

**Our World-Underwater Scholarship Society  
REEF Marine Conservation Internship  
Final Report**

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August 2008

My experience with the Reef Environmental Education Foundation (REEF) Marine Conservation Internship through the Our World-Underwater Scholarship Society has been more educational and valuable than I could have ever hoped. Looking back to the long list of summer internships I had sent my resume and application to this past December, I cannot think of a better organization and staff to be currently working with. I have been able to do everything from diving and teaching individuals fish identification, to organizing and assisting with office management of the REEF building, to even being able to participate in a world-renown scientific conference. I have been challenged through many of the activities I have undertaken but have learned invaluable lessons in the realm of working for a nonprofit organization and the field of marine science.

I arrived in Key Largo in late May, eager to begin my internship at REEF Headquarters. I had been looking forward to getting to the Keys since March when I first found out I had been selected. The Reef Environmental Education Foundation is an international, non-profit, marine conservation organization that educates and engages individuals in conservation-focused activities. Founded by Paul Humann and Ned DeLoach in the early 1990s, REEF aims at “protecting marine life through education, service, and research.” One of the main reasons why REEF was drafted and created was due to the fact that effective management of coastal marine ecosystems requires information on the abundances and distributions of organisms. Adequate funding and availability of field scientists to do this type of research, however, was (and still is) hard to come across, therefore, more often than not incapable of providing this type of information to agencies. The volunteer survey projects that REEF encourages provide a valuable alternative for scientists. Through my internship, I have learned that REEF is one of the few organizations that successfully links the scientific community, divers and snorklers, and dive

resorts and retailers through volunteer survey projects. REEF has trained over 10,000 divers and snorklers in marine life identification through sponsored seminars and materials.

Since its first, initial survey area in the Florida, Caribbean region, or commonly known as the Tropical Western Atlantic, REEF has extended its survey regions up the eastern coast of the United States to Maine, to the west coast of the United States as far north as Canada all the way down to the Gulf of California. REEF also has a region for Hawaii as well as the Galapagos Islands. REEF volunteer survey participants, or citizen scientists, donate their time and energy into learning fish specific to these areas and sending in completed surveys of any of the above regions.

REEF participants use a standardized survey and training materials. Utilizing the Roving Diver Technique, a diver uses an underwater slate (specialized for the region and diving conditions of that area) along with waterproof underwater paper to record what they can positively identify on their dive or snorkel. The Roving Diver Technique simply states that a diver can move about underwater as they would on any normal recreational dive, rather than using materials to aid in a survey such as transects or quadrats. Surveys can be submitted online or mailed into the REEF building on a data entry scanform. Part of my internship at REEF included creating a handout on how to use the online data entry system. After the surveys have gone through error checks, they are entered into the database. REEF's citizen scientist program has generated one of the largest marine life databases in the world, with over 120,000 surveys conducted at thousands of different dive locations.

REEF headquarters are held in one of the oldest houses in the Florida Keys; a small, yellow conch house tucked away from U.S. Route 1. The interior is painted with bright, tropical colors with fish and marine photography on the walls, the perfect atmosphere for a marine life

education foundation. Every member of the REEF staff was extremely welcoming and willing to help me get acquainted to REEF and Key Largo in whatever way they could. I did not have much time for this; however, as they had me working on projects and learning my fish pretty much as soon as I walked in the door. Since then, it has been a nonstop adventure ride at the REEF building.

My first weeks were devoted to learning the basics and what I would be doing for the next three months. I sat down with Lad Akins, Director of Special Projects, and talked about what I wanted to get out of my internship. I also took the first day or two to become familiar with the office management I would be doing around the building. This included how to process and fill orders from the website, how to check the “reef hq” email, what I needed to do in order to coordinate the Great Annual Fish Count, completing inventory and organization of the REEF building, as well as many other day-to-day responsibilities.

Fish Identification has been a major component of my Marine Conservation Internship. Over the past three months, I have learned how to successfully identify and locate a number of species while in the water. Even though I came in with some prior fish identification skills due to a study abroad program I did in the Turks and Caicos Islands during college, I could still tell a huge difference in my ability to identify fish from the beginning of my internship to the end. I found myself looking in certain areas such as open sandy areas to dark crevices among the coral for specific species. I trained myself in fish ID through two primary learning tools: *REEF Fish Identification: Florida, Caribbean, Bahamas* by Paul Humann and Ned DeLoach, as well as a Reef Net Fish Identification DVD. Both resource materials, as well as the staff at REEF, helped me to get up to speed with my fish identification in no time.

I assisted Joe Cavanaugh, REEF's Director of Field Operations, with my first Fish Identification course the following week at an annual *Island Sun Splash* event at a local hotel resort. Observing how Joe taught a Fish ID course was extremely helpful. I have since developed my own teaching style of the Fish ID course and have taught visiting groups how to identify the fish they see around them. During the month of July, I was part of a Fish ID Seminar held at Biscayne National Park. I also spoke about fish survey counts to a group at the Dolphin Research Center and to a class of campers at the Newfound Harbor Marine Institute's Seacamp in mid-August.

Aside from teaching fish identification classes and leading survey seminars, I have really been able to take advantage of the diving opportunities provided by Horizon Divers, a local dive shop in Key Largo. Horizon has established a generous relationship that enables REEF interns to dive frequently aboard their boat, the Cheeca View. Whenever I had a spare time (or whenever I could make spare time) I would call up Horizon and see if I was able to jump on the boat and go out for fish survey dives. Once on the boat, I would most likely be paired up with another solo diver since I was the only intern at REEF, and jump in the water to count my fish. Throughout my three months in Key Largo, I developed my own style of fish surveys and have expanded my fish identification skills dramatically. I still get excited, however, to see some of my favorites, such as the Smooth Trunkfish (*Lactophrys triqueter*) and Blue Parrotfish (*Scarus coeruleus*). As a personal goal, I made an effort to learn the scientific name of the species in addition to the common name.

Joe was very influential and supportive when it came to learning fish identification and survey techniques. Although I knew my method of fish surveying, Joe taught me all of his tricks ranging from what to use when marking a slate to where to find certain species. He also gave me

advice on how to practice looking for a specific family. Through observation, I picked up on many of the tricks of the trade from an experienced diver and fish expert. All of his advice while at REEF has been extremely beneficial and has contributed greatly to my internship experience.

Another area in which I was able to practice and use my fish teaching skills was during Paul Humann's *Discovery Tour*. Every year, REEF plans and organizes trips that emphasize fish identification and surveys in different areas all over the world. In June, the REEF trip just happened to be held in Key Largo, and fortunate enough for me, I was able to assist and participate in this event. This weeklong trip gave me first hand experience of what is involved in teaching marine science in a classroom and field setting. I was also able to dive along side the enthusiastic group of participants, helping to point out fish that they were positively identifying for their first time. With classroom lectures in the afternoon, I was able to observe Mr. Humann's teaching styles, and see how he modified the curriculum covered in the afternoon to what was seen during the morning dives.

Aside from the first hand experience of the course, I also benefited from seeing the behind the scenes of planning and running a trip such as the Discovery Tour. While I helped out in the classroom and on the boat with the group, I was also running around gathering materials and making sure everyone had the proper underwater paper and enough pencils or rubber bands for their slates- things you normally would not think of. I came to appreciate the amount of organization and preparation that goes into any event.

Aside from fish identification, there are two other major components of REEF: invasive species (particularly lionfish) and The Grouper Moon Project. I was first introduced to the involvement REEF has with the growing lionfish dilemma during a two-day technical workshop held in Marathon, Florida on Non-Native marine Fish Introductions of South Florida. I met Lisa

Mitchell, the Executive Director of REEF, for the first time in the car, as well as one of REEF's founders, Ned DeLoach, on our drive down to Marathon for the workshop. Crowded in the backseat with the four oversized fish balloons we would be using that night as part of a social get together after the workshop, I sat and talked with two incredible people in the field of marine science and diving.

The workshop was a great experience and really opened my eyes to not only lionfish, but how different organizations in the field of marine conservation collaborate and join forces to come up with solutions. At the workshop, there were representatives from the National Oceanographic and Atmospheric Administration (NOAA), the Florida Keys National Marine Sanctuary, The Nature Conservancy, The National Aquarium, the U.S. Geological Survey, Mote Marine Laboratory, and the Bermuda Aquarium Museum and Zoo just to name a few. After hearing different representatives talk and present on their stance and position of invasive species, I was beginning to see just how large of a problem this could potentially be.

Non-native marine fishes pose a major threat to marine fisheries, habitats, and ecosystem function. Increased reports of non-native species and the successful invasion by the Indo-Pacific Red Lionfish (*Pterois volitans*) have proven the need for early warning and rapid response to confirmed sightings. Lionfish first began appearing in the Atlantic in small numbers, but have since been documented along the entire U.S. East Coast from Florida through Massachusetts, east to Bermuda, and south throughout the Bahamas and other Caribbean nations such as the Dominican Republic, Turks and Caicos, and Cuba. Lionfish are predators that eat native fish and crustaceans in large quantities. They are binge eaters, so they continue to eat until food is no longer available. Lionfish are very fast in growth and have extremely high reproductive success, as they are capable of reproducing year-round. Venomous dorsal, ventral, and anal spines can be

found on the lionfish and are capable of causing painful injuries in humans. One fact about lionfish that always surprises me is that they have no native predators in the Atlantic. Lad Akins, REEF's Director of Special Projects and a lionfish expert, once showed me a video of an experiment they did where they in essence hand fed sharks lionfish to see if the sharks would eat them. No luck. The sharks either took a bite of the lionfish and proceeded to spit it back out, or just completely ignored the lionfish. Incredible if you ask me, but terrifying at the same time to know that not even sharks will touch the species.

REEF has partnered with local dive operators to help document lionfish sightings and collect lionfish samples for NOAA and Bahamian researchers. As of June 2008, over 1,500 fish have been documented. Various scientific researchers have led a number of lionfish research projects that include educational component as well as diving opportunities to capture and tag lionfish. Research on these trips includes stomach content, genetic testing, and growth analysis. Talking with Lad Akins and other scientists working on the project such as James Morris, with NOAA, and Chris Flook with the Bermuda Aquarium Museum and Zoo has been extremely informative and interesting on the subject of lionfish.

Another aspect of REEF that is a primary focus is the Grouper Moon Project. The Grouper Moon Project began in the winter of 2002 when REEF launched a team to the Cayman Islands. The Project's objectives were to observe the Little Cayman Nassau grouper spawning aggregation and to develop a protocol for monitoring the numbers and activity at the site. Every year, REEF returns and works with the Cayman Islands Department of the Environment to monitor and study the Little Cayman aggregation. A number of scientific papers have been published on this topic. Although I have not had a close relationship to this project, I have been exposed to it through my internship and has been yet another example of what needs to be done



in terms of marine conservation. I was also exposed to The Grouper Moon Project through Dr. Christy Pattengill-Semmens, REEF's Director of Science, who works closely on this project.

My internship with REEF has also allowed me to see how other non-profit organizations in the Keys area function and run. I took advantage of this opportunity by visiting the Dolphin Research Center (DRC) in Marathon. During my time there, I shadowed two of the interns employed for the summer; one in education, one in scientific research. By talking with the two girls, I learned tons of information on dolphin biology and behavior. I was able to witness a research session aimed at studying a dolphins' ability to count. I also sat in on an educational session, lasting about an hour, aimed at an introductory lesson to kids about dolphins. My day at the DRC was quite beneficial to not only learn another aspect of marine science, but to witness another non-profit organization, and am very grateful to the volunteers and staff who helped coordinate my visit.

Another opportunity that my Marine Conservation Internship gave me was to attend the 11<sup>th</sup> International Coral Reef Symposium (ICRS) held in Fort Lauderdale, Florida. Every four years this major scientific conference convenes to provide the latest information on coral reefs worldwide. Natural scientists, conservationists, resource managers and users, and educators meet to discuss and advance coral reef science, management, and conservation. The scientific theme of the symposium was "Reefs for the Future." Pollution, over-fishing, and climate change threaten coral reefs and the ecosystems surrounding them on a global scale.

As the conference drew nearer, I thought I would take this opportunity to exercise my major other than science in undergrad: studio art. Meeting with the REEF staff and discussing the main points we wanted to get across about REEF to the public, I soon began designing possible layouts for the booth REEF would have during the Symposium. This included typing up

new text to catch the attention of individuals walking by, finding and printing images to illustrate what REEF does, as well as preparing materials to have available at a table by the booth. Like most of the projects I have contributed to I found out there is a lot of work that goes on behind the scenes you would not normally think of.

While I worked the booth for a majority of my time at the conference, I was also able to sit in on many of the oral presentations, plenaries, and poster presentations. Although somewhat overwhelming at first, I soon became a sponge- taking in everything and observing as much as I could. Joe helped to keep me on track the entire week whether it was letting me know when there were major talks going on that I should not miss, introducing me to new contacts, or even something as trivial as finding a lunch ticket for me that day. He also helped arrange for me to stay with Laura Dias, a REEF volunteer who lived close to the Convention Center.

The week or two prior to attending the symposium I would page through the ICRS program book and talk with Joe about the talks that I was interested in listening to. Needless to say, I was a little overwhelmed by the quantity of information presented in just the abstract book. Joe helped me to weed through a lot of it. A few of the key concepts covered include the historical significance of reefs, ecological and evolutionary genomics of coral reef organisms, function biology of corals and coral symbiosis, disease on coral reefs, coral microbial interactions, chemical ecology on coral reefs, reef status and trends, reef management and restoration, climate change, biodiversity and diversification of reef organisms, as well as many others. Being able to sit in and hear what some of the top coral reef scientists of the world had to say about our marine ecosystem was incredible. Slightly overpowering, but a very rewarding and inspiring experience in the end. It is definitely something that left a lasting impact on my summer experience.

Aside from the scientific and practical experience REEF has given me over the past few months, my internship has also allowed me to explore the dive industry and how the business side of marine education and awareness operates. Through Horizon Divers, I have worked my way through Advanced and Rescue Diver and am currently in the process of becoming a Dive Master. When REEF sponsors an event such as Paul Humann's *Discovery Tour*, or the ICRS Sponsored Field Trip following the Symposium in Fort Lauderdale, both the diving and classroom components of these trips are held at Horizon.

By diving with Horizon Divers I have become more aware of the safety and practical application of diving as it pertains to marine science. As part of my Dive Master training, I have been able to assist on the boat as well as continued education classes with divers. The staff and crew at Horizon have been extremely helpful in terms of accommodating me throughout my three months in Key Largo. They have given me advice both in the classroom as well as in the water.

I also was able to meet and dive with George Wozencraft, the Our World-Underwater Scholarship Intern Coordinator, with the Horizon staff in late July. It was great to be able to thank him in person or his generous help in regard to my internship after the large amount of communication we had through emails and phone conversations.

Among many other things that I have come to recognize and value while in Key Largo and working with the staff at REEF, the importance of marine life education and public outreach is among the top. Graduating from Denison University with a degree in Biology and having a strong scientific background since grade school, I had it in my mind that I wanted to pursue field research in marine biology. Spending long days- tired, hot, sweating on a boat or in the field conducting experiments and collecting data as you see in a glorified Hollywood adventure film,

seemed like perfect job to me. As I am not completely ruling it out, my time with REEF has showed me a different side to the “real world.” A lot of this is due to my experience at the Newfound Harbor Marine Institute’s, Seacamp- a summer camp program designed to stress and introduce kids ages 12-18 to marine science.

Since just about the first time I met Lisa, I had heard stories of the infamous Seacamp, so naturally I was thrilled to find out that I would be making the hour drive south with her to Big Pine Key to speak as a Science Night Speaker and spend the night. After a tour of the facility by the Science Director, Lisa and I spoke with some of the staff about implementing the REEF survey program into the curriculum. It was not until that night that I was able to see just how enthusiastic and passionate about marine life the campers really were. Lisa and I spoke for about an hour about REEF, its programs, and how each of us had ended up at the organization. At the end, the campers asked some rather impressive questions.

In addition to being a science night speaker, I made the drive to Big Pine Key once again to talk to a SCUBA class about how to conduct a fish survey. I ran through how a fish survey works, what the Roving Diver Technique involves, what to look for, how to find the fish, the best ways that I have found for it, and so on. Once again, the enthusiasm from the kids was off the charts.

A final aspect of my internship with REEF has been simply to take part in a non-profit organization and realize the importance of office management and organization. When not taking part in some of the amazing opportunities I have described above, you can find me sitting at the intern desk processing and filling orders, replying to the “reefhq” e-mails, answering phones, speaking with customers, maintaining a steady inventory, or my favorite- organizing the mailroom area. I have also taken on the task of organizing and establishing a more permanent

REEF Retail Store. Cleaning up the REEF House has become a major priority as our appearance and presentation are crucial. As some of these jobs might seem trivial, I have learned that any successful organization cannot run smoothly without them. I have also been placed in charge of organizing REEF's involvement in certain events.

It is hard to believe that my internship with REEF is almost at an end. Since my arrival in early June, I have had incredible experiences and wonderful opportunities that have opened my eyes and many doors to the field of marine biology and conservation. I will most certainly be visiting the REEF house any time I am back in Key Largo and will continue to use the knowledge I have learned through the REEF staff and my experiences throughout my career in marine biology. I am extremely grateful to not only everyone associated with REEF, but also the Our World-Underwater Society for allowing me the opportunity to work with such a truly incredible organization.