

Khaled Bin Sultan

Living Oceans Foundation



GLOBAL REEF EXPEDITION



2012 Annual Report



His Royal Highness Prince Khaled bin Sultan has shown a steadfast commitment to global ocean conservation through support of the Living Oceans Foundation, by making the assets of the Golden Fleet available for scientific research, and with his vision of Science Without Borders. Thank you, Prince Khaled bin Sultan, for all that you do for our oceans.

Message From the Executive Director

The Khaled bin Sultan Living Oceans Foundation is now fully immersed in our historic Global Reef Expedition. We are circumnavigating the globe aboard the *M/Y Golden Shadow* research vessel in a quest to rapidly map and survey many of the world's shallow tropical coral reefs. This expedition was the vision of His Royal Highness, Prince Khaled bin Sultan as an urgent response to the accelerating global coral reef crisis.

The news of declining ocean health is prominent and shocking in many respects. Exponential growth in human population combined with the spoils of an industrial age has stressed the health of our oceans to a tipping-point. Fish stocks are crashing, essential fish habitat has been wantonly destroyed, plastics and pollution are contaminating the seas, and coastal development continues unabated. Fragile coral reefs, which harbor nearly 25% of all marine species and supply food and livelihoods for millions of people, have taken the brunt of this chronic stress and are withering at a stunning pace.

The objective of our Global Reef Expedition is not to document the demise of the coral reefs but to rapidly advance the world's scientific knowledge and arm countries around the world with essential information to counteract the decline in coral health. Coral Reefs need a massive intervention through strong political will, sustained financial support, and wide-scale resource management.

This annual report chronicles our second full year of the Global Reef Expedition in which we completed our work in the greater Caribbean, conducted research in the Galapagos and journeyed to the South Pacific. Our accomplishments have been impressive to date but much work remains. The resilience of coral reefs is remarkable and we are optimistic that our Global Reef Expedition, combined with the efforts and passion of other conservationists around the world, will have a timely impact on reversing the downward trend in coral health.



CAPT Philip G. Renaud, USN (Ret.)



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Science Without Borders®

The Living Oceans Foundation embraces *Science Without Borders*® in all facets of its operations. *Science Without Borders*® is registered to the Foundation for financial sponsorship of marine conservation programs and scientific research and to promote public awareness of the need to preserve, protect and restore the world's oceans and aquatic resources. The *Global Reef Expedition* is building upon the Foundation's *Science Without Borders*® program through both an unprecedented level of collaborative scientific research and an ambitious education and outreach program. Through the Foundation's scientific work, local resource managers and scientists from countries around the globe are receiving critical scientific information and tools to assist them in management and conservation of their marine resources. Additionally, local scientists work side-by-side with internationally acclaimed coral reef scientists. The international team of scientists aboard the research vessel, *M/Y Golden Shadow* map and survey coral reefs to close critical gaps in scientific knowledge. The Foundation also trains local scientists and resource managers to continue environmental monitoring long after the Golden Shadow departs the region. Following the field work in each region, the Foundation and its partners compile and analyze comprehensive coral reef data, satellite imagery, photos and video and use the knowledge to guide development of regional and global conservation tools and tactics to counter the most serious threats impacting the health of coral reefs.

Note: First use of this service mark by the Living Oceans Foundation in the United States was recorded on December 3rd, 2000. The service mark "Science Without Borders®" was officially registered on September 9, 2003, with the United States Patent and Trademark Office under Reg. No. 2,760,882. The registration was renewed for a ten-year period on January 3, 2013. The mark is also registered with the Registrar of Trade Marks in Australia as Trade Mark No. 1092400 and with the European Community as Trade Mark Reg. No. 4756797. Protection of the trademark has also been registered in the Kingdom of Saudi Arabia. The purpose mark is to provide financial sponsorship of marine conservation programs and scientific research and to promote public awareness of the need to preserve, protect and restore the world's oceans and aquatic resources.

Perseus Award

Prince Khaled bin Sultan bin Abdulaziz was selected as the Perseus Award winner for 2012. The Perseus Award celebrates yacht owners who have demonstrated exemplary effort and contribution toward marine wildlife conservation.

The Award embodies the spirit of Perseus, the Greek hero; a child of the sea who grew up to be one of its greatest heroes and protectors.

The award was accepted by the Vice Chairman of the Foundation, Gen. Charles Horner, on behalf of Prince Khaled bin Sultan at the International Boat show in Florida in fall 2012.

Congratulations Prince Khaled!



Global Reef Expedition Overview

The Khaled bin Sultan Living Oceans Foundation, using the state-of-the-art research vessel Golden Shadow to support an international team of marine scientists, has now completed the second year of a six-year (2011-2016) Global Reef Expedition program. HRH Prince Khaled bin Sultan has generously funded the research vessel and scientific operation for this historic scientific journey. Our ability to facilitate scientific access to remote coral reef ecosystems, relatively unaffected by human-induced stressors, opens an important window into the ecological factors that promote reef health. Comprehensive reef resilience surveys of remote coral reefs are yielding critical scientific knowledge on the functional processes necessary to sustain reef health and promote rapid recovery from past damage. Comparing the ecological conditions between remote (relatively healthy) coral reefs with reefs that have been compromised by chronic, human-induced (anthropogenic) stressors arms the Foundation with the scientific knowledge necessary to identify high-priority management interventions. The intended outcome of the Global Reef Expedition is 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.

The Foundation openly shares the scientific knowledge gained from this ambitious expedition to host countries and international stakeholders to empower natural resource managers with management tools and decision aids that will influence policy and actions urgently needed to improve and sustain global coral reef health. We claim that this Global Reef Expedition is the first global coral reef expedition in the history of man to employ standardized scientific protocols to map, characterize, and evaluate coral reefs throughout the western Atlantic, Pacific, Indian Ocean, and the Red Sea. Comparative assessments of coral reef biodiversity, oceanographic conditions, and human pressures will reliably describe the global status of coral reef health, identify major threats, and determine processes and factors that control the health and resilience of reef ecosystems worldwide.

Global Reef Expedition is targeting remote locations, making it possible to separate natural processes from the impact of human stressors, and determine the critical structural components and mechanisms which maintain a healthy and fully functioning reef ecosystem. The effects of physical and chemical variables (e.g., temperature, salinity, alkalinity, wave action, and sedimentation) and differential responses to climate change are also being described. By characterizing resilience indicators across vast geographic scales, a better understanding of their importance in maintaining the structural integrity and health of reefs is being quantified and will be used to make predictions regarding the future health of coral reefs, including their capacity to adjust to climate

change. The data is analyzed and interpreted to generate science-based tools and decision aids that can be regionally and globally put into action to mitigate local threats to improve the resilience of these life-supporting marine ecosystems.

Conducting effective scientific research and developing conservation tools is only one part of a comprehensive conservation program necessary to halt the degradation of reefs. The scale and urgency of the Global Reef Expedition is unprecedented and calls for an equally bold educational initiative. The Foundation's educational component makes use of the potential of new learning technologies to deliver the urgent message of coral reef conservation to create awareness of the direct contributions reefs make to people's lives no matter where they reside.

By utilizing the latest educational technologies, film-making, internet curriculum, social networks, and blogs, learners around the globe are able to directly participate in the expedition and experience its scientific activities through virtual reality. Educators and students directly interact with working scientists to gain personal insight into real-world applications of marine science.

A "Reef Science Resource Center" is being established as a web-based teaching asset designed to support in-classroom experiences for students around the globe. Through the CREW fellowship program (Coral Reef Educator on the Water), teachers periodically join the research team to help deliver content to millions of virtual learners. Both on-board and underwater experiences provide compelling educational access to the Foundation's work and discoveries. Scientists' journals and real-time broadcasts engage learners on a daily basis, motivating them to track the scientific processes, progress, and results, which will ultimately lead to an enhanced public understanding of these vital coral reef ecosystems.

GRE By The Numbers

189,528	minutes underwater
22,088	square kilometers mapped
3,522	dives logged
172	scientific divers
7	countries visited
4	years left in the GRE

Number of GRE Dive Sites through 2012: 328
Distance traveled: Nearly 15,000 km (9300 miles)
Hurricanes survived: 2 (Both from the Inaguas)

Indian Ocean and Red Sea 2015-2016

- 18 Maldives—2015
- 19 BIOT/Chagos—2015
- 20 Seychelles—2015
- 21 Madagascar—2016
- 22 Red Sea—2016

Pacific Ocean 2012-2014

- 13 New Caledonia—Winter
2013/2014
- 14 Coral Sea, Australia—Spring 2014
- 15 Solomon Islands—2014
- 16 Palau—2014
- 17 Indonesia—2014



Pacific Ocean 2012-2014

- 8 Galapagos—June 2012
- 9 French Polynesia—
Sept. 2012-Apr. 2013
- 10 Cook Islands—May 2013
- 11 Tonga—July 2013
- 12 Fiji—October 2013

Atlantic Ocean 2011-2012

- 1 Cay Sal Bank, Bahamas—2011
- 2 St. Kitts & Nevis—2011
- 3 Inaguas/Hogsty Reef,
Bahamas—2011
- 4 Andros Island, Bahamas—2011
- 5 Jamaica—2012
- 6 Navassa—2012
- 7 Colombia—2012



Jamaica Overview

Between March 10-20, 2012, the Khaled bin Sultan Living Oceans Foundation (KSLOF) collaborated with The Nature Conservancy to assess coral reefs off Pedro Bank, Jamaica, one of the largest offshore banks in the Caribbean. We involved scientists from KSLOF, the Nature Conservancy, the National Environment and Planning Agency of Jamaica (NEPA), Fisheries Division and Veterinary Services Division of the Ministry of Agriculture & Fisheries; the University of the West Indies, Nova Southeastern University's National Coral Reef Institute (NCRI), the Florida Aquarium and the Atlantic and Gulf Rapid Reef Assessment Program. This mission launched the second year of the Foundation's multi-year Global Reef Expedition (GRE). Our primary objective was to obtain scientific information needed to aid in selecting sites for a fishery reserve on this remote bank.

While the coral reefs located off the north coast of the Jamaican mainland are some of the best and most studied reefs in the world, little research has been conducted on the banks located off the south coast of Jamaica. Pedro Bank is Jamaica's most valuable and largest fishing ground. Unfortunately, a long history of overfishing lobster, conch, and fish has led to the overexploitation of these fisheries. Additionally, due to an increasing population, Pedro Cays has resulted in growing resource extraction, destruction of coastal vegetation, excessive trash debris, no sewage treatment, and diminishing habitat for nesting turtles

and seabirds. Pedro Bank was thought to contain some of the healthiest remaining coral reefs in Jamaican waters. KSLOF chose this site as a destination for the GRE to provide scientific information that would inform constituents of the value of these resources and the benefits that would ensue through the development of a network of marine protected areas (MPAs).

Our work included characterization of 1) the location, composition and health of coral reefs; 2) status of reef fish, lobster, conch and sea cucumber populations throughout reef environments; 3) the distribution, diversity and size of larval fish conch and lobster populations; 4) oceanographic currents, temperature and water circulation 5) the distribution of sea turtles, seabirds, sharks, marine mammals, and unusual floating aggregations of *Sargassum* seaweed; and 6) conducted pilot studies on the use of side scan sonar to map the habitats and bathymetry of the proposed fish sanctuary.

Coral reef communities were in surprisingly good condition. Although living coral cover was fairly low, the corals had very little partial mortality and few diseases were seen, with exception of one location. Most reefs had less than 20 species of corals, but certain long lived corals such as the mountainous star coral and lobate star coral (*Montastraea faveolata* & *M. annularis*) were very common and quite large (1-2 m) and we found large



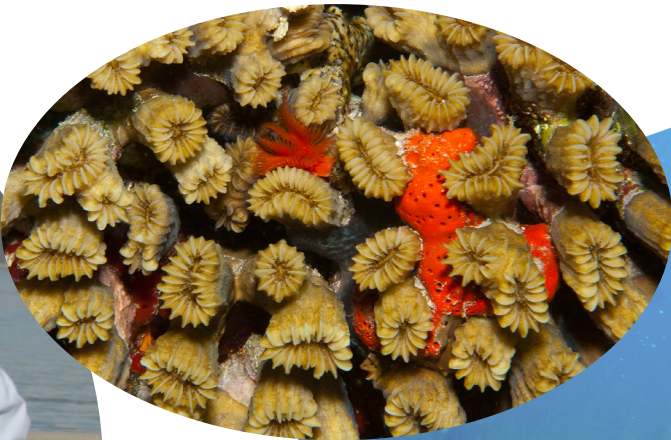
Navassa Overview

patches of staghorn coral (*Acropora cervicornis*) and sites with recovering elkhorn coral populations (*A. palmata*). Most surprising, there was very little fleshy seaweed, even though herbivorous long-spined black sea urchins (*Diadema*), parrotfish and surgeonfish were relatively rare. In general, fish communities were diverse but contained few large predators and most species were small. Nevertheless, fish populations were still considerably healthier than reefs off mainland Jamaica. An unnatural abundance of nurse sharks were seen. These were very curious and followed divers around. This appeared to be related to dead lionfish that were frequently speared by fishermen and left on the reef.

Our fisheries assessments suggest that the bank is under considerable pressure from spearfishermen, which were observed using compressors to target primarily herbivores (parrotfish), and secondarily other reef fish and lobsters. The use of fish traps was also widespread; these primarily caught surgeonfish. Both of these families are critical to the health of the reefs, as they control algal populations. They were significantly depleted, and the current level of fishing pressure appears unsustainable. Since completion of this project, southwest (Bird) Cay has been declared as a fishery reserve and an ecosystem-based, integrated sustainable development approach is being implemented to counteract over-exploitation, habitat degradation, and pollution.

For our second 2012 mission, we headed to Navassa Island, a U.S. possession, 46 miles from Haiti. This rugged, uninhabited island is only 2 square miles in area. The island is composed of jagged, exposed coral and limestone rock, surrounded by 30-50 foot vertical cliffs. Just below the water's surface a reef wall plummets vertically another 30-40 feet, ending in a boulder field. Surrounding the island is a narrow fringing reef, a low-relief spur and groove reef system and deeper patch reefs that extend seaward, sloping quickly to 120 feet or more, before dropping to the abyss. Our team, including our core KSLOF scientists and researchers from National Oceanic and Atmospheric Administration (NOAA) and University of Miami, assessed reef communities along the wall and on the deeper reef systems during the last week of March. This was perhaps the most challenging dive undertaken to date—unusually deep water, strong currents and high seas—but with the use of NITROX we were able to complete assessments of the reef community in 15 locations, along with an additional 25 random fish censuses.

Our research included a reassessment of permanent sites established by NOAA, as well as a number of new locations, to collect information on the status and health of reef building corals, reef fish and large motile invertebrates. Previous surveys identified major changes to reef communities due to several catastrophic events including 1) a widespread outbreak of a coral disease in 2004; and 2) a mass bleaching event in 2006 that included a dramatic loss of coral cover and a subsequent dramatic increase in macro-algal cover, particularly in the best-developed reef habitats. We were here to assess patterns of recovery and ongoing threats.



Navassa continues to be a stronghold for *Acropora palmata*, with corals flourishing predominantly along the reef wall. These colonies exhibited an unusual encrusting growth form. Diseases, bleaching and other signs of recent coral mortality were rarely seen, although evidence of past impacts were widespread. While some species were slowly recovering, a shift in the dominant types of corals appeared to be underway, with decreases in long-lived massive species and increases in smaller, short-lived corals, especially mustard hill coral (*Porites astreoides*) and lettuce coral (*Agaricia*). There was evidence of continued heavy fishing pressure, as large predators were uncommon, while smaller plankton, invertebrate and algae eating fishes were more common.

Colombia Overview

In the southwestern Caribbean, far offshore lies the San Andres Archipelago, a series of remote islands, submerged banks, atolls and coral reefs surrounded by trenches and canyons up to 4,500 meters (m) deep. The northern end of the archipelago includes three banks, Serranilla, Alice, and Nuevo. They were assessed during our third 2012 research mission. These areas were selected because of their importance to the region. Parts of these banks are under joint management between Colombia and Jamaica, Colombia and Honduras, and they also share borders and resources with Nicaragua and Honduras, making them extremely vulnerable to human impacts. Yet, they represent the most isolated and distant reef structures in the Caribbean. They are on the same platform (Nicaragua Rise) as Pedro Bank and share similarities in structure while lacking many of the human impacts affecting Pedro Bank. Most importantly, the strategic location and connectivity patterns between insular and continental environments of the region suggest they have the potential to provide larvae to Central America, Pedro Bank and other reefs within the San Andres Archipelago, helping these areas recover from past impacts and better withstand future human impacts.

Our research focused on habitat mapping and coral reef assessments which included 1) evaluating the current status of these ecosystems and obtaining information

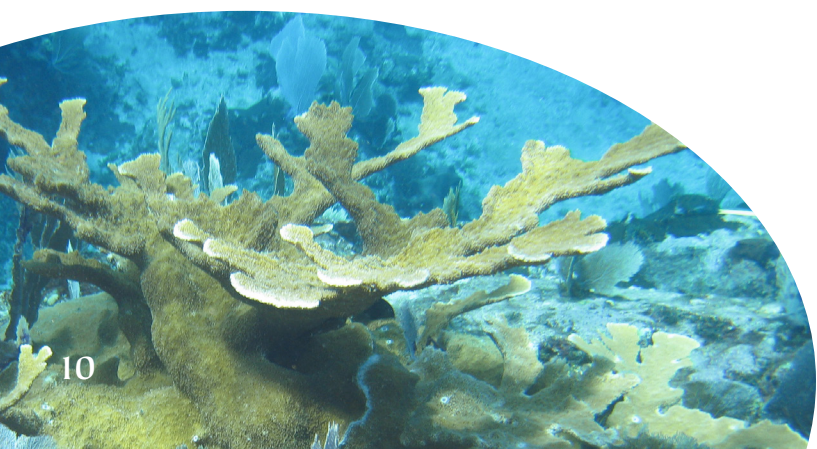
on the distribution and size of reefs 2) associating habitats and the health of corals, fishes and commercially important conch and lobster within these habitats, and 3) collecting information necessary to map the habitats and the bathymetry, providing tools that can assist in the design of marine protected areas and possibly in their proposed designation as World Heritage Sites.

The three banks contained coral reef habitats, sand flats and hardground areas with seagrass beds identified only on Serranilla. Each bank differed dramatically in structure. While many of the common species of reef fish and invertebrates overlapped between the banks, there were unique species. In total, 200 species of reef fish and 38 species of stony corals were identified.

Alice, a completely submerged bank, lacked true coral reefs, mangroves and seagrass beds. Most of the bank is a hardground with low relief ridges and small patches of sand. Coral communities developed on ridges, hardground areas and adjacent to depressions and grooves. Corals were mostly healthy, with little recent or old mortality. Interestingly, many species that normally attach firmly to the bottom consisted of “rolling stones”—round colonies covered with living tissue that were free-living.

Serranilla had several small islands and a ridge at the seaward edge of the northeast side. The site lacked mangroves, but had several small grassbeds. The outer perimeter of the bank sloped gradually into deep water, lacking a prominent shelf edge built up of corals and a spur and groove reef system; corals colonized ridges in shallow water (2-8 m depth) that ran perpendicular to the exposed crest. Within the bank, approximately 5-10 km from the perimeter, were extensive small, well developed patch reefs, many with 30-40% live coral cover. These had several unique species of corals not seen on the other banks.

Nuevo was mostly submerged, with a deep channel separating the bank into two areas and a small sand cay at the edge of the channel. There was a well developed reef crest and extensive lagoonal reefs but no grassbeds or mangroves. Nuevo had the best developed coral areas, including a spur and groove reef system and prominent *Montastraea* reefs within the lagoon. The *Montastraea* reefs were remarkable, with high cover (30-70%) of large several-hundred year old mountainous star coral (3-5 m diameter) and lobate star coral colonies. Sadly, a particularly severe outbreak of coral disease affected several of these communities. We also found large patches of endangered staghorn coral (*A. cervicornis*) within the lagoon. Conch and lobster were rare in all locations. Poachers (boats from Nicaragua and Honduras) were seen fishing. There were still fairly abundant populations of larger groupers, barracuda, nurse sharks and other predators, including Goliath grouper.





Galapagos Overview

In June, the *Golden Shadow* headed through the Panama Canal to our first research destination in the Pacific, the Galapagos. The Galapagos is an island chain in the eastern Pacific consisting of 13 large and 6 small volcanic islands, some of which are still active and in the process of formation while others are older. In addition to hundreds of unique terrestrial species—giant tortoise, land iguanas, boobies, frigate birds, penguins, flamingos, pelicans, albatross, flightless cormorants, and Galapagos hawks, to name a few. Nutrient rich waters support charismatic marine mega fauna such as hammerhead sharks, whale sharks, reef sharks, Galapagos sharks, manta rays, spotted eagle rays, torpedo rays, sea lions, fur seals, turtles, marine iguanas, and dolphins.

The Galapagos provided the KSLOF and our partners from the University of Miami a unique field laboratory to explore the potential implications of climate change, in a natural setting. The Galapagos is at the convergence of major water currents—one carrying cold water from the south, one bringing warm water from the north, and a deep water undercurrent that flows east, bringing nutrient rich cold water to the surface. This causes dramatic variability in water temperatures, nutrients, and carbon dioxide (CO₂), which differ between the southern and northern islands. This is compounded by climate variability due to El Niño (ENSO), every 4-7 years or so, where the normal wind and current patterns breakdown, shutting down upwelling of cold water and increasing rainfall and seawater temperatures. Corals and coral reefs have adapted to these unusual current patterns, which have occurred for 1000's of years. Because of the low levels of compounding human impacts, the corals here offer a unique glimpse of possible scenarios associated with climate change that other coral reef environments may likely to experience in the future.

Our research started in the northern Wolf and Darwin Islands, where the only true coral reefs are found. These reef systems are built by large massive pore corals (*Porites lobata*) and are mixed with several other species, especially cauliflower coral (*Pocillopora*). Further south, corals do not build reefs, but occur as communities with colonies occurring in dense fields or patches. These communities are often made up of a single species, usually massive boulder corals (*Porites* or *Pavona*), but there were also areas dominated by branching cauliflower coral, free living fungiid corals, and free living *Psammocora*.

Our first goal was to evaluate how well these communities had recovered from past ENSO events—especially the 1983 and 1998 events. 1983 in particular was associated with widespread bleaching and mortality. Surprisingly, some of the corals that bleached severely in 1983 (cauliflower coral) did not bleach in 1998 suggesting they may have become adapted to higher temperatures. This was one angle we are exploring—one of our research fellows sampled these corals to determine what type of algae symbiont (zooxanthellae) lived in these corals, and if it was the same regardless of location.

Our second goal was to evaluate the potential impacts of ocean acidification. The acidity of the water varies substantially throughout the Galapagos, being lowest in areas with a lot of cold water upwelling. The upwelled water is very high in CO₂, which causes the pH to drop (water becomes more acidic) and it affects the amount of calcium available for corals. In highly acidic waters, corals have difficulty depositing their skeleton, hence they are much weaker. In every location we examined, we measure the acidity of the water (pH, alkalinity and CO₂ concentration) and we collect coral cores to evaluate how much they have grown over the last decade.

Our research included many other components, such as the reproductive patterns of corals, extent of diseases and predation, amount of erosion, and health of other invertebrates and fishes. Simultaneously, our groundtruthing team collected the data needed to create habitat maps of the shallow marine environments surrounding the eight islands we surveyed.



French Polynesia Overview

September marks the start of five research missions to French Polynesia, each a month long and continuing until May 2013. Working closely with Institut de Recherche pour le Développement (I.R.D.) and Centre de Recherche Insulaire et Observatoire de l'Environnement (CRIOBE), we selected a handful of representative atolls and islands throughout four archipelagos, Society, Tuamotu, Gambier and Austral Islands, covering an area the size of western Europe and extending over 15° latitude. These archipelagos experience vastly differing environmental conditions and varying scales of human impact. They include remote locations that have never been surveyed, as well as more famous and better known destinations like Tahiti and Moorea. Over the last two decades a number of the better known sites have been badly damaged, but little is known regarding how extensive the damage is, and how well the sites are recovering.

We selected reefs off both populated and unpopulated islands. Surveys were completed on fringing and barrier reefs adjacent to high volcanic islands, and lagoonal and fore reefs off low-lying atolls. Each of these had a different geologic structure and unique biological communities. The wide variation provided an ideal location to evaluate coral resilience, the health of key indicator organisms, and processes that affect recovery. Collectively, our research is helping to identify the healthiest and most valuable coral reefs in the region. We will also determine how

quickly these damaged reefs are rebounding, and begin to understand how they are likely to fare in the future. This information and the tools we develop can be used to help protect these reefs, and ensure they continue to support local communities and attract international visitors.

Our first mission focused on eight locations in the Society Islands. Four were remote low-lying atolls (Bellingshausen, Scilly, Mopelia and Tupai), but only one of these had easy access to the lagoon. Two were steep-sloping volcanic islands (Huahine and Raiatea-Tahaa) enclosed by a well developed barrier reef with lots of lagoonal patch reefs. We ended the mission with two small atolls (Maiao and Tetiaroa) closer to Tahiti. The coral community and fish diversity varied considerably in each location.

The three most remote atolls had flourishing coral communities on the fore reef, with live coral cover often approaching or exceeding 80% in shallow water. Yet, deeper areas had little coral, and often many of the colonies were stark white - recently dead. The size of most of the corals in shallow water was not what we expected. Corals that made up most of the living cover were small (10-30 cm). Based on the growth rates of the most common species (the branching corals), a large percentage of the colonies were young—perhaps 5-6 years up to about 10 years old—suggesting that these sites are frequently damaged.



From the water's surface, reefs around Tupai, Huahine and Tahaa-Raiatea looked to be nearly dead in many places. Few large corals remained, thickets of branching corals that made up much of the live coral cover in the other locations were absent; the bottom was covered in rubble (broken branches of dead coral) and dead coral skeletons in growth position. Upon closer examination, it was obvious that the reefs were not dead, but undergoing a rapid recovery. The bottom was carpeted in baby corals (sexual recruits) and juvenile corals (<1 cm - 4 cm in diameter) consisting of the same dominant species - branching cauliflower coral (*Pocillopora*) and branching, tabular and digitate staghorn corals (*Acropora*), massive pore coral (*Porites*), star corals (*Favia*), and plate-like and encrusting corals (*Montipora* and *Pavona*). Often, there were 20-30 new recruits per square meter, which is unusually high, especially when compared to the Caribbean. There were other positive signs as well - high amounts of encrusting calcareous red algae and very little fleshy macroalgae, lots of small herbivorous reef fishes, and few nuisance species. On these reefs we witnessed the effects of the voracious crown of thorns sea star (*Acanthaster*), physical damage from cyclones, or both. But we also witnessed unusually rapid rates of recovery.

Our second mission focused on five atolls in Tuamotu. This included the two largest atolls in French Polynesia (Rangiroa and Fakarava), and two smaller atolls that had no lagoonal access. Rangiroa and Fakarava are known for their channel dives - swift currents, unusually dense coral communities and huge numbers of fishes, especially sharks. In general, the fore reef communities we examined had much more coral, higher diversity and biomass of reef fish, and fewer signs of damage.

Much of our research focused on lagoonal patch reefs. There are thousands of small patch reefs that reach from depths as great as 55 m up to or near sea level (<1 m), especially in Fakarava. Some have an emergent island with coconut palms and sandy beaches, while others are completely submerged either 10-20 cm below the surface, several meters under the surface, or 10s of meters below the surface. Reefs that are 2-4 m below the surface have a community dominated by unusually large (10-20 m wide) pore coral colonies (*Porites*). If the reef reaches sea level, there is usually a rind of living coral colonies that occurs on the reef top's outer edge densely colonized by branching staghorn (*Acropora*) colonies, and the center resembles reef flats found on the atoll's outer rim. The reef slope is usually comprised of old, dead coral colonies covered in algae. These areas have very little coral growth, presumably because recruitment is inhibited by steep slopes and debris shed down the slope. The water is also much more turbid than outer reefs at the same depth due to the high productivity of the benthic communities and the poor flushing of the atoll. At the base of the slope, though, there are often large boulders with a diverse coral community and fleshy green seaweed, some resembling feathers and others more like strings of grapes (*Caulerpa*). One of the questions we hope to answer is how these reefs form.

In addition to habitat mapping and coral reef assessments, we conducted research on invertebrates targeted for food, such as sea cucumbers, large snails (Trochus and Turbo snails) and giant clams. We also looked in detail at two aspects related to climate change—the effects of temperature on corals and their algal symbionts, and the effect of carbon dioxide on ocean chemistry and coral growth. We will continue our studies in French Polynesia in 2013, with missions to the Gambier archipelago and Austral Islands.





Education and Outreach

2012 Education Highlights

Coral Reef Educators on the Water (CREW)

The CREW program offers high school formal and informal educators the opportunity to join the GRE. To date, two educators have participated in the CREW program. In March, Mike Trimble from Corona del Sol High School in Tucson, Arizona attended the Navassa mission. Candice Jwaszko of Paul Kane High School in St. Albert, Alberta, Canada joined the French Polynesia, Society Islands mission in October.

During these missions, CREW educators participated in 1) Skype calls with other schools; 2) lesson plan development; 3) compiling scientist responses to student Q&A's; and 4) observing the research being conducted by the scientific dive teams.

Education Workshops and Presentations

In 2012, over 300 people attended KSLOF education workshops or presentations. Throughout Washington, DC, over 240 youth have been reached through presentations on coral reefs and the GRE. Approximately 25 fishers gathered to hear the status of Pedro Bank fish populations in Port Antonia, Jamaica. Also, in Jamaica, a Conservation Planning Workshop was held for 5 Port Antonio high school students and 25 students from the College of Agriculture, Science, and Education (CASE).

School Visits to *M/Y Golden Shadow*

During the Jamaica and Society Island missions, local school groups visited the *M/Y Golden Shadow*. They were given a tour of the vessel and presented information about the GRE missions and coral reefs. While visiting Jamaica, over 30 students participated; 5 from Port Antonio High School and 25 from the College of Agriculture, Science, and Education (CASE). 50 students from the Fakarava Primary School (ages 6-10) in Society Islands visited the vessel.

Briefing to the French Polynesian House of Representatives

On 13 November, 2012, our Executive Director, Philip Renaud, had the honor of presenting a briefing about the mission of the GRE to the members of the House of Representatives in French Polynesia. The Honorable Mr. Georges Handerson, President of the Legislative Commission for the Environmental Protection of the Natural, Rural, and Urban Regions, presided over this briefing.

CAPT Renaud informed the members of the French Polynesia House of Representatives that the coral reefs of French Polynesia will be the most thoroughly surveyed and mapped region of any of the research sites along the Global Reef Expedition itinerary. Four of the five major archipelagoes of this South Pacific Ocean region will be comprehensively surveyed over an eight month period.

The members of the House of Representatives were extremely appreciative of this briefing, demonstrated concern and interest about their marine resources, and asked insightful questions pertaining to the sustainable management and conservation of their coral reefs.



Esri International User Conference

The Foundation's GIS Analyst, Amanda Williams, attended the 2012 Esri International User Conference July 23-27 in San Diego, California. This conference provided up to 16 hours of Esri software training, hundreds of user presentations that share best practices, and opportunities for GIS professionals to get specific technical questions answered by Esri staff. It also includes vendor and map displays submitted by GIS professionals and special interest group meetings that will connect me with GIS users from our region and industry. Over 15,000 professionals across industries and around the world attend the User Conference, representing nearly every commercial sector, government organization, and non-profit field. This abundance of user-to-user communication opportunities is essential for learning about real-life GIS experiences, best practices, and tips, which have aided the advancement of the Foundation's GIS capabilities.

The 12th International Coral Reef Symposium (ICRS)

The 12th International Coral Reef Symposium (ICRS) was co-hosted by the ARC Centre of Excellence for Coral Reef Studies and James Cook University from the 9-13 of July, 2012 in Cairns, Australia. This international conference is held once every four years and is an opportunity for leading coral reef researchers to gather and present cutting edge research in coral reef studies. The Foundation was both a sponsor and an exhibitor at the event. ICRS provided an excellent opportunity to network and showcase the innovative work of the Foundation. Presentations by KSLOF staff were well received and included a poster by Executive Director Phil Renaud on Red Sea Mapping entitled, "Applying marine habitat maps and biodiversity and resilience assessments to management." Chief Scientist Andrew Bruckner's oral presentation "Factors driving the loss of Montastraea-dominated communities on western Atlantic reefs" outlined key threats affecting important reef building coral in the Caribbean. Coral Reef Ecologist Brian Beck presented a talk entitled, "Characterizing disturbances and recovery of the Red Sea reefs from coral demographics." GIS analyst Amanda Williams gave a presentation entitled, "Utilizing GIS in coral reef conservation." Contacts made during the conference will help to facilitate the Foundation's research in the biodiversity "hot spot" that is the Coral Triangle. Overall, this conference provided an invaluable opportunity for the Living Oceans Foundation to stay on the leading edge of coral reef conservation.

Workshop with Carl Safina and the Stony Brook University Center for Communicating Science

In December, Dr. Carl Safina, author of *Song for the Blue Ocean*, co-chair of the Center for Communicating Science at Stony Brook University, and one of the nation's most esteemed environmental writers, led a science communication workshop for Foundation staff and guests. The workshop focused on effectively distilling our scientific message to the public, as well as adapting our message for a wider variety of audiences. As the Foundation continues to embark on the Global Reef Expedition, it was a successful refresher course to ensure we are communicating with our various audiences in the most effective manner.

Film Premiere and Reception, March 3, Bahamas

To celebrate the first year of the Global Reef Expedition and the completion of field research in the Bahamas, the Foundation hosted a film premiere and evening reception attended by HRH Prince Khaled bin Sultan as well as the Honorable Earl Deveaux, the Minister for the Environment for the Bahamas. A specially selected audience of several hundred collaborating scientists, educators, conservationists, and government officials was invited to attend the film premier at the Atlantis Hotel Bahamas. The evening began with several speeches, including one from HRH Prince Khaled bin Sultan, thanking the Bahamian government for hosting the Foundation's science team for the previous year. Following the speeches, the film 'Global Reef Expedition: Mission Bahamas' was shown. The film details the research that the Foundation has conducted in the Bahamas and features the work of one of our key partners there, The Bahamas National Trust. After the film screening, guests were invited to stay for an evening reception, and were given a copy of the film and scientific report to take and share with their community. This event strived to underline the Foundation's policy of working with local scientists and placing the resulting science back into the hands of local decision makers and the wider community.

VIP and Government Reception, March 20, Jamaica

Following two weeks of field research in Pedro Bank, Jamaica, the Foundation presented scientific findings to a select group of government representatives, conservationists, and local scientists. At the start of the presentation the Foundation welcomed guests on board the *M/Y Golden Shadow* for a VIP tour to get a close up look at the research equipment and the capabilities of the ship. This allowed guests to get a real understanding of what it takes to conduct underwater research and the kind of commitment required by the scientific team to carry out SCUBA surveys. The *M/Y Golden Shadow* was anchored close to Port Royal near Kingston and following

the tour the ship's crew ferried guests back to land for a scientific presentation. The audience of nearly 60 attendees included

the Honorable Robert Pickersgill, Minister for Land, Water and Climate Change. Dr. Andrew

Bruckner gave an overview of both the field research and some preliminary observations from Pedro Bank. The evening concluded with some light refreshments and music.



World Oceans Day, June 8, Galapagos Islands

The Foundation marked World Ocean's Day 2012 with a simultaneous live internet broadcast from both the Galapagos Islands in Ecuador and the Smithsonian Institution in Washington DC. One week prior to World Ocean's Day, we filmed the wildlife and scientific research that the Foundation's team was conducting around the Galapagos Islands. We then edited three short films that we sent electronically back to the Foundation's headquarters near Washington, DC. In Washington, we partnered with Coastal America and Mission Blue, to host a ship-to-shore conversation between Dr. Sylvia Earle in the Smithsonian Institution's National Museum of Natural History, and Philip Renaud and Dr. Andy Bruckner on the *M/Y Golden Shadow* in the Galapagos.



The live conversation revolved around current conditions for coral reefs around the world, and the Foundation's research in the Galapagos, including a showing of three pre-edited short films. It was then sent via YouTube around the world where approximately 70,000 people viewed it. The event received a lot of publicity and helped boost the Foundation's outreach efforts in an original and captivating manor.

BLUE Ocean Film Festival, September, California

The Foundation's film "Global Reef Expedition: Mission Bahamas" was selected as a finalist film in the BLUE Ocean Film Festival in Monterey, California. The festival is a week-long celebration of marine themed films and discussion panels that are shown to an audience that includes some of the world's foremost ocean advocates. In attendance at the 2012 festival were HSH Prince Albert of Monaco, and Dr. Sylvia Earle among many others. The Foundation was invited to present on a panel entitled "Communicating science to the public" and Alison Barrat presented a case study of the Foundation's live broadcast from the Galapagos Islands earlier in the year. During the presentation, she connected via Skype with Executive Director Phil Renaud, who was standing by on the bridge of the *M/Y Golden Shadow* in the Society Islands, French Polynesia. The idea of using readily available technology to achieve 'live science' was well received at the festival.

Fellows



Jeremy Kerr Ph.D.

Jeremy Kerr continued his involvement in the Global Reef Expedition (GRE) by participating in research cruises to Colombia, the Galapagos, and the Society and Tuamotu archipelagos in French Polynesia. He worked with DigitalGlobe prior to each mission to acquire fine resolution WorldView-2 and Quickbird satellite imagery to support mission planning and to facilitate real-time navigation in the field.

During research cruises aboard the *M/Y Golden Shadow*, Jeremy gathered ground-truth data for the creation of benthic habitat and bathymetric maps from satellite images. He also worked to improve the speed and accuracy of image pre-processing, benthic habitat classification, and optically-deriving bathymetry. Jeremy supported upcoming GRE cruises in 2013 by producing areas of interest for future mapping based on the goals of the Foundation and Host nation and delivering the necessary files to DigitalGlobe. He also furthered development on a model for carbonate landscape evolution that integrates the ecological, geological, and oceanographic field data gathered during the Foundation's cruises with the subsequently created geospatial products to understand how these landscapes came to exist in their present state, where they will head in the future, and how this informs marine conservation.

“This year of the Global Reef Expedition has been incredibly exciting as M/Y Golden Shadow moved from the Caribbean Sea to the Pacific Ocean. The opportunity to visit reef systems across these basins is unparalleled and has been more educational than I previously imagined.”

—Jeremy Kerr Ph.D.



Sonia Bejarano Ph.D.

In 2012, Dr. Sonia Bejarano completed her post-doctoral fellowship with the Global Reef Expedition at Khaled bin Sultan Living Oceans Foundation. During the past 3 years, Sonia was in charge of evaluating herbivorous fish communities and the process of herbivory aboard the *Golden Shadow*. To study these, Sonia measured the abundance of all herbivorous species using visual censuses, which included more than 300 hours of high-definition footage, across 7 contrasting geographic locations—Cay Sal and The Inaguas in The Bahamas, Serranilla, Nuevo and Alice Shoals in Colombia, and the Archipelago of the Society Islands and Rangiroa in French Polynesia. Although video analysis is lengthy and laborious, it provided fascinating insights into the grazing behaviour of herbivorous fish species in the absence of divers. Sonia expects to complete these analyses, and then combine grazing intensity and herbivore abundance data to deliver a clear picture of the resilience of the surveyed reefs. Sonia hopes that her results become a practical tool to improve reef management and the reefs' chances to persist into the

future. In collaboration with the University of Queensland, where Sonia was based, and the Khaled bin Sultan Living Oceans Foundation, Sonia published her work on the ecological risks of exploiting herbivores in Micronesia in two peer-reviewed journals.

“I feel very fortunate and grateful for being granted the opportunity to be on board such a wonderful research platform, the Golden Shadow. I am looking forward to keep tracking the Global Reef Expedition as it covers more miles across the World’s reefs. It is inspiring to see that on board meaningful reef conservation goals are being pursued and widely communicated to the public.”

—Sonia Bejarano Ph.D.



João Monteiro

João Monteiro graduated from the University of the Azores in 2004, after which he worked for a couple of years, as a marine biologist, in different positions and projects in the Azores and Madeira. In 2007, he started his Ph.D. on coral community characterization and on the diversity of corals and dinoflagellate symbiont partners present in the Cape Verde archipelago. His research has a special focus on the ecological and phylogeographic implications of such host/symbiont relations. In 2009, he was stationed for nine months in Cape Verde conducting fieldwork and participating in several other scientific missions and projects. He was a visiting scholar to Pennsylvania State University in 2008 and 2010 where he conducted genetic analysis and research on *Symbiodinium* spp. diversity associated with corals from Cape Verde. In 2011, he was the team coordinator for a special program to control the proliferation of *Caulerpa webbiana* in the Azores.

João is an avid scuba diver, underwater videographer and scuba instructor. His images and video footage have been included in books, documentaries and other broadcasts. His varied experience has enabled him to assist in academic courses, dive training programs and planning of field operations.

In 2012 he was part of the science team on board the *M/Y Golden Shadow* for the Galapagos, Society Islands, Tuamotu Islands and Gambier Islands missions. His research focuses on the diversity of symbiont algae associating with *Pocillopora* corals and on their overall photosynthetic efficiency.

“I am not just honored with this fellowship award... I have to admit that it also feels like a dream come true—to join this team on board an amazing vessel and to work and dive in some of the most remote reef sites! But most of all, I am thrilled with this exceptional opportunity - the opportunity to produce relevant science across a broad geographic scale and exchange knowledge and experience with researchers from across the globe. Science Without Borders® indeed!”

—João Monteiro



Badi R. Samaniego

Badi R. Samaniego's passion for the ocean started when he joined the Marine Turtle Conservation Project in the Philippines in 1996. Since then, he has participated as a reef fish specialist in various research projects, some of which has helped identify and establish marine protected areas throughout the Philippines, as well as assess the long term impacts of local reef protection and conservation programs. He worked on juvenile reef fish and habitat associations during his graduate studies in 2003, and started his Ph.D. program with the School of Environmental Science and Management at the University of the Philippines, Los Baños in 2009. He intends to look into fish communities responses to varying levels of fishing pressure and physical gradients, and the roles that marine protected areas might play in enhancing the resilience of fish communities to such drivers. He shares a child-like fascination for coral reefs and always looks forward to getting in the water. He has three lovely children with his amazing wife and spends as much time as possible with them when he's not away counting fish.

"I am very pleased to be a part of the Global Reef Expedition team of the Living Oceans Foundation. This is a great opportunity to do work alongside highly driven researchers. It is an opportunity for me to share what I can, and will surely be a venue for my continuing education on coral reef research and conservation."

—Badi R. Samaniego

Staff Biographies



Executive Director—Captain Philip G. Renaud, USN (Ret.)

Captain Renaud's career in oceanography began at the Naval Academy where he earned a Bachelor of Science degree in Oceanography and his commission as a Naval Officer in 1979. His distinguished 25-year naval career took him to all corners of the earth. CAPT Renaud was the battle group oceanographer and Officer of the Deck aboard the nuclear powered aircraft carrier, *USS Theodore Roosevelt*, during Operation Desert Storm. He also served as the lead oceanographer for the Commander, Second Fleet, aboard the Flag Ship *USS Mount Whitney* and his naval career culminated as the Commanding Officer of the Naval Oceanographic Office where he directed over 1000 oceanographers, a fleet of seven oceanographic survey ships, and the Department of Defense's largest scientific super-computer center. Captain Renaud has earned graduate degrees in Oceanography, Meteorology, Strategic Studies, and an MBA in Technology Management. Since retiring from the U.S. Navy in May 2004, Phil Renaud has been the Executive Director of the Foundation, and has designed and led major research expeditions in the Indian Ocean, Red Sea, and Caribbean Sea. As an accomplished scuba diver, he is the Foundation's Diving Safety Officer and PADI Open Water Scuba Instructor. CAPT Renaud is now focused on leading the Foundation's most ambitious program, the Global Reef Expedition; a six-year circumnavigation of the globe aboard the *M/Y Golden Shadow* to survey remote coral reef ecosystems for advancement of conservation initiatives.





Chief Scientist—Andrew W. Bruckner Ph.D.

Dr. Andrew Bruckner is the Foundation's Chief Scientist. He received his M.S. in Marine Biology from Northeastern University, Boston, MA in 1988, and his Ph.D. from the University of Puerto Rico in 1999. Prior to joining the Foundation, Andrew worked for the NOAA Coral Reef Conservation Program as a Coral Ecologist. He holds a PADI Divemaster certification and was NOAA's co-lead for the Coral Disease and Health Consortium. Andrew has numerous peer-reviewed publications, and has been the recipient of several grants and awards. He has worked closely with resource managers and government agencies in the U.S. and internationally in developing conservation, management and restoration actions for coral reefs through legislation, international (CITES) regulations, development of sustainable management guidelines, and on-the-ground monitoring, research and restoration activities. Dr. Bruckner received a bronze medal from the National Oceanic Atmospheric Administration (NOAA) for his work on elkhorn coral (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*) that contributed to the listing of these species on the U.S. Endangered Species Act. He serves as a Councilor of the International Society for Reef Studies, and is a Science Advisor to SECORE, a consortium of over 50 public aquaria and zoos in the U.S. and Europe.



Director of Communications—Alison Barrat

Alison Barrat is the Director of Communications for the Foundation's Global Reef Expedition. She oversees press, film and internet coverage of the Foundation's activities, and develops films and television series for U.S. and international broadcast. Alison completed her B.S. honors degree in Zoology at Glasgow University in 1994, and a Master's degree in Film and Documentary Production at Sheffield Hallam University, England in 1998. During her career in natural history film production, Alison created films for clients including the Discovery Channel, Animal Planet, and National Geographic Television. Alison taught as an adjunct professor at the University of Idaho's school of Journalism and Mass Media, and worked as the Festival Coordinator for Montana's International Wildlife Film Festival. She has served on the Board of Directors of Wild Talk Africa and currently advises the University of Colorado, Denver on its creation of a Master of Fine Arts degree in Film Program. From 2005-2010, Alison worked for National Geographic Society to develop and produce many hours of Natural History Programs. In 2011, Alison created Discovery Communications first iPad app, which explores the natural history of sharks.



Coral Reef Ecologist—Brian Beck Ph.D.

Dr. Brian Beck is the Coral Reef Ecologist for the Foundation, working to support the research and analysis during the Global Reef Expedition. Brian received his B.S. in Geology from the University of Nebraska at Lincoln in 2002. His M.S. in Geoscience from the University of Iowa (2005) focused on coral paleontology and examined changes in coral skeleton morphology over long periods of time in the Dominican Republic. He received his Ph.D. in marine studies from the University of Queensland in 2011. His dissertation focused on the ecology of reef communities in the South Pacific, specifically looking at the impacts of cyclone frequency, changes over time, and reef accretion. A majority of Brian's field work was in the Solomon Islands directly following the tsunami in April 2007, which allowed for unprecedented cataloguing of modern reefs which were uplifted 3m out of the water due to the earthquake. Brian has over 8 years of experience teaching lab and field-based science at the university level in both the U.S. and Australia. He most recently taught undergraduate courses in field marine ecology and methods. Brian has also focused on communicating his work in marine ecology to broader audiences whenever possible, giving public talks at museums, schools and for radio shows in Australia.



Marine Science Geographic Information System (GIS) Analyst—Amanda Williams

Amanda earned her M.S. in Marine Science with a concentration in Marine Policy at the University of North Carolina, Wilmington and a B.S. in Geographical Sciences at James Madison University, VA. Amanda conducted her Master's research at Boracay Island, Philippines, investigating land use change with satellite imagery and she mapped the geographic distribution of coral reefs utilizing SCUBA diving, GPS and video transect collection from 2006-2008. She also taught GIS and Geography Laboratory courses. Her work at the Foundation entails synthesizing extensive coral reef data sets and developing GIS tools that will facilitate coral reef management and conservation, assisting with outreach activities library, and conducting benthic point-intercept surveys during expeditions. Amanda is also a PADI Divemaster.



Education Coordinator—Eddie Gonzalez

Eddie Gonzalez is Director of Education for the Khaled bin Sultan Living Oceans Foundation. Under the Foundation's theme of Science Without Borders®, Eddie develops program opportunities to engage educators, students, and the general public in the work of the Foundation. His work helps promote the value of preserving, protecting, and restoring the world's oceans and aquatic resources.

Eddie holds a Bachelor of Science Degree in Geology and Biology from Brown University and is currently working on a Master's Degree in Nonprofit Management from Regis University. He strongly believes that activities like scuba diving can be a great way of engaging youth in the marine environment—especially youth with limited access to the water. His personal vision is to expose as many students and teachers as possible to the wonder and value of the underwater world.

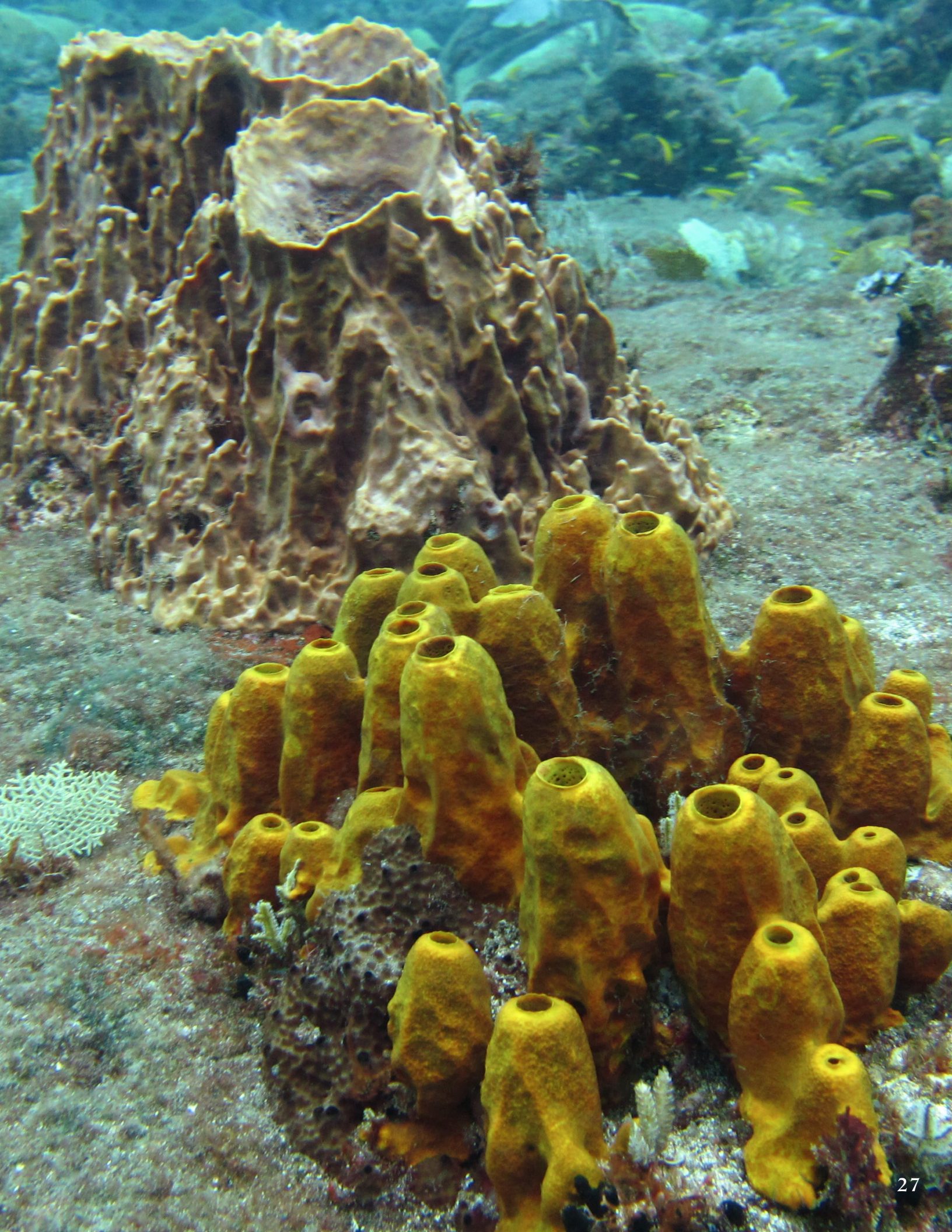
Eddie's background covers science and conservation education, non-profit management, agency partnerships, and program development and implementation. He recently finished a five-year term on the Board of Directors for the North American Association for Environmental Education (NAAEE) and is currently on the Board of Directors of the Association of Partners for Public Lands (APPL). He also teaches introductory scuba classes at a local dive shop for anyone interested in trying out the sport. When not diving or working on marine education, he likes to camp, hike, kayak, and mountain bike near his home in Potomac, Maryland where he lives with his wife, Betsy, and daughter, Ruby.



Office Manager—Patricia Allen

Patricia Allen is the Office Manager and Bookkeeper for the Foundation. Patty has over 17 years of Human Resources experience. During that time, Patty served as Employee Policy Coordinator and Human Resource Director for several companies. She specializes in employment law, employee policy, compensation and performance management design and administration. She loves working with small businesses to assist them in their growth by providing a solid foundation through company policy and procedure. Patty holds an Associate's Degree and Professional Human Resource

National Certification. Having lived near the water for most of her life, Patty has always supported efforts for the conservation of our oceans. Working for the Foundation gives her the chance to take these efforts a step further and to help educate people about challenges facing our oceans today.



Board of Directors



Chairman and President

His Royal Highness, Prince Khaled bin Sultan

Deputy Minister of Defense and Inspector-General for Military Affairs and Full General, Kingdom of Saudi Arabia. Educated at The Royal Military Academy, Sandhurst, UK, United States Army Air Defense Artillery School, Fort Bliss, TX, and U.S. Army Command and General Staff College, Fort Leavenworth, Kansas. Distinguished Graduate of Air War College, Maxwell Air Force Base, AL. Co-authored with Patrick Seale, the riveting account of the Gulf War, *Desert Warrior*.



Vice Chairman

General Charles A. Horner, USAF (Ret.)

Former Commander-In-Chief North American Aerospace Defense Command and U.S. Space Command, Commander, 9th Air Force and Commander, U.S. Central Command Air Forces. Commanded U.S. and allied air operations for Operation Desert Shield and Desert Storm in Saudi Arabia (1990-1991). Co-authored with Tom Clancy, the best selling non-fiction novel, *Every Man a Tiger*.

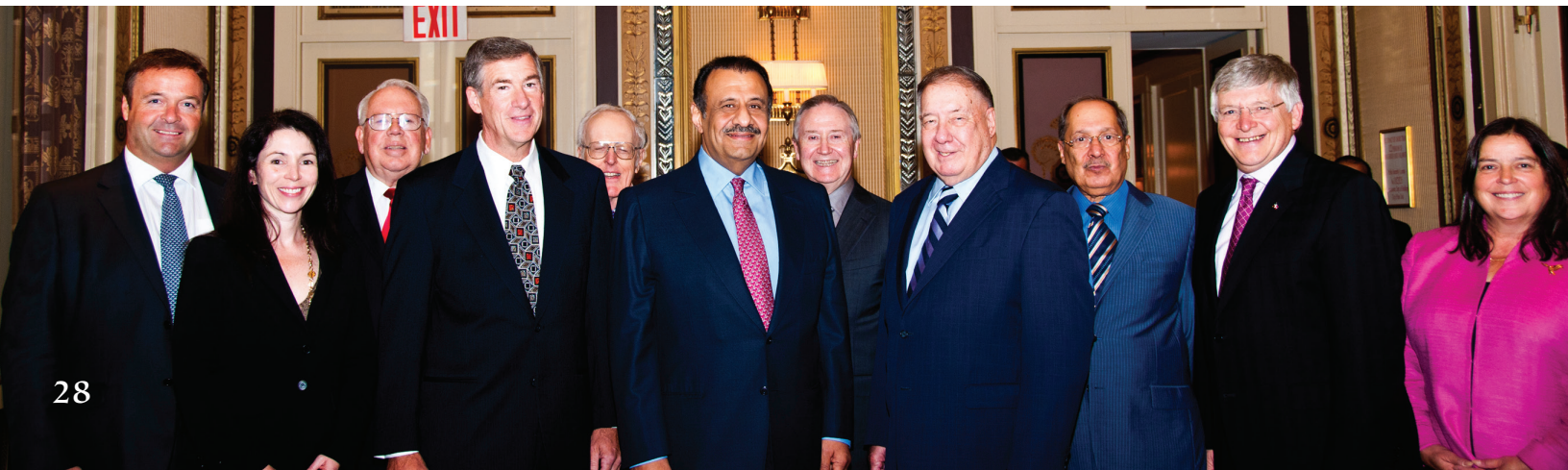


Executive Director

Captain Philip G. Renaud, USN (Ret.)

Former Commanding Officer, Naval Oceanographic Office. Former Board Member of the Blue Frontier Campaign. Former Member of the Marine Protected Areas Federal Advisory Committee.

Photos Courtesy of Jan Baldwin.



Board of Directors (cont.)



Chief Financial Officer

Ian D. Fair

Chairman, The Grand Bahama Port Authority.
Chairman, Bahamas First Holdings Limited.
Chairman Butterfield Bank (Bahamas).



Lead Scientist

Mohamed Faisal, D.V.M., Ph.D.

Professor of Aquatic Animal Medicine, Michigan State University. Former Executive Director of Khaled bin Sultan Living Oceans Foundation.



Secretary

Shawn M. McLaughlin, Ph.D.

Microbiologist and Curator, International Registry of Coral Pathology, National Oceanic & Atmospheric Administration (NOAA).



Director

Professor/Dr. Abdulaziz Abuzinada

Former Secretary General of the Saudi Arabian National Commission for Wildlife Conservation and Development (NCWCD).

Advisors



Douglas Baldwin

Staff Member, His Royal Highness, Prince Khaled bin Sultan, in Riyadh, Saudi Arabia.



Ron Gibbs

Legal Counsel to His Royal Highness. Yachtmaster and Master Scuba Diver.



William E. Beamer

Attorney, Beamer, Lauth, Steinley & Bond, LLP, San Diego, CA.



John Ind, MD

London Physician and Medical Advisor to the Foundation.

Scientific Advisory Council

The work of the Scientific Advisory Council includes project portfolio review, adjudication of grant proposals, and strategic planning for the Foundation. Fellowship applications are reviewed and members participate significantly in the selection process.



Sylvia A. Earle, Ph.D.

Explorer-in-Residence for “National Geographic.” Oceanographer, marine botanist, ecologist, explorer, author, lecturer in more than 60 countries. Scientific Consultant. Participant in numerous television programs concerning ocean research and exploration. Leader of more than 60 research expeditions. Scuba and submersible experience.



John W. McManus, Ph.D.

Professor in Marine Biology and Fisheries at the University of Miami, and Director, National Center for Caribbean Coral Reef Research (NCORE), Rosenstiel School of Marine and Atmospheric Science (University of Miami), Ecosystem Management and Modeling Expert.



Peter J. Mumby, Ph.D.

Professor at the University of Queensland School of Biological Sciences, Brisbane, Australia. Remote Sensing Expert. In 2010, awarded a Pew Fellowship in marine conservation.



Bernhard Riegl, Ph.D.

Associate Professor, Coral Reef Institute, Oceanographic Center, Nova Southeastern University, Dania, FL. Associate Director of the National Coral Reef Institute.



Thomas Spencer, Ph.D.

University Senior Lecturer, University of Cambridge and Director, Cambridge Coastal Research Unit, Department of Geography, University of Cambridge, UK.

Mohamed Faisal, D.V.M., Ph.D.

Professor of Aquatic Animal Medicine in the Department of Pathobiology and Diagnostic Investigation in the College of Veterinary Medicine at Michigan State University. Primary research focus is on pathogenesis of diseases of aquatic animals.

Andrew Bruckner, Ph.D.

Chief Scientist for the Living Oceans Foundation. Conducted research to understand the impacts of natural and anthropogenic disturbance on coral reefs and patterns of recovery following major disturbance events.

Abdulaziz Abuzinada, Ph.D.

Board member of the Living Oceans Foundation, Former Secretary General, National Commission for Wildlife Conservation and Development. Head of the Board of Directors of the Training Centre for Conservation of Natural Resources in Saudi Arabia.

Shawn McLaughlin, Ph.D.

Secretary, Living Oceans Foundation. Curator International Registry of Coral Pathology. Leader of the benthic component of NOAA’s Cooperative Oxford Laboratory’s integrated biotic ecosystem assessment in Chesapeake Bay.



Sam Purkis, Ph.D.

Professor, Oceanographic Center, National Coral Reef Institute, NOVA Southeastern University. Research is focused on status and monitoring of seabed habitat in the Red Sea and Arabian Gulf.



2012 Publications

- 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. (2012) Factors contributing to the regional decline of *Montastraea annularis* (complex). Proceedings of the 12th International Coral Reef Symposium. 5 pp.
- Bruckner A. (2012) Mapping, characterizing and assessing the composition, health and resilience of Galapagos coral reefs. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 47 pp.
- Bruckner A. (2012) Global Reef Expedition: San Andres Archipelago, Colombia. Khaled bin Sultan Living Oceans Foundation. Landover, Maryland. 53 pp.
- Bruckner, A. (2012) 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: Pedro Bank, Jamaica. Field Report. March 10-20, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. 28 pp.
- 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) Applying habitat maps and biodiversity assessments to coral reef management. Proceedings of the 12th International Coral Reef Symposium. 17A Science to support the coral triangle initiative. 5 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.
- Ferrari R, Gonzalez-Rivero M, Ortiz J and P Mumby. (2012) Interaction of herbivory and seasonality on the dynamics of Caribbean macroalgae. *Coral Reefs*. 31(3): 683-692.
- Gentrup G. (2012) Sunken Plane Sheds Light on Coral Reef Development. In *Dive Training*. 22:2, pp 12-14.
- Hamylton S. (2012) A comparison of spatially explicit and classic regression modelling of live coral cover using hyperspectral remote-sensing data in the Al Wajh lagoon, Red Sea. *International Journal of Geographical Information Science*. 26(11): 2161-2175.

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.7(5):e38396

Riegl B, Bruckner A and K Samimi-Namin. (2012) Diseases, Harmful Algae Blooms (HABs) and Their Effects on Gulf Coral Populations and Communities. In Riegl B and S Purkis (eds.) Coral Reefs of the Gulf: Adaptation to Climatic Extremes. Coral Reefs of the World. Pp. 107-125.

Rowlands G, Purkis S, Riegl B, Metsamaa L, Bruckner A, and P Renaud. (2012) Satellite imaging coral reef resilience at regional scale. A case-study from Saudi Arabia. Marine Pollution Bulletin 64(6), 1222–1237.

2012 Film Production

As part of the Education and outreach program, the Khaled bin Sultan Living Oceans Foundation has made several films during 2012. These are:

‘Global Reef Expedition: Mission Bahamas’—This film shows how researchers from the Bahamas National Trust joined up with the Foundation’s science team to conduct reef surveys around the Bahamas.

‘Conducting Coral Reef Surveys’—A ‘how to’ film that conveys the techniques scientists use underwater to collect data on the reefs.

‘Jamaica Education Workshop’—A short film that shows the Foundation’s education team in action as they conduct an educational workshop with students from Jamaica.

Galapagos: Living Oceans, Parts 1,2, and 3—Three short films that highlight the spectacular creatures of the Galapagos islands, and how they might cope with changing ocean chemistry and temperature in the future.

‘Countdown Galapagos’—This film, with Dr. Sylvia Earle, takes a behind the scenes look at conducting a live broadcast from one of the planet’s most remote locations.

‘Jamaica Reef Rescue’—This award winning film tells the story of how fishermen and conservationists work together to rescue a precious marine resource in Jamaica.

Statement of Financial Position

December 31, 2012

ASSETS

Cash and cash equivalents	\$ 1,821,379
Prepaid expenses	21,894
Total current assets	\$ 1,843,273
Furniture and equipment, net	220,855
Other assets:	
Investment restricted for endowment fund	1,477,424
Deposits	4,589
Total other assets	\$ 1,482,013
Total assets	\$ 3,546,141

LIABILITIES AND NET ASSETS

Current liabilities:

Accounts payable and accrued expenses	\$ 69,692
Grants payable	140,000
Total liabilities	\$ 209,692

Net Assets:

Unrestricted:	
Undesignated	985,289
Board designated - operational contingency reserves	873,736
Total unrestricted assets	\$ 1,859,025
Temporarily restricted	—
Permanently restricted	1,477,424
Total net assets	\$ 3,336,449
Total liabilities and net assets	\$ 3,546,141

Statement of Activities

Year ended December 31, 2012

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
REVENUE AND SUPPORT				
Contributions	\$1,028,817	\$ -	\$ -	\$1,028,817
Donated services and goods	1,471,804	-	-	1,471,804
Investment income, net	-	-	149,874	149,874
Net assets released from restrictions				
Satisfaction of restrictions	1,000,000	(1,000,000)	-	-
Total revenue, gains and other support	3,500,621	(1,000,000)	149,874	2,650,495
EXPENSES AND LOSSES				
Program services	3,337,666	-	-	3,337,666
Total program services	3,337,666	-	-	3,337,666
Supporting services:				
Management and general	899,456	-	-	899,456
Fundraising	-	-	-	-
Total supporting services	899,456	-	-	899,456
Total expenses and losses	4,237,122	-	-	4,237,122
Changes in net assets	(736,501)	(1,000,000)	149,874	(1,586,627)
Reclassification of net assets (Note 11)	(221,897)	-	221,897	-
Net assets, beginning of year	2,817,423	1,000,000	1,105,653	4,923,076
Net assets, end of year	\$1,859,025	-	\$1,477,424	3,336,449

