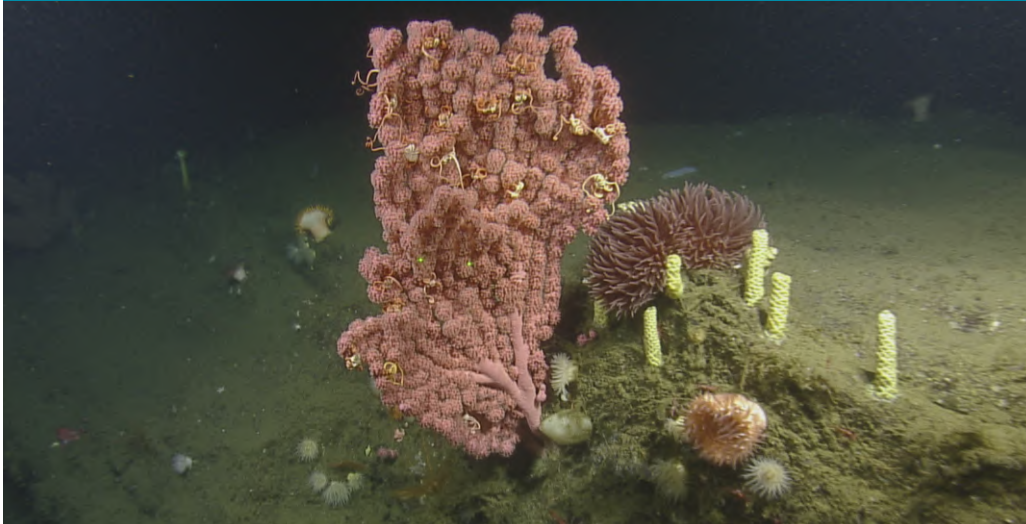


2020 Accomplishments



Credit: Ocean Exploration Trust/NOAA

Guide to Deep-sea Coral Restoration

MBNMS and Monterey Bay Aquarium Research Institute (MBARI) have combined efforts to investigate the best methodology for deep-sea coral restoration at Sur Ridge. This research works to transplant live fragments from multiple coral species and measure their survival rates in the deep sea, and is the first time these restoration methods have been tested in the Pacific Ocean. Published in 2020, the [Guide to Translocating Coral Fragments for Deep-sea Restoration](#) provides a detailed step-by-step guide for fabricating coral translocation modules and for processing coral fragments from multiple taxa. Ultimately, the sustainability of deep-sea corals may be enhanced not only by protecting existing communities, but also repopulating damaged areas using these restoration methods.

Staff Excellence Award

Sophie De Beukelaer, MBNMS Permit Coordinator and GIS Specialist, was awarded the prestigious 2020 National Ocean Service's *Team Member of the Year* for outstanding achievements in sanctuary resource protection. With over 15 years of service to MBNMS, she was instrumental in developing spatial data maps necessary to inform management decisions and improved characterization of the region with partners and stakeholders. As permit coordinator, Sophie evaluates and analyzes research and coastal development projects and works to mitigate any potential environmental impacts associated.

Whale Entanglement Risk Assessment & Mitigation Program

MBNMS served on the California Dungeness Crab Fishing Gear Working Group and provided whale sightings data compiled from the Point Blue Conservation Science Data Portal for Fall risk assessments process in preparation for the crab fishery opener. The marine life concentrations risk factor includes humpback and blue whales, and the observations in the data portal helped to determine trends in relative abundance and distribution of these whale species in California fishing grounds. Additional data sources from aerial and vessel whale surveys and telemetry for leatherback sea turtles were used to determine level of risk for whale and turtle entanglements.

New Distance Learning Programs

In response to school closures due to the COVID-19 pandemic, staff developed five virtual distance learning programs for teachers and students with the following themes: *Protect your Watershed*, *Plankton Exploration*, *Dive into Kelp Forests*, *Deep Sea Discovery*, and *Sounds in the Sanctuary*. Each lesson includes an online presentation, teacher guide, and student activities that dive deeper into the topic with videos and NOAA web resources. Live, interactive programs with education staff were delivered to a total of 1,280 students from 46 classes, grades 2-6. Through these offerings, MBNMS was able to reach more students from broader demographics than with traditional, on-site field trips.

Draft Management Plan Released

After a multi-year public review process involving input from stakeholders, advisory council working groups, and agency partners, the MBNMS draft management plan, draft environmental assessment, and proposed rule were released. A series of virtual outreach meetings were held to provide information on the proposed strategies and 14 action plans during a 60 day public comment period. This process will culminate in an updated management plan and potential modifications to regulations that will guide NOAA in understanding and protecting the sanctuary's resources over the coming decade.



Credit: Acy Wood/NOAA

10th Annual Whalefest Monterey

The 2020 Whalefest Monterey was held in January at the Monterey Conference Center and Old Fisherman's Wharf, which brought an estimated 15,000 people to the event. Presented in partnership with Fisherman's Wharf Association, the two-day event celebrates gray whale migration and biodiversity in the sanctuary. Featuring over 40 marine science and education institutions hosting exhibit booths, live musical entertainment, a 43-foot life sized inflatable whale model, research vessel tours, kids activities, cooking demos, and whale watching trips, the annual event brought the latest in local marine science and conservation efforts to the public.

Salmonscape Traveling Exhibit

In partnership with NOAA Fisheries, U.S. Forest Service, National Marine Sanctuary Foundation, and Sea Studios, MBNMS completed a series of four interactive exhibit panels that use colorful art by Ray Troll to highlight the California "Salmonscape." Several themes, stories, and messages came together that focus on California salmon life cycle, threats to populations, recreational fishing, salmon research, and highlights what people can do to help protect salmon. The fourth panel, completed in 2020, connects salmon from California national marine sanctuaries to national forests through watershed habitats. All four panels will be available for display in partner visitor centers as a mobile exhibit for years to come.

Vessel Traffic Analysis Report

MBNMS staff analyzed automated information system (AIS) data from Marine Traffic and United States Coast Guard (USCG) to evaluate compliance by cargo vessels and tankers with the International Maritime Organization (IMO) recommended vessel tracks. The [2019 report](#) evaluates a full year of data and builds on the 2018 report, which examined monthly deviation rates based on GIS analysis of historical USCG AIS data from 2018 and 2019. MBNMS staff verified 248 inshore vessel deviations in 2019, with the majority being cargo vessels while 6% were tankers and 17% were vehicle carriers. MBNMS staff will continue to work with District 11 Waterways Management to improve compliance with the recommended tracks to protect sanctuary resources.

Black Abalone Translocation Project

In May 2017, the Mud Creek landslide reshaped the Big Sur coastline, creating 15 acres of new land and extending 600 feet into the sanctuary. The rocky intertidal buried by the slide was designated in 2011 as critical habitat for the federally endangered black abalone and the spread of sediments, and the subsequent conversion of rocky intertidal into sandy beach posed an on-going threat to black abalone and their habitat. A multi-agency team from MBNMS, National Marine Fisheries Service, California Department of Fish and Wildlife, CalTrans, Tenera Environmental, and UC Santa Cruz worked to collect, tag, translocate, and monitor black abalone in danger of being buried by encroaching sediments from slide debris. The [Black Abalone Translocation Manual](#) was created in 2020 to serve as a guide for future emergency responses.



New Tools for Streamlining Ecosystem Assessment

MBNMS contributed to the development of data products and online tools to more efficiently generate management information from key data streams from long-term monitoring programs along the west coast. The integrated approach leverages existing data services and portals to rapidly inform sanctuary condition reports, interactive infographics, and other science communication products. These tools are a collaborative effort with partners from Channel Islands National Marine Sanctuary, California Current Integrated Ecosystem Assessment (CCIEA), Marine Biodiversity Observation Network (MBON), Central and Northern California Ocean Observing System (CeNCOOS), and EcoQuants, LLC.

Octopus Garden and Whale Fall Revisited

Monterey Bay and Greater Farallones national marine sanctuaries staff completed a deep-sea research cruise from October 7-18 aboard the E/V *Nautilus*, in partnership with Ocean Exploration Trust, following NOAA-approved COVID-19 safety protocols. Through ROV technology and telepresence, scientists were able to participate from home during the expedition. The mission was successful at gathering new seafloor characterization data of Pioneer Canyon, and revisiting areas near Davidson Seamount known as the octopus garden and the octocone, which hosts thousands of deep-sea octopus brooding their eggs within warm water seeps located 3,200 meters deep. The whale fall discovered in 2019 was also reexamined to document ecological succession and to collect animals and bones from the seafloor site.

Volunteer Training Goes Virtual

In response to the shelter-in-place orders due to COVID-19, training for new Bay Net, Team OCEAN, and Sanctuary Exploration Center volunteers was offered as an eight week online course. As the Exploration Center remained closed throughout 2020 and Bay Net and Team OCEAN field programs were put on hold, volunteers received additional learning enrichment webinars with subject matter experts, to expand their knowledge about sanctuary research and resource protection issues. Some topics included ocean acidification, marine heat waves, and deep-sea corals. The new education modules will be available for future trainings and serve as a resource for existing volunteers.



Credit: Ocean Exploration Trust/NOAA

Historic Shipwrecks Profiled

In an effort to increase awareness of the sanctuary's submerged cultural resources, the MBNMS maritime heritage web page was expanded to include six historic [shipwreck profiles](#). Several wrecks have cultural significance on the California coast, where coastal promontories or navigation hazards were named after the wrecks: *Pigeon Point*, *Harlech Castle Rock*, and *Point Sierra Nevada*. Each shipwreck profile includes the following: vessel origin and specifications; nature of vessel casualty; map of approximate wreck location; original newspaper articles describing the vessel and wreck event; and references. More than 460 known losses occur within, or adjacent to, the sanctuary.

Monterey Bay Sanctuary Foundation Partnership

This year, the Monterey Bay National Marine Sanctuary Foundation raised funds to support programs protecting wildlife, advance scientific discoveries, and inspiring the public to become ocean stewards. As in-person events were canceled, the foundation created virtual events, such as the annual "Sea Star" brunch and a distinguished speaker's series. From 2019 pledges, the foundation directed \$50,000 to Team OCEAN and \$20,000 to whale rescue efforts in 2020, resulting in funding a successful abandoned fishing gear retrieval project that removed 1430 pounds of entanglement hazards, including 22 fishing pots, 3967 feet of line, three mud anchors, and multiple buoys from the sanctuary.

Unmanned Aircraft Systems (UAS) Monitoring

To better address the lack of information about the effects of low UAS overflights on wildlife within the sanctuary, staff developed and piloted field protocols to monitor shoreline UAS activities close to wildlife populations. The data collected helped inform the development of appropriate UAS guidelines and permit terms and conditions for safe UAS operations that avoid wildlife impacts within NOAA regulated overflight zones.

Advisory Council Meetings

The advisory council gathered six times in 2020, five of which were held virtually. Discussion topics included marine debris impacts, agricultural plastics, draft management plan update, updating council work plan, developing best practices for Unmanned Aerial Vehicles (UAV) uses in the sanctuary, and monitoring underwater sounds. A special presentation was provided on a proposed offshore wind energy project off Morro Bay.

First Flush Sampling

The 21st annual First Flush event, a long-term citizen science monitoring program that utilizes trained volunteers to collect water samples at outfalls during the first major rainstorm of the winter season, occurred in December, the latest in 21 years. Staff and volunteers collected field measurements and water samples at 13 storm drain outfalls and two ocean receiving water sites. First Flush results help to determine if the efforts that local cities have taken under their National Pollution Discharge and Elimination System (NPDES) permits are improving the quality of water flowing into MBNMS. Partner organizations were able to collect First Flush samples during November 2020: San Mateo Resource Conservation District was able to mobilize on November 17th to monitor 12 outfall sites with 20 volunteers, and Watsonville Wetlands Watch monitored their 17 slough sites on November 18th with the help of nine collectors.

Dive in: Get Into Your Sanctuary

For the annual Get Into Your Sanctuary event held each August, staff created a webinar presentation to highlight recreation in the sanctuary, including scuba diving, kayaking, and surfing. Broadcast on Facebook Live and featuring MBNMS staff, a Monterey Bay Kayaks naturalist, and a pro-surfer, each shared their experience sanctuary recreation with unique stories and messages on how to responsibly enjoy and protect the sanctuary.

Pilot Outreach

In collaboration with Greater Farallones National Marine Sanctuary, MBNMS engaged with Federal Aviation Administration (FAA) to educate California airplane pilots on the need to fly high over NOAA regulated overflight zones in West Coast marine sanctuaries. The partnership resulted in an outreach effort to approximately 26,000 pilots and a virtual presentation to over 400 pilots, entitled "Ten Secret Sights on the California Coast and How to Fly Them Like A Pro." The webinar featured a retired NOAA corps pilot and highlighted national marine sanctuaries, wildlife protection regulations, and awareness of the seabird breeding season.



Credit: Lisa Emanuelson/NOAA

Team OCEAN Resumes

As more and more people engaged in on-the-water recreational activities due to COVID-19, an increase in wildlife disturbances also occurred. In October, Team OCEAN interpretive program resumed to interact with kayakers in Elkhorn Slough, with newly implemented COVID-19 precautions and safety protocols in place. Team OCEAN's presence on the water helps to educate recreators about the importance of giving sensitive marine life space and how to responsibly view wildlife in their natural habitats.

Teacher Leadership Institute

For a second year, MBNMS participated in the Santa Cruz County Office of Education's Teacher Leadership Institute. In collaboration with local 4th-5th grade teacher leaders, staff built lesson sequences based on the Next Generation Science Standards and the Education and the Environment Standards to support the sanctuary's K-12 education goals. All of the student activities and lesson plans were offered virtually to meet the needs of teachers and schools conducting remote learning in 2020.

Permitting Activities

MBNMS issued a total of 44 permits and amendments in 2020: 24 research; 4 assist in sanctuary management; 2 education; 3 special use; 3 education/research; 3 letters of authorization under the superintendent's permit; and 5 authorizations. Permitted activities included, but were not limited to, overflights, dredge disposal, sediment collection, deployment of autonomous underwater vehicles (AUVs), motorized personal watercraft (MPWC) search and rescue training, deployment of tags and buoys, and deployment of benthic cameras.

Climate Change Impacts Report

In July, MBNMS worked with the Office of National Marine Sanctuaries to develop a [publication](#) on climate change in the sanctuary, and included the impacts of rising water temperatures, marine heatwaves, sea level rise, hypoxia, harmful algal blooms, and ocean acidification. The report highlighted the changing ecological communities and how climate change is altering large scale processes such as atmospheric circulation and El Niño events.

Healthy Soils Project

In partnership with the California Marine Sanctuary Foundation, MBNMS provided outreach to 347 ranchers and growers to implement soil health best practices to sequester greenhouse gases into the ground of working lands. These practices can improve soil health by building the amount of carbon in the soil, promoting microbial growth that returns nutrients to plant roots, and in developing pores for air space and water movement through the soil. The benefits for farmers include increased crop yield, improved infiltration to groundwater, farm drought resilience, improved water quality, and removal of greenhouse gases from the atmosphere that support healthy ocean ecosystems.

New Exhibits Developed

New Sanctuary Exploration Center exhibits were created highlighting the recent deep-sea discoveries from Davidson Seamount, including the octopus garden and the new species of bone eating worm from the whale fall. Other projects included Monterey Canyon exhibit signs, a “Seasonal Migrations in the Sanctuary” display, and a new series of exhibit panels focusing on the “The Problem with Plastic,” educating visitors about issues with microplastics in ocean ecosystems and conservation solutions.

Outstanding Volunteer Service

Kim Akeman received the 2020 MBNMS Volunteer Service Award for her work as a Bay Net volunteer. She is devoted to educating and informing coastal visitors about the marine life that inhabits the sanctuary and keeps watch over the harbor seals that pup on Monterey Peninsula beaches by monitoring births, photographing moms and their pups, and alerting local enforcement officials to issues concerning harbor seals. By spending over a thousand hours each year, over the past 10 years, Kim makes a noticeable impact in the number of people that hear about MBNMS and the protections for harbor seals and other marine life.

New Research Publications

MBNMS staff collaborated with partners to publish numerous peer-reviewed science articles: [Octopus Gardens and a Whale Fall in Monterey Bay National Marine Sanctuary](#); [Seal Bomb Noise as a Potential Threat to Monterey Bay Harbor Porpoise](#); [Effects of Marine Reserves on Predator-prey Interactions in Central California Kelp Forests](#); and [Marine Protected Areas Do Not Prevent Marine Heatwave-induced Fish Community Structure Changes in a Temperate Transition Zone](#). More can be found on the [MBNMS website](#).

Salinas Urban Watch

Under COVID-19 safety protocols, Urban Watch began its third year in July to monitor urban runoff and creek samples from 18 sites in Salinas. Staff and volunteers processed samples in the field for detergents, ammonia, phosphate, and chlorine, then sent samples to a local certified lab for analysis of bacteria as well as human-sourced bacterioides. Urban Watch engages trained community members to identify water quality issues that get communicated to city staff in order to help minimize urban pollutants entering the sanctuary during the dry weather season.

California Marine Sanctuary Foundation Partnership (CMSF)

CMSF continued to partner with MBNMS to support Bay Net, Team OCEAN, and urban and agriculture water quality programs. An Agriculture Plastic White paper, funded by CMSF, outlined the challenges of plastics used within Monterey County agriculture. This has led to the creation of multiple projects focused on practical mitigation methods to reduce agricultural plastics entering MBNMS. CMSF currently manages 16 contracts for MBNMS totaling more than \$760,000.

Vessel Groundings and Sinkings

Each year, staff work with partners, including U.S. Coast Guard and NOAA Office of Law Enforcement, to respond to emergencies including vessel sinkings and groundings in MBNMS. Such events can crush marine habitat, release hazardous chemicals, and discharge nets, hooks, and other hazards to marine life. In 2020, 13 incidents occurred from sailboats and motorboats, ranging in size from 12 to 92 feet in length, many of which contained fuel and motor oil. If not properly managed, response and cleanup efforts can exacerbate the environmental damage caused by a vessel casualty. To help prevent such incidents, MBNMS collaborated with local harbors to identify proactive measures that can address derelict vessels before they end up grounding or sinking in the sanctuary.

Monitoring Underwater Sounds

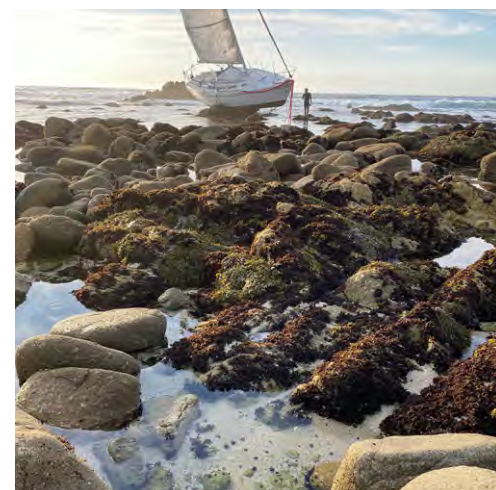
As part of a four-year SanctSound Project, NOAA and the U.S. Navy deployed three underwater hydrophones to characterize ambient sound levels, detect species diversity with acoustic signatures, and monitor sound from geophysical and human activities over time. In partnership with Monterey Bay Aquarium Research Institute, University of California at Santa Cruz, Moss Landing Marine Labs, Hopkins Marine Station, and Southall Environmental Associates, 9 hydrophones were measuring sound in the sanctuary this year, from 230 to 2,800 feet deep. The team is working regionally and nationally to analyze and share data to demonstrate the importance of sound in sanctuary habitats.

Ed Ricketts Memorial Award

The 33rd annual Ed Ricketts Memorial Award was presented to Dr. Terrie M. Williams, UC Santa Cruz, who provided a webinar entitled, “From ‘Doc’ and Dogs to Denizens of the Deep: How understanding biological design will save the oceans and ourselves,” virtually attended by 338 participants, from 26 states and six countries. The Ed Ricketts Award was created to honor scientists who have exhibited exemplary work throughout their career and advanced the status of knowledge in the field of marine science.

Agricultural Use of Plastic

A partnership between CMSF, CSU Monterey Bay, and MBNMS resulted in a [study](#) on plastic pollution risk and reduction for regional waterways. An assessment was conducted to determine how much plastic is used in Monterey County crop production, the types of agricultural plastic pollution evident in 10 surveyed stream banks, and addressed what agricultural stakeholders can do to help reduce the plastic pollution problem that can impact the sanctuary by way of regional waterways.



Credit: Bridget Hoover/NOAA