The 2011 fiscal year challenged us as never before, as public and private funding for science continued to shrink at local, state and federal levels. Traditional sources of the backbone grants that underpin research programs cut back on their competitive, extramural grant programs and are offering smaller and shorter awards. Some funding organizations, for the first time ever, did not accept proposals at all and this trend is expected to worsen as budget cuts from the debt-ceiling negotiations begin to sink in.

Hubbs-SeaWorld Research Institute received increased national attention in 2011, hosting visits by NOAA Administrator, Dr. Jane Lubchenco and the head of NOAA's National Marine Fisheries Service, Eric Schwaab. Media attention to HSWRI programs was strong this past year. Here are a few examples:

» A film company associated with the National Council for Science and the Environment produced a mini-documentary about HSWRI, Science in the Sea. The Institute was one of only eight U.S. scientific organizations to be highlighted in the 5-minute documentaries.

» The Department of Interior produced and is airing daily to visitors to the Channel Islands National Park, documentary that highlights HSWRI's research within the National Park on seals and sea lions.

» Animal Planet's new series I, Predator featured interviews and other information provided by HSWRI scientists during its "Polar Bear vs. Seal" episode.

» The release of the motion picture Dolphin Tale, about a severely injured dolphin calf, has brought new accolades for the Institute's marine mammal stranding research and response program. It was a member of the HSWRI team who spent many hours in the cold water with the young calf, caring for her until reinforcements arrived to transport her to a rehabilitation center for further care.

Another significant event in 2011 was the awarding of The Explorers Club's Lowell Thomas Award to Dr. Brent Stewart, in recognition of his contributions to scientific discovery. The Explorers Club, founded in 1904, counts among its members those who were first to the North Pole, first to the South Pole, first to the deepest point in the ocean and first to the surface of the moon. Past winners of the award, named in honor of the American writer and explorer who made Lawrence of Arabia famous, include Carl Sagan, Sir Edmund Hillary, and Wally Schirra.

AquACulture

Researchers at HSWRI and the Inter-American Tropical Tuna Commission (IATTC) completed the first successful air shipments of yellowfin tuna eggs and larvae into the U.S. in 2011. The cultured eggs and larvae, spawned at an IATTC facility in Panama, are being used in a joint effort to advance hatchery technologies for this popular food fish. The outcome of this effort is being watched around the world, as there are very few captive breeding populations of tuna. The ability to ship eggs and larvae over great distances will open opportunities to work with these delicate, high-performance food fish.

Another new program this year involves using regionally sourced fish trimmings from fish processing plants to replace industrial fish meal and fish oil in aquaculture feeds. These trimmings, a source of high quality protein, are usually discarded.

Phase II construction at our Melbourne Beach laboratory also was completed in 2011, including installation of four 5m-diameter tanks for future mariculture efforts in partnership with the Florida Marine Fisheries Enhancement Initiative. Discussions with local, state and federal partners regarding a fish replenishment hatchery in Pensacola, Florida, took place throughout 2011. There is increasing interest in a hatchery at this location as part of a regional effort to address.
Message from the President

This year is very special as it marks Hubbs-SeaWorld Research Institute’s 50th Anniversary. Through the years, the Institute has remained an organization comprised of dedicated scientists, advisors and volunteers working together to leave future generations an ocean environment at least a little better than they found it.

When Hubbs-SeaWorld Research Institute (HSWRI) was first conceptualized by its founder, Milt Shedd, he envisioned a marine research institute that would study the animals in SeaWorld’s zoological collection to increase our understanding of them and thereby help conserve them for the future. That vision has been carried through five decades now, through the hundreds of scientists and students that have worked at the Institute right down to the scientists that work here today.

But the Institute’s relationship with SeaWorld is only part of the story. Renowned scientific mentors like Carl Hubbs, Ken Norris and Bill Evans were the inspiration that led to our history of ocean exploration and discovery. Some of our research studies including those in the Indian River Lagoon in Florida, on the California Channel Islands, and in the Arctic and the Antarctic, span decades and have led to long-term collaborations with other researchers close to home and in distant countries. Could our Founders have envisioned that our research programs would extend from pole-to-pole and to every ocean of the world? With private contributions and the support of collaborating organizations and government agencies, HSWRI conducts the farthest reaching collaborative whale shark research program, the largest marine aquaculture program in the western United States, and one of the most active marine mammal stranding response and research programs in the Nation. Whether it’s working on noise impacts on marine animals, or investigating the causes for marine mammal Unusual Mortality Events, Institute scientists maximize the results of their work by combining their efforts with those of their colleagues in these and other research organizations.

Environmental problems are not causes célèbre for Institute scientists, but rather a focal point for their research. I take great pride in how the Institute’s scientists conduct their research in a measured and authoritative manner as a means to solve the actual problems at hand. As the world’s human population continues to grow, we will need to steward our ocean resources in an ever more responsible manner to provide more energy, water, food and habitat while ensuring that vibrant and viable habitats are maintained for the animals that live there now and in the future.

The Institute’s Mission ‘to return to the sea some measure of the benefits derived from it’, is even timelier now than it was 50 years ago. I am excited about how we may continue to work together to launch the next 50, to accomplish an enhanced research and problem resolving capability. Our Institute has a commendable history and I look forward to an even more gratifying future.

Don Kent
President/CEO

A Message from the Chairman

The person that should be writing this 50th Anniversary message for the Institute’s annual report is my father, Milt Shedd. However, even though he passed away in 2002, his interest and passion for the Institute was so strong and so consistently embedded in our family’s culture that I can easily relay what Dad would say.

First, he would describe the importance of his vision for a research institute and how in its beginnings, it was a family affair. Dad would describe what an important partner my mom was in founding the Hubbs-SeaWorld Research Institute and he would smile when he told you that for the first six years of its existence, she did the accounting for the Institute on the family’s kitchen table in their Newport Beach home.

Then he would tell you about how important the scientists at the Institute are — about how he saw one generation of scientists develop the next into the leaders in their fields that they are today. He would say how important Bill Evans and Dick Ford were as mentors and how wonderfully their charges Pam Yochem, Ann Bowles, Brent Stewart, Mark Drawbridge and Don Kent have developed into world-class scientists. Dad would remind us that these senior research scientists have more than 140 years of collective service with HSWRI and that because of their work, and the work of others on over 1,000 research projects, the oceans and the creatures that call them home are better off.

Dad would next tell us that since HSWRI celebrates its 50th anniversary in 2013, and SeaWorld doesn’t celebrate its 50th until 2014, that something very special and unique took place. Even before the Park opened in 1963, SeaWorld was already quietly giving back to the marine community by supporting ocean research. Fifty years ago the business world was a different place and that type of commitment was unknown. After they become successful many businesses establish non-profit public benefit foundations, but I cannot think of a single business that founded its not-for-profit prior to profits being realized.

Our 50th Anniversary story is greater than a single company and extends far beyond San Diego. The Hubbs-SeaWorld Research Institute and SeaWorld partnership is a classic story of business in America committing to giving something back, not because it was fashionable or a good marketing ploy but because it was the right thing to do. All of us who have played a role in either the Institute or SeaWorld take great pride in what we have accomplished together in these last 50 years. We all welcome you to join us as the legacy continues into next 50 years.

Bill Shedd
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Board of Trustees

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CHAIR EMERITUS
Science Committee
Clark Hubbs, Ph.D. (deceased)

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William Shedd
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Arthur DeFever (deceased)
Char DeMotte
George Gildred
Capt. Walter M. Schirra (deceased)

Scientists

SENIOR RESEARCH SCIENTISTS

Ann E. Bowles, Ph.D.
Mark A. Drawbridge, M.S.
Don Hunsaker, II, Ph.D.
Donald B. Kent, M.S.
Brent S. Stewart, Ph.D., J.D.
Pamela K. Yochem, D.V.M., Ph.D.

RESEARCH SCIENTISTS

Wendy Noke Durden, M.S.
Kristen Gruenthal, Ph.D.
Dave Jirsa, M.A.
Rebecca Rivera, Ph.D.
Michael A. Shane, M.S.
Connie Silbernagel, D.V.M, M.P.V.M.
Megan K. Stolen, M.S.
Kevin Stuart, M.S.

SENIOR ADMINISTRATIVE MANAGEMENT

Donald B. Kent, M.S.
President and Chief Executive Officer

Pamela K. Yochem, D.V.M., Ph.D.
Executive Vice President

Bethany Smith, M.B.A.
Chief Financial Officer

Eileen Sigler, CFRE
Director of Development
The Institute continued to build its reliance on private individual, corporate and foundation support in 2013 as government funding for science persisted in shrinking at local, state and federal levels. Despite increased staff efforts to increase proposal submittals, traditional grant sources that underpin research programs were cut back once again due to the economy and federal sequestration.

50th Anniversary Milestones & Future Directions

Aquaculture — Sea Food Solutions

Hubbs-SeaWorld Research Institute (HSWRI) conducts research in marine aquaculture and fisheries science with projects that have the highest goals in common — to feed people by making the most sustainable use of marine resources and to replenish those resources. Given the current status of fisheries worldwide, these efforts are timely and critical. Our aquaculture roots date back to the 1970s, when HSWRI worked with collaborators at SeaWorld San Diego to develop a sustainable and locally-reared source of ornamental fish for aquarium displays. However, the core of the HSWRI aquaculture program in recent decades has been the white seabass replenishment program centered at our marine fish hatchery in Carlsbad and operated in partnership with the recreational fishing community and the State of California. Another major emphasis of the aquaculture program is the multi-species breeding and research program operated from the Institute’s main San Diego lab.

Historical and Present Contributions of the Program

Mariculture (marine aquaculture)

- developing culture methods for high-value marine finfish species and sustainable ocean farming practices
- refining broodstock management and juvenile propagation protocols using genetics
- designing and engineering new fish life support systems to minimize energy and water consumption

In 2013, HSWRI demonstrated commercial production of white seabass and California yellowtail from egg to market and launched a multi-state, multi-institution research program focused on egg quality in California halibut and other marine species.

Fisheries Science

- understanding species’ ecological requirements to optimize their performance in culture and in the wild
- assessing post-release movement, growth, and survival of cultured fish

HSWRI recently initiated a collaborative study using cultured fish to study the potential impacts of ocean acidification on larval marine fish.

Fish Physiology and Health

- studying thermal preferences and tolerance ranges of juvenile fish to optimize culture conditions
- improving rearing, husbandry, and veterinary techniques for cultured fish

Future Directions

The need for sustainable commercial-scale ocean aquaculture to meet U.S. seafood demand will provide HSWRI with mariculture leadership opportunities in the coming years. The Institute will continue to improve the sustainability and management of marine fish in culture through research in larval rearing, genetics, nutrition and health. We will seek new opportunities to expand our popular ‘Seabass in the Classroom’ STEM (Science Technology Education Math) education program.

Bioacoustics — Sound Solutions for Sea Life

The bioacoustics program at HSWRI was conceived to address its mission ‘to return to the sea’ by building on the unrivaled opportunity provided by access to SeaWorld’s animals. Research in zoological environments has always been at the core of our understanding of marine animal bioacoustics. In addition to a focus on animal sound perception and communication, the bioacoustics laboratory’s major research goals include reducing the impact of human-made — that is, anthropogenic — noise and developing acoustic tools to prevent important human-caused mortality, such as collisions with vessels or entanglement in fishing gear.

Historical and Present Contributions of the Program

Access to SeaWorld’s animals has enabled HSWRI to achieve a series of bioacoustics ‘firsts’ over its history:

- behavioral hearing measurements on killer whale, beluga, short-finned pilot whale, false killer whale, and polar bear
- electrophysiological hearing measurement on a seal
- research on echolocation of Commerson’s dolphins
- clarification of interactions between porpoises and fishing nets
- measurements of physiological responses to oil industry noise
- analysis of killer whale color patterns and vocal behavior that anticipated ongoing research on the complex population genetics of the species

Our bioacoustics research program is also well known for work over a 35-year period studying the effects of anthropogenic noise on wildlife. Working in both marine and terrestrial environments, research subjects have ranged from the 5-gram endangered Coastal California Gnatcatcher to 50-ton baleen whales in the Southern Indian Ocean.

Notable accomplishments in the past year include publication of research on behavioral responses of marine mammals to potentially entangling objects and gear and publication of a study on auditory psychophysics of a threatened large carnivore, the polar bear.
Future Directions
Plans include expanding the education and outreach components of the program and conducting research on marine mammal interactions with their acoustic environment whether natural, social, or anthropogenic. In addition, HSWRI will continue to seek a greater understanding of how marine mammals experience their acoustic environment in the face of changing conditions, and communicate it in both the classroom and community-at-large.

Ecology – Oceans of Life
Long-term ecosystem research (i.e., ten years or longer) is essential for developing sound environmental policies and for managing the world’s natural resources. HSWRI’s historical and present leadership in this area has facilitated pioneering research far beyond the goals and intent of the initial studies. Long term ecological studies include:

- seals and sea lions of the Southern California Channel Islands
- stranded cetaceans in east central Florida
- bottlenose dolphins, manatees and sea turtles of the Indian River Lagoon (IRL)
- migratory birds at Mono Lake and other alkaline lakes in the West

HSWRI is afforded an unique scientific opportunity as a result of its long association with the SeaWorld parks. Some of the species in SeaWorld’s care are very common in the wild (e.g., emperor penguins, California sea lions, reef fish) allowing for research on how human interactions with the environment might impact robust and growing wild populations of these charismatic animals. Other species maintained within the collections are threatened or endangered (e.g., monk seals, sea turtles); these animals provide opportunities for Institute scientists and their SeaWorld colleagues to develop tools to conserve and recover the species.

Historical and Present Contributions of the HSWRI Marine Vertebrate Ecology Lab (MarVEL)

- using traditional approaches, such as ship-based and aerial surveys, and more advanced techniques such as molecular genetics and diet analysis, to study marine mammals in tropical, temperate and polar aquatic environments
- engaging marine vertebrates to opportunistically collect biological and physical data integrating ocean- and space-based sensing technologies
- studying trends in abundance and changes in distribution of marine mammal and aquatic bird populations in California and Florida in support of wise management and conservation of these species

Notable ‘firsts’ include abundance estimates for dolphins in the Indian River Lagoon, Florida, and demographic analysis of dolphins in the region, which produced a model life table for bottlenose dolphins worldwide. HSWRI research at the California Channel Islands has documented decades of exponential growth in some pinniped (seal and sea lion) populations and, in 2013, our data served as important benchmarks for evaluating a federally-declared ‘Unusual Mortality Event’ in California sea lions. HSWRI scientists have tracked the movements of the world’s oldest reptile (leatherback sea turtle), the world’s largest seal (southern elephant seal) and the world’s largest fish (whale shark). Their collaborative whale shark research is the largest program of its kind in the world.

Future Directions
We intend to continue our long-term, integrated ecological studies as touchstones to general understandings of structure and function of marine ecosystems. New initiatives will focus on wildlife refuges and other protected habitats identified as areas of national and international significance and on expanding HSWRI’s STEM education and outreach programs to advance science literacy.

Physiology and Ocean Health — Healthy Oceans, Healthy Planet

Studying how animals react to a changing environment allows us to make predictions about whether animals can survive and/or thrive under a particular set of natural or artificial conditions.

HSWRI has significant expertise in performing health assessments of marine mammals, reptiles and fish and is a recognized leader in investigating the trends and causes of marine mammal strandings. Our scientists have made contributions in the areas of infectious disease research, including characterizing novel viruses in marine mammals and understanding their potential impact on ocean and human health. Other important research includes studying impacts of naturally-occurring (algal toxins) and human-caused (DDT, mercury, oil) contaminants.

As a result of its long association with the SeaWorld parks, the Institute is able to conduct investigations requiring sensitive physiological measurements on animals under controlled conditions. Access to the animals in SeaWorld’s care over their entire lifetime provides data nearly impossible to obtain in the wild. Availability of multiple life stages of several species of marine fish through the HSWRI aquaculture program provides additional opportunities for physiological and health research.

Historical and Present Contributions of the Program

Diving Physiology

- describing physiological adaptations that allow marine mammals and sea turtles to endure long breath-hold dives to great depths
- documenting the impact of health status on dive performance and behavior of marine mammals and aquatic birds

Physiological Ecology

- evaluating how animals respond and adapt to small-scale or short term changes in their environment (e.g., warm water effluent from power plants) as a way of predicting the impacts of large-scale or multi-decadal changes such as ocean warming and acidification

Toxicology

- developing techniques for safely cleaning oil from the fur of marine mammals
- documenting the presence and impact of toxins such as heavy metals (e.g., mercury in dolphins) and pesticides (e.g., DDT in seabirds)

Ocean Health

- discovering and measuring the physical and biological factors that influence the health of marine animals and their habitats
- documenting the impacts of discarded fishing gear and other entangling materials on the health and survival of dolphins
- conducting long-term research on health and disease of marine mammals at the Channel Islands (California) and in the Indian River Lagoon (Florida) as a foundation for addressing factors that limit and regulate their vitality and population growth
- collaborating on studies of the health of endangered species and Antarctic seals to provide information needed for wise management and conservation decisions

Future Directions

The concept of ‘One Health’ recognizes that human, animal and environment health are closely aligned. HSWRI will continue its One Health focus in coming years by exploring links between the oceans and human health and by working with academic partners to develop the next generation of aquatic animal health professionals. Of particular interest are studies of zoonotic diseases and emerging or resurging diseases that affect both humans and animals. Zoological parks such as SeaWorld provide a means of communicating the Institute’s ocean health discoveries to millions of people each year.
Hubbs-SeaWorld Research Institute Celebrates 50 Years of Sea Life Solutions

HWSRI marked 50 years of Sea Life Solutions in 2013 and celebrated this milestone at a fundraising event, "Fins, Flukes & Feathers", held at SeaWorld San Diego on September 7, 2013.

Co-chaired by Chevron Corporation and SeaWorld, the event recognized historical contributors and board members, and attendees enjoyed animal encounters, science presentations, live music and a delectable buffet of sustainable culinary offerings.

Peggie and Milt Shedd & Family were Honorary Chairs. Other major sponsors included: Robert H. Baker & Family; Edison International; San Diego Gas & Electric; Keith Kasen; The Coca-Cola Company; NRG Energy, Inc.; Ingrid Poole Williams and Wilt Williams; Senator Dede and Michael Alpert; Cox Communications; San Diego Zoo Global; and Alison and George Gildred.

Four of the Institute’s senior research scientists, Dr. Ann Bowles, Mark Drawbridge, Dr. Brent Stewart, and Dr. Pamela Yochem conducted science presentations during the event, complemented by some of SeaWorld’s animal ambassadors.

More than $250,000 was raised through corporate sponsorships and individual contributions, silent and live auction, and a STAND UP for Sea Life Solutions call-to-action. Special thanks to all of our sponsors, supporters and attendees for helping us commemorate this important Institute benchmark!

Financial Information

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Charitable Expenditure Breakdown by Percentage

- **Management and General**: 4%
- **Scientific Research**: 78%
- **Fundraising**: 18%
Creating a legacy that “returns to the sea for an eternity”

You can play a significant role in assuring the success of our mission through planned giving in the form of a bequest or trust. Even persons of modest means can become donors and enjoy deep personal fulfillment as well as recognition and lifetime benefits. Your remembrance of Hubbs-SeaWorld Research Institute will provide our dedicated scientists with the necessary equipment and capital to continue to conduct vital marine research. Moreover, your bequest can help unlock some of the most mysterious questions of the sea and ensure that we conserve our oceans for future generations to enjoy.

It is important that everyone have a Will and that it be carefully thought out and kept up to date. The Trustees and staff at Hubbs-SeaWorld Research Institute respectfully request that you consider remembering the Institute and its research as you make important decisions. We believe your bequest should be looked upon as an investment in the future. Like other investments, your bequest should bring personal satisfaction.

Additionally, if you have property and/or appreciated securities that could be offered today to support our research projects, our staff would be happy to talk with you. Beyond knowing that you will ‘return to the sea some measure of the benefits derived from it’, you may also receive significant tax benefits.

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 so that we may properly recognize you.

The Milton and Peggie Shedd Endowment Circle recognizes those who have contributed to our endowment fund which is designed to ensure our research programs for generations to come:

Jill and Bill Shedd
Carol Shedd McCarron
Terri and Frank Murrut
Peggie Shedd
Terri and Steve Shedd

The Carl L. and Laura C. Hubbs Legacy Circle recognizes contributors who are planning to leave lasting legacies through bequests and trusts:

Anonymous
The David DeMotte Family
Kimberley and Sheldon Fisher
Ronnie Hunter
Carla Laemmle
Caroline McKean
Myron Nosedeker
Linda and Jack Miller
Linda Sue Shelton
Tammy and Dr. Graham Worthy

Hubbs-SeaWorld Research Institute scientists continued to provide innovative sea life solutions to complex marine conservation challenges with the help of generous contributions from the individuals, foundations and corporations listed below.

Donors

$100,000 to $499,999
Chevron Corporation
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Terri and Steve Shedd
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Tuna Club Foundation
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Margaret and John Snyder
Sportfishing Association of California
Bernice Stark and Myron Nosedeker
Karen and Dr. Donald Vance
Anne and Ting Wohlford
Seaforth Sportfishing Corporation
Drs. Pam Yochem and Brent Stewart

This listing is comprised of donors who supported Hubbs-SeaWorld Research Institute from June 2012 through September 2013. Though we take every possible step to ensure its accuracy, with a list of this nature it is possible that an oversight has occurred. If your name has been omitted or there is an error in the listing, we apologize and ask that you contact us at 619-226-3871 or solutions@hswri.org.
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AquAculture
Researchers at HSWRI and the Inter-American Tropical Tuna Commission (IATTC) completed the first successful air shipments of yellowfin tuna eggs and larvae into the U.S. in 2011. The cultured eggs and larvae, spawned at an IATTC facility in Panama, are being used in a joint effort to advance hatchery technologies for this popular food fish. The outcome of this effort is being watched around the world, as there are very few captive breeding populations of tuna. The ability to ship eggs and larvae over great distances will open opportunities to work with these delicate, high-performance food fish.

Another new program this year involves using regionally sourced fish trimmings from fish processing plants to replace industrial fish meal and fish oil in aquaculture feeds. These trimmings, a source of high quality protein, are usually discarded.

Phase II construction at our Melbourne Beach laboratory also was completed in 2011, including installation of four 5m-diameter tanks for future mariculture efforts in partnership with the Florida Marine Fisheries Enhancement Initiative. Discussions with local, state and federal partners regarding a fish replenishment hatchery in Pensacola, Florida, took place throughout 2011. There is increasing interest in a hatchery at this location as part of a regional effort to address...