KHALED BIN SULTAN

LIVING OCEANS FOUNDATION

Two Decades of Aquatic Life Exploration

The Khaled bin Sultan Living Oceans Foundation

Providing science-based solutions
to protect and restore ocean health

Khaled bin Sultan
Living Oceans
Foundation

The Khaled bin Sultan Living Oceans Foundation (KSLOF) was incorporated in California as a 501(c)(3), public benefit, private operating foundation in September 2000. The Living Oceans Foundation is dedicated to providing science-based solutions to protect and restore ocean health. *For more information, visit www.livingoceansfoundation.org.*

Khaled bin Sultan Living Oceans Foundation
7 Old Solomons Island Rd, Suite 200
Annapolis, MD 21401
info@livingoceansfoundation.org

Follow us on social media:
Facebook: facebook.com/livingoceansfoundation
Twitter: @LivingOceansFdn
Instagram: @LivingOceansFoundation

Photo copyrights:
All photos @Living Oceans Foundation, unless otherwise noted.
Cover: @iLCP/Michele Westmorland
Pg. 5, 9, 10, 18, 23, 28, 40, 51: @iLCP/Michele Westmorland
Pg. 7 (science), 36: @iLCP/Keith Ellenbogen
Pg. 15, 16, 43: @iLCP/Juergen Freund

SCIENCE WITHOUT BORDERS®

Table of Contents

EXECUTIVE SUMMARY

The Khaled bin Sultan Living Oceans Foundation is a nonprofit operating environmental science organization that was established by His Royal Highness Prince Khaled bin Sultan Al-Saud to help preserve, protect, and restore the world's oceans and aquatic resources through science, education, and outreach.

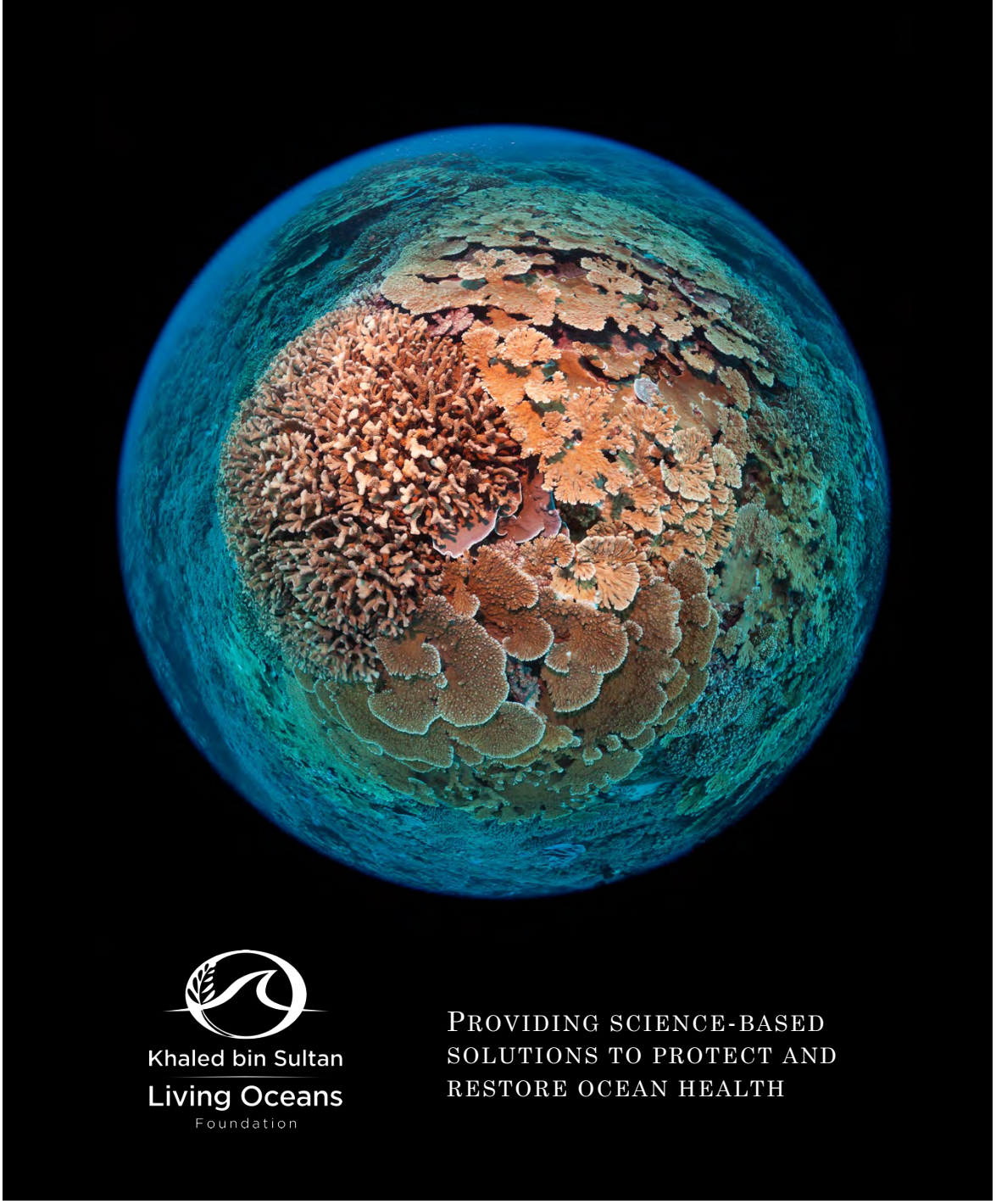
Prince Khaled witnessed the rapid deterioration of coral reefs as he granted scientists the use of his ship and resources to investigate the demise of coral reefs around the globe. Upon learning that climate change and numerous human impacts, such as overfishing and pollution, were contributing to the decline in coral reefs, the lungs through which the planet Earth breathes, Prince Khaled was inspired to do whatever he could to contribute to ocean conservation. So, he, along with a dedicated group of environmentally conscientious men and women, established a private operating foundation devoted to the conservation and preservation of our precious living oceans for the sake of generations to come.

The Prince agreed to fund the Foundation's operations for twenty years to allow scientists to provide science-based solutions to protect and restore ocean ecosystems in general, and coral reefs in particular. Understanding that the Foundation needed to work across oceans and political boundaries, and recognizing that collaboration is vital to ocean conservation, the Foundation made ***Science without Borders***® the motto and the core philosophy of the Foundation. As such, the Foundation formed partnerships with scientists, conservation organizations, and local leaders around the world to leverage resources, commitment, and ideas necessary to make substantial progress in ocean conservation.

Since our founding in September 2000, the Foundation has used its three-pronged approach of science, outreach & communications, and education to conserve vulnerable coral reef systems. The Foundation has developed state-of-the art data collection techniques and collaborated with international teams of scientists and managers working harmoniously together to conserve our oceans. The Foundation also organized many large-scale scientific expeditions, including the Global Reef Expedition (GRE), the world's largest coral reef survey and high-resolution habitat mapping expedition in the history of mankind.

Over the course of five years (2011-2016), the GRE circumnavigated the globe surveying and mapping some of the most remote coral reefs on the planet. This expedition was done in collaboration with the governments of 15 countries, and 200 scientists belonging to 55 scientific institutions. During this expedition, scientists developed innovative protocols to map,

THE KHALED BIN SULTAN LIVING OCEANS FOUNDATION WAS ESTABLISHED IN 2000 TO HELP PRESERVE, PROTECT, AND RESTORE THE WORLD'S OCEANS AND AQUATIC RESOURCES.



characterize, and evaluate coral reefs throughout the western Atlantic, Pacific, and Indian Oceans to complement research we conducted in the Red Sea.

Now that the field research for the Global Reef Expedition is complete, the Foundation is sharing the scientific results with participating countries as well as regulatory agencies so they can be used by countries to develop management strategies to protect and restore their coral reef ecosystems.

The Living Oceans Foundation focuses on coral reefs because they are a keystone ecosystem for measuring the vitality of the entire ocean. Although coral reefs occupy less than 1% of the marine environment, more than 25% of

all known marine fish species thrive in these delicate habitats, and one in every seven people on Earth rely on coral reefs for food or income. To raise awareness of the need to protect and preserve coral reefs, the Foundation runs robust education and outreach programs for students, stakeholders, and the public.

The Foundation has developed a state-of-the-art online *Coral Reef Ecology Curriculum*, where students and teachers can log on to learn about coral reefs and how they are connected to this unique ecosystem. Teachers can download lesson plans and educational materials, or they can set up classes on the online platform so that students can learn at their own pace, take quizzes, and earn badges while tracking their progress and engaging in interactive learning exercises. So far, over 4,000 students and teachers from 112 countries have signed up to access the *Coral Reef Ecology Curriculum*, bringing coral reef education to the next generation of ocean advocates. In addition to coral reef education, the Foundation conducts a Mangrove Education and Restoration program in Jamaica and The Bahamas. In these programs, students and teachers learn about the mangrove ecosystem while participating in a hands-on science project throughout the school year.

The Foundation also runs the *Science without Borders® Challenge*, a yearly art competition that engages students to raise awareness of the need to preserve, protect, and restore the world's oceans and aquatic resources. The contest incorporates marine science education into classrooms worldwide, inspiring students to be creative while learning about important ocean conservation issues.

At the Khaled bin Sultan Living Oceans Foundation, we know that studying and understanding our oceans is critically important, but to save our oceans we need to inspire people to protect them. Conservation and restoration of the marine environment calls for human action, and we believe that through targeted outreach, we can motivate people to take action toward lasting ocean conservation. The Foundation has a robust outreach program that supports our science and education efforts. We have created Emmy® award-winning conservation films that have been shown at film festivals around the world, broadcast on television, streamed online, and incorporated into our educational materials. These films transport viewers to places that they may never otherwise see, make complicated science easy to understand, and connect people in a visceral and emotional way to the incredible beauty of the natural world. The Foundation also reaches out to the public to encourage them to protect the oceans, leads students and teachers to our educational resources to improve ocean literacy, and communicates our latest science to stakeholders and decision-makers so they can make informed decisions on how to use and enjoy their marine environment.

Over the past twenty years, the Foundation's three-pronged approach to marine conservation has yielded many positive results for the ocean. Our work led to the development and expansion of Marine Protected Areas (MPAs) in Jamaica, the Cook Islands, and Fiji, and our scientific research is currently being used to inform marine spatial planning efforts across the South Pacific. Prince Khaled has received many awards on behalf of the Foundation including the Peter Benchley Award for Excellence in Ocean Exploration, the Fabian Cousteau Blue Award, and the Perseus Award for his contribution to ocean conservation.

The Foundation is now looking forward to building on our expertise, developed innovative research tool, and models by expanding our conservation efforts, finding new funding partners, and forming new international partnerships to safeguard coral reefs for the use and enjoyment of future generations.

THE KHALED BIN SULTAN LIVING OCEANS FOUNDATION FOCUSES ON CORAL REEFS BECAUSE THEY ARE A KEYSTONE ECOSYSTEM FOR MEASURING THE VITALITY OF THE ENTIRE OCEAN.

About Us

The Khaled bin Sultan Living Oceans Foundation (KSLOF) is a nonprofit organization dedicated to the preservation of the world's oceans and aquatic resources. For two decades, the Foundation has used its three-pronged approach of science, education, and outreach to create lasting conservation for some of the world's most remote and vulnerable coral reef systems. Success in these three pillars of our work has helped the Foundation become a global player in marine conservation.

The Foundation was established in 2000 by His Royal Highness Prince Khaled bin Sultan Al-Saud of the Kingdom of Saudi Arabia, who saw the decline of coral reefs firsthand and decided to do something about it. Since then, we have developed state of the art data collection techniques, collaborated with international teams of scientists, and formed partnerships for ocean conservation. The Foundation also organized many large-scale scientific surveys, including the Global Reef Expedition—the world's largest coral reef study in the history of mankind.

Based in the United States, our core staff are located in Annapolis, MD, and work closely with an international team of scientists and partners on marine conservation issues critical to the health and resiliency of our oceans.

Science without Borders® is the overarching theme of the Living Oceans Foundation. The synergy created through this approach is imperative for making significant impacts in the restoration of ocean health. Through partnerships with scientific institutions and conservation organizations around the world, the Foundation is able to leverage the resources, commitment, and ideas necessary to make substantial progress in the grand challenge inherent in our mission: to protect, restore, and conserve the world's oceans.

Khaled bin Sultan Living Oceans Foundation

Our Mission:

To protect and restore ocean health by providing science-based solutions

Our Work

The Khaled bin Sultan Living Oceans Foundation works to protect, preserve, and restore the world's oceans and marine resources through science, outreach, and education.

Science

Expertise in coral reef ecosystems

The Foundation conducts coral reef ecosystem research in remote locations around the world. The Foundation works with local scientists to map coral reef habitats, conduct scientific surveys, and assess coral reef resilience. The resulting scientific findings and maps are shared with participating countries and are used to develop sound environmental management strategies for coral reefs.

Education

Teaching the next generation of ocean advocates

In order to advance ocean literacy and the conservation and restoration of our living oceans, the Foundation provides educational opportunities for students around the world. The Foundation conducts workshops and seminars, develops coral reef educational materials for students and teachers, and runs programs to inspire, educate, and engage students in ocean conservation.

Outreach & Communications

Inspiring conservation action

A key component of the Foundation's conservation program is media relations and outreach. The Foundation communicates our scientific findings to government officials, stakeholders, and decision makers so they can understand the value of their marine resources and what they can do to protect them. The Foundation also creates films and publishes articles to illustrate the complexity of life underwater, convey ocean conservation messages, and inspire others to care about the ocean.

Our Founder

His Royal Highness Prince Khaled bin Sultan

His Royal Highness Prince Khaled bin Sultan bin Abdulaziz Al-Saud spearheaded the efforts that led to the Foundation's incorporation, along with a dedicated group of men and women who are committed to join efforts for ocean conservation. Price Khaled also provided operational funding and support for the Foundation's first twenty years. In 2001, the Foundation's Board decided to name the Foundation after Prince Khaled in recognition of his support and commitment.

As he traveled the seas aboard his yacht, visiting popular dive sites in the Red Sea year after year, Prince Khaled witnessed the rapid deterioration of coral reefs firsthand. It affected him on a personal level, and he turned to scientists and experts to understand why this was happening. Upon learning that numerous human impacts, such as unsustainable fishing and terrestrial pollution were contributing to the decline in coral reef health, His Royal Highness was inspired to do whatever he could to contribute to ocean conservation.

In order to help address the coral reef crisis and the decline in ocean ecosystems more generally, Prince Khaled offered scientists the use of his yacht as a research vessel. After numerous requests and successful scientific expeditions, he decided to formalize and expand this arrangement by creating a private operating foundation. He tasked the Foundation with conducting the applied research necessary to provide science-based solutions to protect and restore ocean ecosystems, while informing and educating the public on the need for effective ocean conservation and management.

> "I HAVE A PASSION FOR PRESERVING AND PROTECTING THE FRAGILE BALANCE OF THE SEAS—NOT ONLY FOR MY CHILDREN BUT ALSO FOR FUTURE GENERATIONS THROUGHOUT THE WORLD."
>
> — PRINCE KHALED BIN SULTAN AT THE IUCN WORLD CONSERVATION CONGRESS ANNOUNCING THE GLOBAL REEF EXPEDITION

Science Without Borders®

Science Without Borders® is the overarching theme of the Khaled bin Sultan Living Oceans Foundation

The Khaled bin Sultan Living Oceans Foundation understands the challenges of conserving Earth's coral reefs across oceans and political boundaries and recognizes that collaboration is vital to ocean conservation and international political stability.

The Foundation forms partnerships with scientists and conservationists around the world to leverage resources, commitment, and ideas necessary to make substantial progress in the grand challenge inherent in our mission: to protect, restore, and conserve the world's oceans and aquatic resources.

The Foundation employs a collaborative approach in its operations to leverage individual capabilities and resources of partners. The synergy created through this approach is imperative for making significant impacts in the restoration of ocean health.

A History of Accomplishment

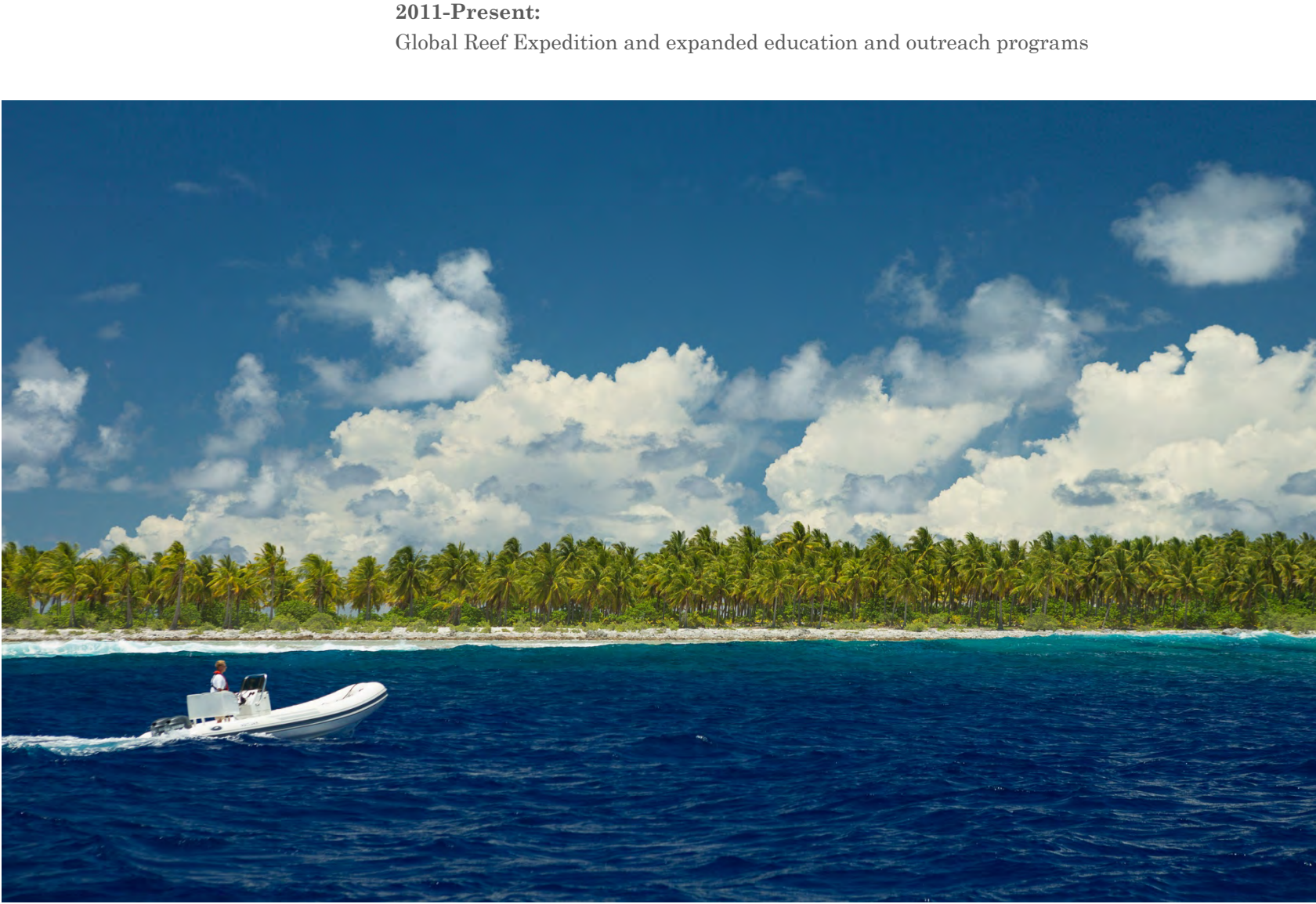
What we have achieved so far

In the generation since the inception of the Khaled bin Sultan Living Oceans Foundation, there have been many notable accomplishments. The operations and research activities conducted by the Foundation are listed on the following pages in a chronological manner, and may be categorized into three distinct phases:

2000-2005:
Scientific capacity building and development of remote sensing capabilities

2006-2010:
Saudi Arabian Red Sea coral reef research program

2011-Present:
Global Reef Expedition and expanded education and outreach programs



Timeline of our Accomplishments:

2000

His Royal Highness Prince Khaled bin Sultan incorporated the Khaled bin Sultan Living Oceans Foundation as a US-based nonprofit organization dedicated to the conservation and preservation of our living oceans.

2001

- **The Sea of Cortez Ocean Health Research Expedition** searched for natural products from marine organisms that may benefit human medicine.
- **The US Virgin Islands CASI Habitat Mapping Expedition** reached remote areas and discovered coral reefs that had never been described before.
- **The Mediterranean Sea Expedition** mapped coastal habitats along the southern coast of France, focusing on two native seagrass species and an invasive green alga.
- Launched the **KSLOF Fellowship program** to sponsor graduate students and post-doctoral scholars whose research focuses on ocean health and resiliency.

2003

- Worked with the State Department and US Geological Survey to organize the **Second Bilateral Conference between Russia and the US**. Over 150 scientists from the US and Russia came together to discuss diseases of aquatic animals and conservation efforts.
- Conducted the **Santorini Island Expedition** to explore the remaining effects of the volcanic eruption.

2004

- Established the **Coastal Ecotoxicology Laboratory at the Bermuda Institute of Ocean Sciences (BIOS)** to research the effects of toxins on coral health.
- Established the **Khaled bin Sultan Living Oceans Foundation Laboratory of Aquatic Animal Health at the University of Cheikh Anta DIOP** in Dakar, Senegal. This laboratory became instrumental for the training of marine scientists on parasite diagnosis in marine fishes.

2005

- **The Seychelles Coral Reef Research Expedition** conducted habitat mapping and surveys of the Amirante Islands.
- The **Post-Tsunami Coral Reef Rapid Assessment Survey in Sumatra, Indonesia** surveyed coral damage resulting from the disastrous Indian Ocean earthquake and tsunami of Dec 26, 2004.

2006

- The Living Oceans Foundation began the **Red Sea Coral Reef Research Project**, an ambitious multi-year project to assess the coral reef resources along the entire Saudi Arabian Red Sea coast, starting with **Surveys in the Farasan Islands**. The research was undertaken to improve the understanding of the spatial distribution, size and condition of shallow marine habitats, and to identify options to enhance the conservation and management of Saudi Arabian coral reef ecosystems.

2007

- **Red Sea Coral Reef Surveys of Ras Al-Qasabah**
- The Foundation completed the **Bahamas Biodiversity Study** and planning for new marine reserves. Outcomes of the project included an online interactive GIS map and establishment of marine protected areas surrounding the Exumas Land and Sea Park and Conception Island in 2011.
- **Project SeaCAMEL hosted digital classrooms from the Aquarius Habitat** in the Florida Keys, the world's only underwater laboratory.

2008

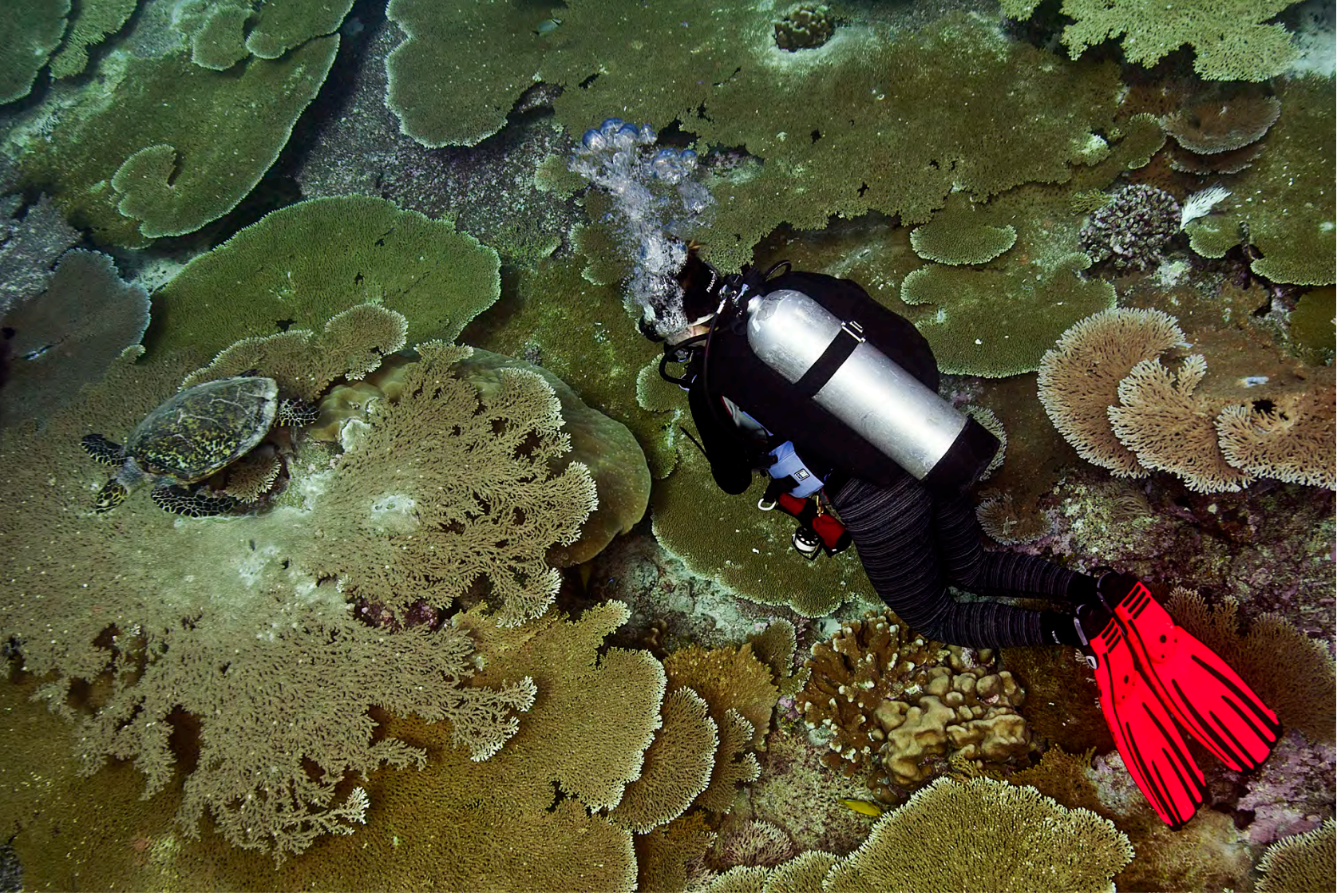
- **Red Sea Coral Reef Surveys of Al Wajh and Yanbu**

2009

- **Red Sea Coral Reef Surveys of the Farasan Banks**
- The Foundation organized the **Third Bilateral Conference between Russia and the United States**, which focused on marine and aquatic animal health.

2010

- At the request of the Cayman Island Department of the Environment, the Foundation conducted a **Coral Disease Rapid Response Training Workshop** on Little Cayman Island to teach local scientists and resource managers how to identify, study, and treat outbreaks of coral diseases.
- **The Caymans Research Expedition** assessed coral reef health and characterized the ability of these reefs to persist and rebound following impacts associated with climate change.
- On the **Bonaire Coral Reef Resilience Research Mission**, the Foundation collaborated with NOAA's Office of Habitat Conservation to conduct a detailed assessment of the condition of coral reefs in Bonaire.



2011

- **The Global Reef Expedition (GRE) begins**, the world's largest coral reef study in the history of mankind. Over the course of 5 years, the Foundation circumnavigated the globe conducting standardized assessments of the health and resiliency of coral reefs. Through the Foundation's scientific work, local resource managers and scientists from developing countries received critical scientific information and tools that can assist in management and conservation of their coral reef resources.
- **Global Reef Expedition Research Missions to The Bahamas**
- **Global Reef Expedition Research Mission to St. Kitts & Nevis**

2012

- **Global Reef Expedition Research Mission to Jamaica**
- **Global Reef Expedition Research Mission to Navassa Island**
- **Global Reef Expedition Research Mission to Colombia**
- **Global Reef Expedition Research Mission to Galapagos Islands**
- **Global Reef Expedition Research Missions to the Society and Tuamotu Islands of French Polynesia**

2013

- **Global Reef Expedition Research Missions to the Gambier and Austral Islands of French Polynesia**
- **Global Reef Expedition Research Mission to the Cook Islands**
- **Global Reef Expedition Research Mission to Fiji**
- **Global Reef Expedition Research Mission to Tonga**
- The Foundation's **Tonga and Fiji coral reef education programs** taught local middle and high school students as well as community members about coral reef science and conservation.
- **Global Reef Expedition Research Mission to New Caledonia**
- The ***Science Without Borders® Challenge*** **international student art competition** was created to encourage children to promote the need to protect and preserve the ocean and aquatic resources.
- The Foundation created the **World Reef Map** to share coral reef habitat and bathymetric maps with the scientific community. This free online resource showcases all of the high-resolution coral reef habitat and bathymetric maps created by the Living Oceans Foundation since our founding.

2014

- **Returned to Tonga** to conduct land-based research on fisheries to supplement the field research conducted on the Global Reef Expedition.
- **Global Reef Expedition Mission to the Great Barrier Reef**
- **Global Reef Expedition Mission to the Solomon Islands**
- The **Solomon Islands coral reef education program** teaches local students about coral reefs and why it is important to protect them.
- Partnered with endurance swimmer and UN Patron of the Ocean Lewis Pugh on ***Swimming the Seven Seas*** to highlight the need for more Marine Protected Areas.
- The Foundation publishes the ***Atlas of Saudi Arabian Red Sea Marine Habitats***, the first comprehensive atlas of the coral reefs and shallow water marine ecosystems along the entire Saudi Arabian Red Sea coast.
- **Jamaica Awareness of Mangroves in Nature (J.A.M.I.N.)** program launches to bring mangrove education and restoration efforts to students in Jamaica.

2015

- **Global Reef Expedition Research Mission to Palau**
- **Global Reef Expedition Research Mission to the British Indian Ocean Territory (BIOT)**
- The Foundation published the ***Atlas of Shallow Marine Habitats of Cay Sal Bank, Great Inagua, Little Inagua and Hogsty Reef, Bahamas***, and shared it with government officials and conservation leaders in The Bahamas to help them effectively manage their coral reefs and associated fisheries.

- **The Starfish Control and Removal (SCAR) Program** is created to control Crown-of-Thorns-Starfish (COTS) outbreaks in the Maldives and the Cook Islands.
- The Foundation creates the **Bahamas Awareness of Mangroves (B.A.M.)** program to teach high school students about the importance of mangrove forests and how they can be restored to provide vital ecosystem services to the community.
- ***Sharks of the Coral Canyon*** **wins a Suncoast Emmy® Award for Best Environment-Program.**

2016

- The Foundation launched the **Coral Reef Education Portal**, an online resource students and teachers can use to learn about life on coral reefs.
- Supported the UNESCO World Heritage Program with **World Heritage for the High Seas** communications campaign, highlighting the need to create marine protected areas in areas outside of national jurisdiction.
- Published **COTS Best Management Practices**, a guide to eradicating outbreaks of this predatory starfish.
- **Expanded J.A.M.I.N. and B.A.M.** programs to include a second year where students learn about monitoring and managing a mangrove forest.
- Worked with IUCN on the **Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) project** to inform Marine Spatial Planning in the South Pacific.

2017

- **The Foundation partnered with the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS)** to use Global Reef Expedition data to generate products and tools to address the coral reef crisis and create new models to determine the resiliency of coral reefs.
- ***An Ocean Mystery: The Missing Catch*** **premieres at the Smithsonian Museum of Natural History.**
- Worked with UNESCO Marine World Heritage on the **#MyOceanPledge** campaign to raise awareness of the importance of marine world heritage sites for conservation.
- Launched **Corals in the Classroom** professional development workshops to introduce middle and high school teachers to our *Coral Reef Ecology Curriculum*.
- **Added citizen science component to the Mangrove Education and Restoration program** in the Caribbean to study mangrove diseases.
- Participated in the **Red Sea Biodiversity Project**, a research initiative to catalog all the living marine organisms in the Red Sea.
- Formed a partnership with **Black Girls Dive Foundation** to help bring the love of aquatic exploration to underprivileged girls in Baltimore, MD.
- **Returned to Lau Province, Fiji** to conduct follow-up research on the Global Reef Expedition with Conservation International and share the **Global Reef Expedition: Fiji Final Report** with local leaders and scientists.
- Published Global Reef Expedition Final Reports for **Tonga** and **French Polynesia**.

2018

- **Began collaboration with King Abdullah University of Science and Technology (KAUST)** on science and education programs.
- **Expanded the J.A.M.I.N. program to Portland, Jamaica** through a partnership with the Alligator Head Foundation.
- **Conducted Corals in the Classroom workshop** to provide teachers with tools and classroom exercises to educate their students about life on coral reefs.
- **Brought the World Water Challenge to B.A.M. and J.A.M.I.N. students** in collaboration with EarthEcho International.
- Published the **Global Reef Expedition: Cook Islands Final Report**.
- Participated in the **KAUST Workshop on the Future of Red Sea Biodiversity**
- Attended the launch of the **Alliance for Conservation Evidence and Sustainability** to explore what works in community-based conservation.

2019

- **Updated the World Reef Map with data from the Global Reef Expedition,** creating the largest collection of high-resolution coral reef habitat maps in the world. This ground-breaking research was published in the prestigious journal *Coral Reefs*.
- **Microsoft's Azure supercomputer** was used to process the extensive Global Reef Expedition database to help build a coral reef resilience model.
- **Analyzed photo transects of benthic habitat in Saudi Arabian Red Sea** for Saudi Aramco-KAUST Center for Marine Environmental Observations (SAKMEO).
- Contracted to **complete marine benthic habitat and bathymetric maps of Farasan Banks, Saudi Arabia** for KAUST's Red Sea Research Center.
- Participated in the **IUCN US National Committee Meeting** to provide input on priorities for the next World Conservation Congress.
- Published the **Global Reef Expedition: New Caledonia Final Report**.
- Participated in the **Seagrass Experts Mapping Workshop** to discuss best practices for mapping seagrass globally.
- **Learned about emerging ways to utilize satellite data** to monitor and model global climate change at the NASA's Jet Propulsion Laboratory (JPL) at Caltech.
- Shared KSLOF's work in island nations globally at the **DC Network of Island Professionals** launch event at the Embassy of the Kingdom of the Netherlands.
- Pursuing a partnership with **NASA Ames Laboratory for Advanced Sensing** to work together on a global coral reef mapping project.

2020

- **The Foundation will complete analysis of the Global Reef Expedition data and announce our findings.**

Science

For nearly two decades, the Khaled bin Sultan Living Oceans Foundation has been conducting cutting-edge coral reef research in remote locations around the world. Wherever we work, our core marine science team partners with local scientists who are familiar with the marine community and understand the major threats coral reefs face in their waters. To date, our collaborative approach to scientific research has focused on:

Scientific Surveys:

Characterizing the community structure and functional role of reef fishes, stony corals, algae and other ecologically and economically important organisms in marine ecosystems.

Habitat Mapping:

Mapping the spatial distribution of marine habitats in poorly studied, remote coral reef ecosystems.

Coral Ecology:

Studying the relationships between coral reef organisms and their interactions with the natural and human environment.

Reef Resilience:

Assessing the current status and major threats to coral reefs and studying factors that can enhance their capacity to survive in a rapidly changing environment.

A crucial part of our scientific research is sharing our results with other scientists, government officials, local leaders, and environmental organizations to aid in the conservation of marine resources. Our research is published in top-tier scientific journals as well as our own scientific reports created specifically to share what we found with stakeholders in each country. All of our scientific findings and maps are published and shared with participating countries and scientific and regulatory organizations so that they can be used to develop sound environmental management strategies for coral reefs and other coastal marine ecosystems.

THE GLOBAL REEF EXPEDITION

THE LARGEST CORAL REEF SURVEY AND MAPPING EXPEDITION IN HISTORY

The Khaled bin Sultan Living Oceans Foundation is currently undertaking the largest research project we have ever done: The Global Reef Expedition (GRE). Over the course of five years (2011-2015), the field portion of the Expedition circumnavigated the globe surveying and mapping some of the most remote coral reefs on the planet. A team of the world's most prestigious international research scientists employed standardized protocols to map, characterize, and evaluate coral reefs throughout the western Atlantic, Pacific, and Indian Oceans to complement our previous research in the Red Sea. We completed gathering data from each reef in 2015. Now, we are working our way through our data, summarizing our findings, and publishing our results.

The Global Reef Expedition brought together nearly 200 coral reef researchers from 25 countries including Australia, the United Kingdom, France, Germany, The Bahamas, Jamaica, Tonga, and the Cook Islands. All activities were performed side by side with scientists and managers from host countries in order to conduct management-driven coral reef research under the Foundation's ***Science Without Borders***® program. The primary scientific goals of the Global Reef Expedition are to map and characterize coral reef ecosystems, identify their current status and major threats, and examine factors that enhance their ability to resist, survive and recover from major disturbance events like bleaching, cyclone damage or crown-of-thorns outbreaks. The scientific results are shared with participating countries as well as scientific and regulatory organizations so they can be used by countries to develop management strategies to protect and restore their coral reef ecosystems.

Utilizing the latest educational technologies, internet curriculum, social networks, blogs, and real-time streaming video, learners around the globe participated in the Expedition and experienced its scientific activities as they were conducted. Educators and students were provided the opportunity to interact with working scientists to gain personal insight into real-world applications of marine science. Through the Foundation's C.R.E.W. program (Coral Reef Educator on the Water), teachers joined the research team to help

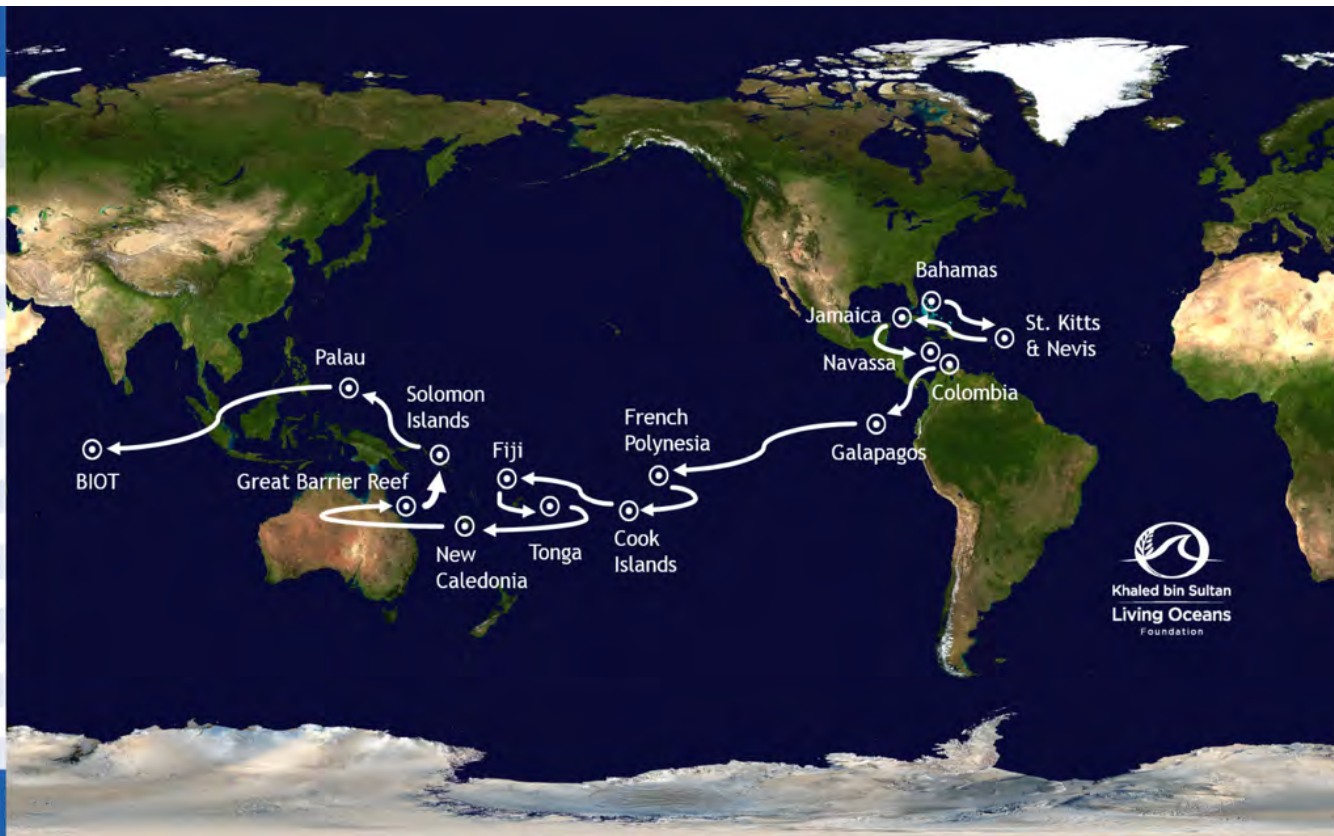
deliver content to millions of virtual learners. Both onboard and underwater experiences provided compelling educational access to the Expedition's work and discoveries. Scientists' blog posts and real-time broadcasts engaged learners on a daily basis, while world-class photographers and videographers joined the Expedition to document our research and education activities and share what our scientists saw underwater with the rest of the world.

Now that the field research is complete, we are in the process of analyzing our data and publishing scientific reports about the status of coral reefs in each country. We have already achieved some major successes. Leveraging advanced satellite technologies, the Foundation has produced the largest collection of high-resolution habitat maps of coral reefs ever made. These maps are being used to build models and make comparative assessments of coral reef biodiversity, oceanographic conditions, and human pressures that will reliably describe the status of coral reef health, identify major threats, and determine processes and factors that control the health and resilience of reef ecosystems worldwide. Our research has also informed the creation of a marine protected area (MPA) in Pedro Bank, Jamaica, another MPA in Lau Province, Fiji, and is currently being used to inform marine spatial planning efforts across the South Pacific. We are sure to have more positive conservation outcomes as we continue to provide applied scientific knowledge to local resource managers and relevant government environmental agencies, bridging science with management to achieve the long-term goal of ensuring healthy and sustainable coral reef ecosystems around the globe.

OVER THE COURSE OF FIVE YEARS, WE CIRCUMNAVIGATED THE GLOBE SURVEYING 1,000 CORAL REEFS IN 15 COUNTRIES ON THE GLOBAL REEF EXPEDITION

GRE By the NUMBERS

50,435	km Traveled (1.25 times around the world)
35,000	km² of Coral Reefs Mapped
12,995	Hours SCUBA Diving (541 days underwater)
9,190	COTS Collected
7,313	Fish Surveys
7,309	Dropcam Videos
6,902	Education Seminar Attendees
5,911	Coral Samples Taken
5,740	Coral & Phototransect Surveys
5,500	Benthic Surveys
1,066	Dive Sites
1,460	Fish Species Recorded
1,004	Coral Reefs Studied
486	Coral Species Recorded
408	Days of Research
196	Scientists
97	Islands
22	Research Missions
15	Countries
5	Years
1	The Most Important Coral Reef Expedition in History



Other Research Expeditions

The Khaled bin Sultan Living Oceans Foundation has conducted cutting-edge scientific research of coral reefs and other shallow water marine ecosystems since our founding. The aim of all of this research is to provide science-based solutions to protect and preserve our ocean treasures for future generations.

Sea of Cortez, 2001

U.S. and Mexican scientists joined forces to conduct a scientific research expedition in the Sea of Cortez off the coast of Mexico aboard the *Golden Shadow*. The teams went to 12 different research sites, covering a distance of over 500 miles between northern Loreto and southern Cabo San Lucas. Scientists from the Scripps Institution of Oceanography, led by Professor William Fenical, collected and partially processed fungi, soft coral, and sediment samples in an ongoing search for natural products from marine organisms. With a unique sediment collector, samples were pulled up from as deep as 400 feet. Joining the Scripps team was a group of Mexican scientists led by Dr. Rosalba Encarnacion Dimayuga of the Universidad Autonoma De Baja California. As part of a cooperative agreement, the Scripps scientists worked closely with the Mexican team to develop methods of collecting and processing marine organisms to discover those that may be key to treat human diseases.

U.S. Virgin Islands Habitat Mapping, 2001

The U.S. Virgin Islands expedition was the Foundation's first “remote sensing” mission, during which scientists from the US, Canada, and the UK visited 400 sites and surveyed the coral reefs of St. John and St. Thomas Islands and investigated marine life diversity. This led to the deployment of the Compact Airborne Spectrographic Imager (CASI) and provided Dr. Fenical and Dr. Peter Mumby (Principal Investigators), and other scientists at Scripps Institution the opportunity to collect marine organisms that exhibit antibiotic, antiviral or anticancer properties. The Foundation focused on gathering data to support management action on behalf of marine resource conservation. After establishing baseline data for targeted coral reef systems in the area, the US Virgin Islands expedition team pinpointed potential Marine Protected Areas (MPAs) that could be designed for conserving regional marine biodiversity. Detailed marine habitat maps have been created and are available on the Living Oceans Foundation website.

The Mediterranean Sea, 2001

Scientists from the US, Canada, Monaco, UK, Netherlands, and Italy assembled aboard *Golden Shadow*, under the lead of Professor Jean Jaubert of Monaco's European Oceanographic Center (EOC). They mapped the northwest Mediterranean's coastal habitats, from Toulon, in France, all the way to the French-Italian border, with particular emphasis on the distribution of two native seagrass species and an invasive green alga. The team made extensive use of a Compact Airborne Spectrographic Imager (CASI) sensor installed in an amphibious aircraft to profile light attenuation in the water column. These data were used to build a reference biotope database to analyze changes over time for the shallow coastal areas of the Mediterranean Sea.

Seychelles Islands, 2005

In January 2005, the Foundation partnered with the Cambridge Coastal Research Unit of the University of Cambridge, the Seychelles Centre for Marine Research and Technology, and Trident Trust to establish a comprehensive ecosystem knowledge baseline due to the dramatic impact of the 1997/1998 El Nino Southern Oscillation (ENSO) ocean warming event on the Indian Ocean coral reefs. This ENSO event resulted in the loss of 60-90% of live coral cover in the Seychelles Islands. Scientists used the *Golden Shadow* to survey more than 800 square kilometers of shallow marine environments through CASI, mounted on the Golden Eye seaplane. The primary objectives of this research project included aerial spectrographic mapping of numerous islands and their surrounding reefs in the southern Seychelles, and surveys of the benthic communities and fish communities of these reefs. Eleven high-resolution benthic habitat maps were created from this research project for the purpose of aiding the Seychelles government in marine conservation efforts and management plans, which are available in the *Atlas of the Amirantes*.

Many of the Foundation's research missions were conducted aboard the *M/Y Golden Shadow*

Aceh Province, Indonesia, 2005

In October 2005, the Foundation joined with Reef Check and The World Conservation Union (IUCN) to assess the damage to coral reefs on the west coast of Aceh Province, Sumatra, Indonesia, associated with the December 26, 2004 earthquake and tsunami in which the earthquakes caused more physical damage to coral reefs than did the tsunami. The expedition covered over 600 kilometers of the northwestern tip of Indonesia and unveiled that human activities were the persistent cause of the long-term degradation of reefs in the Aceh area. After which, a comprehensive report was published by the Global Coral Reef Monitoring Network (GCRMN). The report highlighted the findings of the project and raised global awareness to the need for tsunami early warning systems and better management measures.

Bahamas Biodiversity Study and Planning for New Marine Reserves, 2007

Throughout 2007, the Foundation and the Marine Spatial Ecology Laboratory (University of Exeter, UK) collaborated on an endeavor to support the Bahamian government's Marine Protected Areas (MPA) decision-making process. The primary effort involved in-depth analysis of data on biodiversity, fisheries habitat, and impacts of hurricanes and climate change collected in and around the Bahamas Islands. Further, the Foundation surveyed coral reefs of the Exumas Land and Sea Park and Conception Island to fill critical knowledge and data gaps. Outcomes of the project included an online GIS portal and establishment of an MPA surrounding the Exumas Land and Sea Park and Conception Island in 2011.

Our research helped establish a new marine protected area in The Bahamas

Red Sea Coral Reef Research Project, 2006 – 2009

The Foundation completed an ambitious multi-year project to assess the coral reef resources along the entire Saudi Arabian Red Sea coast. An interdisciplinary team of international research scientists (from the Khaled bin Sultan Living Oceans Foundation, National Commission for Wildlife Conservation and Development (NCWCD), King Abdulaziz University, National Coral Reef Institute, World Conservation Union (IUCN), Coastal Research and Development – Indian Ocean (CORDIO), University of Exeter, and Cambridge Coastal Research Unit) embarked the *Golden Shadow* to conduct coral reef surveys. The data collected was used in the subsequent classification of QuickBird multi-spectral satellite imagery and airborne hyperspectral imagery to produce marine habitat maps of the region.

There were four expeditions to the Red Sea: Farasan Islands (2006), Ras Al Qasabah (2007), Al Wajh and Yanbu (2008), and Farasan Banks (2009). Data were collected to complete the baseline characterization, and mapping of shallow marine habitats. Detailed assessments of the structure, composition, and condition of shallow coral reef ecosystems were alsoconducted. The primary purpose of the expedition was to significantly enhance and expand upon existing marine resource habitat maps and to identify areas of rich biodiversity for management considerations. This project was the first in which the Foundation acquired and analyzed multi-spectral QuickBird satellite data from DigitalGlobe, Inc. in deriving detailed coral reef habitat maps. In addition to scuba surveys, much of the fieldwork incorporated detailed ground-truthing and collecting bathymetric data to optimize analysis of the satellite data. Another objective was to identify, through conducting coral and fish surveys, indicators of resilience and ascertain the level of reef resilience. This is one of the Foundation's principles applied to the advancement of knowledge and management of impacts associated with climate change and other natural and anthropogenic stressors, and to be integrated into Marine Protected Areas (MPA) design and management.

Cayman Islands Resilience Surveys, 2010

During June and December of 2010, a team of marine scientists surveyed 41 shallow reefs off Little Cayman, Cayman Brac, and Grand Cayman. These surveys assessed benthic cover, population dynamics (size structure and condition) of reef-building corals, and community structure of about 100 species of reef fishes, along with a number of factors that confer resilience. At the time of these surveys, the reefs were recovering from a recent (2009) bleaching event, and an ongoing outbreak of white plague was threatening the vitality of these communities. In addition, an infestation by a pest species of macroalgae (*Microdictyon* spp.) carpeted northern Cayman Brac reefs, and the algae was overgrowing many of the corals. In general, reefs of all three islands are in better shape than many other locations in the Caribbean.

Bonaire Resilience Surveys, 2010

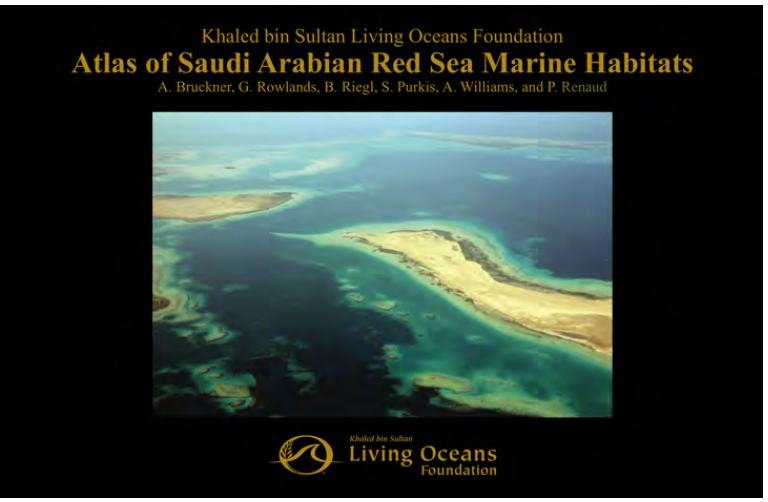
In July 2010, a dedicated team of Foundation researchers completed transect surveys on 25 reefs located on the leeward side of Bonaire and the adjacent Klein Bonaire to characterize the current status, threats, and resilience of Bonaire's reefs. The assessments focused on corals, fish, algae and motile invertebrates using belt transects, point intercept methods and photographic documentation, incorporating attributes of the Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocol and the IUCN bleaching resilience protocol. The main purpose of this work was to 1) assess changes in reef structure and health since the last region-wide AGRRA assessments (1998-2000) and other surveys (2001, 2005); 2) identify sites in excellent health, exhibiting a high biodiversity and cover of reef-building corals and an intact fish communities; and 3) characterize the health and resilience of these reefs. The intent of this project was to provide critical information that can assist the Bonaire government and Bonaire Marine Park in the conservation and management of their precious resources. In general, Bonaire's reefs show signs of high resilience and a good ability to recover from acute disturbances. Reefs had high coral cover, low levels of disease, high levels of recruitment, and low amounts of fleshy macroalgae.

The Living Oceans Foundation surveyed and mapped coral reefs along the entire Saudi Arabian Red Sea coast.

Scientific Publications

Since the inception of the Khaled Bin Sultan Living Oceans Foundation, scientific research on coral reefs has been at the forefront of the Foundation's mission. The Living Oceans Foundation has supported the research of some of the most prestigious coral reef scientists whose research interests include coral reef communities, mapping of coral reef habitats, reef fish communities, ocean acidification, marine taxonomy, and many more. Our research around the world over the past two decades has allowed the Foundation to meaningfully contribute to the scientific community by helping author and co-author hundreds of scientific papers in some of the highest impact peer-reviewed journals.

Besides peer-reviewed scientific publications, the Living Oceans Foundation has developed and published numerous field reports, final country reports, atlases, and monitoring protocols. The field reports include information about research sites visited, our initial observations and an in-depth description of our methods used to measure coral reefs while in the field. The final country reports provided information catered to each country visited, explaining our findings and recommendations for best conservation practices based on our research in the area.



We have published two atlases, one depicting and describing five major regions along the Saudi Arabian Red Sea coastline, and one depicting and describing Bahamas nearshore marine habitats. These atlases are incredibly useful tools for both scientists and managers as they can interrogate the maps and use them to work with communities to establish long term monitoring programs and marine protected areas to conserve vital nearshore marine ecosystems.

In addition to our other publications, we have developed monitoring protocols in both the Galapagos and Cook Islands. The Galapagos monitoring protocol provides recommendations catered to the region for long term monitoring of the northern islands which are the most remote and hardest to reach by most scientists. The Cook Islands monitoring protocol was developed to help locals mitigate and safely remove the detrimental Crown-of-Thorns Starfish (COTS), a corallivore that feeds on coral, when there is an outbreak to help conserve their reefs. This protocol has been shared with other countries as it can be easily applied to other regions experiencing a COTS outbreak.

*For a full list of our publications, see **Appendix A: Publications**.*

Education

The Khaled bin Sultan Living Oceans Foundation has established a variety of marine science education programs to engage the next generation of ocean advocates. These programs include a comprehensive *Coral Reef Ecology Curriculum* to teach students about life on coral reefs, an international ocean art contest to raise awareness of the need to protect our oceans, and a mangrove education program that helps students restore mangrove forests.

Our marine science education programs extend the Foundation's impact to reach middle and high school students and teachers, as well as graduate students and post-doctoral scholars via fellowship opportunities. In addition, education workshops and presentations are provided locally, abroad, and online to teach the public about coral reefs and the Foundation's research. By working to increase ocean literacy, the Foundation is helping to advance the conservation and restoration of our living oceans well into the future.

Our education program reaches students around the world, but we focus our efforts in countries where coral reefs and other coastal marine resources have an outsized impact on the lives and livelihoods of its citizens.

Coral Reef Ecology Curriculum

The Khaled bin Sultan Living Oceans Foundation's *Coral Reef Ecology Curriculum* was created to increase ocean literacy by creating awareness about coral reefs. The curriculum was designed for middle and high school students and teachers, but it is a useful teaching tool for anyone interested in learning about coral reefs. The curriculum helps bring 21st-century learning into the classroom while teaching students about coral reefs and how they are connected to this unique ecosystem.

The *Coral Reef Ecology Curriculum* is hosted on a state-of-the-art website platform called the Education Portal, which won the W3 Award for Environmental Awareness. On the Education Portal, teachers can download the curricular materials, or they can set up classes on the online platform so that students can learn at their own pace, take quizzes, and earn badges while tracking their progress. The curriculum is comprised of twelve units which are readily available online and for download. The lesson plans and interactive exercises contained in this curriculum bring innovative content, graphics, photos, videos, worksheets, and quizzes to its users.

Course materials have been designed to be cross-curricular; they can be integrated into a variety of courses such as art, biology, chemistry, math, environmental science, marine science, and physics. The curriculum is also a great resource for incorporating new strategies to address a variety of different learning styles in or out of the classroom.

The curriculum is aligned to the Next Generation Science Standards (NGSS), the Common Core State Standards (CCSS), and the Ocean Literacy Essential Principles and Fundamental Concepts (OL), which aim to help students understand the ocean's influence on their lives, and their influence on the ocean.

So far, well over 4,000 students and teachers from 112 countries have signed up to access the *Coral Reef Ecology Curriculum*, bringing coral reef education to the next generation of ocean advocates.

Corals in the Classroom

Corals in the Classroom is a credited, two-day professional development workshop that helps build teachers' understanding of coral reef ecosystems. The workshop aims to increase ocean literacy while providing teachers with greater confidence teaching about coral reefs. Teachers that are more confident in teaching about coral reefs are more likely to include this information in classroom instruction.

During the workshop, teachers are introduced to a set of classroom-ready activities from the Foundation's *Coral Reef Ecology Curriculum*. The activities include a wide variety of educational materials including custom-built interactive exercises, lesson plans, educational videos, and quizzes, all aligned to the latest education standards (Next Generation Science Standards, Common Core State Standards, and Ocean Literacy Principles). Participants learn how coral reefs can be used to teach about everyday topics, such as classification, mitosis, and symbiosis. They also learn how to connect this information to other subject areas such as Math and English.

Corals in the Classroom is credited by the Maryland Department of Education (MSDE). Maryland teachers that attend the workshop are eligible to receive one MSDE Professional Development Credit.

THE *CORAL REEF ECOLOGY CURRICULUM* BRINGS MARINE SCIENCE EDUCATION TO STUDENTS AND TEACHERS AROUND THE WORLD

SCIENCE WITHOUT BORDERS® CHALLENGE

The *Science Without Borders® Challenge* is an international art competition that engages students to promote the need to preserve, protect, and restore the world's oceans and aquatic resources. The contest incorporates STEAM (Science, Technology, Engineering, Art, and Math) education into classrooms worldwide, inspiring students to be creative while learning about important ocean conservation issues.

Each year a new ocean conservation theme is revealed. Past themes have included ocean conversation topics that relate specifically to coral reefs as well as the greater ocean. Each theme is designed to educate youth about the ocean, how humans are connected to the ocean, and/or the threats that affect the ocean.

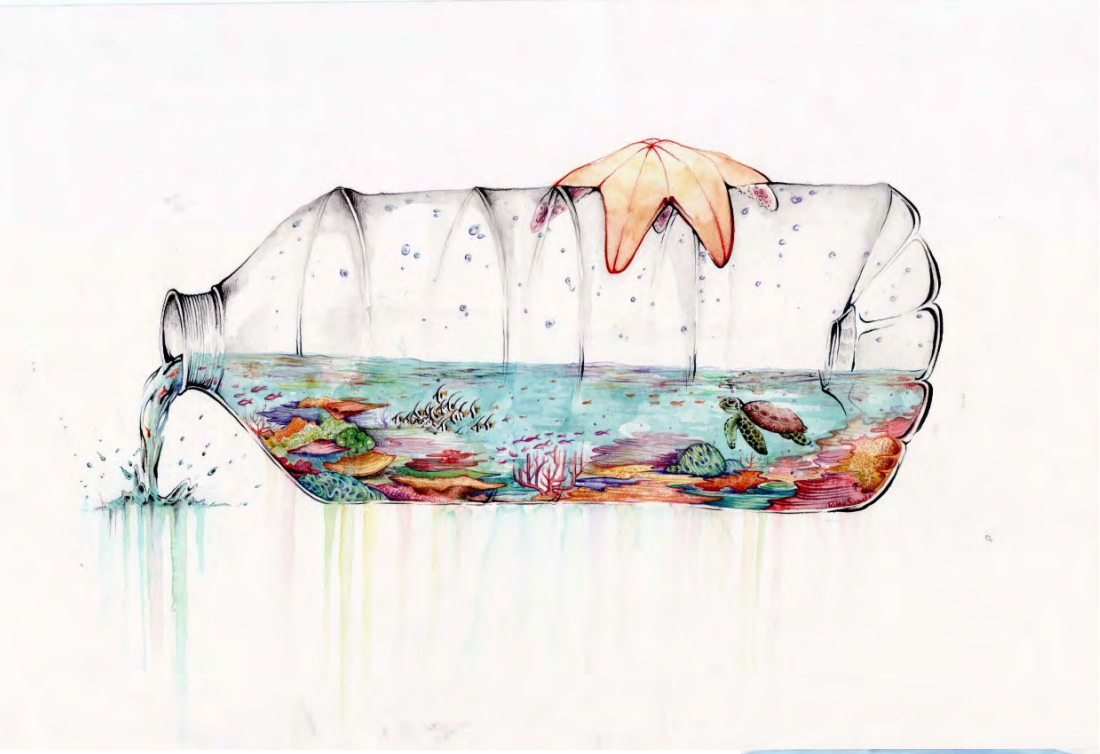
The contest is open to all students 11-19 years old who are enrolled in primary, secondary, or the home school equivalent. Students use a variety of techniques and media including oil and acrylic paintings, and watercolor, pastel, crayon, colored pencil, and marker, to produce a piece of 2-dimensional art.

The artwork is judged in two categories: middle school (11-14 year-olds) and high school (15-19 year-olds). The first-place winners in each category receive a scholarship of $500 and award certificate for their artwork.

Since 2013, over 1600 students have participated in the contest from 62 countries. The Foundation uses the students' artwork to raise awareness and spark conversations about ocean conservation.

Past Themes:

- 2013*: How are We All Connected to the Oceans?*
- 2014*: Protect Our Coral Reefs*
- 2015*: Reef Relationships*
- 2016*: Fishing Under the Radar*
- 2017*: Reef SuperSpecies*
- 2018*: Why Coral Reefs Matter*
- 2019*: Connected Ocean: No Barriers, No Boundaries, and No Borders*
- 2020: *Take Action: Conserve Coral Reefs*



2014 Winner:
Reef in a Bottle
by Riley Samels
Age 18, Ohio, USA

2015 High School Winner:
Treasure Reef
by Michelle Huang
Age 17, Texas, USA

2018 High School Winner:
The Last Coral Reef
by Selena Yang
Age 16, California, USA

Mangrove Education & Restoration

Our Mangrove Education and Restoration program aims to increase environmental awareness and restore mangrove forests in the Caribbean. We educate students and teachers about the ecological importance of their mangrove forests and help them get involved in mangrove restoration efforts.

Mangroves are extremely important ecosystems and the health of these ecosystems is interconnected with coral reef ecosystems offshore. Mangrove forests protect the coast from storms and hurricanes, are a nursery habitat for coral reef fish, sequester massive amounts of carbon, and filter the water providing good clean water to nearby coral reefs and seagrass meadows. But mangrove forests are in peril around the world. It's estimated that around fifty percent of the world's mangroves have been lost in the past 50 years. The Foundation's mangrove programs help to restore these critical ecosystems by engaging high school students and encouraging them to be the next generation of conservation leaders.

Students learn about mangrove ecosystems while conducting science experiments and helping restore their local mangrove forest

We work with educational institutions and NGOs to establish and implement our Mangrove Education and Restoration program in high schools in Jamaica and The Bahamas. This program educates students and teachers about mangrove forests and gets them engaged in conservation. It is an opportunity to get students out in nature and involved in a hands-on collaborative project that will help restore their local mangrove forest.

In Jamaica, we work with local schools, the Discovery Bay Marine Lab, the Alligator Head Foundation, and Seville National Heritage Trust to implement our **Jamaican Awareness of Mangroves in Nature (J.A.M.I.N.)** program in high schools around the country. In The Bahamas, we work with Friends of the Environment to implement the **Bahamas Awareness of Mangroves (B.A.M.)** program, which teaches students in Abaco about mangroves, their importance to the coastal marine ecosystem in the region, and their value to Bahamian society.

Our Mangrove Education and Restoration program provides students and teachers the opportunity to participate in STEAM-based, project learning throughout the school year. To effectively implement this program in Jamaica and The Bahamas, we have developed a customized *Mangrove Ecology Curriculum* that is aligned to each country's educational standards and work with high school science students and their teachers to use this mangrove curriculum in their classroom as well as on field trips to the mangrove forest.

This program increases ocean literacy by creating awareness about mangroves, the threats posed, and how people can help preserve these diverse ecosystems. In the first year of the program, students learn about the animals that live in the mangrove forest, run an experiment on mangrove growth rate, then help to restore the mangrove forest by planting mangrove propagules. In the second year of the program, students learn how to monitor the forest, test the water quality, and look for signs of mangrove disease.

Graduate Fellowships

The Khaled bin Sultan Living Oceans Foundation sponsors a Graduate Fellowship program for doctoral students and post-doctoral scholars whose research focuses on activities that contribute to a better understanding of the health and resilience of coral reefs in countries surveyed throughout the Global Reef Expedition as well as the Foundation's previous research expeditions to the Red Sea.

Our fellowship program welcomed scientists from around the world, regardless of citizenship or nationality, with a career interest in coral reef science or management. In addition to graduate students and post-docs working at a university, the program also welcomed recent graduates employed by a government agency and conducting research on coral reef conservation and management.

Fellows received generous support from the foundation, including a grant to cover legitimate educational and research expenses, such as tuition and research field-work expenses. All costs (lodging, meals, diving activities, etc.) while on board the *Golden Shadow*, as well as travel to the research location was covered by the Foundation, so these early-career scientists could participate in this once-in-a-lifetime research expedition.

The Khaled bin Sultan Living Oceans Foundation has honored 15 scholars with research fellowships, who have joined us on all of our major research expeditions to the South Pacific, Indian Ocean, Caribbean, and the Red Sea.

LIVING OCEAN FOUNDATION FELLOWS:

IN ORDER OF PARTICIPATION

- **Tracy J. Mincer,** a PhD student at Scripps Institution of Oceanography at University of California San Diego. The KSLOF Fellowship supported his work to investigate the potential use of unique marine actinomycetes as a new biomedical resource.
- **Mary Engles,** a graduate student at the University of Hawaii studying geology and geophysics. Her KSLOF Fellowship supported her work using airborne remote sensing, diver ecological surveys, and wire-line drill coring to determine the response of Hawaii's largest fringing reef to changing environmental influences over the past 10,000 years.
- **Justin Prosper**, who used his KSLOF Fellowship to complete a graduate program in Geographic Information Systems at the University of Edinburgh and return to the Seychelles to put his skills to use at the Ministry of the Environment and Natural Resources.
- **Arfang Diamanka** and **Aminita Sene,** graduate students at the University Cheikh Anta DIOP of Dakar, who studied diseases in the cultured fishes in Senegal.
- **Alex Venn,** a PhD student working at the Bermuda Institute of Ocean Sciences (BIOS) on the impact of environmental stressors on corals and their symbiotic algae. He used his KSLOF fellowship to develop gene-based markers of coral stress to build the capacity for improved means of coral health assessment.
- **Gwilym Rowlands,** a PhD student at the National Coral Reef Institute (NCRI) at Nova Southeastern University. He used his Fellowship to develop powerful spectral remote sensing techniques to allow scientists to investigate coral reef processes over space and time.
- **Sarah Hamylton,** a post-doctoral scholar working on marine resource management at Southampton University, joined us on our research missions to the Red Sea.
- **Renata Farreri,** a doctoral student at the University of Exeter working with Pete Mumby. She used her KSLOF Fellowship to join us on the Global Reef Expedition to study the effects of coral-algae competition on the growth rate and mortality of coral colonies.
- **Jeremy Kerr,** a doctoral student working under Dr. Sam Purkis at Nova Southeastern University. His KSLOF Fellowship allowed him to participate in Global Reef Expedition missions in the Caribbean, Pacific, and Indian Oceans, mapping coral reefs using a combination of satellite imagery and field observations.
- **Sonia Bejarano,** a post-doctoral scholar from Colombia, who joined the GRE missions in the Caribbean and in French Polynesia to study fish grazing as a source of reef resilience.
- **João Monteiro**, a PhD student who joined Global Reef Expedition on many of our research missions in the Pacific Oceans to study *Symbiodinium spp.* diversity.
- **Badi R. Samaniego**, a doctoral student at the University of the Philippines working on coral reef fish ecology. His KSLOF Fellowship allowed him to participate in most of the GRE missions to the Pacific and Indian Oceans and study reef fish communities.
- **Anderson Mayfield,** a post-doctoral scholar working on coral genetics at the National Museum of Marine Biology and Aquarium in Taiwan. His KSLOF Fellowship allowed him to sample corals from various locations visited on the Global Reef Expedition.
- **Steve Saul,** a post-doctoral scholar working at the National Marine Fisheries Service. For his KSLOF Fellowship, he developed models that look at how coral reef-dependent fisheries can most appropriately be managed to meet subsistence needs while protecting biodiversity in small island developing states.

Coral Reef Educator on the Water (C.R.E.W.)

The Coral Reef Educator on the Water (CREW) program offered high school science teachers the opportunity to join the Global Reef Expedition on one of its missions aboard the *M/Y Golden Shadow*. The program was designed to give first-hand experience of life on board a working scientific research vessel, a greater understanding of the importance of coral reefs, and inspiration to convey what they have learned to their students and members of their community.

As part of the Global Reef Expedition, each CREW participant worked with the science team to develop educational content and lesson plans, hosted a live Q&A session for students from onboard the ship, and developed a conservation action challenge for their classroom. They also participated in educational outreach efforts to share our knowledge of coral reefs with local students, teachers, and community members where we conducted research.

C.R.E.W. Participants:

- **Candice Jwaszko**, Ecole Paul Kane High School in St. Albert, Alberta, Canada
- **Mike Trimble**, Corona del Sol High School in Tempe, Arizona, USA
- **Megan Berkle**, Linda Esperanza Marquez High School in Huntington Park, California, USA
- **Jim Evans**, Schools Without Walls in Washington, DC, USA

Project SeaCAMEL

Prince Khaled expressed interest in creating an "underwater classroom" to bring the ocean alive for those who do not have an opportunity to personally experience undersea wonders. In 2007, the vision of His Royal Highness came to life with Project SeaCAMEL in an underwater laboratory called Aquarius, inhabited by six "Aquanauts" who brought live coral reef classroom teaching to the world.

The Aquanauts included KSLOF's former Executive Director, Phil Renaud, Chief Project Scientist, Annelise Hagan, and the Principal Investigator from the Virginia Institute of Marine Science, Mark Patterson. Dr. Patterson, a veteran of eight previous Aquarius missions, directed his team of graduate student 'aquanauts' in underwater classroom experiments to test hypotheses on the cutting edge of marine science and coral reef ecology.

Project SeaCAMEL was designed to inspire young marine scientists by providing them an unparalleled opportunity for actual and virtual participation in coral reef science classes conducted underwater. Live underwater classroom modules were broadcast from NOAA's Aquarius Habitat, the world's only underwater laboratory, located off the coast of Key Largo, FL, during Project SeaCAMEL in November 2007. These marine science classes have since been archived and are available on the Living Oceans Foundation website.

"Our video conference this afternoon was one of the coolest educational experiences in which I've ever participated! The students were really excited about the whole event."

—Nancy Bourgeois, teacher at Broadneck High School, Arnold, MD

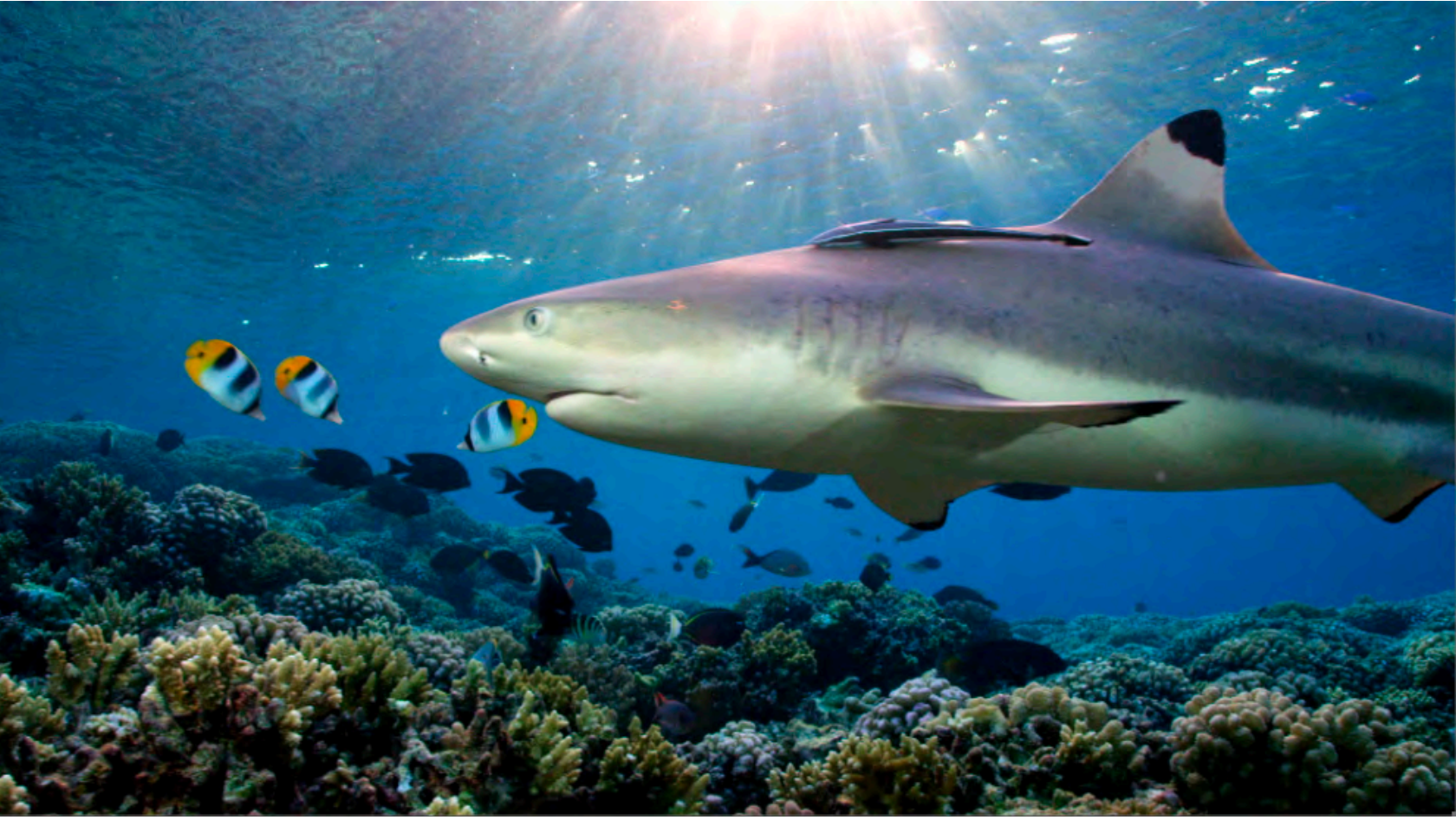
Outreach & Communications

At the Khaled bin Sultan Living Oceans Foundation, we know that studying and understanding our oceans is critically important, but to save our oceans we need to inspire people to protect them. Conservation and restoration of the marine environment calls for human action, and we believe that through targeted outreach and communications, we can motivate people to take action toward lasting ocean conservation.

The Foundation has a robust outreach and communications program that supports our science and education efforts. We reach out to the public to encourage them to protect the oceans, communicate our latest science to stakeholders and decision-makers so they can make informed decisions on how to use and enjoy their marine environment, and lead students and teachers to our educational resources to inform and inspire the next generation of ocean leaders.

Some people may never get a chance to swim in the ocean, dive on a coral reef, or fish in the sea (or get the chance to do so as often as they would like). The Living Oceans Foundation brings the joy and deeper understanding of the ocean to them through engaging films, world-class photography, live events, and digital media streams. We understand that different groups of people would like to receive information in different ways, so we use all the communications tools that are available in today's media landscape.

In order to save our oceans, we need to inspire people to protect them



Films

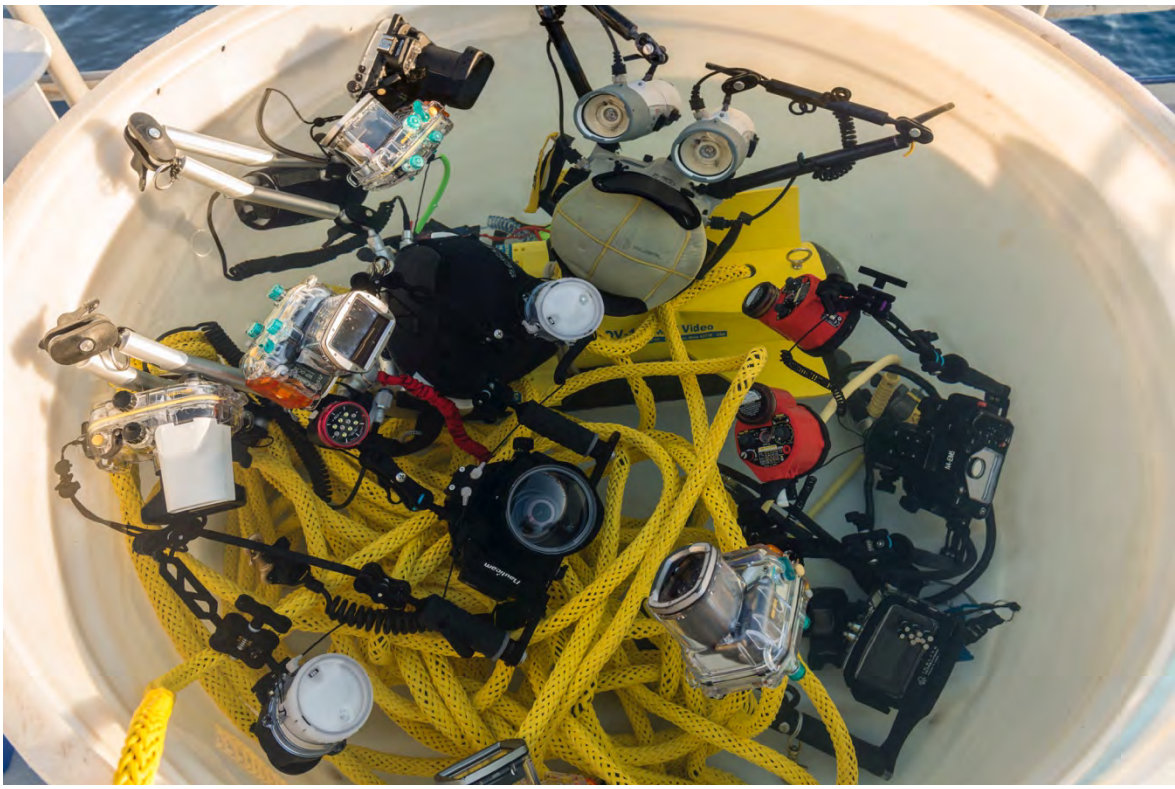
The Foundation creates award-winning conservation films that have been shown at film festivals around the world, broadcast on television, streamed online, and incorporated into our educational materials. The films the Foundation produces can transport viewers to places that they may never otherwise see, make complicated science easy to understand and connect people in a visceral and emotional way to the incredible beauty of the natural world. While our science team collects an extraordinary amount of valuable data, our film division tells the story of what the data means and connects people across the world in far-flung countries.

Since the start of the Global Reef Expedition in 2011, the Foundation has produced over 100 films, from short films to share our work online, to full length documentary films. Our films have been recognized for their outstanding production and conservation value as well as their conservation message. All of our full-length films have won awards and international acclaim. One of our films, *Sharks of the Coral Canyon*, won the Suncoast Emmy® Award for Best Environment Program. This film tells the story of how sharks and coral reefs are intricately linked and uncovers how coral reefs and sharks depend on one another and must be protected together if either of them is to survive into the future.

Photography

At the Khaled bin Sultan Living Oceans Foundation, we strongly believe in the value of a powerful image. Perhaps because it helps make an emotional connection to a creature many of us will never meet, or it illustrates a concealed threat to our coral reefs, or it inspires us to take a moment to reflect and appreciate all that the oceans can offer us. For these reasons and more, professional underwater photographers join us on many of our expeditions to capture the beauty of coral reefs and the threats they face.

Many of our best images have come from our partnership with the International League of Conservation Photographers (iLCP), a nonprofit organization that enlists some of the world's best conservation photographers to advance conservation communication efforts around the world. We have invited several iLCP photographers to join us on the Global Reef Expedition to capture the stunning beauty of life on a coral reef including Michele Westmorland, Jürgen Freund, and Keith Ellenbogen.



Scientists on the Global Reef Expedition shared photos and updates with the Foundation's online community every day they were at sea

Events

In order to engage and educate the public about marine conservation issues, we hold live events throughout the year. Our events range from scientific presentations to photography exhibitions and film premieres. Most of our live events are open to the public. We hold events in many countries where we work and near our headquarters in the greater Washington DC area.

Our past events include the premiere of our award-winning film *An Ocean Mystery: The Missing Catch* at the Smithsonian Museum of National History. The film screening was followed by a discussion with experts featured in the film, Dr. Daniel Pauly and Dr. Stephen Box, as well as the filmmaker, Alison Barrat of the Living Oceans Foundation.

We also held an event at the National Aquarium, where we presented at the Marjorie Lynn Bank Lecture Series. "Coral Reefs Through the Lens" took attendees on a digital tour of the world, showcasing magnificent coral reefs and demonstrating the Foundation's creative use of film and media arts to inspire and educate.

The Living Oceans Foundation celebrated Earth Day with the Key School located in Annapolis, Maryland where we focused on the importance and conservation of coral reef ecosystems as part of the International Year of the Reef (IYOR). Throughout the day, students learned about coral reefs by attending lectures and participating in hands-on activities led by KSLOF staff. These activities are designed to encourage environmental awareness and appreciation of coral reefs. The celebration closed with students identifying various ways to make a difference in protecting the environment.

Digital Outreach

The Living Oceans Foundation strives to connect with the marine conservation community and the public through digital platforms including our website, social media, blogs, and webinars. Our award-winning website recently underwent a number of updates with the addition of our Coral Reef Education Portal, interactive coral reef habitat maps, and digital atlases showcasing the shallow water marine habitats we surveyed.

The best way for people to stay connected to the Foundation is by subscribing to our quarterly newsletter and the expedition blogs our scientists and educators write about their latest work. They can also follow us on Facebook, Twitter, and Instagram to get real-time updates about our work and keep up to date on the latest news in coral reef science, conservation, and education.

Awards

Recognition of our work to protect, preserve, and restore the oceans

2012

The Perseus Award

Prince Khaled received the Perseus award in 2012 as an acknowledgment of his contribution to ocean conservation. The Perseus Award recognizes yacht owners who have demonstrated exemplary effort and contribution toward marine wildlife conservation and to encourage luxury yacht owners to take a greater role in conserving our marine heritage given their privileged and intimate relationship with the ocean.

2013

KSLOF Website wins Best in Class at the Interactive Media Awards

The Foundation's website wins "Best in Class" in the Natural Environment/Green category at the Interactive Media Awards. The Best in Class award is the highest honor bestowed by the IMA and it represents the very best in planning, execution and overall professionalism – an achievement only a fraction of sites in the IMA competition earn each year.

2014

Peter Benchley Award for Excellence in Ocean Exploration

His Royal Highness Prince Khaled bin Sultan and the Khaled bin Sultan Living Oceans Foundation were honored with the prestigious Peter Benchley Award for Excellence in Ocean Exploration. This award was given in recognition of our work exploring and creating first-ever detailed maps of some of the world's most remote coral reef systems in order to provide science-based solutions that will empower people to keep ocean resources healthy and sustainable.

Website wins Davey Award and W3 Award

The Living Oceans Foundation's website won the silver Davey Award for the best Eco-Friendly website in 2014. This international award honors the achievements of creative people at smaller organizations who derive their

strength from big ideas rather than big budgets. The same year, the Foundation's website won a W3 award for the best science website. The W3 award honors outstanding websites created by some of the best interactive agencies, designers, and creators worldwide.

World Reef Map Wins ESRI Award
The Living Ocean Foundation's World Reef Map won 1st place in the Maps and Apps Gallery for electronic submissions at the 2014 ESRI Ocean Forum. The World Reef Map is a web map interface where users can visualize and see all of the benthic habitat and bathymetric data layers created from our research on the Global Reef Expedition.

Best Film at the Blue Ocean Film Festival
The Khaled bin Sultan Living Oceans Foundation and its founder, His Royal Highness Prince Khaled bin Sultan, won the award for Best Film in the Conservation Innovation and Solutions category of the 2014 Blue Ocean Film Festival for *Mapping the Blue*, which tells the story of the world's largest marine park. This film festival is dedicated to showcasing the best cinematic works for ocean conservation and awareness.

2015

Fabien Cousteau Blue Award
Oceanco and Jean-Michael Cousteau presented the Fabien Cousteau Blue Award to the Khaled bin Sultan Living Oceans Foundation at the 25th Anniversary of the International Superyacht Society Design and Leadership Awards ceremony. This award was given in recognition of our educational and outreach programs, and for "raising the awareness for the need to preserve the world's oceans through research, education, and implementation of best practices."

Emmy Award
Our film, *Sharks of the Coral Canyon* won the Suncoast Emmy® Award for Best Environment Program. The winner of 6 other awards as well, the film tells the story of how sharks and coral reefs are intricately linked and uncovers how two of the most threatened groups of animals in the ocean—corals and sharks—depend on one another, and must be protected together if either of them is to survive into the future.

2016

Coral Reef Education Portal wins W3 Award

Our Coral Reef Education Portal, which is the home to our *Coral Reef Ecology Curriculum*, won the 2016 W3 Award for Environmental Awareness. This award was given in in recognition of our outstanding work on building a state-of-the-art educational platform for students and teachers to learn about coral reefs online as well as for the quality lesson plans and interactive content created for the digital curriculum.

2017

Best of Show

Our latest feature-length film *An Ocean Mystery: The Missing Catch* won Best of Show at the Impact Docs Awards, recognizing it as the best film shown at the festival. This film also won the Green Spark award at the American Conservation Film Festival, and the Conservation Award at the International Ocean Film Festival and won the prestigious Award of Excellence at the Indiefest Film Awards in 2017.

THE LIVING OCEANS FOUNDATION HAS WON DOZENS OF FILM WARDS INCLUDING A SUNCOAST EMMY® AWARD, THE GRAND REMI AWARD AT THE WORLDFEST INTERNATIONAL FILM FESTIVAL, AND THE CONSERVATION INNOVATION AND SOLUTIONS AWARD AT THE BLUE OCEAN FILM FESTIVAL.

Board of Directors

HRH Prince Khaled bin Sultan
CHAIRMAN AND PRESIDENT

His Royal Highness Prince Khaled bin Sultan was the first Commander of the Saudi Air Defense Force, Joint Forces Commander of the Gulf War, and former Deputy Minister of Defense and Aviation. Prince Khaled is a dedicated ocean conservationist and avid diver. Upon learning that numerous human impacts, such as unsustainable fishing and terrestrial pollution were contributing to the decline in coral reef health, His Royal Highness was inspired to advocate for ocean conservation. He established the Khaled bin Sultan Living Oceans Foundation in 2000.

Charles Horner, General, USAF (ret)
VICE CHAIRMAN

General Charles A. Horner is a former Commander in Chief of the North American Aerospace Defense Command and the U.S. Space Command; and Commander of Air Force Space Command at Peterson Air Force Base. While Commander of 9th Air Force, he also managed U.S. Central Command Air Forces, in charge of all U.S. and allied air assets during operations Desert Shield and Desert Storm.

Mr. Ian D. Fair
CHIEF FINANCIAL OFFICER

Ian D. Fair is the current Chairman of Butterfield Trust (Bahamas) Limited. A distinguished business professional in The Bahamas, he is a former Chairman of the Bahamas First Insurance Group, the Bahamas Maritime Authority, and the Grand Bahama Port Authority. He was also the Founding Chairman of the Bahamas Financial Services Board and of The Bahamas International Securities Exchange, the latter of which he still serves as a Director. He has extensive involvement in charities in The Bahamas, the USA, and the UK.

Shawn M. McLaughlin, PhD
SECRETARY

Shawn M. McLaughlin, PhD is a research microbiologist at the National Oceanographic and Atmospheric Administration's Cooperative Oxford Laboratory in Oxford, MD. She currently investigates the impacts of land use on coastal ecosystem health. Previous research was focused on the effects of disease and other stressors on aquatic animal health. Dr. McLaughlin holds a B.A. from Notre Dame of Maryland University, a M.S. in Microbiology from the University of Maryland, and a PhD in Biology from Abo Akademi University. She is a graduate of the Department of Commerce's Executive Leadership Development Program.

Professor Mohamed Faisal
LEAD SCIENTIST

Dr. Mohamed Faisal, DVM, PhD, Dr. Honoris Causa is a Professor of Aquatic Animal Medicine the College of Veterinary Medicine and the College of Agriculture and Natural Resources at Michigan State University. He is certified aquatic veterinarian and SF Snieszko Distinguished Fellow and Professor. He is also Distinguished Fellow of the World Aquatic Veterinary Medical Association. Professor Faisal is world renowned in the field of aquatic animal medicine, authored and coauthored over 400 peer-reviewed publications, serving on a number of committees in federal agencies such as the national Science Foundation and National Institutes of Health. He received several honors and awards the last of which is the Snieszko Career Award of the American Fishery Society.

HRH Princess Hala bint Khaled bin Sultan
DIRECTOR

Her Royal Highness Princess Hala bint Khaled bin Sultan is the Founder of Burhan Almarifa, a Saudi company focused on maturing the culture, encouraging innovation, and enabling research and development in the legal sector in the Kingdom of Saudi Arabia (KSA). She is the Founder of the Saudi Law Conference and Chairman of its Organizing Committee since its launch in 2018. With a passion to preserve and conserve the ocean, she is also a Director of the Khaled bin Sultan Living Oceans Foundation's board since 2016. Princess Hala is also the ICC Young Arbitrators Forum representative for KSA. She started her career in 2008 as a legal researcher at the Saudi Arabian General Investment Authority Economic Cities Agency (SAGIA-ECA), and then as a legal advisor at SAGIA-ECA. She is currently also a legal advisor at Faisal bin Adel Abu Khalaf Law Firm. Princess Hala graduated with a Bachelor's Degree in International Relations from Wellesley College in 2005 and then earned her Jurist Doctorate (JD) degree from Boston University School of Law in 2008.

Professor Abdulaziz Abuzinada
DIRECTOR

Professor Abdulaziz Abuzinada received his PhD in Ecology from the University of Durham, United Kingdom. He was a professor and Chairman of the Department of Botany at King Saud University before becoming Secretary General of the Saudi Arabian National Commission for Wildlife Conservation and Development. In his 17 years in that role, he helped creating the Saudi Arabian system plan for protected areas and establishing 16 National Protected Areas and four research centers for biodiversity conservation. He is also the founder and president of the Saudi Biological Society (SBS) and an Honorary Member of IUCN & SBS.

STAFF

SAMUEL PURKIS, PHD
CHIEF SCIENTIST

After completing training as a marine biologist at the University of Southampton (1994-1998), Dr. Purkis relocated to the Netherlands and completed a MSc and PhD in 2004. Thereafter, he received post-doctoral training from Bernhard Riegl at the National Coral Reef Institute – Nova Southeastern University, before joining the faculty there himself in 2006. Dr. Purkis is currently a Professor at the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS) and Chair of the Department of Marine Geosciences. Dr. Purkis has served the Foundation as its Chief Scientist since 2017.

MS. AMY M. HEEMSOTH
DIRECTOR OF EDUCATION

Ms. Heemsoth develops and implements innovative education projects and programs for K-12 students, teachers, and non-formal educators. Additionally, she enhances the Foundation's community engagement through education and outreach. Ms. Heemsoth earned her Bachelor of Science in Marine Biology at Spring Hill College, she also attended Nova Southeastern University and obtained a Master's degree in Marine Biology.

MS. LIZ R. THOMPSON
COMMUNICATIONS DIRECTOR

Ms. Thompson is a professional science communicator who specializes in marine conservation. She holds a bachelor's degree in Marine Biology from Brown University and a master's degree in Marine Affairs and Policy from the University of Miami. She has worked on outreach and communications at the Marine Conservation Institute, Stanford, and Caltech. Ms. Thompson now works to convey the scientific and conservation mission of The Khaled bin Sultan Living Oceans Foundation to people around the world.

Ms. Alexandra C. Dempsey
DIRECTOR OF SCIENCE MANAGEMENT

Ms. Alex Dempsey is the Director of Science Management for the Khaled bin Sultan Living Oceans Foundation. Alex has participated in all 15 Global Reef Expedition missions as the lead benthic scientist. She directed and now oversees the coral reef ecology research and analysis for Living Oceans Foundation. She graduated magna cum laude from the College of Holy Cross with a Bachelor's of Science in Environmental Science and a Bachelor's of Arts in Environmental Philosophy. Later, Ms. Dempsey attended Nova Southeastern University obtaining a Master's of Science degree in Marine Biology and Coastal Zone Management.

Ms. Renée D. Carlton
MARINE ECOLOGIST

Ms. Carlton is the Marine Ecologist for the Khaled bin Sultan Living Oceans Foundation. She conducts research and analyzes data collected on the Global Reef Expedition, writes and publishes the final reports for the countries visited on the GRE, and assists with peer reviewed publication and preparation of the data collected. Ms. Carlton develops tailored conservation recommendations to countries based on data collected by KSLOF to further conservation efforts globally. She also participates in planning and executing research objectives for ongoing scientific research at the Foundation, designing field studies, and analyzes collected data. Her background is in understanding the impacts of ocean acidification on coral reef ecosystems and communities. Ms. Carlton attended San Diego State University graduating with a Bachelor of Science Degree in Biology and obtained her Master's of Professional Science from the Rosenstiel School of Marine and Atmospheric Science at the University of Miami.

Appendix A: Publications

A complete list of scientific publications from the Khaled bin Sultan Living Oceans Foundation

2001

Mumby P, Chisholm J, Edwards A, Clark C, Roark E, Andrefouet S,and J Jaubert. (2001) Unprecedented bleaching-induced mortality in Porites spp. at Rangiroa Atoll, French Polynesia. Marine Biology 139: 183-189.

Mumby P, Chisholm J, Clark C, Hedley J, and J Jaubert. (2001) A bird's-eye view of the health of coral reefs. Nature 413:36

Mumby P, Chisholm J, Edwards A, Andrefouet S, and J Jaubert. (2001) Cloudy weather may have saved Society Island reef corals during the 1998 ENSO event. Marine Ecology Progress Series 222: 209-216.

2002

Mincer T, Jensen P, Kauffman C, and W Fenical. (2002) Widespread and persistent populations of a major new marine actinomycete taxon in ocean sediments. Applied and Environmental Microbiology 68: 5005-5011.

2003

Kubanek J, Jensen P, Keifer P, Sullards M, Collins D, and W Fenical. (2003) Seaweed resistance to microbial attack: A targeted chemical defense against marine fungi. PNAS vol.100 no.12, 6916-6921.

2004

Mumby P, Hedley J, Chisholm J, Clark C, Ripley H, and J Jaubert. (2004) The cover of living and dead corals from airborne remote sensing. Coral Reefs 23: 171-183.

Mincer T, Spyere A, Jensen P, and W Fenical. (2004) Phylogenetic analyses and diterpenoid production by marine bacteria of the genus Saprospira. Current Microbiology 49:300-307.

2005

Cipriano R, Shchelkunov I, and M Faisal, editors. (2005) Health and Diseases of Aquatic Organisms: Bilateral Perspectives. Proceedings of the Second Bilateral Conference between Russia and the United States. 21-28 September 2003. Shepherdstown, West Virginia. Michigan State University, East Lansing, Michigan. ISBN: 0-9765653-0-7.

Jensen P, Gontang E, Mafnas C, Mincer T, and W Fenical. (2005) Culturable marine actinomycete diversity from tropical Pacific Ocean sediments. Environmental Microbiology.

2006

Aji Gunawan C, Allen G, Bavestrello G, Cerrano, C., Destari A, Foster R, Hagan A, Hazam I, Jaafar Z, Manuputty Y, Perera N, Pinca S, Silaban I and Y Yaha. (2006) Status of Coral Reefs in Indonesia Following the December 2004 Tsunami. In: Status of Coral Reefs in Tsunami Affected Countries: 2005, Australian Institute of Marine Science, Townsville, Australia. pp. 43-56.

Fair S. (2006) Anthology: The First Five Years. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 20 pp.

Hagan A. (2006) Benthic Habitat Assessment and Mapping in the Farasan Islands Marine Protected Area, May 2006. Preliminary Field Report. 23 pp.

Renaud P. (2006) "Coral Reef Rapid Habitat Mapping." Sea Technology, Sept., 2006: editorial.

2007

Hagan A, Foster R, Perera N, Gunawan C, Silaban I, Yaha Y, Manuputty Y, Hazam I and G Hodgson. (2007) Tsunami Impacts in Aceh Province and North Sumatra, Indonesia. Atoll Research Bulletin. No. 544. 18 pp.

Hagan A, Spencer T, Stoddart D, Loustau-Lalanne M and R Renaud. (2007) Tsunami Impacts in the Republic of Seychelles, Western Indian Ocean. Atoll Research Bulletin. No. 544. 21 pp.

Stoddart D, ed. (2007) Atoll Research Bulletin: Tsunamis and Coral Reefs. Smithsonian Institution. No. 544. 164 pp.

2008

Barnes R, Smith D, Barnes D and J Gerlach. (2008) Variation in the distribution of supralittoral vegetation around an atoll cay: Desroches (Amirante Islands, Seychelles). Atoll Research Bulletin. No. 565. 8 pp.

Bruckner A, Roberts G. (2008) Proceedings of the International Cyanide Detection Testing Workshop. NOAA Technical Memorandum NMFS-OPR-40, Silver Spring, MD, 167 pp.

Bruckner A. (2008) Throwing corals a life preserver. The Convention on the International Trade in Endangered Species (CITES) is being used more often as a conservation tool to promote a sustainable marine aquarium trade. FAMA 31: 30-39.

Raymundo L, Couch C, Bruckner A, Harvell C, Work T, Weil E, Woodley C, Jordan-Dahlgren E, Willis B, Aeby G, and Y Sato. (2008) Coral Disease Handbook: Guidelines for assessment, monitoring and management. CRTR, Australia, 131 pp.

Woodley C, Bruckner A, McLenon A, Higgins J, Galloway S, and J Nicholson. (2008) Field manual for investigating coral disease outbreaks. Coral Disease and Health Consortium. NOAA Tech Memo. NOS NNCOS 80 and CRCP 6 National Oceanic and Atmospheric Administration, Silver Spring, MD 85pp.

Venn A, Loram J and A Douglas. (2008) Photosynthetic symbioses in animals. Jour of Exp Biol. doi:10.1093/jxb/erm328

2009

Bruckner A and R Hill. (2009) Ten years of change to coral communities off Mona and Desecheo Islands, Puerto Rico from disease and bleaching. Disease of Aquatic Organisms. 87:19-31.

Bruckner A. (2009) Rate and extent of decline in Corallium (pink and red coral) populations: existing data meet the requirements for a CITES Appendix II listing. Marine Ecology Progress Series. 397:319-332.

Bruckner A. (2009) Progress in understanding coral diseases in the Caribbean. In: Proceedings of the CDHC Hawaii workshop: Vision for Action (edited by: Galloway, S.B., Bruckner, A.W. and Woodley, C.M.), NOAA Technical Memorandum NOS NCCOS 97 and CRCP 7. National Oceanic and Atmospheric Administration, Silver Spring, pp 126-161.

Bruckner A. (2009) The global diversity and distribution of coral diseases. In: Proceedings of the CDHC Hawaii workshop: Vision for Action. (edited by: Galloway, S.B., Bruckner, A.W. and Woodley, C.M.),. NOAA Technical Memorandum NOS NCCOS 97 and CRCP 7. National Oceanic and Atmospheric Administration, Silver Spring, pp 90-121.

Bruckner A and G Roberts. (2009) Proceedings of the first international workshop on Corallium science, management and trade. NOAA Tech Memo NMFS- OPR-43, CRCP-8, Silver Spring MD 153 pp.

Bruckner A. (2009) Characterizing coral reef resilience across landscape scales. Journal of the Washington Academy of Sciences 95(4):25-40.

Galloway S, Bruckner A and C Woodley, eds. (2009) Coral Health and Disease in the Pacific:

Vision for Action. NOAA Technical Memorandum NOS NCCOS 97 and CRCP 7. National Oceanic and Atmospheric Administration, Silver Spring, MD 314 pp.

Gayanilo F and A Williams. (2009) The KSLOF GIS Data Portal: Administrative and user guide to the portal. Khaled bin Sultan Living Oceans Foundation, Landover, MD.105 pp.

Hamylton S, Hagan A and T Spencer. (2009) Development of an island habitat classification scheme for the Amirante Islands, Seychelles, WIO Journal of Marine Science, 6(3):15-34.

Hamylton S and T Spencer. (2009) An investigation of seagrass patterns at Alphonse Atoll, Seychelles: Linking structure to function in marine landscapes. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, 7-11 July 2008.

Hamylton S. (2009) Determination of the separability of coastal community assemblages of the Al Wajh Barrier Reef, Red Sea, from hyperspectral data. Central European Journal of Geosciences. 1:95-105.

Hamylton S. (2009) Airborne remote sensing of the Al Wajh barrier reef, Saudi Arabia, Red Sea. In: Expedition Field Techniques: GIS, GPS and Remote Sensing Manual. Royal Geographical Society-Institute of British Geographers.

Harborne A, Renaud P, Tyler E and P Mumby. (2009) Reduced density of the herbivorous urchin

Diadema antillarum inside a Caribbean marine reserve linked to increased predation pressure by fishes. Coral Reefs. 28:783-791.

Rhyne A, Rotjan R, Bruckner A and M Tlusty. (2009) Crawling to collapse: ecologically unsound ornamental invertebrate fisheries. PLOS One. 4(12): 1-8.

Riegl B, Bruckner A, Coles S, Renaud P and R Dodge. (2009) Coral reefs: threats and conservation in an era of global change. The Year in Conservation Biology and Ecology 1, Annals of the NY Academy of Sciences 1162:136-186.

Rowlands G, Goodman J, Riegl B, Renaud P, and S Purkis S. (2009) Habitat mapping in the Farasan Islands (Saudi Arabia) using CASI and QuickBird imagery. Proceedings of the 11th International Coral Reef Symposium, Ft Lauderdale, Florida, 7-11 July 2008.

Spencer T, Hagan A, Hamylton S and P Renaud. (2009) Atlas of the Amirantes. Cambridgeshire: PMT Digital Ltd. Print. 66 pp.

2010

Bruckner A, Bruckner R and R Hill. (2010) Improving restoration approaches for Acropora palmata: Lessons from the Fortuna Reefer Grounding in Puerto Rico. Proceedings of the 11th International Coral Reef Symposium Ft Lauderdale, Florida, 7-11 July 2008, 1: 1199-1203.

Bruckner A and E Borneman. (2010) Implications of coral harvest and transplantation on reefs in northwestern Dominica. Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744) Vol. 58 (Suppl. 3): 111-127.

Bruckner A. (2010) Western Atlantic Coral Identification Field Guide. Woods Lithographics, 22 pp.

Bruckner A. (2010) Western Atlantic Health and Resilience cards. Woods Lithographics, 12 pp.

Bruckner A. (2010) Assessing decline in Corallium populations: Do existing data meet the criteria for a CITES Appendix II listing? In: Proceedings of the International Workshop on Red Coral Science, Management, and Trade: Lessons from the Mediterranean (Eds Bussoletti, E., Cottinham D, Bruckner A. et al.). NOAA Technical Memorandum CRCP-13, Silver Spring, MD pp. 58-71.

Bruckner A. (2010) Population dynamics and life history traits of Corallium rubrum populations: implications for sustainable management and trade. In: Proceedings of the International Workshop on Red Coral Science, Management, and Trade: Lessons from the Mediterranean (Eds. Bussoletti, E., Cottinham D., Bruckner A. et al.) NOAA Technical Memorandum CRCP-13, Silver Spring, MD pp. 184-194.

Bruckner A. (2010) Quantifying the decline in Corallium rubrum populations: Reply to Santangelo & Bramanti (2010). Mar Ecol Prog Ser. 397:317-332.

Bruckner A. (2010) Cayman Islands coral reef health and resilience assessments. Khaled bin Sultan Living Oceans Foundation, Landover, Maryland. 62 pp.

Bruckner A, Williams A and P Renaud. (2010) An assessment of the health and resilience of Bonaire's coral reefs. Khaled bin Sultan Living Oceans Foundation, Landover, Maryland. 51 pp.

Bussoletti E, Cottingham D, Bruckner A, Roberts G and R Sandulli. (2010) Proceedings of the International Workshop on Red Coral Science, Management, and Trade: Lessons from the Mediterranean. NOAA Technical Memorandum CRCP-13, Silver Spring, MD 233 pp.

Eakin M, Morgan J, Bruckner A and 53 others. (2010) Caribbean Corals in Crisis: Record Thermal Stress, Bleaching, and Mortality in 2005. PNAS 5(11): e13969. oi:10.1371/journal.pone.0013969.

Hagan A, Spencer T, Ashworth J, Bijoux J, Quatre R, Callow M and B Stobart. (2010) Morphology and marine ecology of Boudeuse, Amirantes, Seychelles. Atoll Research Bulletin. No. 575. 15 pp.

Hagan A, Spencer T, Ashworth J, Bijoux J, Quatre R, Callow M, Stobart B and P Matyot. (2010) Terrestrial and marine ecology of Desnoeufs, Amirantes, Seychelles. Atoll Research Bulletin. No. 576. 24 pp.

Hagan A, Spencer T, Ashworth J, Bijoux J, Quatre R, Callow M, and B Stobart. (2010) Terrestrial and marine ecology of Etoile, Amirantes, Seychelles. Atoll Research Bulletin. No. 577. 15 pp.

Hagan A, Spencer T, Ashworth J, Bijoux J, Quatre R, Callow m, Stobart B and P Matyot. (2010) Terrestrial and marine ecology of Marie-Louise, Amirantes, Seychelles Atoll Research Bulletin. No. 578. 32 pp.

Hagan A. (2010) Terrestrial and marine ecology of Poivre, Amirantes, Seychelles. Atoll Research Bulletin. No. 579. 35 pp.

Hamylton S, Spencer T and A Hagan. (2010) Coral reefs and reef islands of the Amirantes Archipelago, western Indian Ocean, pp. 99 – 106. In: Harris, P & Baker, E (Eds.) 2009 Atlas of Seafloor Geomorphology as Benthic Habitat, Elsevier, Chatswood, Australia. 600pp.

Hamylton S. (2010) The Al Wajh Bank reef system, Saudi Arabia, Red Sea, pp. 28-37. In: Harris, P & Baker, E (Eds.) 2009 Atlas of Seafloor Geomorphology as Benthic Habitat, Elsevier, Chatswood, Australia. 600pp.

Hamylton S and T Spencer. (2010) An integrated approach to landscape ecology in marine systems: Remote sensing, patches and spatial statistics. Continental Shelf Research, Special Issue on Coastal Remote Sensing (DOI:10.1016/j.csr.2010.02.003).

Hamylton S. (2010) Spatial modelling of live coral cover using hyperspectral remote sensing data in the Al Wajh lagoon, Red Sea. Coral Reefs.

Lumsden S, Hourigan T and A Bruckner. (2010) Deep-sea Coral Ecosystems of the United States. Feature Article 3 Our Living Oceans, 6th Edition.77-87.

Purkis S, Rowlands G, Riegl B and P Renaud. (2010)The paradox of tropical karst morphology in the coral reefs of the arid Middle East. Geology 38: 227-230.

Rowlands G, Goodman J, Riegl B, Renaud P and S Purkis. (2010) Habitat mapping in the Farasan Islands (Saudi Arabia) using CASI and QuickBird imagery. Proceedings of the 11th International Coral Reef Symposium, Ft Lauderdale, Florida, 7-11 July 2008, p 642-646.

Tissot B, Best B, Borneman E, Bruckner A, et al. (2010) How U.S. ocean policy and market power can reform the coral reef wildlife trade. Marine Policy 2010, oi:10.1016/j.marpol.2010.06.002.

Williams A and N Sappington. (2010) Seychelles Research Expedition Surveys Remote Islands. Sea Technology, June 2010. p. 10-13.

2011

Bruckner A. (2011) The Recent Emergence of Coral Diseases. In: Cipriano, R, A Bruckner and I Shchelkunov (eds) Aquatic Animal Health: A Continuing Dialogue Between Russia and The United States. University of Michigan Press. Pp. 26-46.

Bruckner A, Faisal M and H Alnazary. (2011) Paradigm Shift for Fisheries Management to Enhance Recovery, Resilience, and Sustainability of Coral Reef Ecosystems in the Red Sea. In Sustainable Fisheries: Multi-Level Approaches to a Global Problem. American Fisheries Society. Pp. 85–111.

Bruckner A. (2011) The Global Reef Expedition: Science without Borders®: A five year research program to map, characterize and assess the resilience of coral reef ecosystems and develop tools for conservation and management. Journal of the Washington Academy of Sciences, Washington, D.C. Vol. 97:3, Pp. 19-32.

Bruckner A. (2011) Khaled bin Sultan Living Oceans Foundation Habitat Mapping and Characterization of Coral Reefs of the Saudi Arabian Red Sea: 2006-2009 Final Report Part I. Panoramic Press, Arizona. 140 pp.

Bruckner A. (2011) Khaled bin Sultan Living Oceans Foundation Habitat Mapping and Characterization of Coral Reefs of the Saudi Arabian Red Sea: 2006-2009 Final Report Part II, Ras Qisbah, Al Wajh, Yanbu, Farasan Banks and Farasan Islands. Panoramic Press, Arizona. 248 pp.

Bruckner A, Rowlands G, Riegl B, Purkis S, Williams A and P Renaud. (2011) Khaled bin Sultan Living Oceans Foundation Atlas of Saudi Arabian Red Sea Marine Habitats. First Edition. Panoramic Press, Arizona. 262 pp.

Bruckner A. (2011) Khaled bin Sultan Living Oceans Foundation 2011 Coral Reef Assessment Cay Sal Bank, Bahamas. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 59 pp.

Bruckner A, Alnazry H and M Faisal. (2011) A Paradigm Shift for Fisheries Management to Enhance Recovery, Resilience, and Sustainability of Coral Reef Ecosystems in the Red Sea. In Taylor W, Lynch A and M Schechter (eds.), Sustainable Fisheries: Multi-Level Approaches to a Global Problem. American Fisheries Society. ISBN: 978-1-934874-21-9.

Diamanka A, Neifar L, Pariselle A and L Euzet. (2011) Lamellodiscus (Monogenea: Diplectanidae) parasites of Dentex macrophthalmus (Teleostei: Sparidae) from North Atlantic coast of Africa, with redescription of L. dentexi Alioshkina, 1984, and description of three new species. Folia Parasitologica 58(1): 17-26.

Diamanka A, Boudaya L, Toguebaye B and A Pariselle. (2011) Lamellodiscus Euzeti N. SP. (Monogenea: Diplectanidae), a parasite from Dentex canariensis and D. gibbosus (Teleostei: Sparidae) in the Atlantic Ocean and Mediterranean Sea. Parasite-Journal De La Societe Francaise De Parasitologie 18:145-150.

Hamylton S. (2011). An evaluation of waveband pairs for water column correction using band ratio methods for seabed mapping in the Seychelles. International Journal of Remote Sensing, 32(24): 9185-9195.

Hamylton S. (2011) Estimating the coverage of coral reef benthic communities from airborne hyperspectral remote sensing data: multiple discriminant function analysis and linear spectral unmixing. International Journal of Remote Sensing 32:9673-9690.

2012

Bruckner A. (2012) Field Guide to Indo-Pacific and Red Sea Coral Diseases and Other Causes of Coral Mortality CD-ROM. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland.

Bruckner A. (2012) Static measures of the resilience of Caribbean coral populations. Rev Biol Trop. 60:39-57.

Bruckner A. (2012) Preserving the world's coral reefs for the benefit of future generations through the Global Reef Expedition: Science Without Borders. CORAL. pp 90-98.

Bruckner A and A Williams. (2012) Assessment of the Community Structure, Status, Health and Resilience of Coral Reefs off St. Kitts and Nevis. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 65 pp.

Bruckner A and P Renaud. (2012) The Global Reef Expedition: Bahamas 2011, Marine Research Activities Undertaken at: Cay Sal Bank, Great Inagua, Little Inagua, Hogsty Reef, and Andros Island. Report to the Bahamas Department of Marine Resources (Fisheries) in fulfillment of Research Permit: MAF/FIS/17. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 31 pp.

Bruckner A, Rowlands G, Riegl B, Purkis S, Williams A, and P Renaud. (2012) Khaled bin Sultan Living Oceans Foundation Atlas of Saudi Arabian Red Sea Marine Habitats. Second Edition. Panoramic Press, 262 pp.

Bruckner, A. (2013) Global Reef Expedition: Pedro Bank, Jamaica. March 10-20, 2012. Final Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 94.

Bruckner, A. (2012) Global Reef Expedition: Pedro Bank, Jamaica. Field Report. March 10-20, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 28.

Bruckner, A. (2011) Global Reef Expedition: Navassa. Field Report. March 25-31, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. 34 pp.

Bruckner, A. (2012) Global Reef Expedition: San Andres Archipelago, Colombia. Field Report. April 9-24, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 52

Bruckner, A. (2012). Mapping, characterizing and assessing the composition, health and resilience of Galápagos coral reefs. Field Report. June 1-16, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 46

Gentrup G. (2012) Sunken Plane Sheds Light on Coral Reef Development. In Dive Training. 22:2, pp 12-14.

Rhyne A, Tlusty M, Schofield P, Kaufman L, Morris, Jr. J, and A Bruckner. (2012) Revealing the Appetite of the Marine Aquarium Fish Trade: The Volume and Biodiversity of Fish Imported into the United States. PLoS One 7:5, 9 pp.

Riegl B, Bruckner A, Rowlands G, Purkis S and P Renaud. (2012) Red Sea coral reef trajectories over 2 decades suggest increasing community homogenization and decline in coral size. PLoS ONE (in press).

2013

Bruckner, A.W. (2013) Galápagos Coral Reef and Coral Community Monitoring Manual. Khaled bin Sultan Living Oceans Foundation Publication #10, Landover MD. 81 pp.

Bruckner, A.W. (2014) Global Reef Expedition: New Caledonia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 38.

Bruckner, A.W. (2014) Global Reef Expedition: Kingdom of Tonga. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 28 pp.

Bruckner, A.W. (2013) Mitigating the impacts of an Acanthaster planci (crown-of- thorns starfish, COTS) outbreak on coral reefs in Aitutaki, Cook Islands. Khaled bin Sultan Living Oceans Foundation, Landover MD. USA pp. 33.

2014

Andréfouët, S., S. Van Wynsberge, C. Fauvelot, A. W. Bruckner & G. Remoissenet (2014): Significance of new records of Tridacna squamosa Lamarck, 1819, in the Tuamotu and Gambier Archipelagos (French Polynesia), *Molluscan Research*.

Andréfouët, S., A. Bruckner, L. Chabran, J. Campanozzi-Tarahu, A. Dempsey (2014). Spread of the green snail Turbo marmoratus in French Polynesia 45 years after its introduction and implications for fishery management. *Ocean and Coastal Management* 96:42-50.

Baums, Iliana B., Meghann Devlin-Durante, Beatrice A. A. Laing, Joshua S. Feingold, Tyler B. Smith, Andrew Bruckner, and Joao Monteiro. (2014). Marginal Coral Populations: the Densest Known Aggregation of Pocillopora in the Galápagos Archipelago is of Asexual Origin. *Frontiers in Marine Science*:1 -11.

Bruckner, A.W. (2014). Global Reef Expedition: Lau Province, Fiji. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 33 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Great Barrier Reef, Australia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 31.

Bruckner, A.W. (2014). Global Reef Expedition: Cook Islands. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 19 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Society Islands, French Polynesia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 28 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Tuamotu Archipelago, French Polynesia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 23 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Gambier Archipelago, French Polynesia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 25 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Rangiroa Atoll, French Polynesia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 16 pp.

Bruckner, A.W. (2014). Global Reef Expedition: Austral Islands, French Polynesia. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. 20 pp.

Bruckner, Andrew W., Beck, Brian, & Renaud, Phil. (2014). The status of coral reefs and associated fishes and invertebrates of commercial importance in Pedro Bank, Jamaica. *Revista de Biología Tropical*, 62(Suppl. 3), 258-268.

Feingold J.S., Glynn P.W. (2014) Coral Research in the Galápagos Islands, Ecuador. In: Denkinger J., Vinueza L. (eds) The Galapagos Marine Reserve. Social and Ecological Interactions in the Galapagos Islands. Springer, Cham.

Manzello, Derek & Enochs, Ian & Bruckner, Andrew & G. Renaud, Philip & Kolodziej, Graham & Budd, David & Carlton, Renee & Glynn, Peter. (2014). Galápagos Coral Reef Persistence after ENSO Warming Across an Acidification Gradient. *Geophysical Research Letters*. 41.

Purkis, S.J., Kerr, J.M., Dempsey, A.C., Calhoun, A., Metsamaa, L., Riegl, B.M., Kourafalou, V.H., Bruckner, A.W., & Renaud, P. (2014). Large-scale carbonate platform development of Cay Sal Bank, Bahamas, and implications for associated reef geomorphology. *Geomorphology* 222.

Roff, G., Bejarano, S., Bozec, YM. et al. (2014). Porites and the Phoenix effect: unprecedented recovery after a mass coral bleaching event at Rangiroa Atoll, French Polynesia. *Marine Biology* 161:1385.

2015

Bruckner, A.W. (2015). Global Reef Expedition: British Indian Ocean Territory. Field Report. Khaled bin Sultan Living Oceans Foundation, Annapolis, MD. pp 36.

Bruckner, A.W. (2015). Global Reef Expedition: Solomon Islands. Field Report. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 39.

Bruckner, A., J. Kerr, G. Rowlands, A. Dempsey, S. Purkis, and P. Renaud (2014) Khaled bin Sultan Living Oceans Foundation Atlas of Shallow Marine

Habitats of Cay Sal Bank, Great Inagua, Little Inagua and Hogsty Reef, Bahamas. Panoramic Press, pp. 304.

Evans, N., Gilbert, A., Andréfouët, S. et al. A massive subtidal aggregation of hermit crabs in Surprise Atoll lagoon, New Caledonia. *Coral Reefs* (2015) 34: 917.

Glynn, P.W., Riegl, B., Purkis, S., Kerr, J.M., Smith, T.B. (2015). Coral reef recovery in the Galápagos Islands: the northernmost islands (Darwin and Wenman). *Coral Reefs* 34: 421.

2016

Bruckner, A.W., Dempsey, A.C., Coward, G., Saul, S., Rauer, E.M. & Heemsoth, A. (2016). Global Reef Expedition: Lau Province, Fiji. Final Report. Khaled bin Sultan Living Oceans Foundation, Annapolis, MD. 113p.

Mayfield, A., A. Bruckner, C. Chen, & C. Chen. (2015). A survey of pocilloporid corals and their endosymbiotic dinoflagellate communities in the Austral and Cook Islands of the South Pacific. *Platax* 1-17.

Miller M, Williams DE, Huntington BE, Piniak GA, Vermeij MJA. (2016). Decadal comparison of a diminishing coral community: a study using demographics to advance inferences of community status. *PeerJ* 4:e1643.

Robbins, W.D. & Renaud, P. (2016). Foraging mode of the grey reef shark, Carcharhinus amblyrhynchos, under two different scenarios. *Coral Reefs* 35: 253.

Viviani, J., Williams, J.T. & Planes, S. (2016) Two new pygmygobies (Percomorpha: Gobiidae: *Trimma*) from French Polynesia. *Journal of the Ocean Science Foundation*, 23, 1–11.

Williams, J.T., & Viviani, J. (2016). Pseudogramma polyacantha complex (Serranidae, tribe Grammistini): DNA barcoding results lead to the discovery of three cryptic species, including two new species from French Polynesia. *Zootaxa*, 4111 3, 246-60.

2017

Castro-Sanguino C, Bozec Y-M, Dempsey A, Samaniego BR, Lubarsky K, Andrews S, et al. (2017) Detecting conservation benefits of marine reserves on remote reefs of the northern GBR. *PLoS ONE* 12(11): e0186146.

Mayfield, A., C. Chen, & A. Dempsey. (2017). The molecular ecophysiology of closely related pocilloporid corals of New Caledonia. *Platax* 14: 1-45.

Mayfield AB, Chen C-S, Dempsey AC (2017) Biomarker profiling in reef corals of Tonga's Ha'apai and Vava'u archipelagos. *PLoS ONE* 12(11): e0185857.

Mayfield AB, Chen C-S, Dempsey AC (2017) Identifying corals displaying aberrant behavior in Fiji's Lau Archipelago. *PLoS ONE* 12(5): e0177267.

Purkis, S., Dempsey, A., Carlton, R.D., Andréfouët, S., Samaniego, B., Rauer, E.M., and Renaud, P.G. (2017). Global Reef Expedition: French Polynesia. Final Report. Khaled Bin Sultan Living Oceans Foundation, Annapolis, MD. Vol 5: 80p.

Purkis, S., Dempsey, A., Carlton, R., Samaniego, B., Lubarsky, K. and Renaud, P.G. (2017). Global Reef Expedition: Kingdom of Tonga. Final Report. Khaled Bin Sultan Living Oceans Foundation, Annapolis, MD. Vol 8.

Sheppard, C., Sheppard, A., Mogg, A., Bayley, D., Dempsey, A. C., Roche, R., and Purkis, S. (2017). Coral bleaching and mortality in the Chagos Archipelago. *Atoll Research Bulletin*, 2017(613).

2018

Mayfield, A., A. Dempsey, J. Inamdar & C. Chen. (2018). A statistical platform for evaluating coral health in an era of changing global climate-I: a case study from Fiji's Lau Archipelago. *Platax* 15: 1-35.

Purkis, S., Dempsey, A., Carlton, R., Lubarsky, K. and Renaud, P.G. (2018). Global Reef Expedition: Cook Islands. Final Report. Khaled Bin Sultan Living Oceans Foundation, Annapolis, MD. Vol 9.

Taylor, B., S. Brandl, M. Kapur,& W. Robbins, G. Johnson, C. Huveneers, P. Renaud, & J. Howard Choat. (2018). Bottom-up processes mediated by social systems drive demographic traits of coral-reef fishes. *Ecology*. 99. 642-651.

2019

Mayfield, Anderson, A. Dempsey, and C. Chen. (2019). Modeling environmentally-mediated variation in reef coral physiology. *Journal of Sea Research*. 145: 44-54.

Purkis, S.J., Gleason, A.C.R., Purkis, C.R., Dempsey, A.C., Renaud, P.G., Faisal, M., Saul, S., Kerr, J.M. (2019). High-resolution habitat and bathymetry maps for 65,000 sq. km of Earth's remotest coral reefs. *Coral Reefs* 38: 467.

Purkis, S., Dempsey, A., Carlton, R., Lubarsky, K., Andréfouët, S. and Faisal, M. (2019). Global Reef Expedition: New Caledonia. Final Report. Khaled bin Sultan Living Oceans Foundation, Annapolis, MD. Vol 10.

Johnson, Garrett B., Brett M. Taylor, William D. Robbins, Erik C. Franklin, Rob Toonen, Brian Bowen, and J. Howard Choat. (2019). Diversity and Structure of Parrotfish Assemblages across the Northern Great Barrier Reef. *Diversity*. 11. 14.

Khaled bin Sultan
Living Oceans
Foundation