



HUBBS-SEAWORLD RESEARCH INSTITUTE

ANNUAL REPORT 2014



Greetings

MESSAGE FROM THE PRESIDENT



This was a particularly notable year for Hubbs-SeaWorld Research Institute (HSWRI) as we closed out the celebration of our 50th anniversary. We were honored to have the fellowship and support of so many of our friends at our *Fins, Flukes & Feathers* celebratory event and, in turn, to recognize some of the remarkable historical contributions of our supporters. On behalf of our trustees, scientists and staff let me say “Thank You” for helping us reach this milestone of innovative scientific discovery of *sea life solutions!*

It is only through your dedicated support that our talented researchers and staff are able to continue to accomplish our mission that, five decades later, remains vitally relevant today: “to return to the sea some measure of the benefits derived from it.” In fact, your commitment to marine science and research is more critical than ever. *The New York Times* reported survey results that indicated “an overwhelming majority of scientists now believe the United States has lost its position as the global leader in scientific research.” The declines in research investment are inevitably leading to missed opportunities to solve environmental problems and to train the next generation of problem-solvers.

HSWRI’s response to the situation is not to shrink back but rather to push harder to collaborate, support, and partner with other scientific institutions and to continue to work diligently to bring unique opportunities for positive impact to our constituents. The best way you can stand up for scientific research, reverse this trend, and preserve for our children the quality of life that comes with healthy oceans, is to take up the torch alongside us.

I hope the stories and accomplishments highlighted here in our 2014 annual report will excite and compel you to consider your role in the future of our oceans and to share this vital message with family, colleagues and friends.

Please help us **Sustain, Support and Save** our oceans and sea life! Two-thirds of our world — the ocean, our most precious resource — is depending on you to ensure future animal and human health. Stand with us in advancing and celebrating the discoveries that will make a difference for generations to come.

Don Kent
President/CEO

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Cover photo by Dr. Brent Stewart.
King Penguin Colony, South Georgia, Antarctica

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*A copy of the official registration and financial information may be obtained from the Florida Division of Consumer Services by calling toll-free 1-800-help-fla (435-7352) within the state. The registration number issued to HSWRI in Florida is CH10200.

Oceans and Human Health

Knowing the energy requirements of an animal is fundamental to understanding its role in an ecosystem. Some scientists had previously suggested that the metabolic rate of killer whales would be much higher than (perhaps even double) terrestrial animals of similar size. Working with a trained adult male killer whale at SeaWorld, HSWRI researchers provided experimental evidence to the contrary — the whale's metabolic rate was similar to terrestrial animals of comparable size. Lack of adequate prey has been identified by NOAA Fisheries as an important factor affecting the endangered Southern Resident killer whale population in the Pacific Northwest and findings from this energetics study will help inform resource managers in the conservation and management of wild whales there and around the world.



An adult male killer whale at SeaWorld Orlando was trained to rest quietly while a flow-through metabolic dome was placed over his blowhole to measure how much oxygen he extracted from the incoming air. Photo credit: Tamara Worthy, Physiological Ecology and Bioenergetics Lab, University of Central Florida

HSWRI scientists, in collaboration with an NIH-funded consortium of influenza investigators including colleagues from U.C. Davis, continued surveillance research for flu virus in seals, sea lions and seabirds off the California coast. The team discovered that a highly contagious influenza virus, similar to one collected from a human in San Diego during a flu outbreak in 2009, also emerged in marine mammals along the California coast. Elephant seals and harbor seals with antibodies to this virus in their blood were first detected in 2009; the first California sea lion that tested positive for this virus was sampled in 2010. Widespread exposure suggestive of epidemic transmission was documented in elephant seals but not in harbor seals or sea lions. The appearance and geographic spread of a pandemic influenza virus in both marine mammals and humans in the same year is unprecedented and demonstrates the importance of the 'One Health' approach to infectious diseases with medical doctors, veterinarians, and environmental scientists working together to protect humans and animals alike.



Taking a nasal swab from a sleeping juvenile northern elephant seal at San Nicolas Island.

Sustainable Seafood to Feed a Hungry World

HSWRI's fish nutrition research program has historically focused on economic and environmentally sustainable alternatives to traditional sources of fish meal as well as custom ingredients for larval feeds. Expanded research this year included enhanced broodstock diets, critical to healthy offspring. Small groups of yellowtail broodstock were selected for feeding and spawning trials.

Genetics tools are being used to identify the parents of larval offspring in yellowtail to help optimize our breeding program and the culture performance of larvae and juveniles.

HSWRI's white seabass program, operated in partnership with the California Department of Fish & Wildlife and volunteer anglers throughout southern California, maintains a breeding population of 200 adult fish. 100 broodstock were examined, measured, and samples were collected for health assessments and genetic studies. Older fish were culled or redistributed among broodstock tanks to ensure proper genetic mixing and stock management.



More than 170,000 hatchery-produced juvenile white seabass were tagged and released this past year. High tag recovery rates suggest that recent changes to protocols have improved post-release survival.

Two projects designed to support large scale production of marine fish were initiated this year including culture refinement techniques for white seabass. To advance yellowtail aquaculture, construction began on a biosecure larval rearing center at our Mission Bay Laboratory. The facility will also support a two-year project testing state-of-the-art self cleaning tanks.

120 day-old yellowtail



Sound & Human Impact on Wild Animal Populations

Drawing on data collected over two decades with our collaborative partner SeaWorld, HSWRI published two scientific papers on killer whale vocal learning, providing the strongest evidence yet that young killer whales have the ability to copy sounds both within and across species. Underwater audio and video recording equipment in SeaWorld pools allowed researchers to observe whales and their social partners, both above and below the water over several years, things that have proved impossible to do in the wild.

An HSWRI intern records data from killer whales. The study took advantage of a unique habitat at SeaWorld that was outfitted with multi-channel video and eight underwater hydrophones.



Learning ability of the type HSWRI demonstrated in killer whales is rare among mammals. Future work will study how other large highly social whales learn, providing more data on how social and behavioral context affect vocalizations. Of key interest is to determine whether learning ability changes with age and whether some species have greater ability to copy vocalizations than others. These new findings will help scientists and resource managers interpret results to benefit wild whales and promote conservation of populations facing competition with human needs.

Juvenile male killer whales acquired new calls from an unrelated adult male after they started associating with him, suggesting that learning was stimulated by the social change. Photo credit: Mike Aguilera, SeaWorld San Diego



Marine Ecology: Oceans of Life

Ecological studies conducted by HSWRI scientists in east central Florida are playing an important role in understanding the underlying causes of two Unusual Mortality Events (UMEs). Scientists used several decades of published life history data, and new samples collected during the two UMEs, to assist NOAA Fisheries in the on-going investigation of dolphin mortality. The extremely poor body condition of the dolphins, coupled with expansive loss of seagrass and increased mortality of manatees and pelicans in the Indian River Lagoon (IRL) suggest that habitat degradation and prey availability played an important role in the first UME.

Our scientists have surveyed the movements and body condition of free-swimming dolphins throughout the IRL and the adjacent Halifax River spanning several decades. These data served as an early-warning system and helped prepare the stranding network for a second wave of dead dolphins — animals affected by a deadly virus related to human measles that moved from the outer Florida coast into the IRL. HSWRI's broad-based ecological approach is critical to discovering the reasons for the unprecedented occurrence of two UMEs that overlapped in space and time.

HSWRI scientists have been documenting changes in seal and sea lion reproductive success, foraging ecology and health at the California Channel Islands for over 30 years. The Institute's long term studies include documenting the impact of the temporary warm water events (El Niño) that occur every few years, allowing for predictions of the potential consequences of long-term changes in sea surface temperature associated with climate change. These long-term ecological studies provided benchmark data to assist NOAA Fisheries in investigating the California sea lion pup UME of 2013. Research by HSWRI and colleagues on the epidemiology of infectious diseases in pinniped populations in the region assisted wildlife resource managers' efforts to rule out possible causes of the UME.

New tools, such as unmanned aerial vehicles (e.g., quadcopters), and tethered balloons carrying digital video cameras, are being used by HSWRI scientists in ocean basins around the world to enhance behavioral and ecological studies of marine life. Audio and video recordings and digital photographs of penguin distribution and abundance were collected and analyzed at several southern colonies in 2013 and 2014. By returning to the same sites over several years, scientists can evaluate differences in abundance and habitat use relative to changes in ice extent, water temperature, and other environmental factors.



An unusually high number of dolphins, manatees and pelicans perished during the 2013 Indian River Lagoon die-off.



HSWRI teamed with SeaWorld Animal Rescue to disentangle, rescue, rehabilitate and save the lives of several dolphins. HSWRI scientists were first on the scene for the rescue of 'Hope' (Star of Dolphin Tale II). Her co-star 'Winter', from Dolphin Tale I, was also rescued by HSWRI.



HSWRI scientists attached transmitters to five rescued and rehabilitated sea lion pups, victims of the 2013 UME, to track their welfare after being returned to the ocean by SeaWorld. Photo credit: Mike Aguilera, SeaWorld San Diego

HSWRI is using state-of-the-art technology to survey and record hundreds of thousands of penguins in the field and in zoological parks.



Creating a Legacy

You can play a significant role in assuring the success of our mission through planned giving in the form of a bequest or trust.

To discuss your particular interests, please call Eileen Sigler, Development Director, at 619-226-3881. If you have already included the Institute in your estate plans, please let us know.



Hubbs-SeaWorld Research Institute 2013 Financial Information

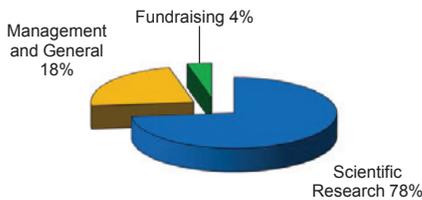
Revenue

Research Contracts and Grants	\$4,033,709
Unrestricted Gifts	\$572,540
Restricted Gifts	\$120,000
Other Revenue	\$32,475
Total Support Revenue	\$4,758,724

Expenditures

Scientific Research	\$3,638,095
Management and General	\$1,134,208
Fund Raising	\$191,987
Total Charitable Expenses	\$4,964,290

Charitable Expenditure Breakdown by Percentage



A copy of the audited financial statement is available upon request by calling 619-226-3871.



HSWRI 50th Anniversary event guests enjoy SeaWorld animal ambassadors.



Fins, Flukes & Feathers event honoree Peggie Shedd and friends.

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Thanks for helping us continue "to return to the sea some measure of the benefits derived from it"

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HSWRI educates students and community members from coast to coast about conservation of the ocean and its precious inhabitants at events throughout the year.

Over 800 San Diego and Orange County students participated in HSWRI hands-on STEM (science, technology, engineering, math) education projects in their classrooms.

The Seabass in the Classroom program increased in popularity this year, expanding from two to nine schools.