

Khaled Bin Sultan

Living Oceans Foundation



GLOBAL REEF EXPEDITION



2011 Annual Report

Message From the Executive Director

Our ambitious and highly anticipated Global Reef Expedition (GRE) began this year, marking 2011 as a milestone year for the Khaled bin Sultan Living Oceans Foundation. Planning for this complex project began in 2007 and GRE research operations are anticipated to continue through 2016; defining a new decade of advancements in surveying, mapping and conserving global coral reefs. The scale and scope of the coral reef crisis unfolding before our eyes demands bold and decisive actions and the Living Oceans Foundation is rising to that challenge.

The GRE began with multiple research projects in the Caribbean Sea. The choice for beginning our program in the Caribbean was compelling given that it's most efficient to circumnavigate the globe east to west and the Foundation had pre-existing relationships and research history with Caribbean countries. In consultation with the Bahamian Government, it was determined that three remote locations had the highest priority for our survey and mapping capabilities: 1) Cay Sal Bank, 2) Great and Little Inaguas, and 3) Andros Island. Each of these sites had unique attributes and remarkable marine resources deserving of more active management and conservation initiatives. Our comprehensive mapping and coral reef surveys will arm the Bahamian Government with the scientific knowledge so essential to advance resource management.

The GRE also conducted research in the waters of The Federation of St Kitts and Nevis, located in the Leeward Islands of the West Indies. This project was in collaboration with The Nature Conservancy (TNC) due to their active involvement with St Kitts and Nevis marine resource management. The extensive surveys we conducted there will be invaluable to the establishment of coastal zone management policies.

2011 was an exciting year for the Khaled bin Sultan Living Oceans Foundation and the GRE is off to a grand start.



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 will build 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 will receive critical scientific information and tools that can assist in management and conservation of their precious resources. Additionally, local scientists will work side-by-side with internationally acclaimed coral reef scientists. Emphasis will be placed on training local scientists and resource managers to continue rigorous environmental monitoring long after the *Golden Shadow* departs the region. This international team of scientists will assemble aboard the *Golden Shadow* for the purpose of closing critical gaps in scientific knowledge. Following the field work in each region, the Foundation and its' partners will 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 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 main intention of this mark is to promote public awareness of the need to preserve, protect and restore the world's oceans and aquatic resources.



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 launched a multiyear (2011-2015) Global Reef Expedition program. HRH Prince Khaled bin Sultan has generously funded the research vessel and scientific operation for the Global Reef Expedition. This core funding will facilitate unique scientific access to remote coral reef ecosystems that have been relatively unaffected by human-induced stressors. Comprehensive reef resilience surveys of remote coral reefs will yield 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 and relatively pristine coral reefs with reefs that have been compromised by chronic human-induced stressors will enable the Foundation to identify high-priority management interventions. The anticipated principal 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 will provide knowledge of the critical ecosystem components that promote coral reef resilience and produce effective reef management tools/decision aids that will influence policy and resource management actions urgently needed to improve and sustain global coral reef health. International research scientists will employ standardized protocols to map, characterize, and evaluate coral reefs throughout the western Atlantic, Pacific, and Indian Oceans, and the Red Sea. Comparative assessments of coral reef biodiversity, oceanographic conditions, and human pressures 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.

Leveraging advanced satellite technologies, the Foundation will produce high-resolution habitat maps (complemented with underwater surveys) to document and analyze four major reef components: 1) primary biotic communities that make up the reef community, 2) ecological interactions that drive dynamics within and among these groups, 3) habitat and environmental influences that directly affect the function of healthy reefs, and 4) external drivers of change, including human-induced impacts and climate factors.

The GRE will target remote locations, making it possible to separate natural processes from the impact of human stressors, and determine the critical structural components and functional processes which maintain a healthy and fully functioning reef ecosystem. The GRE will also characterize the effects of physical and chemical variables (e.g., temperature, salinity, alkalinity, wave action, and sedimentation) and

differential responses to climate change. By characterizing resilience indicators across vast geographic scales, a better understanding of their importance in maintaining the structural integrity and health of reefs will be gained, and will be used to make predictions regarding the future health of coral reefs, including their capacity to adjust to climate change. The data will generate science-based tools and decision aids that can also be used to mitigate the threats to and/or 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 GRE is unprecedented and calls for an equally bold educational initiative. The Foundation's educational component of the GRE will make 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, internet curriculum, social networks, blogs, and real-time streaming video, learners around the globe will participate directly in the Expedition and experience its scientific activities through virtual reality. Educators and students will 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 will periodically join the research team to help deliver content to millions of virtual learners. Both on-board and underwater experiences will provide compelling educational access to the GRE's work and discoveries. Scientists' journals and real-time broadcasts will engage learners on a daily basis, motivating them to track the scientific processes, progress, and results, which will lead to understanding vital coral reef ecosystems.



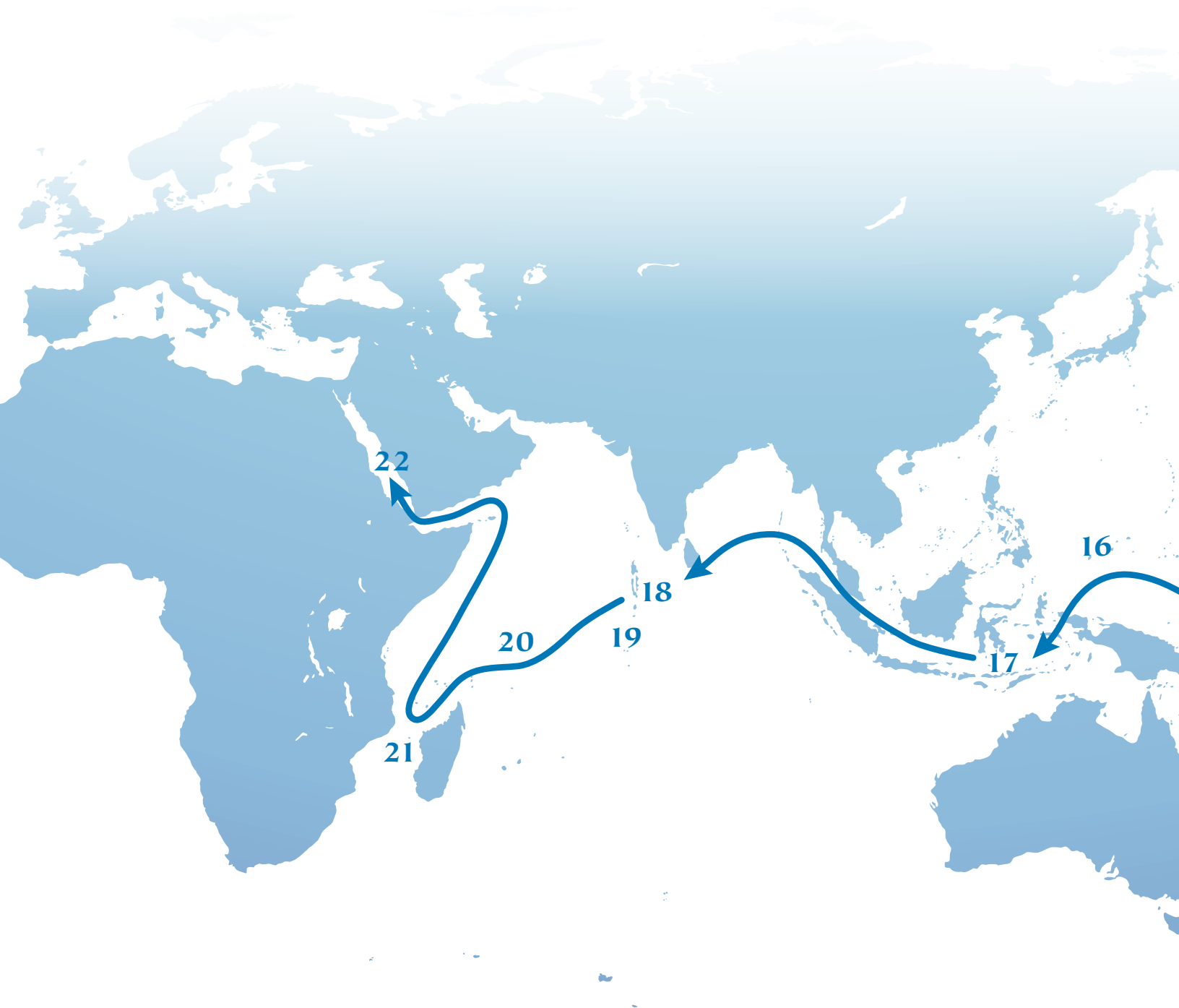
Global Reef Expedition

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 2013
- 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



Bahamas Research Overview

The Foundation completed three Global Reef Expedition research missions in the Bahamas during 2011: Cay Sal Bank (April 26 - May 18), Great Inagua, Little Inagua and Hogsty Reef (August 6-21) and Andros Island (October 1-6). Research was undertaken by scientists from the Foundation, the National Coral Reef Institute (NCRI), University of Queensland (UQ), University of Miami Rosenstiel School of Marine and Atmospheric Science (RSMAS), Atlantic and Gulf Rapid Reef Assessment Program (AGRRA), Florida Aquarium, Michigan State University (MSU), the Bahamas Department of Marine Resources (Fisheries), the Bahamas National Trust (BNT), the Nature Conservancy (TNC), and College of the Bahamas (COB). Professional videographers accompanied the science team on the Cay Sal and Inagua missions. The *M/Y Golden Shadow* was used as the research platform, the *M/Y Golden Osprey* was employed as the principal dive boat and various small vessels were deployed for groundtruthing and SCUBA assessments. The Cessna Caravan 208 floatplane (Golden Eye) was used for aerial surveys of the three regions.

The research included habitat mapping and characterization of coral reef community structure. Habitat mapping efforts included acquisition of WorldView-2 (WV2) multi-spectral satellite imagery (acquired from Digital-Globe, Inc.), aerial reconnaissance and photography, and detailed groundtruthing using a small catamaran.

Groundtruthing focused on continuous bathymetry measurements, drop camera videos, sediment sampling, and low frequency sonar to profile the seafloor's sub-bottom, all linked into a geographic positioning system (dGPS). Scuba assessments focused on 1) characterization of the benthos including substrate type and cover and biomass of benthic organisms; 2) coral community structure, population dynamics and health; 3) fish community structure; and 4) resilience indicators, with emphasis on herbivory and algal growth, coral recruitment patterns, prevalence of diseases and other stressors, patterns of coral reef recovery, and physical oceanographic parameters. A detailed research project on the effects of herbivory in controlling algal populations was undertaken during the first and second mission. Research to characterize coral diseases, with emphasis on dark spots disease, was conducted. Disease prevalence and impacts were quantified and tissue/skeleton samples of eight species of scleractinian corals were collected during the August and October missions. Additional physical parameters were measured, including salinity, temperature and current profiles. Legacy Site were established at Cay Sal Bank and Great Inagua. Legacy Sites are coral reefs noted to have exceptional characteristics of scientific interest to monitor changes over time, precisely located and marked on the four corners with stainless steel markers. Each Legacy Site (area of 100 square meters) was thoroughly photographed using a high-resolution



digital camera and all corals were comprehensively surveyed. Temperature loggers are attached to each legacy site for long term water temperature monitoring.

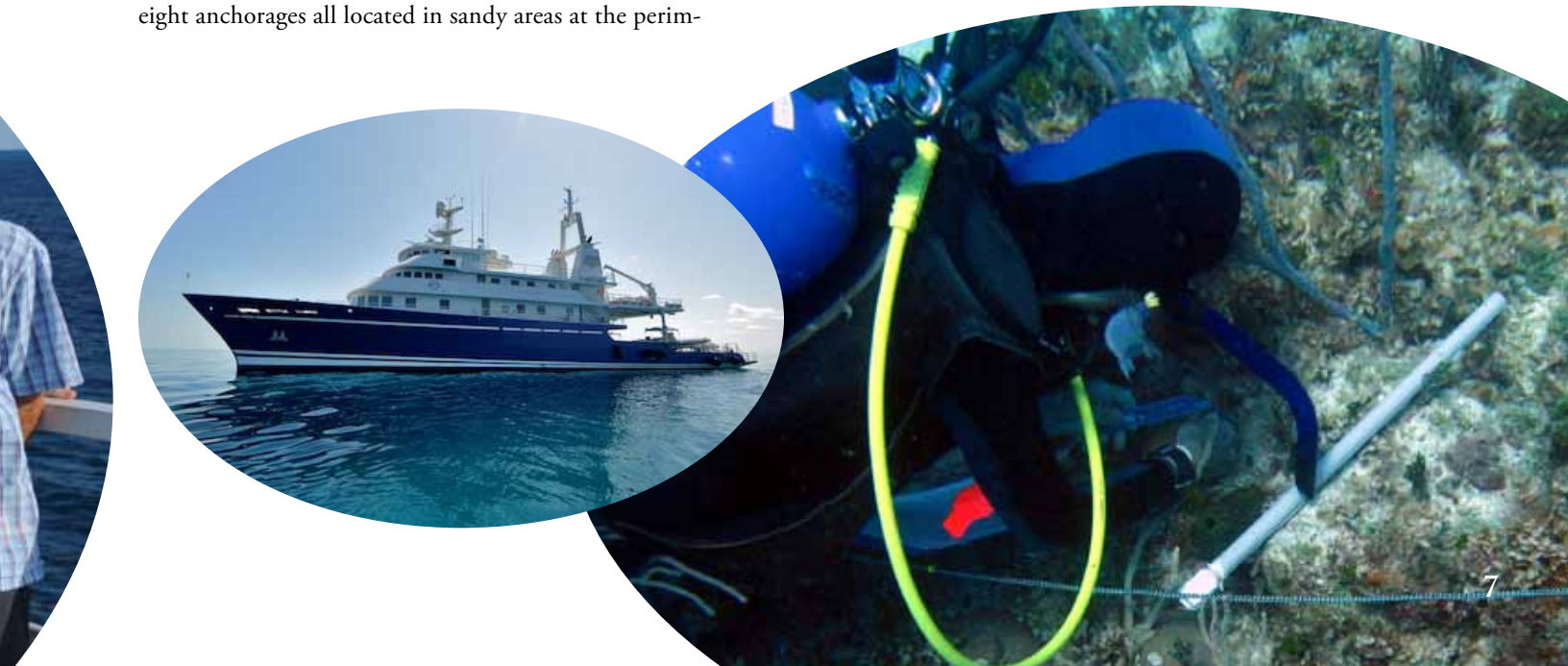
A total of 23,407 km² of WV2 satellite imagery was acquired for the five Bahamas research sites. Continuous bathymetry was recorded over a 572 km track and 1,157-drop camera videos were digitally recorded. The researchers completed 1,003 dives for a total of 842 hrs and 52 min bottom time, with surveys conducted to a maximum of 30 m depth. Products and information resulting from this mission include: 1) high resolution habitat maps depicting twelve marine habitats at a 6 m resolution and three-dimensional bathymetric maps for shallow (0-25 m depth) habitats; 2) sub-bottom profiles of the underlying substrate; 3) a detailed characterization of the coral reef community structure, including the biomass of reef fishes, population dynamics of coral, benthic attributes of reef habitats, threats and resilience indicators; 4) a better understanding of rates of algal growth and role of herbivorous fishes in regulating algal populations; and 5) characterization of a prevalent coral disease (dark spots disease). All of the imagery, maps and information are being compiled into a Geographic Information System (GIS) database. Additionally, a detailed Atlas of Bahamian Shallow Marine Habitats is under development.

Cay Sal Bank

An aerial assessment of Cay Sal Bank was undertaken on March 24, 2011. The purpose of this was to identify key areas for groundtruthing surveys and to obtain aerial photographs of the landmasses and shallow underwater features. Field research was conducted on Cay Sal Bank from April 26-May 18, 2011. The *Golden Shadow* used eight anchorages all located in sandy areas at the perim-

eter of the bank and small boats were deployed to conduct research. Great care was taken to avoid damaging seafloor habitats with the ship's anchor and chain. A total of 5,979 km² of WV2 satellite imagery was acquired for Cay Sal Bank. The groundtruthing team covered a total distance of over 1,100 km from depths of 0.50 m to 138 m to obtain detailed information on the characteristics of the shallow marine habitats. Sub-bottom profiles were collected along the northern, eastern, and southern drop-offs, over both sediment-filled and unfilled blue holes, and over the sand shoals in the north-central interior of the platform.

The research team examined the coral reef community composition in 39 locations for a total of 512 dives (392 hrs total dive time). In total, 31 locations were fore-reef sites and eight were lagoonal sites. The team examined the benthic composition and cover, coral population structure and condition, and fish composition, size structure and biomass. Benthic surveys included 318 transects; each 10 m transect contained 100 points. For coral surveys, a total of 153 transects were completed. These contained 4,586 corals. Coral recruits were assessed on 39 reefs, within 4,230 quadrats, each 0.25 m² in size. A total of 363 fish transects, each 30 m in length were completed. Transects had a mean density of 68 fish/100m² (fore-reef) and 83 fish/100m² (lagoonal sites) for the target list of 88 species. Additional fish transects (30 m x 4 m, n=8 per site) targeting 11 species of roving herbivores were completed at 22 sites.



Great Inagua, Little Inagua, and Hogsty Reef

An aerial assessment of this region was undertaken on June 30, 2011. Field research was conducted from August 6-21, 2011. The research team joined the *Golden Shadow* in Nassau, Bahamas on August 1, but the start of the research was delayed due to Tropical Storm Emily. The mission also ended two days early due to Hurricane Irene. The *Golden Shadow* used one anchorage at the western end of Hogsty, one at the western end of Little Inagua and two off Great Inagua.

Scuba assessments of coral reef habitats were conducted at Great Inagua (19 locations, 242 dives; total bottom time was approximately 218 hrs), Little Inagua (5 locations, 41 dives, total bottom time was approximately 34 hrs) and Hogsty reef (8 locations, 110 dives; total bottom time was approximately 96 hrs). Due to high seas, no dives were completed on the exposed northeastern and southeastern end of Great Inagua and Little Inagua.

In total, 30 locations were on the fore-reef, 1 was in the reef crest and 1 was a lagoonal site. The sites ranged in depth from 4.5-18.9 m. The team examined the benthic composition and cover, coral population structure and condition, and fish composition, size structure and biomass. Benthic surveys included 255 transects; each 10 m transect contained 100 points. A total of 39 benthic transects were completed on Little Inagua, 67 on Hogsty Reef and 149 on Great Inagua. For coral surveys a total of 98 transects were completed, 12 on Little Inagua, 27 on Hogsty Reef and 59 on Great Inagua. These con-

tained 3,179 corals. Coral recruits were assessed within 3,035 quadrats (each 0.25 m² in size). Coral recruitment and algal biomass was assessed in 530 quadrats on Little Inagua, 825 on Hogsty Reef and 1,680 on Great Inagua.

Andros Island

An aerial assessment of Andros Island was undertaken on September 1, 2011. Field research was conducted at the southern end of Andros Island and off Berry Island from October 1-5, 2011. The mission was terminated early on October 6th due to inclement weather. The *Golden Shadow* used two anchorages, one at the southern end of Andros and one off Berry Island. No suitable anchorages could be located further north, due to the narrow barrier reef, absence of sand-bottom communities on the seaward side of the reef crest and close proximity of deep water. Small boats were deployed to conduct research.

Scuba assessments of coral reef habitats were conducted off the southern end of Andros (n=7 sites) and north of Andros near Berry Island (n=3 sites). A total of 98 dives were completed (total bottom time of approximately 111 hrs). The team examined the benthic composition and cover, coral population structure and condition, and fish composition, size structure and biomass. Benthic surveys included 92 point intercept transects; each 10 m transect contained 100 points. For coral surveys a total of 45 belt transects (10 m x 1 m) were completed. These contained 1,946 corals. Coral recruits were assessed within 460 quadrats, each 0.25 m² in size. A total of 95 fish transects, each 30 m x 2 m, were completed.





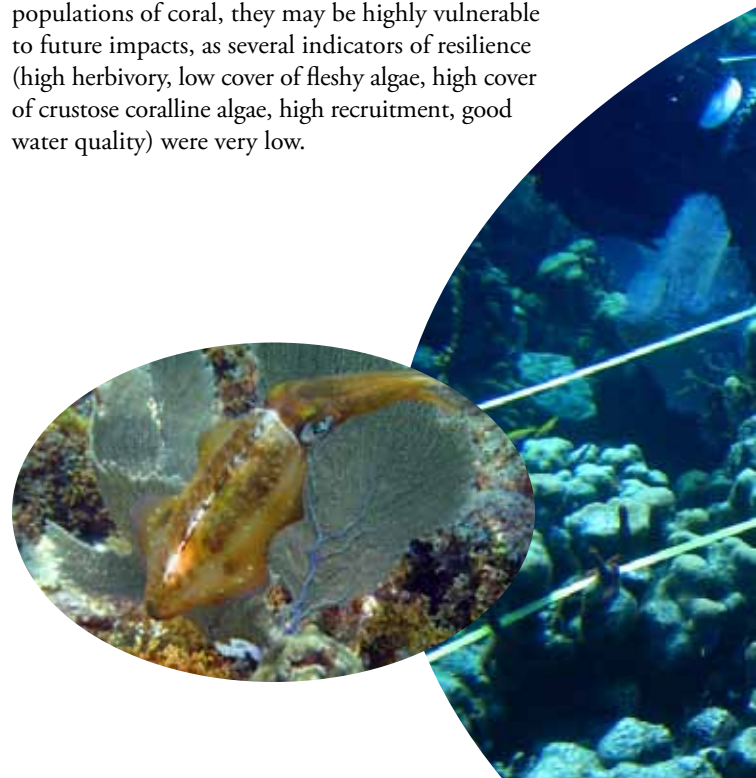
St. Kitts & Nevis Research Overview

From June 4-12, 2011 the Foundation, in collaboration with seven divers from St. Kitts and Nevis, two researchers from Grenada, and six scientists from The Nature Conservancy, surveyed the coral reefs around St. Kitts and Nevis. The Federation of St. Kitts and Nevis is a small, two-island nation located in the Eastern Caribbean. St. Kitts is 168 km² and Nevis is 94 km². The total population is approximately 50,000, with 38,000 living on St Kitts and 12,000 on Nevis. The land masses are volcanic with steep mountainous slopes. The ocean shelf is relatively small (approximately 845 km²), but it supports a number of critical habitats, with fringing reefs along much of the coastline and deeper submerged bank reef structures offshore. While these areas support many key marine species, including endangered corals and turtles, commercially important food fishes and invertebrates, and marine mammals, little was known about their status prior to these assessments. The Foundation's science team examined 25 different reef communities on the leeward and windward sides of the islands at depths of 0-25 m. Two permanent Legacy Sites were established, one at Dieppe Bay (10-12 m depth) and one north of Basseterre at the Vent (16-18 m depth). Legacy Sites are established at coral reefs noted to have exceptional characteristics of scientific interest to monitor changes over time, precisely located and marked on the four corners with stainless steel bars. Detailed assessments of the coral community structure and health, benthic assemblages, and reef fishes were conducted at the 25 dive sites using a modified Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocol. Habitat features and individual corals were photo-documented, and 10 m phototranssects were taken at each site. The assessments included a characterization of 1) species diversity and abundance, benthic cover, size and condition of reef building corals and patterns of coral recruitment; 2) cover of six algal functional groups; 3) substrate condition; 4) benthic cover of sponges, tunicates and other sessile invertebrates; 5) prevalence and impact of nuisance species; 6) abundance of keystone motile invertebrates (sea urchins, lobster, octopus and conch); and 7) abundance and size structure of 88 species of ecologically and commercially important fishes.

In 2010, the government of St. Kitts and the Nature Conservancy (TNC) completed the first benthic habitat mapping project. This effort resulted in high resolution habitat maps for the shallow shelf (to about 25 m depth) containing twelve different benthic habitats. These maps were used to draft a federation-wide marine zoning plan to protect coral reefs, seagrass beds, nursery grounds and other areas vital to the Federation's marine life and

economy. The draft marine zoning plan has identified several important candidate sites for protection including areas of endangered corals and large seagrass beds, most notably in the Narrows, the shallow area between the two islands. These areas serve as vital breeding grounds and nursery areas for reef fishes and queen conch (*Strombus gigas*). As of 2011, St. Kitts and Nevis had no officially declared marine protected areas. However, as part of the Convention on Biological Diversity Program of Work on Protected Areas (PoWPA) requirements, a national gap assessment was recently completed. This includes the identification of important marine areas for protection. It is the intent of the Federation to declare these areas as MPAs, as a commitment to fulfill the Caribbean Challenge, a regional initiative to protect at least 20% of coastal areas and establish effective management methods through a sustainable funding framework.

St. Kitts and Nevis is surrounded by extensive coral reef habitat and contains several offshore reef communities. These included reefs with a diverse geomorphology, as well as extensive hardground habitats colonized by gorgonians. Reef habitats contained numerous threatened reef-building species. Coral cover in most locations was very low and showed evidence of extensive old mortality (presence of dead coral skeletons) that occurred several decades ago (e.g. elkhorn coral skeletons in growth position) and more recently (mortality of massive corals, possibly following the 1998 and 2005 bleaching events). In contrast, recent mortality was minimal. In general, the reefs with the highest cover occurred on the leeward side of the island, including sites in close proximity to the most densely populated area. While these reefs still contained healthy populations of coral, they may be highly vulnerable to future impacts, as several indicators of resilience (high herbivory, low cover of fleshy algae, high cover of crustose coralline algae, high recruitment, good water quality) were very low.



Evidence of several particularly severe past disturbances was visible, although most locations were showing promising signs of recovery. These reefs, like other locations in the Caribbean, were affected by severe bleaching events in 1998 and 2005, periodic damage from hurricanes, and disease outbreaks and other acute events. Nearshore reefs also appear to be subjected to chronic stressors including sedimentation from dredging and coastal development, input of nutrients and pollutants (especially on reefs adjacent to populated coastlines), and intensive fishing pressure. Characteristic signs of degradation included reefs with extensive stands of dead corals still in growth position, high abundances of fleshy macroalgae, cyanobacterial mats covering the substrate, shifts in community assemblages from coral dominated systems to encrusting sponge, tunicate and soft coral communities, low species diversity, low abundances and small sizes of reef fishes, and depleted populations of commercially important reef fishes, lobster and conch.

During these reef assessments, water temperatures were extremely high. A pocket of warm water was sitting over the eastern Caribbean, causing reef temperatures to exceed 29°C and occasionally reach 30°C; 27-28°C is normal for this time of year. Interestingly, water temperatures were slightly warmer in 2010 than in 2011, but the temperature started out warmer in 2010 and increased more slowly.

In 2011, the temperature was lower at the beginning of the year, increasing by over 2°C in a period of about a week. As a result of the sudden temperature spike, corals began to show signs of stress and large proportion of the corals had begun to bleach. There were no stark white corals, but the perimeters of the colonies and the edges of corallites were white, certain species had turned pale blue, and others were light yellow, instead of their normal dark brown or green coloration.

Several diseases were noted during the surveys, including black band disease, white plague, dark spots disease and yellow band disease. This time of year is usually the period when disease prevalence increases, but most cases of disease were fairly minor – colonies had small (2-5 cm) patches of white exposed skeleton. In fact, there was not a single colony seen with a severe infection of white plague, which is something that Chief Scientist Dr. Andy Bruckner had seen on every other reef system he had examined over the last 10 years. On certain reefs (e.g. Dieppe Bay), many of the remaining larger colonies of mountainous star corals had prominent yellow band disease lesions, but these were older infections that first appeared 1-3 years ago, as evidenced by the extensive patches of denuded skeleton (this disease kills corals at rates of 1-2 cm per month as compared to 1 cm per day for white plague).



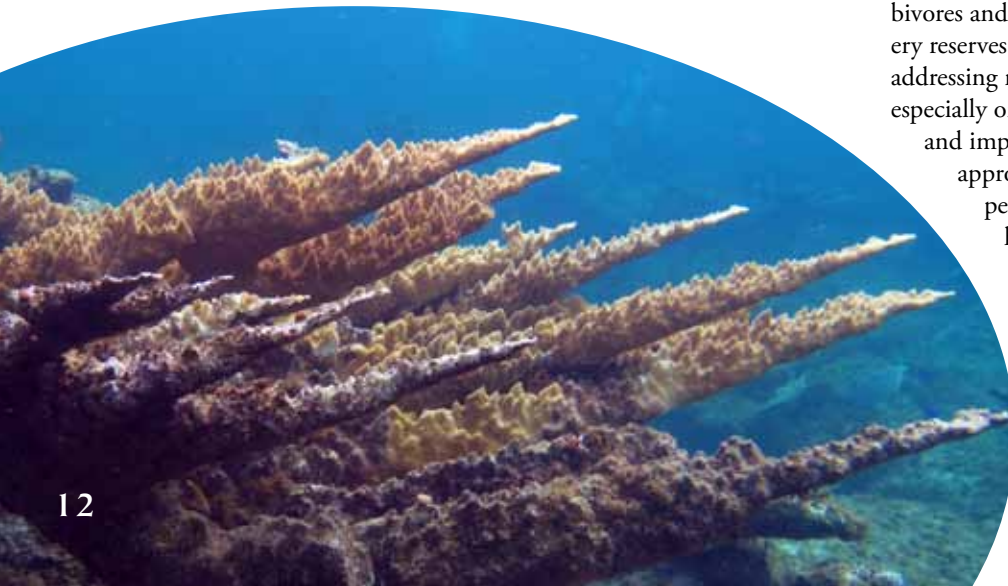
In an area known as Grid Iron (on the Atlantic side of St. Kitts and Nevis), there is an extensive elkhorn coral framework that was predominantly dead, having lost most of the *Acropora palmata* over 30 years ago. The presence of dense thickets of dead corals, still in normal upright growth position, suggests this mortality event was from white band disease (WBD) and not hurricane damage or other factors. WBD is the primary factor responsible for a mass die-off of this species throughout the wider Caribbean over a period of about a decade (1979-1990), and in most locations this species is now considered critically endangered. The presence of isolated sexual recruits, small, completely live colonies (10-30 cm diameter) with protobranches, surviving remnants on larger elkhorn coral skeletons, and surviving fragments is indicative of early stages of recovery of this species. However, several of these colonies were being impacted by predators (*Coralliophila abbreviata*, coral-eating snails) and algal lawns associated with damselfish territories.

A select group of biological and environmental resilience indicators were used to characterize and compare the resilience of the 25 reefs examined in this study. These include: 1) substrate quality; 2) biotic cover of algal functional groups; 3) aggressive invertebrates; 4) coral diversity and cover; 5) coral mortality; 6) recruitment; 7) relief; 8) herbivore abundance. The specific parameters used included the following negative resilience indicators: cover of rubble, macroalgae, aggressive invertebrate, cyanobacteria, dead coral, and partial colony mortality. Positive resilience indicators included: relief, cover of live coral and crustose coralline algae, density of recruits, density and size of parrotfish and acanthurids. All data were ranked on a scale of 1 to 5 and a resilience index was calculated. Most reefs showed moderate levels of resilience, as demonstrated by the presence of coral recruits, tissue remnants on larger corals that were resheeting, and a high abundance of juvenile corals, as well as a low prevalence of coral diseases. The reefs have, however, been severely impacted by past disturbances and a high cover and abundance of dead coral framework and dead colonies were

evident. Negative resilience indicators included: 1) high cover of macroalgae and cyanobacteria, which was greatest near the coastline especially off populated areas; 2) low abundances and small size of predatory fishes; and 3) low biomass of herbivores, including surgeonfishes, parrotfishes and *Diadema* urchins. Promising signs of recovery were apparent in many locations, but certain areas (e.g. Grid Iron) may require decades to rebound, as sources of coral recruits (*A. palmata*) and fragments are minimal. With exception of a few sites, most reefs exhibit a high potential to rebound from past impacts, but persistence of these reef systems hinges on the successful development and implementation of new management measures for fisheries, marine zoning, and steps to address runoff, siltation and land-based pollution. On nine reefs, the substrate quality is good – prominent encrustations of pink crustose coralline algae covering 10% or more of the bottom were found under the macroalgae. These reefs still contain a moderate amount of live coral (10-15% cover) dominated by a diverse assemblage of small corals in excellent health. There were moderate levels of recruitment of many of the important reef building corals. Reefs still had a high number of small colonies of lobate and mountainous star coral, both surviving tissue remnants that were actively growing and juveniles that had colonized these reefs in the past 5-10 years. Because corals consist of colonies of animals, small patches of live tissue can continue to grow upward and outward and it may resheet over the original skeleton, if conditions are conducive to growth. Several deeper reefs were characterized by a dominance of the third species of star coral, boulder star coral (*Montastraea franksi*), and large sheets of scroll coral (*Agaricia lamarcki*), both in good condition. The presence of rare and endangered elkhorn coral and staghorn coral on the windward Atlantic reefs, including newly settled sexual recruits, tissue remnants and fragments that were rapidly growing, and the occasional larger adult colony, provides a glimpse of the high potential for recovery of these species.

St. Kitts and Nevis could help promote the recovery of their reefs and enhance the resilience through several key steps. These include: reduction of fishing pressure on herbivores and key predatory fishes; implementation of fishery reserves within sites that exhibit the highest resilience; addressing runoff and discharge of nutrients and sewage especially on the western, leeward sides of St. Kitts;

and implementation of ecological restoration approaches emphasizing coral nurseries, removal of pest species and possible translocation of key herbivores (*Diadema*) to reef habitats, if a source population is identified. A detailed coral reef monitoring program should be implemented to assess future changes and gauge success of management interventions.





Education and Outreach



The National Council for Science and the Environment (NCSE) presented its 11th National Conference on Science, Policy and the Environment: Our Changing Oceans from January 19-21, 2011 in Washington, DC and was held at the Ronald Reagan Building and International Trade Center. The Foundation was a sponsor and exhibitor at the event. Our Changing Oceans provided a forum to address the crisis facing our oceans, new knowledge and innovative tools to address the challenge, and the policy and governance needed to restore and protect the oceans. The conference brought together over 1,200 attendees, including scientists, professionals, policy makers, university faculty and students, and educated citizens from a wide range of disciplines. Participants shared their perspectives and developed a set of policy recommendations to be distributed to the appropriate decision-makers. NCSE submitted the recommendations to the National Ocean Council, in response to the call for comments on the Council's Strategic Action Plans. In an effort to maximize impact, the recommendations were first mapped onto the nine national priority objectives which include the following: Ecosystem-Based Management; Coastal and Marine Spatial Planning; Inform Decisions and Improve Understanding; Coordinate and Support; Resiliency and Adaptation to Climate Change and Ocean Acidification; Regional Ecosystem Protection and Restoration; Water Quality and Sustainable Practices on Land; Changing Conditions in the Arctic; and Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure. NCSE utilizes a multi-disciplinary and multi-sectoral approach to convene involved scientists and decision-makers from various sectors of society.



AMLC meeting

The 35th Association of Marine Laboratories of the Caribbean (AMLC) Scientific Meeting was held May 23-27, 2011 in San Jose Costa Rica. AMLC, founded by coral reef researchers in 1956, works to 1) advance common interests in the marine sciences; 2) to encourage the exchange of research results; 3) to foster cooperative research projects; 4) to expose students to established scientific methods; and 5) to participate in decisions made by national and international organizations concerning the marine environment. The semi-annual meeting provides scientists and managers focused on Caribbean coral reefs with the opportunity to exchange scientific findings and address relevant issues in marine conservation. Dr. Bruckner presented a talk on the use of coral data to assess resilience of Bonaire's reefs and has a manuscript from the 2010 Bonaire research mission coming out in a Special Issue of the *Revista de Biología Tropical*.



The Foundation took part in the Society of Environmental Journalists' Conference in October in Miami. This annual conference brings together more than a thousand participants, representing journalists and environmentalists from across the hemisphere. The 2011 conference had a special focus on the

oceans and featured plenary sessions, panel discussions, and seminars on the theme of Ocean Conservation. Distinguished attendees included senior correspondents from the LA Times, the Washington Post, and the Baltimore Sun to name a few. The Foundation hosted a tour of the M/Y *Golden Shadow*, offering journalists a rare look at a working research vessel, a demonstration of scientific equipment used to collect research data, and a scientific presentation on the work of the Global Reef Expedition, followed by refreshments on the top deck. The tour event was highly successful with many journalists attending it. After completing the ship tour and learning about the work of the foundation one journalist gave us the following feedback:

“The Khaled bin Sultan Living Oceans Foundation is a truly remarkable organization that I am convinced is likely to make a real difference in the long-term health of the world’s coral reefs. I’m so glad to have had the opportunity to meet you and learn about your organization.”

Sea Space Symposium

In 2011, CAPT Renaud attended a Sea Space Symposium meeting in Loreto, Mexico, as a guest speaker where he presented a briefing on the Global Reef Expedition. Subsequently, he was invited to become a full member of this prestigious organization. The Sea Space Symposium is an organization of eminent figures in government, industry and academia, specifically dedicated to the advancement of scientific research and development in sea and space. The Sea Space Symposium provides a vehicle by which leaders from involved research and development organizations can come together in companionship, to share their visions and mold their plans for the furthering of man’s most exciting challenges; the exploration and utilization of sea and space.

10-Year Anniversary of the Khaled bin Sultan Living Oceans Foundation and Global Reef Expedition Launch Event

In March, the Foundation celebrated its 10-year anniversary at the EPIC Hotel in downtown Miami, Florida with a reception aboard the *Golden Shadow*. Nearly 100 supporters of the Foundation were in attendance to celebrate this major milestone in the Foundation's existence, in addition to witnessing the official launch of the Global Reef Expedition. Speeches were given by Executive Director CAPT Philip Renaud (USN, ret.), Vice Chairman Gen. Charles A. Horner (USAF, ret.), and His Royal Highness Prince Khaled bin Sultan, with reflections on the Foundation's ten years of ocean research and conservation accomplishments, as well as looking ahead to future endeavors, specifically the Global Reef Expedition. The itinerary for the 5-year Global Reef Expedition was unveiled, highlighting the strong year of research ahead with 3 locations in the Bahamas and St. Kitts and Nevis. The 10-Year Anniversary and Global Reef Expedition Launch event marked a significant point in the life of the Khaled bin Sultan Living Oceans Foundation and it was wonderful to celebrate with so many of the Foundation's supporters.





Khaled Bin Sultan

Living Oceans
Foundation

GOLDEN

10

ANNIVERSARY

Fellows



Jeremy Kerr Ph.D.

In 2011, Jeremy participated in the three Bahamian legs of Global Reef Expedition. Prior to the fieldwork, he acquired WorldView-2 (WV2) satellite imagery from DigitalGlobe, Inc. for Cay Sal Bank, Great and Little Inaguas, and Hogsty Reef. The imagery was pre-processed to support mission planning and to facilitate real-time navigation while collecting the groundtruth data needed for seafloor mapping. Jeremy refined his method for estimating water depth from a WV2 image for manuscript publication. This method was integrated to produce benthic habitat and bathymetric maps using imagery and Definiens eCognition software, which allows a hierarchical classification based upon objects (i.e., groups of neighboring pixels with similar spectral characteristics). Alongside the Foundation, Jeremy participated in the Society of Environmental Journalists media outreach event aboard the *M/Y Golden Shadow* in which he described the types of ground-truth information collected for seafloor mapping and the equipment used to gather the data. Jeremy also worked to acquire WV2 imagery for the 2012 Global Reef Expedition missions in Colombia, the Galápagos, and French Polynesia, which included a visit to DigitalGlobe, Inc.'s headquarters in Colorado to present his research on mapping shallow seafloor features from WV2 imagery.

“This first year of the Global Reef Expedition has been incredibly successful. Each leg of the Expedition offers a new opportunity to explore remote reefs and gain valuable insight into the influences of ecology, geology, and oceanography on their development. I’m very excited and grateful to participate in such an ambitious and amazing research campaign.”

—Jeremy Kerr



Sonia Bejarano Ph.D.

Dr. Sonia Bejarano participated in the successful first year of the Global Reef Expedition as a Foundation Post-Doctoral Fellow. For the past six years, Sonia has been part of the Marine Spatial Ecology Lab (directed by Professor Peter J. Mumby) at the University of Queensland, Australia. Sonia investigates the roles of herbivorous fish in Pacific coral reefs and how these respond to tides, productivity of their food sources and fishing pressure.

On board the *Golden Shadow* in 2011, Sonia participated in Cay Sal Bank and Great Inagua, Bahamas missions to research the herbivorous fish communities and quantify how effectively these fish are grazing the reef. Sonia used stationary high-definition cameras to watch the feeding behaviour when undisturbed by divers. The herbivore abundance and grazing intensity data provide detailed spatial information on the geographic variability of the process of feeding. Sonia also examined algal productivity rates in Great Inagua to show how spatial variation of herbivorous reef fish abundance (and their modelled grazing intensity) can be explained by the spatial differences in wave action and productivity of their algal food sources.

“Participating in the first year of the Global Reef Expedition was a great experience, and has made me look forward to carry on exploring the complexities of herbivorous fish and their grazing behaviour as the Golden Shadow expands its geographic coverage.”

—Sonia Bejarano (PhD)



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, on different positions and projects in the Azores and Madeira. He started his Ph.D. in 2007 on coral community characterization and on the diversity of corals and dinoflagellate symbiont partners present in Cabo Verde archipelago. His research has a special focus on the ecological and phylogeographic implications of such host/symbiont relations. More recently he was stationed for nine months in Cabo Verde, for fieldwork and he participated 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 associating with corals from Cabo Verde. He is also an avid scuba diver, underwater videographer and scuba instructor.

“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 and efforts that 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 of the University of the Philippines, Los Baños in 2009. He intends to look into the degrees of responses of fish communities 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 almost 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 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 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 Dive-master 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 United States 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 US and international broadcast. Alison completed her Bachelor of Science honors degree in Zoology at Glasgow University in 1994, and a Masters 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 very 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) focusing 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 Ph.D. thesis 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 3 meters 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 US 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.

Staff Biographies (cont.)



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

Amanda earned her Master's Degree in Marine Science with a concentration in Marine Policy at the University of North Carolina, Wilmington and a Bachelor's of Science Degree 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 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.



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 HR 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 Living Oceans 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; Full General. Educated at The Royal Military Academy, Sandhurst, UK, United States Army Air Defense Artillery School, Fort Bliss, TX, and US 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 of Bahamas Maritime Authority.
Chairman, Bahamas First Holdings Limited.
Deputy 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). Recipient of the Presidential Early Career Award for Scientists and Engineers.



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.



Dr. John Ind

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.

2011 Publications

- 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. (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.

Statement of Financial Position

December 31, 2011 and 2010

ASSETS	2011	2010
Cash and cash equivalents (Note 2)	\$ 2,482,219	\$ 1,371,276
Pledges receivable, net (Notes 2, 5)	1,000,000	2,000,000
Prepaid expenses	30,197	36,679
Investment restricted for endowment fund (Notes 2, 4, 10, 13)	1,327,541	1,305,937
Furniture and equipment, net (Notes 2, 6)	315,607	278,779
Deposits	6,466	6,466
Total assets	\$5,162,030	\$ 4,999,137
LIABILITIES AND NET ASSETS		
Accounts payable and accrued expenses	\$ 98,954	\$ 62,415
Grants payable (Note 7)	140,000	70,000
Total liabilities	238,954	132,415
Net Assets: (Notes 2, 4, 10)		
Unrestricted		
Undesignated	2,595,526	810,776
Board designated to endowment	221,897	217,578
	2,817,423	1,028,354
Temporarily restricted	1,000,000	2,750,000
Permanently restricted	1,105,653	1,088,368
Total net assets	4,923,076	4,866,722
Total liabilities and net assets	\$5,162,030	\$4,999,137

The accompanying notes are an integral part of these financial statements.

Statement of Activities

Year ended December 31, 2011 (With Comparative Totals for 2010)

	Unrestricted	Temporarily Restricted	Permanently Restricted	2011 Total	2010 Total
REVENUE AND SUPPORT					
Contributions (Note 2)	\$1,000,000	\$1,000,000	\$ -	\$2,000,000	\$2,551,920
Donated services and goods (Note 8)	1,339,717	-	-	1,339,717	-
Investment income, net (Note 4)	4,319	-	17,285	21,604	83,740
Other revenue	103	-	-	103	1,162
Net assets released from restrictions	2,750,000	(2,750,000)	-	-	-
Total revenue and support	5,094,139	1,750,000	17,285	3,361,424	2,636,822
EXPENSES					
Program services	2,763,278	-	-	2,763,278	801,774
Supporting services:					
Management and general	513,691	-	-	513,691	363,698
Fundraising	28,101	-	-	28,101	19,643
Total supporting services	541,792	-	-	541,792	383,341
Total expenses	3,305,070	-	-	3,305,070	1,185,115
Changes in net assets	1,789,069	(1,750,000)	17,285	56,354	1,451,707
Net assets, beginning of year	1,028,354	2,750,000	1,088,368	4,866,722	3,415,015
Net assets, end of year	\$2,817,423	\$1,000,000	\$1,105,653	\$4,923,076	\$4,866,722

The accompanying notes are an integral part of these financial statements.

Khaled bin Sultan Living Oceans Foundation

8181 Professional Place, Suite 215, Landover, MD 20785

(301) 577-1288 Toll-free (877) 484-3623

www.livingoceansfoundation.org

prenaud@livingoceansfoundation.org

Executive Director: CAPT Philip G. Renaud, USN (ret)



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