



Monterey Bay Aquarium®

SEA OTTER RESEARCH AND CONSERVATION PROGRAM 2014 ANNUAL PROGRESS REPORT PREPARED FOR _____ January 23, 2015

Thank you, _____, for all you do for the Aquarium and ocean life. Over the past 30 years, you've been a steady champion for California's sea otters. We're moved by your heartfelt support, which has done so much to advance our work with these remarkable animals as well as our mission *to inspire conservation of the oceans*.

You've done more than you know to save California's sea otters and, consequently, all ocean animals living along the central coast. You've generously given more than \$_____, and that amount doesn't include the numerous gifts you've inspired through the *Wild About Otters* campaign or the many thoughtful commitments people have made answering your invitation to join our Ocean Legacy Circle.

On behalf of the otters we've nursed back to health, the abandoned pups we've comforted, and the future sea otter generations that will benefit from our fieldwork and care, please accept our deepest gratitude for your dedication and commitment.



WORKING TOWARD RECOVERY OF A KEYSTONE SPECIES

In 2014, the sea otter count showed only a negligible increase from 2013. The US Geological Survey reported the California sea otter population index as 2,944 in 2014, up from 2,939 in 2013. To consider removing sea otters from the *Threatened* species list, the population index would have to exceed 3,090 for at least three consecutive years. With low survival rates of sea otter pups and high mortality in prime-age adult otters, recovery remains elusive, and an array of threats, stressors, and challenges continue to plague sea otters.

Known as a keystone species, sea otters help keep ocean ecosystems in balance by eating animals like sea urchins that graze on giant kelp. Unchecked, these grazing animals can destroy kelp forests and, ultimately, the creatures that live within them. Kelp forests protect coastlines from storm surge and absorb carbon dioxide from the air, so they're important for those of us who dwell on land, too. Sea otters also help us understand the impacts we have on the nearshore habitat. Changes in their health can be an indicator of problems in the ocean environment itself.

SEA OTTERS NEED OUR HELP

Situated in the heart of the southern sea otter range, the Monterey Bay Aquarium is the only facility to care for orphaned pups and release these animals back to the wild. We must raise nearly \$1 million every year to conduct our field studies and provide veterinary care for hundreds of sick and injured sea otters. During the past three decades, and thanks to the support of animal lovers like you, we've rescued and cared for nearly 700 otters who needed our help.

We've inspired generations of children to become otter—and ocean—advocates. And our field studies and research programs have supported increasing the sea otter population to sustainable levels.



We work with other aquariums and wildlife rescue facilities to respond to every sea otter that comes ashore in distress along the California coast. Our goal is to restore these otters to health and return them to the wild with a high chance of survival.

When it comes to sea otters, our ongoing goals are to:

- Improve otter health
- Increase the otter population
- Generate public interest in otters
- Advance the protection of otters
- Contribute to scientific knowledge about otters

We work toward those goals in three ways: rescue and recovery, education and engagement, and research and conservation. We made great strides in all three areas in 2014.

RESCUE AND RECOVERY



The otters at the Aquarium are more than engaging ambassadors for a threatened species. They also play a role in recovery efforts, serving as surrogate mothers for dozens of stranded pups. This is Ivy, the youngest otter on exhibit.

Throughout 2014, the Sea Otter Research and Conservation Program participated in the rescue and management of 57 sea otters, a slight decrease from the stranding numbers seen over the past few years. Our team reunited two stranded pups with their mothers in the wild and released two surrogate-reared pups and an adult otter. Five young otters remain in the program awaiting release.

The team arranged to shift three non-releasable adult females into collaborative research projects at Long Marine Laboratory (University of California, Santa Cruz) and transferred four young, non-releasable otters to homes at accredited zoological facilities including:

- Oregon Zoo (Portland)
- Oregon Coast Aquarium (Newport)
- SeaWorld (San Diego)
- Shedd Aquarium (Chicago)

The young otter that went to Shedd Aquarium, Pup 681, first spent four weeks with us. She was found on September 30 on Coastways Beach between the San Mateo and Santa Cruz county line by a woman on an evening walk who heard the pup's cry. Orphaned, Pup 681 was tiny for a newborn sea otter, and her situation was urgent. We gave her around-the-clock care, got her stabilized, and then found her a home with our partners at Shedd Aquarium. They named her Luna.

EDUCATION AND ENGAGEMENT

As a world-renowned Aquarium, we have the opportunity to inspire millions of people to become advocates for the oceans and sea otters, and we encourage them to take actions that will lead to long-term population recovery. Our two-story Sea Otter Exhibit and online Sea Otter Cam are among our most popular attractions. The Aquarium's five sea otters, Rosa, Abby, Kit, Gidget, and Ivy, rotate between the exhibit and our behind-the-scenes pools where they provide surrogate care to stranded, orphaned sea otter pups. Visitors also enjoy viewing *Luna: A Sea Otter's Story* in our auditorium and watching sea otters in the wild at our new Otter Spotter station off the Aquarium's back decks.

Visitors to the Aquarium learn about our efforts to increase the sea otter population by talking with our staff and volunteers, and we offer lectures and special activities during Sea Otter Awareness Week, held annually in September. During the summer, we conduct two Young Women in Science Otter Mystery camps, serving a total of 60 participants with programming in Spanish and English. The camps focus on the life of sea otters and their importance to their habitat and the other organisms living in it.

In 2014, we continued to work with partners including the US Geological Survey on a three-year study of sea otters in Elkhorn Slough that began in the fall of 2013. The main objective of the study is to better understand how sea otters use their habitat so we can improve the conditions at Elkhorn Slough to positively impact conservation and restoration efforts. In conjunction with that study, we're helping coordinate an education and outreach initiative for youths, community members, policymakers, legislators, and other stakeholders in the region as a way to share our findings and engage in meaningful discussions about the plight of the sea otter.

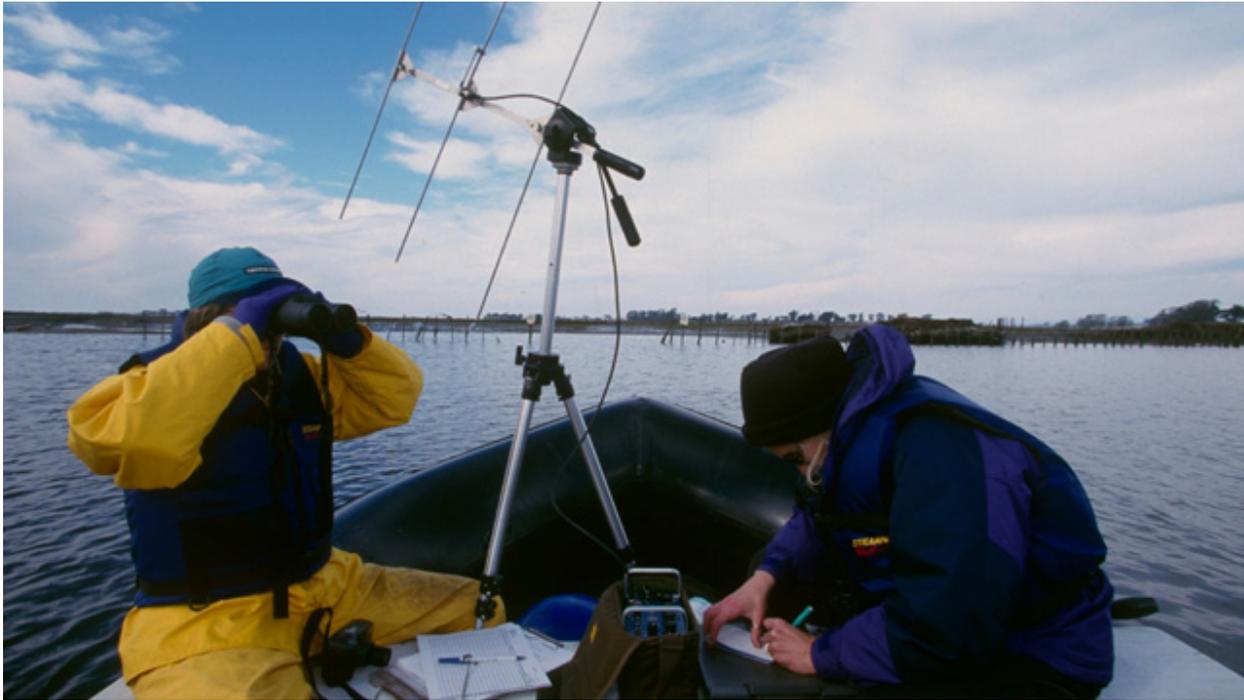
As you know, despite our growing knowledge and accomplishments in animal care today, the work to protect sea otters is needed well into the future. We remain committed to doing all we can to ensure their survival, including expanding our programs to inspire future generations of ocean stewards.

We have an exciting development in our education programming that will help us double the number of staff-led programs for schoolchildren and teachers. Thanks to a lead gift from the S.D. Bechtel, Jr. Foundation, we recently purchased a building very near the Aquarium that will become our Ocean Education and Leadership Center, a new place for children to learn about the oceans and ocean animals. We plan to open the Center in 2018, and we're excited about the sea otter ambassadors it will help inspire.



Fifth grade students in teacher and Otter Care volunteer Bowen Lee's classroom share their knowledge about the sea otter with younger students.

RESEARCH AND CONSERVATION



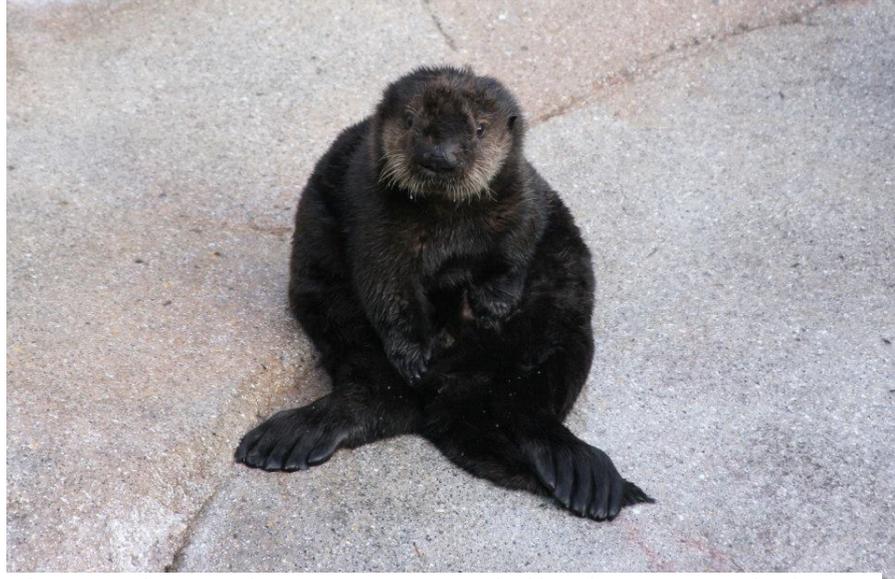
Our program biologists and Aquarium veterinary personnel are making substantial contributions to sea otter care and field research.

The field team has been busy over the past year. They're studying ways to improve the monitoring of sea otters via network tags, which are currently in the design phase. When completed, the tags will allow remote recovery of individual sea otter information, such as GPS location, diving depth, and core body temperature, without the limitations of daylight or line-of-sight observation. Data from these tags will be used to more reliably determine individual sea otter range, foraging efforts, reproduction, survival, and other behaviors of interest without having to recapture them to recover implanted instruments years later.

A group of approximately 15 otters will be the foundation of this study, including Houdini, the territorial male at Hopkins Marine Station who has a keen ability to elude our efforts to recapture him and collect additional data. (Rather than continue naming our tagged wild otters with their radio frequencies, in some cases we've started giving them actual names. In addition to Houdini, we're also tracking Bigfoot, Tewks, Yelsi, and Red, among others.)

One area that has seen sea otter recolonization in recent years is Elkhorn Slough. Population and ecosystem monitoring by the Aquarium and its partners provides strong evidence that such environments can once again provide rich habitat for sea otters, and that sea otters, in turn, greatly enhance the ecosystem health of the estuaries. Lessons from Elkhorn Slough provide valuable insights to the impact of eventual otter recolonization of other estuarine habitats such as Estero Bay, Tomales Bay, and San Francisco Bay.

With the successful release of our twentieth surrogate-reared sea otter at the end of June 2013, we reached the sample size for the first phase of our multi-year surrogacy study. Our tracking of recently weaned juvenile sea otters has shown that surrogacy provides an effective means of rearing live-stranded sea otter pups and successfully returning them to the wild.



When rescued in November 2013, Otter 649 weighed less than seven pounds. The pup blossomed to a comfortable 19 pounds under our care, and we transferred him to the Oregon Coast Aquarium on May 13, 2014.

In the next phase, and in conjunction with the new field study in Elkhorn Slough, we intend to study free-ranging, surrogate-reared sea otters as a means of sampling the health of the environment and will look at factors affecting survival of juvenile and sub-adult sea otters within this habitat. We also intend to investigate alternative release locations for surrogate-reared pups and to examine how we could adapt surrogacy methods to accommodate larger numbers of pups in the event of an oil spill or other disaster.

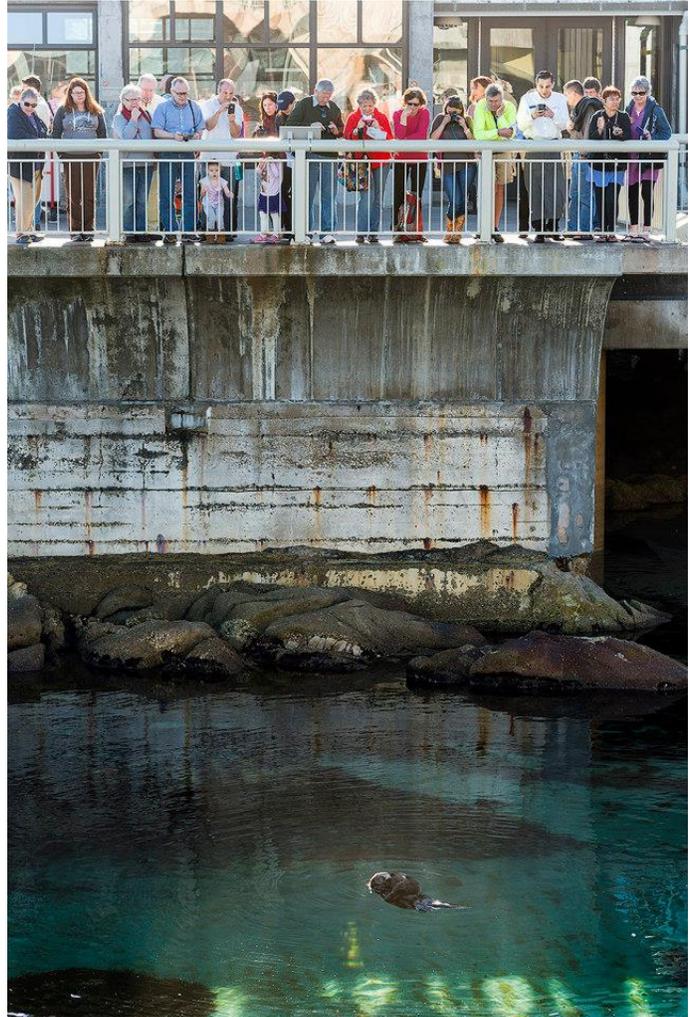
In June, investigators from the University of California, Santa Cruz, and the Aquarium published a long-term study in the *Journal of Experimental Biology* on the energetics of growing sea otter pups. They found that the daily energy demands of female sea otters increase by 96 percent when they have a growing pup, a factor that may account for high mortality among prime-age females in resource-limited areas. Keep in mind that sea otters aren't equipped with blubber like whales and seals. They must rely on their fur coat and high metabolic rate to stay warm. That means they need to hunt and eat 20 to 30 percent of their body mass in food each day to meet their energy requirements. Add in the demands of motherhood, and that number greatly increases.

Other projects that we helped support through the year included an investigation of sea otter habitat use, behavior, and range expansion in the southern part of the range and a study of otter behavior and impacts of white shark attacks on sea otters in the Estero Bay region, an area of high otter mortality associated with white sharks.

GOALS FOR 2015

We will continue to study live-stranded sea otters to answer key questions about sea otter population health and physiology, and we will disseminate the results of our research to inform marine conservation policy, decision-making, and Aquarium programming. Here are some of the specific projects we will be working on in 2015.

- Our Director of Veterinary Services, Dr. Mike Murray, and Dr. Lisa Tell at the University of California, Davis, will analyze samples from a recently concluded study of the long-lasting antibiotic cefovecin to determine how long the drug remains at therapeutic levels in sea otters, and will then publish the results. This information will allow veterinarians caring for sea otters to administer proper doses of the drug while reducing the frequency of antibiotic injections from a few times per day to perhaps once per week.
- Dr. Murray is also taking part in a multi-zoo project to evaluate the safety of an antibody response to a killed West Nile Virus (WNV) vaccine in sea otters. The study will vaccinate a minimum of 10 captive-held sea otters over a one-year period. Results will provide valuable information for the preventive medical care of captive sea otters in high-risk WNV areas and for oil spill response strategies.
- We will help develop and test solar-powered and implantable flipper tag prototypes to create a network for monitoring and detecting population-level impacts of environmental changes on sea otters.
- Over the next three years, we will partner with investigators from the University of California, Santa Cruz, to measure metabolic rates of pregnant and lactating sea otter females to further clarify the energetic challenges they face.



A wild sea otter and her newborn pup stopped by for a visit in our Great Tide Pool in January, delighting some very lucky visitors.

- We have started work with endocrinologists at the Lincoln Park Zoo in Chicago to determine the nature of the sea otter endocrine response to chronic stress and will validate or disprove previous studies that have used hormones to compare and contrast various populations of free ranging sea otters.
- We will devote additional resources and expertise to a new project with the US Geological Survey involving the documentation of ecosystem effects of sea otters at San Nicolas Island.

WE'RE MAKING GREAT PROGRESS, BUT THERE'S MORE WORK TO DO

California's sea otter numbers are holding steady against the many forces pushing against their population recovery, but we have a long way to go to get them off the *Threatened* species list. That's why we're so appreciative of your support and that of the foundations, corporations, and other individuals who are committed to bringing the sea otter back from the brink.

Thank you again for believing in us and supporting the crucial work we do, not only for the sea otter but for all life in the ocean that depends on a healthy, diverse environmental system that, ultimately, sustains us all.

