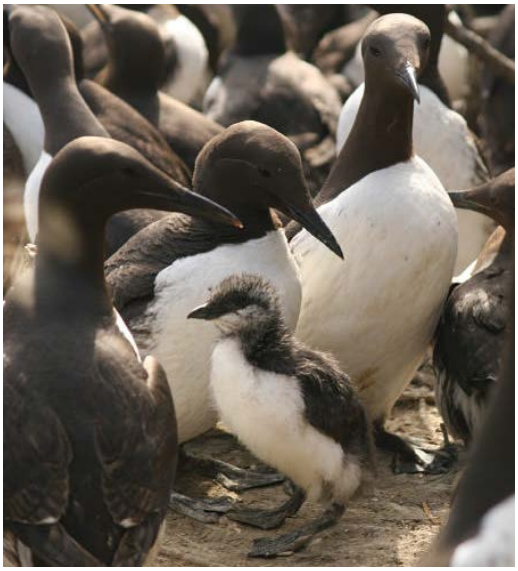
To prevent seabird colony disturbance, Greater Farallones sanctuary staff partnered with the Federal Aviation Administration's (FAA) Safety Team to present a seminar to 10 small plane pilots in the coastal town of Little River, California on March 17th. The seminar highlighted the sensitivity of breeding seabirds on the California coast to low overflights and the importance of wildlife protections provided by sanctuaries and NOAA-regulated overflight zones. After the presentation, one pilot remarked, "I've gained new appreciation for the importance of flying at higher altitudes over their breeding areas."

Pilots based at Little River Airport frequently fly over sanctuary waters. Presentations give pilots the information they need to avoid disturbing wildlife and comply with regulations, and build the sanctuary's engagement with this key constituency.

Air Force pilots get "seabird-smart"

To prevent wildlife disturbance from low overflights, Greater Farallones National Marine Sanctuary's Seabird Protection Network staff presented to 20 pilots from the United States Air Force 129th Rescue Wing at Moffett Field, California on June 2. These helicopter and fixed wing pilots fly daily missions that include flights over sanctuary waters.
Staff highlighted NOAA Regulated Overflight Zones as indicators of high concentrations of sensitive wildlife, and asked that pilots be aware of the need to fly high over these areas. Following the presentation, the 129th Rescue Wing tweeted our photo and presentation to their 5,000 followers, and the California National Guard retweeted it to 6,500 followers.

Helicopter and fixed wing pilots based at the 129th Rescue Wing fly daily missions that include flights over sanctuary waters. Engaging with pilots helps build support for flying high to protect sensitive wildlife and increases awareness about sanctuary regulations, and building partnerships with the US Air Force deepens the sanctuary's engagement with a key agency.



Murres' dense colonies are subject to overflight disturbances. Credit: OCNMS/NOAA

Working with air show to protect seabirds

To prevent disturbance from low-flying planes, Greater Farallones Seabird Protection Network partnered with organizers of the Pacific Coast Dream Machines air show and fly-in at the Half Moon Bay Airport on April 29. The event attracts pilots from across the state, who fly over sensitive seabird colonies en route. Prior to the event, staff sent postcards to previous attendees that emphasized the importance of flying high over the coast and abiding by NOAA Regulated Overflight Zones. Staff briefed air show pilots before their performance and hosted a table for pilots who flew in for the day. The sanctuary routinely sends out reminders to the public to emphasize the vulnerable nature of coastal nesting seabirds from disturbance.

Educating pilots reduces wildlife disturbance, and fosters respect the NOAA Regulated Overflight Zones – key goals of the sanctuary.

High-flying pilots at Pacific Coast Dream Machine air show near San Francisco. Credit: Paul Hobi/GFNMS

Building Bay Area boater seabird awareness

Greater Farallones sanctuary and the Seabird Protection Network team partnered with California State Parks to distribute information and present at a seminar at the Pacific Sail and Power Boat Show over Earth Day weekend. The seminar and the information distributed highlighted the importance of the sanctuary and the wildlife that breed, feed and rest here, and the small protected areas, called special closures, set aside to give wildlife space.

The Pacific Sail and Power Boat Show is the San Francisco Bay Area's largest boater extravaganza that includes exhibits, in-water demonstrations and boating lecture series. The presentation reaches boaters in sanctuary waters and give them critical information regarding safe wildlife watching experiences and ways to comply with regulations.

Sheriff's Air Squadron to help sanctuary protect seabirds

Thirty pilots from the San Mateo County Sheriff's Air Squadron met with staff from Greater Farallones National Marine Sanctuary's Seabird Protection Network on June 14 in San Mateo. Staff gave a lively and interactive presentation that included tactics for pilots to use in identifying and avoiding sensitive coastal wildlife. Staff highlighted the simplest way for pilots to avoid high concentrations of sensitive wildlife: knowing and abiding by NOAA Regulated Overflight Zones.

Pilots from the air squadron are frequent flyers over sanctuary waters for both missions and off-duty sightseeing. Increasing awareness and appreciation for sensitive coastal wildlife creates positive environmental behavior change and compliance with sanctuary regulations.

Protecting Marine Mammals

Sanctuary staff meet to refine ship strike reduction strategies

In April sanctuary staff from Cordell Bank and Greater Farallones National Marine Sanctuaries met to review 2017 ship strike reduction accomplishments and refine strategies to achieve the objective of reducing the threat of lethal ship strikes. The main strategy implemented is a fixed-date voluntary Vessel Speed Reduction (VSR). The VSR is active for the traffic lanes into San Francisco Bay from May-November a period that brackets peak whale abundance in the sanctuaries. During the 2017 VSR, NOAA monitored the United States Coast Guard Automatic Identification System (AIS) data to assess the industry's commitment to the VSR. Results of the cooperation with the 2017 VSR, along with other data supporting the project were presented at the annual meeting. In 2018 NOAA's National Marine Sanctuary will explore additional ways to engage the maritime community to help increase cooperation with the VSR and reduce the risk of ship strikes in sanctuaries.

Lethal collisions between endangered whales and commercial shipping are thought to affect whale populations and are a major concern for west coast sanctuaries. The co-occurrence of whales and ships in sanctuaries creates an elevated risk of vessel strike, mortality to whales, and the recovery of the species.

Greater Farallones experiences spike in ship strike whale deaths

Between May 6 and June 16, 2018 a spike in dead whale strandings occurred in the San Francisco Bay

Area, in Greater Farallones National Marine Sanctuary and adjacent waters. Of seven whales, five died from ship strike and/or entanglement in lines. This included one blue and two fin whales, listed as Endangered Species. Massive blunt force trauma injuries included skull and spinal fractures. The locations of the collisions and the identity of the vessels involved are unknown. One whale rode into San Francisco Bay on a ship's bow: the collision could have occurred anywhere between ports.

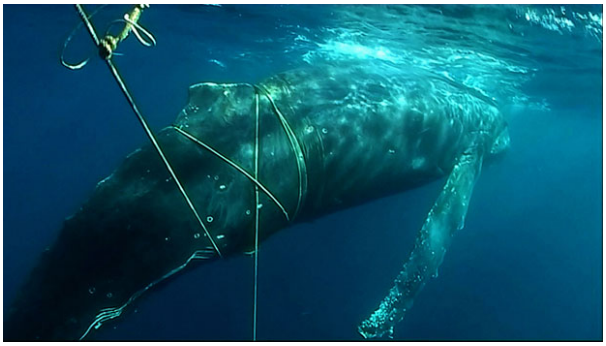
Greater Farallones, Cordell Bank, their research partners, the shipping industry and others are working together to reduce human-caused whale deaths. In 2013 shipping lanes were changed, and a voluntary ship speed reduction program is in effect throughout late spring into fall. See https://farallones.noaa.gov/eco/vesselstrikes/welcome.html. Greater Farallones is the gateway to several major shipping ports in the San Francisco Estuary system. Reducing anthropogenic wildlife impacts of all kinds is a major sanctuary challenge and concern.

Fin whale near Bolinas, with skull, vertebrae, rib fractures. Credit: The Marine Mammal Center

Training for whale entanglement response

On June 20, Farallones sanctuary communications staff took part in a training with NOAA's Large Whale Disentanglement Team in Sausalito, California. In addition to logistics and gear handling, NOAA Fisheries' West Coast Stranding Network staffers discussed interagency coordination, handling of media and other types of communications during entanglement response operations.

Greater Farallones National Marine Sanctuary is prime habitat for several commercial and recreational fisheries, and each year, whales become entangled in various types of fishing gear. The Dungeness crab fishery is one of the most economically important fisheries in the region, and crab gear line entanglement is a common humpback entanglement scenario. It is essential to have staff trained and equipped to step immediately into various roles during a rescue operation.



Entangled humpback whale. Photo by NOAA MMHSRP Permit

Adapting to Climate Change

ONMS presents on building capacity for climate adaptation within marine protected areas

The Marine Protected Areas (MPA) Center and Greater Farallones National Marine Sanctuary presented at the *International Symposium on the Effects of Climate Change on the World's Ocean*, June 4-8 in Washington, DC. The symposium was organized by the International Council for the Exploration of the Sea (ICES), the North Pacific Marine Science Organization (PICES), and the UN Food and Agriculture Organization, with NOAA as a local sponsor. It attracted over 600 scientists from around the world to share knowledge about climate impacts on the ocean and its resources. MPA and sanctuary staff presented on "Building Capacity for Climate Adaptation within Marine Protected Areas," describing the collaboration with Canada and Mexico to create a rapid vulnerability assessment tool through the Commission for Environmental Cooperation. It included a case study of how Greater Farallones National Marine Sanctuary is moving from climate vulnerability assessment to implementing adaptation actions. The symposium provided an opportunity to learn about the latest science on

oceans and climate change, and to share lessons on applying vulnerability assessments and adaptation.

EDUCATION

Increasing Awareness of the Sanctuary

Exhibits

Renovated Randall Museum features new ocean habitats exhibit

After extensive renovation, a revitalized Randall Museum re-opened to the public with a new Coastal Ocean Habitats exhibit features the marine and estuarine flora and fauna of Greater Farallones National Marine Sanctuary and adjacent waters. Its live aquaria represent features and creatures of the rocky shore, sandy shore and estuarine habitats. The Marine Science Study Carrell invites the visitor to dive deeper into additional ocean topics. Sanctuary education staff developed the graphics and videos for the exhibit with deep-sea footage obtained from NOAA's submersibles used to explore research in the deep ocean. The National Marine Sanctuary Foundation provided project support.

The Randall Museum is the only free nature museum

focusing on science, natural history and the arts in San Francisco designed for children and families. Its mission is ensuring a diverse group of children and students are engaged in hands-on learning. Over 100,000 children a year participate in Science, Technology, Engineering and Mathematics (STEM) learning at the museum.

Sanctuary Soirées

Albatrosses take sanctuary soirée to the heights!

The April 28 the Farallones Sanctuary Soirée science and arts celebration spotlighted albatrosses - our planet's largest seabirds. Our local albatross species soar across vast ocean basins from nesting grounds in the remote tropical Pacific to sanctuary waters where they feed. The evening was co-sponsored by Greater Farallones National Marine Sanctuary, the Greater Farallones Association, and the San Francisco Zoo; there were 138 guests attending. Seabird biologist Breck Tyler with the Institute of Marine Sciences at University of California at Santa Cruz described their lifestyles, lovestyles, biology and conservation. Artists, photographers and authors Caren Loebel-Fried and Susan Middleton exhibited their works.

The avian star of the reception was a huge Wandering Albatross specimen from the Southern Ocean, collected in 1887, courtesy of the California Academy of Sciences. Messaging focused on lethal plastics impacts on seabirds. One hundred sixty attendees enjoyed art printmaking, and a *son et lumière* show by the light of a rising full moon.

Soirées are sophisticated evenings wherein a diverse group of adults gain a deeper appreciation for the marine life that inhabits our changing ocean.

19th Century albatross specimen impresses soirée attendees. Credit: Monika Krach/GFA

Sanctuary Explorations

The Sanctuary Explorations Series provides monthly opportunities for the public to connect with, and experience, our national marine sanctuaries. Building a strong public sanctuary constituency as well as inspiring ocean literacy, conservation ethics and wildlife etiquette through experiential learning are the goals for the series.

Sanctuary Explorations visits tidepools, glimpse migrating gray whales

Greater Farallones National Marine Sanctuary education staff and docents provided a tidepool adventure for Sanctuary Exploration participants at Pigeon Point on Sunday March 25, 2018. Twenty-three participants explored the intertidal habitat at the edge of the sea while learning how the animals and algae survive under ever-changing conditions. They also learned proper tidepool etiquette to explore and view tidepool life in a respectful, safe manner. Participants found chitons, anemones, urchins, more than 20 sea stars (a fantastic sign after the sea star wasting syndrome), many species of algae and even saw some gray whales migrating along the coast!

Exploring tidepools near historic Pigeon Point LIghthouse. Cr: Sara Heintzelman, NOAA/GFNMS

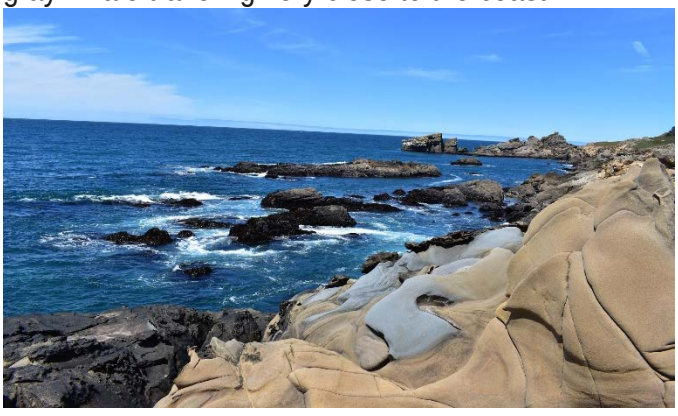
Gray whale mom, calf delight whale watchers

Greater Farallones National Marine Sanctuary education staff partnered with the Oceanic Society to provide an opportunity to watch the gray whale migration on Saturday, April 21. Forty-one participants from the Sanctuary Explorations program had a great day of sightings, including a mother and calf gray whale pair on their northward migration just outside the Pillar Point Harbor. Many seabirds, including Pigeon Guillemots, Pelagic Cormorants, Surf Scoters and many types of gulls, were also spotted. Participants not only learned about the natural history of gray whales and the conservation efforts to protect this amazing species, but they also learned about good whale watching practices and etiquette and enjoyed celebrating earth day by marveling at some of the ocean's amazing creatures.

Farallones naturalist teaches about gray whale conservation success. Credit: Sara Heintzelman/GFNMS

Farallones Exploration offers wildflowers, rock "sculptures," and a whale!

Greater Farallones sanctuary staff and a California State Park Environmental Scientist guided 11 Sanctuary Exploration participants on a coastal wildflower and whale walk on Sunday, May 6. Participants explored Salt Point State Park learning about bluff, coastal prairie, and nearshore coastal ecology. Explorers discovered how State Parks are protecting and restoring these unique habitats, and how the sanctuary protects many species of ocean life that thrive along the coast. Participants enjoyed the wide array of blooming wildflowers and unique geology, and were lucky enough to spot a migrating gray whale traveling very close to the coast.



Sandstone “waves” sweep across Salt Point, frozen in time.
Photo: S. Heintzelman/GFNMS

Sanctuary Explorers view rookery life up-close at Alcatraz Seabird B&B

On June 2, twenty participants from the Greater Farallones’ Sanctuary Explorations program joined Alcatraz Island docents and sanctuary staff for a thought-provoking walk through the seabird rookeries to learn about their ecology and current conservation status. Alcatraz, infamous for its history as an island federal prison, supports the only nesting colonies of Brandt’s and Pelagic Cormorants inside San Francisco Bay. The naturalists discussed the significance of Pigeon Guillemots, Black-crowned Night Herons, Snowy Egrets, and other nesting species. They learned about the impacts of human disturbance and efforts to protect these birds. They were fortunate to see, up close, adults in breeding plumage and newly hatched gull, cormorant, Great Blue Heron & Snowy Egret chicks.

Visitor Center

The Farallones Sanctuary Visitor Center serves ocean enthusiasts of all ages, from the San Francisco Bay Area and all over the world. It welcomes drop-in visitors, as well as structured programs for various ages and interests.

Visitor centers promote ocean literacy as well as other sanctuary education programs, through naturalists and exhibits. This quarter 4,496 people stopped by to virtually “explore” our sanctuary.

Visitor Center 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. Students take part in indoor as well as outdoor activities on Crissy Field Beach in the Golden Gate National Recreation Area.

Visitor Center Field Trips: These programs promote ocean literacy and provide standards-based interactive programs inside the center and in the field for kindergarten through high school. Visitor Center field trips served 1,116 students this quarter.

Puzzling it out: Comparing and keying out plankton species from projected images. Photo: Justin Holl, GFNMS

Visitor Center programs can create new partnerships between sanctuaries and universities and help in recruiting volunteers. Professor Carpenter has requested that the field trip become an annual event, and an undergraduate offered to join the sanctuary volunteer program.

Farallones sanctuary Weekend Family Workshops give budding marine scientists and their families an opportunity to share their enthusiasm and increase their ocean literacy at the sanctuary Visitor Center and Pier Classroom. These workshops have a regular following and provide new participants recruited from school programs an exciting hands-on opportunity to stay connected to sanctuary education programs throughout the year.

Weekend Family Workshops

Weekend family workshops are held twice a month at Greater Farallones National Marine Sanctuary facilities. These programs foster connections within the sanctuary community and provide ocean education to children between ages 4 to 10. This month's programs were particularly engaging for young and curious ocean enthusiasts who are very interested in exploring their local coastline. Three-hundred ten people enjoyed the workshops this quarter

Farallones Family "Bioblitz" explores shorelife

This spring, the Greater Farallones Association organized two weekend family workshops. On March 17th, we hosted a Bioblitz with 31 attendees. Participants explored the coastal waters of Crissy Field beach, recording species names and taking photos along the way. On March 25th, we hosted a Fish for Crabs workshop with 37 total attendees. Participants learned about the diversity of crabs in California. Afterwards they used crab snare traps to fish for crabs in San Francisco Bay. Several families caught red rock crabs, providing an opportunity to learn about fisheries before we returned the crabs to the water.

Families get "hands-on" with salmon, learn about endangered leatherback turtles

This April, The Greater Farallones Association organized two days of weekend family workshops. On April 8, Greater Farallones education staff hosted two Salmon Family Workshops, which had 32 attendees in total. Participants learned about salmon anatomy through a naturalist-led native Chinook salmon dissection; and created fish print artwork. Then, on April 14, Greater Farallones hosted two Leatherback Turtle Family Workshops with 32 people in attendance. Participants discovered what it takes to be the world's biggest species of sea turtle, through interactive games and videos. Endangered Pacific leatherbacks routinely travel thousands of miles to the Farallones sanctuary to feed. The class ended with the assembly of a life-sized model of a leatherback.

Oceans After School Programs

Sanctuary Educators Complete Oceans After School Series

Using the endless appeal of our local marine wildlife and habitats, the sanctuary education team completed the ninth and final week of an 18-hour Oceans after School curriculum, educating 158 third through fifth grade students from San Francisco's Visitacion Valley and Sunnyside Elementary schools. These science enrichment programs are dynamic, interactive, and integrated into California state standards. Program topics include the National Marine Sanctuary system, crabs, sharks, salmon, marine mammals, squid, seabirds, remotely operated vehicles, and plankton. Our marine science educators deliver the programs during a nine-week window and the students served are primarily low-income and underserved.

Oceans after School is a partnership between the sanctuary and City of San Francisco's Department of Children, Youth, and Their Families. The City provides funding for 12 sites throughout San Francisco and sanctuary educators provide low-income students with 18 hours of high quality science programming that promotes sanctuary awareness as well as ocean and climate literacy.

At Your School Programs

The At Your School (AYS) programs serve schools throughout the San Francisco Bay area and beyond, primarily during the school term. The AYS program 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 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 twelfth grade.

During the quarter, AYS staff traveled to bring ocean education to schools. In total, the programs served 1,370 students and teachers this quarter.

Fisherman In The Classroom

Bringing Fisheries into the Classroom

Greater Farallones National Marine Sanctuary regularly collaborates with local fishermen to bring the treasures of the ocean to the desks of students in the San Francisco Bay Area. Through the "Fisherman In the Classroom" program, students hear about the challenges, economics, and rewards of fishing for salmon and Dungeness crab in national

marine sanctuary waters, as well as the relationship between the fisherman and sanctuary conservation policies. Putting a human face on important issues such as sustainable fisheries, watershed restoration, and national marine sanctuaries, students learned the importance of sustainable use of our ocean resources. This quarter 225 students took part in this program, from elementary, middle and high schools.

This program fulfills the objectives of increasing ocean literacy and promoting sustainable fishing. It also profiles the economic value of protecting healthy marine ecosystems that support commercial fishing in sanctuary waters.

Floating classroom a window to life on the sea

On April 12, five students from the Athenian School, Danville, CA, met local fisherman Mike Hudson on his commercial fishing vessel in the Berkeley Marina. Hudson, who has been interviewed by National Public Radio about fishing lifestyles and issues, used hands on teaching techniques and incorporated special salmon fishing gear and other equipment on the boat as he demonstrated their use. The students learned about the lifestyles and challenges of being a fisherman in Central California. A Greater Farallones National Marine Sanctuary education specialist led the presentation with an introduction to the sanctuary system, and explained the importance of fishing communities to our west coast sanctuaries.

Fisherman in The Classroom promotes the principles of ocean literacy, sustainable fishing practices, and the value of commercial fishing in sanctuary waters.

Capt. Mike Hudson (r) and students aboard the *Cash Flo II.* Credit Pete Winch/GFNMS

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 that trains teachers and students to become involved in real scientific investigations and become ocean stewards. It is a citizen science program that 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. This quarter 546 students and teachers from various schools and partners in the Bay Area carried out LiMPETS shore surveys. This included in-class trainings, and individual monitoring events at different monitoring sites. For details on LiMPETS, see www.limpets.org

Farallones sanctuary scientists advise educators on LiMPETS program

This spring Conservation Science and Education staff attended an all-day workshop to assist and advise staff from the Long term Monitoring Program and Experiential Training for Students (LiMPETS) project. The goal of the workshop was to provide project managers with methods that could be incorporated into the LiMPETS sampling efforts and identify how to incorporate management science objectives into the project. Key science priorities include: 1) create and sustain a long term monitoring program supported by a robust quality assurance plan; 2) provide a publicly accessible, scientifically sound data set used to inform marine resource management as well as ongoing targeted research questions, as defined by their target audience; 3) identify long term status and trends in intertidal regions to detect emerging issues to inform resource management and to enhance awareness and stewardship of the ocean and coasts; and 3) assist sanctuary management in the early detection of environmental events.

Integrating sanctuary science needs and experiential training for students increases the public awareness of sanctuaries and creates positive environmental behavior change.

Partner Events

Love Among Leviathans talk intrigues yacht club audience

On April 18, communications staff delivered a talk to 75 members of the Sausalito Yacht Club (SYC). "Love among Leviathans" focused on the reproductive habits and physiology, socio-sexual behaviors, habitat needs, and adaptations of whales, dolphins and porpoises. Reproductive studies reveal how species have recovered from past human impacts such as whaling; show how sustainability is linked to reproductive patterns; and help managers assess the severity of current threats, enabling us to mitigate current impacts. E.g., sanctuaries are addressing vessel impacts such as engine noise that may mask whales calling for mates over distances, or reuniting with their calves. Social/sexual interactions, as well as reproductive matters were discussed. The SYC, through ongoing contact with the sanctuary, is demonstrating leadership among the yachting community by becoming involved in ocean protection.

Lectures to groups who recreate on the ocean build upon an existing strength and mutuality of interests, making it possible to focus their attention, concern and action toward a conservation-directed ethic.

Greater Farallones Association Attends "Sea Star, Sea Change" Earth Day Event

On April 21, 2018, Greater Farallones Association (GFA) represented the sanctuary at the Pacifica Beach Coalition Earth Day EcoFest celebration in Pacifica, CA. The theme of the celebration was "Sea Star, Sea Change" with a focus on intertidal habitats and their conservation along the California coast. GFA staff and volunteer taught the public about sea star anatomy, importance of intertidal species and their environment, and how GFA and GFNMS study, educate, and protect the sanctuary coastline and its inhabitants. About 1,000 people visited the booth.

Also, on June 9, at the March for the Oceans / World Oceans Day Celebration in Sausalito, approximately 400 people visited the Farallones table.

Engaging with and educating the public about marine life in our sanctuary is important to build an informed community of stewards. This event helped us extend our reach and bring awareness of the sanctuary to the South Bay-San Francisco area.

GFA volunteer Amanda McGreal explains the inner workings of sea stars. Credit: Alayne Chappelle, GFA.

Interactive tidepool table display. Photo: Alayne Chappell, Greater Farallones Association

Introducing Greater Farallones to Broader Public

On May 17, 2018 the Burlingame Library launched a new lecture series – The World Around Us – which focuses on unique natural places and how to access them. Sanctuary staff presented the Greater Farallones National Marine Sanctuary to twenty people. Attendees sailed through the Greater Farallones and along the way found out: What marine sanctuaries are; why marine animals such as white sharks, leatherback turtles, and whales call it home; and ways to visit and experience their local national marine sanctuary were explained.

Sea stars "star" at Farallones exhibit. Credit: A. Chappelle

Increasing awareness of the national marine sanctuaries and how to enjoy them results in new sanctuary supporters.

World Ocean Day event visitors examine marine debris issue through games, exhibits

For World Ocean Day, June 9 at Point Arena, staff represented the sanctuary at Discover the Coast, sponsored by the Bureau of Land Management and the local community. It drew around 450 people, with around 35 taking part in sanctuary activities and speaking with sanctuary staff.

The Discovery Trail station spotlighted Farallones Beach Watch coastal monitoring, demonstrating survey techniques, and encouraging public involvement in conservation. The City Hall exhibit focused on marine debris impacts on seabirds and whales, with an entangled whale model, a plastic-filled albatross bolus (stomach contents pellet), and Common Murre models. Visitors played the “Hand Band Challenge” – simulating an entanglement by trying to remove a rubber band from around one’s hand without using other body parts or objects. They colored pictures of sea creatures and marine debris, and matched photos of seabird chicks with their adult forms.

The sanctuary cultivates and strengthens local support through education and outreach efforts. Maintaining a positive sanctuary presence is important to the community and the sanctuary.

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2018 Calendar Updates

May

6 Sanctuary Explorations, Whales and Wildflowers, Salt Point State Park. Contact sheintzelman@farallones.org

9 Sanctuary Advisory Council meeting, Red Barn, Pt. Reyes National Seashore. https://farallones.noaa.gov/manage/sac.html

19 Kent Island restoration – now through October). Contact Kate.bimrose@noaa.gov

June

1 & 16 Kent Island restoration – now through October). Contact Kate.bimrose@noaa.gov

July

6 Sanctuary Explorations, "Seabirds of Alcatraz." Contact sheintzelman@farallones.org

6 & 21 Kent Island restoration. Contact Kate.bimrose@noaa.gov

August

3 & 18 Kent Island restoration. Contact Kate.bimrose@noaa.gov

4-5 Get Into Your Sanctuary – various events including whale watching, kayaking, workshops. Contact sheintzelman@farallones.org

29 Sanctuary Advisory Council Meeting, location Half Moon Bay Yacht Club

September

7 & 15 Kent Island restoration. Contact Kate.bimrose@noaa.gov

29 SharktoberFest, GFNMS HQ. http://farallones.noaa.gov

October

5 & 20 Kent Island restoration. Contact Kate.bimrose@noaa.gov

November

10 Sanctuary Salmon Soirée Contact sheintzelman@farallones.org

14 Sanctuary Advisory Council meeting, San Francisco Zoo, San Francisco.

Ongoing Public Programs

Exploring Greater Farallones Sanctuary!

Year-round, the Explorations Series provides monthly opportunities to connect with and experience the Sanctuary and surrounding waters. Excursions include Bioluminescence Paddling, Whale and Wildlife Cruises, and tidepooling. Join one of our seasonal upcoming programs!
Visit http://farallones.noaa.gov/visit/exploration-program.html

Greater Farallones Visitor Center

The Visitor Center in the San Francisco Presidio offers 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. Wednesdays through Sundays, 10 a.m. to 4 p.m., our VC naturalists can introduce you to our aquarium critters. Drop in!

Bolinas Lagoon/Kent Island Restoration Project

From April-October, teams remove invasive plants on Kent Island to restore native plants and wildlife in Bolinas Lagoon and free captured sediment that impacts the flow of water. Sign up for Friday and Saturday programs and learn as you work. It's free. For information: Kate Bimrose kbimrose@farallones.org, see https://farallones.noaa.gov/eco/bolinas/kentisland.html

Sanctuary Soirées

Sanctuary soirées are held twice yearly, and are sophisticated evenings celebrating science, art and culture. They feature top-of-the-line scientist presentations blended with arts, music and crafts for an adult (16+ ys.) 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

GET INVOLVED, AND 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 Farallones sanctuary Facebook is also now up and running at Facebook.com/the Farallones sanctuary.

To learn how you can become involved in the sanctuary visit: http://Farallones.noaa.gov; or to subscribe to Upwelling, the Farallones Marine Sanctuary Association newsletter: visit http://www.Farallones.org.

Learn more about the Sanctuary Advisory Council: http://Farallones.noaa.gov/manage/SanctuaryAdvisory Council.htm

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Follow Greater Farallones National Marine Sanctuary:

Follow National Marine Sanctuaries and our *Earth is Blue* Campaign on:

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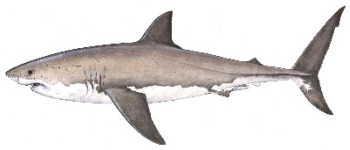

Join us for Sharktoberfest! ***Saturday, September 29, 11am-4pm***

Superintendent's Quarterly Report

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