

Khaled bin Sultan

Living Oceans Foundation



Photo courtesy of Andy Bruckner.

2008 Annual Report



Global Reef Expedition

Invitation to the World

Join our Global Reef Expedition
to circumnavigate the world to
explore, map and characterize shallow
reef ecosystems.

SCIENCE
Without
BORDERS

Healthy Coral Reefs for
Future Generations

Expedition Objectives:

- Produce Baseline Habitat Maps
- Assess Threats and Impacts on Reef Health
- Measure Resilience of Reefs Worldwide
- Prioritize Conservation
- Identify

www.globalreefexpedition.com



HRH Prince Khaled bin Sultan at the IUCN Conference in Barcelona. Photo Courtesy of Jan Baldwin.

Global Reef Expedition: Science Without Borders® Program Announced

Headlines from newspapers throughout the world heralded the Global Reef Expedition, which was announced in Barcelona by His Royal Highness, Prince Khaled bin Sultan, on October 7, 2008. Opening a climate change workshop at the World Conservation Congress in Barcelona, His Royal Highness took the stage amidst a flurry of journalists, videographers, conservationists and members of the Board of the Living Oceans Foundation.

Prince Khaled spoke to the need for a thorough scientific understanding, which must precede any effort by man to manage nature. To this end, he explained the need for research into coral reef health as a necessary precursor to management actions.



*HRH Prince Khaled bin Sultan with Living Oceans Foundation Director, Phil Renaud, at the IUCN Conference in Barcelona, Spain.
Photo Courtesy of Jan Baldwin.*

“Today marks the formal announcement of our “Global Reef Expedition: Science Without Borders®” program. This voyage will be an historic opportunity for nations threatened with declining coral reef resources to have these threats studied and better understood for the purpose of improving or initiating conservation plans and management actions. The Living Oceans Foundation is prepared to outfit, equip, and finance this three-year Global Reef Expedition and to share the resulting scientific information freely with the host governments for the benefit of all people worldwide.”

— HRH Prince Khaled bin Sultan

The formal announcement of this ambitious multi-year program heralds the dawn of a new era for the Khaled bin Sultan Living Oceans Foundation and a renewal of hope for the protection of coral reefs worldwide.



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Message from the Executive Director



Phil Renaud on the Farasan Banks Expedition, April 2009.

The year 2008 was a period of impressive growth and visibility for the Khaled bin Sultan Living Oceans Foundation. By far, the most exciting development this past year was the formal announcement by Prince Khaled bin Sultan during the World Conservation Congress of our upcoming multi-year program titled Global Reef Expedition: Science Without Borders®. This ambitious program will begin in 2010 at which time we will commence our global circumnavigation on the capable research ship, *Golden Shadow*. We anticipate that the program will conclude at the end

of 2012. Throughout the coming three years, the Foundation will map and survey coral reef ecosystems around the world with the objectives of advancing scientific knowledge and promoting conservation management activities. This program will institutionalize the Foundation's overarching vision of Science Without Borders® through the power of collaboration between international, regional, and local scientists who share the common goal of protecting the world's majestic coral reefs.

Our operational highlight in 2008 was the successful completion of the third Red Sea expedition to survey and map the coral reef ecosystems of the Saudi Arabian coastline. This research project was the most complex of the series and took place north of Jeddah along the Yanbu Barrier Reef system and at the Al Wajh Bank. This was our first expedition employing both multispectral satellite and airborne hyperspectral imagery technologies. We have one more major expedition to complete this effort and will return to the Saudi coastline in April 2009 to survey a rich coral ecosystem south of Jeddah known as the Farasan Banks. In October 2009, we will conduct an international symposium in Jeddah to release our initial results of this four-year program and receive "stakeholder" feedback so that we may develop the most useful conservation management products.

Another operational highlight this past year was the creation of an online Bahamas Geographic Information System (GIS) resulting from the 2007 biodiversity study with our very capable partners at the Marine Spatial Ecology Laboratory (University of Exeter, UK). This excellent marine conservation tool is in the testing stage now and we anticipate this product will be made available for free public access in July 2009.

Please take some time to review this Annual Report. I am confident that you will agree that the Khaled bin Sultan Living Oceans Foundation is on-stride towards attaining meaningful impact on the challenge of marine conservation, education, and outreach.

Science Without Borders®

Science Without Borders® is the trademarked operating principle and vision of Khaled bin Sultan Living Oceans Foundation. Every activity and operation we engage in has this principle at the core. From collaborative expeditions with international, regional, and local scientists to international fellowships to the upcoming Global Reef Expedition, we tackle the world's common threats to the health and wellbeing of our ocean by joining people from around the world to create solutions. We continue to build an international network of ocean conservation experts who will embody the Science Without Borders® philosophy and join forces in a collective effort to reverse declining health and improve the wellbeing of our oceans.

Note: First use of this service mark by the Living Oceans Foundation in the United States was recorded on December 3, 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 is currently being 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.



The Living Oceans Foundation is dedicated to conservation and restoration of living oceans and pledges to champion their preservation through research, education, and a commitment to Science Without Borders®.

Photo Courtesy of Annelise Hagan.

2008 Projects and Operations

EXPEDITIONS

NORTHERN RED SEA HABITAT MAPPING AND BIODIVERSITY ASSESSMENT (PHASE II): May 2008

The Foundation's science team headed back to the Red Sea once again in continuation of our expansive program to map and survey the coral reefs of the Saudi Arabian Red Sea coastline. This expedition was the third extensive coral reef survey we have conducted off the Red Sea coast of Saudi Arabia, examining coral reefs and associated habitats of the Yanbu Barrier Reef System and Al Wajh Bank, north of Jeddah. Previous Red Sea coral reef research projects focused on the northernmost area of the Red Sea near the Strait of Tiran, east of Ra's Qisbah (September 2007), and around the Farasan Island Archipelago (May 2006). Results of these three field projects, along with a fourth study to the Farasan Banks in April 2009, will be synthesized and compiled into a comprehensive report, marine Atlas, and GIS database for use in coral reef conservation and management initiatives. The information and conservation recommendations will also be presented to the Kingdom of Saudi Arabia in an International Conference to be held in Jeddah, Saudi Arabia in October 2009.

Phase II of the Northern Red Sea research expedition continued to operate under our Science Without Borders® principle, with collaborative involvement of partners from the National Commission for Wildlife Conservation and Development (NCWCD), National Coral Reef Institute (NCRI), International Union for Conservation of Nature (IUCN), and Cambridge Coastal Research Unit (CCRU). From May 7-24 2008, researchers collected critical information on spatial extent, biodiversity, and health of shallow marine habitats and resources, with the goal of identifying and characterizing key ecological areas with a rich biodiversity and high resilience that should be considered in future management initiatives.

Our Saudi Arabian Red Sea Coral Reef Research Program will result in the development of high resolution benthic habitat maps incorporated into a GIS database with detailed information, photographs, and video characterizing the dynamics of Red Sea coral reef communities. A primary focus of this



Red Sea surgeonfish, Acanthurus sobal.

Photo Courtesy of Andy Bruckner.

mission involved the collection of detailed ground-truthing and bathymetric data to optimize multispectral Quickbird satellite imagery, and develop accurate benthic habitat maps. Our research team, working with SpecTIR LLC, also conducted airborne hyperspectral surveys in the Al Wajh Bank area using the *Golden Eye* seaplane equipped with the AISA Eagle hyperspectral sensor. Simultaneous field assessments were undertaken to assist in georectifying the hyperspectral data, identifying landscape scale structural features, and understanding potential biophysical factors like depth, water movement, turbidity, and sediment characteristics that are predicted to be responsible for the development of these features. Concurrent detailed coral reef surveys were conducted to characterize the current status of coral reef resources, the extent and impacts of local and global threats, patterns of recovery from past disturbances, and levels of resilience across biophysical gradients.

Saudi Arabia's Red Sea coastline includes the largest coral reef area in the region, extending southward approximately 1,840 km from the Jordan border to the border with Yemen. Large parts of the Red Sea coastline are dominated by narrow fringing reefs, while the shallow marine habitats we examined from Al Wadj to Jeddah often extended 10-50 km



ROV Surveying the Reef.

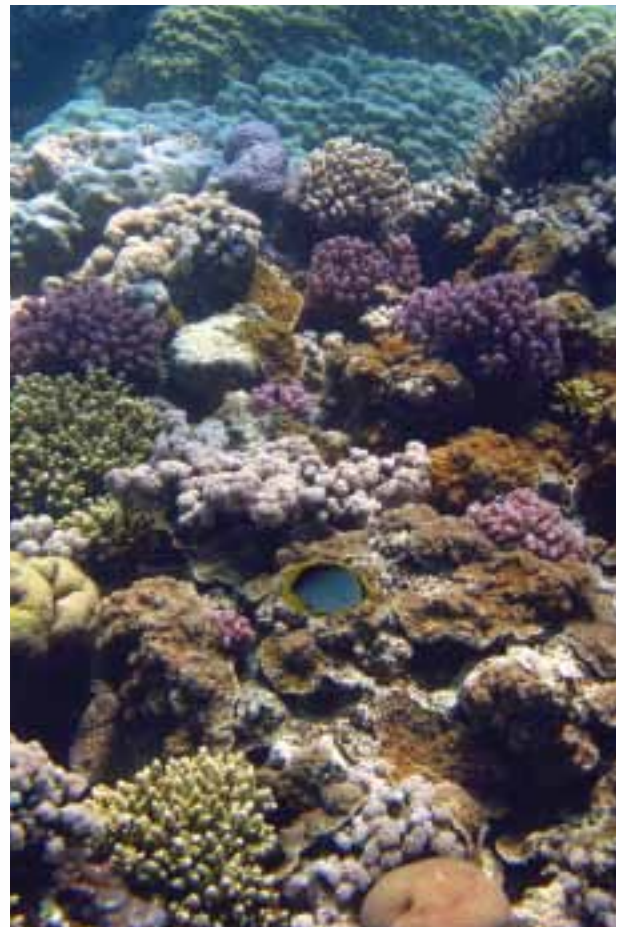
Photo Courtesy of Andy Bruckner.

offshore and include a complex series of coral reef habitats as well as important seagrass and mangrove communities. We identified six different geomorphological reef structures in this region, including barrier reef systems, lagoonal patch reefs, reticulated reefs, submerged limestone platforms, coral pinnacles, and fringing reefs. Our resulting habitat maps will include 8-12 primary habitat types extending over each of these reef structures, as well as detailed reef profiles extending from the reef flat to the deeper reef slope.

Using these habitat maps, it will be possible to identify sites and habitats of high conservation value, and establish spatially-based conservation measures such as marine protected areas. The maps also allow an assessment of the overall size (spatial extent) of coral reefs along the Red Sea coastline, and the amount of suitable habitat for corals. Underwater SCUBA surveys provide critical information on the current density of corals in each habitat type, as well as the population dynamics (e.g., size and age) and health status for each type of coral. Together, these two data sources can be used to estimate the total number of corals expected to occur in the region and the total carrying capacity if all suitable habitats were occupied with living coral.

One of the Foundation's key objectives of underwater surveys was to identify indicators of resilience and categorize key ecological areas of high biodiversity and resilience. We were able to characterize the health of coral reef communities and major threats, as well

as patterns of recovery that have occurred since major disturbances, such as the 1997-1998 El Niño seawater temperature warming event. In both regions, localized occurrences of coral diseases and predators, such as the crown of thorns seastar and coral eating snail, were identified, but their impacts appear to be minimal at this time. Coral communities had 5-70% living coral cover, with most corals being small to medium in size, and fewer large completely intact colonies. Reefs also had a low cover of fleshy seaweed (macroalgae), and certain sites had a high cover of crustose coralline algae, both healthy indicators of low nutrients and high rates of herbivory. These and other unique physical attributes of these sites provide evidence that past disturbances caused extensive, but localized coral mortality, yet reefs are exhibiting extensive recovery and a high degree of resilience.



Shallow Red Sea Coral Reef.

Photo Courtesy of Andy Bruckner.



Dr. Bernhard Riegl Conducting Coral Survey.

Photo Courtesy of D.J. Roller.

Reef fish communities were generally overfished, with few large predatory fishes observed and most herbivores observed were of a small size. The only exception to this was certain offshore sites, especially around Yanbu where few fishermen were observed, as well as some of the deeper locations with very high structural relief. Many small groupers and snappers were identified, but these were usually less than 30 cm in length. Herbivore fish populations were largely intact. Of note was the large number of juvenile and sub adult humphead wrasse recorded in Al Wajh. This is a species that has been assigned an endangered status in the IUCN Red List and is now protected through CITES due to heavy fishing pressure in support of the live reef food fish trade. Giant clams also appeared to be very abundant, although the largest individuals were generally less than 20 cm.

The results of this expedition build upon the baseline habitat mapping project “the study on coastal/marine habitat and biological inventories in the northern part of the Red Sea coast in the Kingdom of Saudi Arabia” which was completed by NCWCD-JICA between 1998-2000. Our findings highlight the importance of this region as a biodiversity hotspot. While we identified a number of impacts associated with climate change, overfishing, and other natural and man-made stressors, coral reef habitats in most locations exhibit a high degree of resilience. The outputs of our Red Sea Research program will identify options for management and conservation, incorporating resilience principles in the design of Marine Protected areas, fishery management priorities, and other management strategies.



Ghardaqa seastar (Fromia) and Stylaster coral.
Photo Courtesy of Andy Bruckner.



Red Sea Acropora Field.

Photo Courtesy of Andy Bruckner.

RESEARCH AND CONSERVATION

Development of the Khaled bin Sultan Living Oceans Foundation Laboratory of Aquatic Animal Health at University of Cheikh Anta DIOP de Dakar, Senegal

The Living Oceans Foundation continues to support the Laboratory of Aquatic Animal Health at the University of Cheikh Anta DIOP in Dakar. The laboratory was established in 2004 with financial and



UCAD Center of Measurements.

developmental assistance from the Foundation in order to assist Senegal in their efforts to maintain and regulate a sustainable fisheries industry. The exciting development in 2008 was significant progress towards construction of their Center of Measurements. Once this building is completed, the Laboratory of Aquatic Animal Health will move in and begin to realize the benefits of modern facilities. One of our Foundation fellows, Aminata Sene, completed a Ph.D. on helminth (flatworm) fish parasites and associated diseases. We congratulate Aminata on the award of her PhD! Our second Senegal fellow, Arfang Diamanka, was awarded his Master of Science degree. His project was examining monogenetic (protozoan) parasites found in captive-reared marine and freshwater fishes. In 2008, his research culminated in a peer-reviewed publication documenting a myxosporidian (protozoan) parasite in a flathead mullet. The laboratory continues to develop capabilities and is concentrating on the study of parasitic infections of Senegal fisheries.

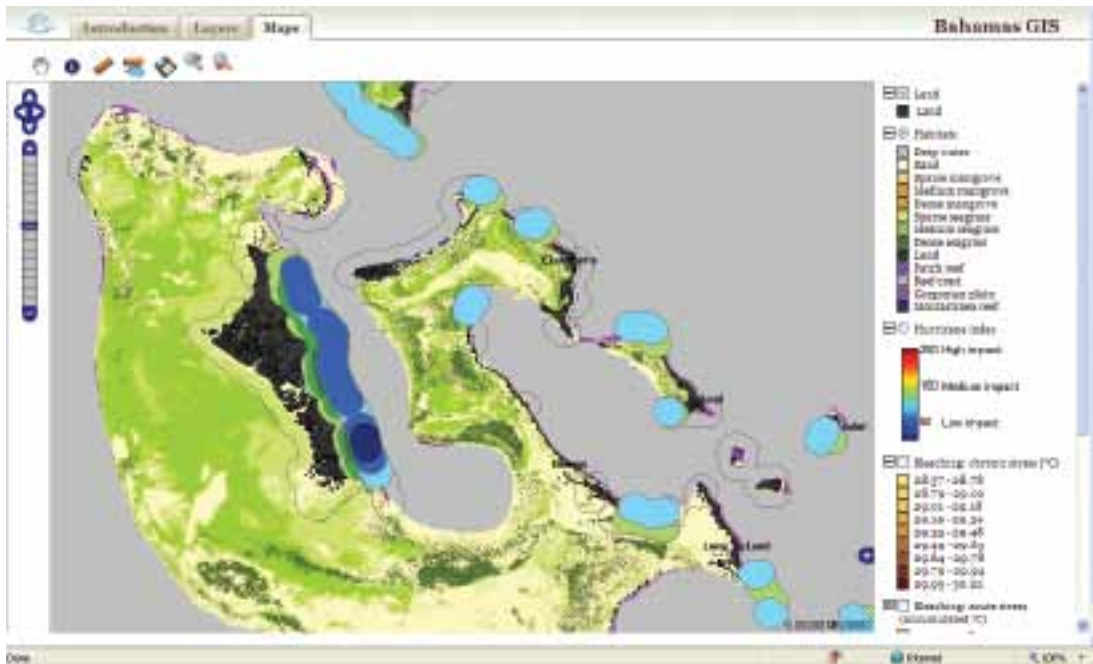
Atlas of the Amirantes

Culminating our multi-year research program in the Amirantes Group of the Seychelles Islands, we proudly announce the completion of the Atlas of the Amirantes. Authors of this work include Dr. Tom Spencer, Dr. Annelise Hagan, Sarah Hamylton, and Philip Renaud. The foreword to this seminal atlas includes messages from HRH Prince Khaled bin Sultan, Chairman and President of the Living Oceans Foundation, and James Michel, President of the Republic of Seychelles. The atlas includes sections on the Geology of the Western Indian Ocean, Climatology and Oceanography of the region, and detailed habitat maps of 12 atolls and reefs

that comprise the Amirantes Group. Additionally, the atlas contains terrestrial and marine survey descriptions and photographic examples of flora and fauna of the region. This important product resulting from the collaborative work between Living Oceans Foundation, Cambridge University, and the Seychelles Centre for Marine Research and Technology—Marine Parks Authority will certainly stand the test of time and be an invaluable resource for Seychelles conservation initiatives. This atlas is testimony to the productivity and effectiveness of Science Without Borders®. We congratulate Dr. Tom Spencer on leading the production of this excellent resource.

MARINE SCIENCE KNOWLEDGE MANAGEMENT

Development and Implementation of a Bahamas GIS



Bahamas Geographic Information System.

During 2008, an online Bahamas Geographic Information System (GIS) was created in continuation of the 2007 collaborative biodiversity study by the Living Oceans Foundation and the Marine Spatial Ecology Laboratory (University of Exeter, UK). Prof. Peter J. Mumby and Ian Elliot of MSEL have been an integral part of data analysis and GIS development in this project. The purpose of the project was to support the Bahamian government in making natural resource management decisions, particularly regarding the use of Marine Protected Areas (MPAs). The GIS was the result of in-depth analysis of data on Bahamas biodiversity, fisheries habitat, impacts of hurricanes and climate change, and coral surveys at Exumas Land and Sea Park and Conception Island. The data generated from this survey was also used in a wider Caribbean study by Prof. Mumby and others, which discussed the use of habitat surveys to further decision-making in conservation measures.

The Bahamas GIS, set to go live July 2009, is comprised of three parts: a Project Overview page, a Layers page, and a Maps page. The Project Overview is the homepage

for this GIS site and has a detailed, interactive, Google-based map of the Bahamas along with a briefing of the data and the GIS's capabilities. Through user-friendly tabbing, the Layers and Maps pages may easily be viewed. The Layers page includes detailed descriptions, how each layer was created, literature references, and an interactive overview map for each mapped layer. The five layers are Habitats, Bleaching, Hurricanes, Beta Diversity, and Mangrove-reef Connectivity. The Maps layer consists of an interactive map displaying the Bahamas Archipelago region. Several basic analytical tools have been implemented in the GIS, such as panning and zooming, line and area measurement, and feature information querying. Additionally, map images may be exported and saved as a bitmap (BMP) or Portable Network Graphic (PNG). Layers may be displayed simultaneously and in a user-defined hierarchy for greater visualization and analysis of target areas for conservation. Additionally, the map includes mouse-sensitive latitude and longitude detection, so precise locations of interest may be recorded.



Bleached Colony of Agaricia coral.

Photo Courtesy of Andy Bruckner.

This project has produced a national-scale map of marine habitats for the Bahamas that includes land, deep water, sand, four classes of coral reef (patch reef, reef crest, gorgonian plain, and *Montastraea* reef), three classes of seagrass (sparse, medium, and dense seagrass), and three categories of mangrove (sparse, medium, and dense mangroves). Each habitat is listed with a detailed description and a photographic example. The map legend for this habitat layer displays distinct colors for easy identification of features.

The Bleaching layer gives a description of how the data were derived, as well as how to interpret the data in relation to coral bleaching. Chronic stress was measured as the maximum of monthly means experienced at each site prior to 1993 during non-bleaching conditions. Acute thermal stress was measured as the annual accumulation of degree heating weeks summed over the last 10 years of the sea surface temperature dataset (1996–2005). The map legend accentuates hot spots by using a bright red coloration of those critical bleaching areas.

To map hurricane impacts, geographic tracks of hurricanes and tropical storms were obtained from the U.S. National Oceanographic and Atmospheric Administration (NOAA). The result is a map illustrating the average hurricane impact at each site in the Bahamas, which reveals those areas that have been most-heavily affected. Also, it highlights the implication that the areas which appear to experience less hurricane impact over time may be favored during the reserve design process.

Beta Diversity, a significant measure of biodiversity, was mapped and monitored at meaningful scales for conservation and marine reserve design. This layer is intended to help conservation efforts by identifying some of the richest areas of the Archipelago for priority conservation. Such information will be particularly useful to local communities that are actively engaged in locating local marine reserves.

The Mangrove-Reef Connectivity layer emphasizes the importance of mangroves along the shoreline. Reefs with prolific mangrove access have a greater supply of several commercially important fishes and increased levels of grazing, which are known to promote the reef's recovery from hurricanes and bleaching events. We identified the locations of such areas using the national-scale habitat map and new algorithms. The algorithm considers fringing mangroves within 10 km of *Montastraea* reefs. The layers provide areas of reef that have greatest fisheries and grazing productivity, as well as areas of mangrove that are strongly connected to *Montastraea* reefs. It has been recommended that mangrove restoration activities be prioritized in areas connected to coral reefs, especially following major hurricanes or in response to coastal development.

This project has been a success and we look forward to continued publications from this research, and even more to the implementation of conservation measures by the Bahamian national government in an attempt to ensure the longevity of their ocean ecosystems.



Conception Mangroves, Bahamas.

Photo Courtesy of Annelise Hagan.

Education and Outreach

11th International Coral Reef Symposium

The Living Oceans Foundation was a proud Barrier Reef sponsor of the 11th International Coral Reef Symposium in Ft. Lauderdale, Florida, from July 7–11, 2008. The ICRS is the world's preeminent coral reef science meeting and is held every four years, devoting itself to the best reef science available, with the stated purpose of sharing scientific findings with government agencies, Non Governmental Organizations, and industry throughout the world. Florida was internationally showcased for its successful science, conservation, and management efforts such as the U.S. state/federal management of Florida Keys National Marine Sanctuary as well as its many excellent regional marine research programs. During the Symposium, focus was on the reefs of Florida, Western Atlantic, Eastern Pacific, Caribbean, and Gulf of Mexico.

Given current awareness that over a third of the world's coral species are at elevated risk of extinction due to climate change, pollution, and human activity, the Symposium drew a record number of concerned attendees. Nearly 3,000 conservationists from over 75 countries, and over 300 press representatives, convened for five days of information exchange. The agenda included 1,000 oral and 1,600 poster presentations, as well as 26 mini-symposia, and a number of field trips. The Living Oceans Foundation joined 450 exhibitors in showcasing our expertise in coral reef research. The award-winning documentary, *Our Coral Islands*, attracted many enthusiastic visitors to the booth. Foundation staff members and fellows presented abstracts and submitted posters for competition.

Healthy Ocean, Healthy Humans

Prior to the conference, the Living Oceans Foundation had initiated a collaborative education and outreach partnership with Kathleen Frith, Assistant Director of the Center for Health and the Global Environment at Harvard Medical School. The center hosts an annual Human Health and Global Environmental Change lecture series at Harvard Medical School, as well as an intensive course for the U.S. Congress on human health and environment in order to educate policy makers. Their Healthy Ocean, Healthy Humans program was launched to inspire ocean conservation through a human health lens, linking human health and its reliance on the marine environment.



*Harvard's Emily Hulm at the IUCN Conference, Barcelona.
Photo Courtesy of Jan Baldwin.*

The Center focuses on Ocean Healing by exploring recent discoveries of breakthrough medicine based on marine organisms found in coral reef ecosystems and emphasizes the threats of pollution, disease, and rising sea temperatures which threaten these discoveries. Their focus on Ocean Nourishment examines the crucial role seafood plays in the global diet and the corresponding dangers of over-fishing, and their Sustainability theme reflects the concern of global warming. The synergy between the goals of Harvard Medical Center and those of the Living Oceans Foundation has created a valuable and inspirational impact on the thousands of people with whom we have connected.

World Conservation Congress, Barcelona



Prof. Abuzinada, His Royal Highness Prince Saud bin Naif bin Abdulaziz, General Charles Horner, and IUCN's Margarita Astralaga. Photo Courtesy of Jan Baldwin.

The International Union for Conservation of Nature (IUCN)'s World Conservation Congress convened in Barcelona in October 2008 to concentrate on solving the world wide environmental crisis. The IUCN is the world's oldest and largest global environmental network, with more than 1,000 government and NGO member organizations, and 11,000 volunteer scientists and experts in over 160 countries.

“Conservation can only succeed if we attack the underlying causes of biodiversity loss, and action is taken at the same time to reduce the impacts of that loss,” said Julia Marton-Lefèvre, Director General of the IUCN. More than 8,000 specialists from the conservation community, governments, NGOs, academia, private sector, and indigenous groups gathered at The Forum for workshops, films, lectures, and events to solve the most pressing problems of the day.

Following the Congress, the Members' Assembly recorded 144 motions, which were deliberated and voted on—significantly influencing international environmental policy.



*Ian Fair and His Daughters Kelly and Sasha with the Golden Eye.
Photo Courtesy of Phil Renaud.*

A large portion of the agenda was devoted to the state of the world's coral reefs. Reporting that a fifth of corals have been lost, and one-third are facing short-term extinction, Carl Gustaf Lundin, Head of the IUCN Global Marine Programme, spoke of the effects of climate change on reefs by increasing sea surface temperatures and seawater acidification. Clive Wilkinson, Coordinator of the Global Coral Reef Monitoring Network said, "If nothing is done to substantially cut atmospheric carbon dioxide emissions, we could effectively lose coral reefs as we know them, with major coral extinctions." Science Magazine reported, "When

corals die off, so do the other plants and animals that depend on coral reefs for food and shelter, and this can lead to the collapse of entire ecosystems." On a more positive note, the adaptability of some corals to recover after major bleaching events was acknowledged.

His Royal Highness, Prince Khaled bin Sultan, was invited to be a guest speaker at the World Conservation Congress. With an audience dedicated to marine conservation, he took this opportunity to introduce the Foundation's Global Reef Expedition: Science Without Borders® program. Having observed first-hand the decline in coral reef health through his own diving experiences, Prince Khaled pledged to commence a three-year scientific study of coral reef ecosystems around the world, beginning in 2010.

Following the announcement of the Expedition, a reception was held aboard the research ship, *Golden Shadow*, drawing more than 125 distinguished guests from around the world, including IUCN leaders, dignitaries, and heads of conservation organizations. As our Board of Directors meeting was held in Barcelona, all of the directors and advisors were present at this auspicious occasion.



*IUCN Reception aboard Golden Shadow, Barcelona.
Photo Courtesy of Jan Baldwin.*

Fellowship Program



Sarah Hamylton is currently pursuing a Ph.D. at Cambridge University, developing coastal management tools from remote sensing datasets. In 2008, Sarah produced a series of maps of the Amirante Islands, Seychelles, by processing Compact Airborne Spectrographic Imager (CASI) data collected during a Foundation expedition after the Indian Ocean tsunami. These maps provide the basis for an Atlas of the Amirantes, a previously little known group of coral islands in the West Indian Ocean. In their electronic form, they are currently being used to support natural resource management decisions.

Sarah participated in the May 2008 Red Sea expedition, where she led ground-truthing efforts to support classification of hyperspectral imagery of the area, acquired from simultaneous airborne surveys conducted during this period. This dataset is being used to develop models that empirically link coral community features apparent on the Al Wajh Bank, to potential biophysical drivers, including depth, water movement, water turbidity, and sediment characteristics.

Sarah remains firmly convinced of the value of remote sensing datasets for coastal resource management.

“The ability of remote sensing data to resolve features on coral reefs is breathtaking. We often use imagery to make maps and then file them away, thinking that the job is done. But these are valuable datasets in their own right and we ought to make the most of them. Interrogating electronic maps allows us to support statements that we might otherwise never be able to make about reef systems that are both expensive and logistically challenging to visit. Developing models that utilise the statistical power inherent in these maps can answer questions at the forefront of the reef management agenda.”

—Sarah Hamylton



Gwilym Rowlands is a Ph.D. student at the National Coral Reef Institute (NCRI), Nova Southeastern University in Florida. Gwilym's Ph.D. project, 'A spatial perspective on coral reef development in the Saudi Arabian Red Sea', draws on one of the most extensive image and field data set of the region to date. It combines advances in remote sensing, biological resource mapping and spatial analysis, and develops tools that enhance marine conservation. Gwilym's thesis examines the influence of current growth conditions and past geologic structure on regional reef development. Gwilym is driven by his belief that marine management and conservation can only be successful when large scale

ecological patterns are taken into account. One of Gwilym's goals is to characterize and develop high resolution habitat maps spanning most of the Saudi Arabian coastline. These will enhance place-based management, such as the identification of key areas for consideration as Marine Protected Areas (MPAs). Gwilym participated in the 2007 and 2008 Red Sea Research expeditions, and recently completed the processing of the Compact Airborne Spectrographic Imager (CASI) data from the hyperspectral surveys conducted in 2006 at the Farasan Islands. The results of this portion of work were presented by Gwilym at the International Coral Reef Symposium, Fort Lauderdale, 2008.



*Cauliflower coral (*Pocillopora*) and Boulder coral (*Goniastrea*) on a Shallow Reef Crest in the Red Sea.*

Photo Courtesy of Andy Bruckner.



Awards and Recognition

Dr. Mohamed Faisal, Lead Scientist for the Living Oceans Foundation and professor of aquatic animal medicine at the College of Veterinary Medicine, Michigan State University, was bestowed the highest honorary degree, “docteurs honoris causa,” at the University Cheikh Anta DIOP in Dakar, Senegal. Professor Faisal has been working closely with UCAD and the Senegalese government to help develop sustainable aquaculture in the country, establish a regional aquatic animal health laboratory serving West Africa, train Senegalese graduate students, and integrate molecular biological sciences into the curriculum of veterinary medicine and allied sciences. The Living Oceans Foundation has supported University Cheikh Anta DIOP for several years.

The Living Oceans Foundation was delighted to learn that our film, *Our Coral Islands: A Red Sea Documentary*, was accepted as a contribution to the Conservation Cinema at the IUCN. Subsequently, more than 1,000 copies of the film were distributed at workshops and conferences around the world.

Capt. Philip Renaud, Executive Director of the Living Oceans Foundation was a keynote speaker at Florida State University’s 2008 Ocean Exploration Symposium, SCIFI TO SCIFACT, *Ocean Exploration: Making the Impossible a Reality*. The purpose of the symposium was to educate students and the community with research relating to ocean technologies and studies that protect and advance a better understanding of the ocean environment. Capt. Renaud joined a distinguished group of speakers from NOAA, SEALAB, and the private sector in their outreach to engineers, scientists, and students.

Dr. Andrew Bruckner, Chief Scientist of the Living Oceans Foundation 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. Dr. Bruckner was elected as a Councilor of the International Society for Reef Studies, where he will serve for the next four years. He was recently appointed as a Science Advisor to SECORE (Sexual Reproduction in Corals), a consortium of over 50 public aquaria and zoos in the United States and Europe that is growing corals from sperm and eggs collected from coral reefs during annual mass spawning events. In November, Dr. Bruckner was appointed to the Scientific Advisory Board of *Coral*, a new magazine for aquarium hobbyists dedicated to the conservation and sustainable husbandry of coral reef species.

Publications

LIVING OCEANS FOUNDATION Publications 2008

Bruckner AW, Bruckner RJ, Hill R (2009) Improving restoration approaches for *Acropora palmata*: Lessons from the Fortuna Reefer grounding in Puerto Rico. Proceedings of the 11th International Coral Reef Symposium, Ft Lauderdale, Florida, 7-11 July 2008

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

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

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

Hamylton S (2009) Multiple discriminant determination of the hyperspectral separability of coastal benthic assemblages from the Al Wajh barrier reef, Red Sea. Central European Journal of Geosciences. 1:95-105

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

Raymundo LJ, Couch CS, Bruckner AW, Harvell CD, Work TM, Weil E, Woodley CM, Jordan-Dahlgren E, Willis BL, Aeby GS, Sato Y (2008) Coral Disease Handbook: Guidelines for assessment, monitoring and management. CRTR, Australia, 131 pp

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

Rowlands GP, Goodman JA, Riegl BM, Renaud PG, Purkis SJ (2009). Habitat mapping in the Farasan Islands (Saudi Arabia) using CASI and QuickBird imagery. Proceedings of the 11th International Coral Reef Symposium, Ft Lauderdale, Florida, 7-11 July 2008

Woodley CM, Bruckner AW, McLendon AL, Higgins JL, Galloway SB, Nicholson JH (2008). Field manual for investigating coral disease outbreaks. Coral Disease and Health Consortium. NOAA Tech Memo. NOS NNCOS 80 and CRCP 6 National Oceanic and Atmospheric Administration, Silver Spring, MD 85pp

Motor Yacht *Golden Shadow*

The Living Oceans Foundation has the capabilities to access remote marine sites to conduct scientific research via periodic employment of a 219 ft logistics support vessel. The Motor Yacht *Golden Shadow* has dedicated laboratory facilities, a diving recompression chamber, and an embarked amphibious aircraft (*Golden Eye*) that has been used extensively for aerial multi-spectral surveys of coral reef ecosystems. One of the most important capabilities of the *Golden Shadow* is its stern elevator platform. This system is used to launch and recover the *Golden Eye*, as well as its various tenders, and can handle loads up to 12 tons. To ensure the safety of visiting divers, the *Golden Shadow* also has a recompression chamber capable of accommodating one casualty and one medic. Fully qualified medical staff members are present during all dive operations.



The *Golden Eye*

The *Golden Eye* is a Cessna Caravan 208 Amphibious Aircraft embarked aboard the *Golden Shadow*. The aircraft has long endurance and can carry up to a maximum of 11 passengers and two pilots. It also carries the sophisticated hyperspectral sensor for conducting remote sensing operations over shallow water coral reef ecosystems.



Living Oceans Foundation Staff



Executive Director

Captain Philip G. Renaud, USN (Ret)

Captain Philip G. Renaud, USN (Ret), is the Executive Director of the Living Oceans Foundation. His career in oceanography began at the Naval Academy where he earned a Bachelor of Science Degree in Oceanography in 1979.

Captain Renaud's naval career took him to all corners of the earth. During his distinguished 25-year career in the Navy, he served as the oceanographer for an aircraft carrier (USS Theodore Roosevelt), was the lead oceanographer for the Commander, Second Fleet, and his naval career culminated as the Commanding Officer of the Naval Oceanographic Office.

Captain Renaud has earned Masters Degrees in Oceanography, Meteorology, Strategic Studies, and Business Administration. He continues to lead the Foundation in developing advanced capabilities to conduct efficient and effective coral reef scientific studies.



Chief Project Scientist

Andrew Bruckner, Ph.D.

Andrew Bruckner is a coral reef ecologist with a Ph.D. from the University of

Puerto Rico and an M.S. in marine biology from Northeastern University, Boston, MA. His focus on the effects of coral disease, bleaching, coral predation, and hurricanes on the survival of reef-building corals has led to the inclusion of two species on the Endangered Species List.



GIS Analyst

Amanda Williams

Amanda Williams has completed her Master's Degree in Marine Science with a concentration in

Marine Policy at the University of North Carolina in Wilmington. Following completion of her Bachelor's Degree in Geographical Sciences at James Madison University, Amanda conducted her Master's research on Boracay Island in the Philippines. Her work at the Foundation entails synthesizing extensive coral reef data sets and developing GIS tools that will facilitate coral reef management and conservation.



Executive Assistant

Melinda Harrison

Melinda has been with the Foundation since 2004 and has witnessed its increasing status as a world recognized and respected organization.

Board of Directors



Chairman and President

His Royal Highness, Prince Khaled bin Sultan

Assistant Minister of Defense and Aviation 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. He 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. Board Member of the Blue Frontier Campaign.

Member of the Marine Protected Areas Federal Advisory Committee.

Directors



Chief Financial Officer

Ian D. Fair

Chairman, Bahamas First Holdings Limited; Deputy Chairman Butterfield Bank (Bahamas) Limited.

Chairman of Bahamas Maritime Authority.



Secretary

Shawn M. McLaughlin, Ph.D.

Research Microbiologist and Curator, International Registry of Coral Pathology, National Oceanic &

Atmospheric Administration (NOAA); Doctor of Philosophy in Marine Biology; Recipient of the Presidential Early Career Award for Scientists and Engineers.



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.



Director

Professor/Dr. Abdulaziz Abuzinada

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



*Board Meeting in Barcelona. Professor Abuzinada and Professor Faisal.
Photo Courtesy of Jan Baldwin.*

Advisors



Douglas Baldwin

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



Ron Gibbs

Recently retired from Linklaters (head of shipping and aviation dept.) 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.

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.

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 of Marine Ecology, Marine Spatial Ecology Lab, University of Exeter, UK. Remote Sensing Expert.

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.

Board Photos Courtesy of Jan Baldwin.



Statement of Financial Position

December 31, 2008

ASSETS

Cash and cash equivalents	\$ 333,610
Pledges receivable	3,000,000
Prepaid expenses	30,476
Investment restricted for endowment fund	1,016,670
Furniture and equipment, net	251,895
Deposits	6,466

Total assets **\$4,639,117**

LIABILITIES AND NET ASSETS

Accounts payable and accrued expenses	\$ 57,858
Grants payable	120,000

Total liabilities **177,858**

Net Assets:

Unrestricted	
Undesignated	444,580
Board designated to endowment	200,000

644,580

Temporarily restricted	1,600,000
Permanently restricted	2,216,679

Total net assets **4,461,259**

Total liabilities and net assets **\$4,639,117**

Statement of Activities

Year ended December 31, 2008

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Revenue and other support:				
Contributions	\$ 1,000	\$1,600,000	\$1,400,000	\$3,001,000
Donated goods and services	446,250	-	-	446,250
Other revenue	4,435	-	-	4,435
Investment income	11,097	-	9,680	20,777
Net assets released from restrictions	1,800,000	(1,800,000)	-	-
Total revenue and support	2,262,782	(200,000)	1,409,680	3,472,462
Expenses:				
Program services:				
Red Sea expedition	958,138	-	-	958,138
Knowledge management	161,050	-	-	161,050
Research and conservation	131,558	-	-	131,558
Education and outreach	305,489	-	-	305,489
Total program services	1,556,235	-	-	1,556,235
Supporting services:				
Management and general	360,976	-	-	360,976
Fundraising	10,061	-	-	10,061
Total supporting services	371,037	-	-	371,037
Total expenses	1,927,272	-	-	1,927,272
Changes in net assets	335,510	(200,000)	1,409,680	1,545,190
Net assets, beginning of year	309,070	1,800,000	806,999	2,916,069
Net assets, end of year	\$644,580	\$1,600,000	\$2,216,679	\$4,461,259

Khaled bin Sultan Living Oceans Foundation

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



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