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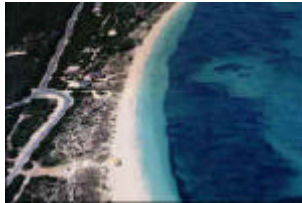
**Articles and Stories:**

**Title:** REEF RELIEF

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**Photo's By:** Living Classroom Foundation

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The Islands of the Turks & Caicos are often described as a brilliant collection of pearls scattered in an endless sea. It is true that these lustrous isles luminescent from afar, but it's the setting that adds sparkle to these jewels. Framed with a fringing lace of reefs submerged in emerald colored surroundings set the stage for the splendor of these jewels.

Metaphorically speaking, this analogy symbolizes more than just a destination. Undeniably, it is the watery realm that enchants the eye and captivates the crowds here. Although the land has its own indelible appeal, it is the lure of ocean life that attracts most people to these shores.

For there is nothing ordinary about them. Our waters contain one of the most diverse ecosystems in the world--the coral reef. The tiny archipelago coined the Turks & Caicos is laced and studded with countless fringing and patch reefs. A haven for multifarious troupes of water borne treasures, the reefs are a key component in the complex ecology of the ocean system.

But for most humans, it is merely a wondrous playground, filled with colorful fish and curious looking creatures. In a world that craves to be entertained, the reef is quite possibly one of the greatest spectacles on earth! The simple act of snorkeling can bring one face to face with all of life's dramas on one seemingly small stage. Like a soap opera in full swing, there are murder and mayhem, courtships and caresses, and other acts unfolding before your eyes with a single flip of your fins. And the costumes are to die for in the watery realm, every act is purposeful and perfectly choreographed to orchestrate the balanced cycle that brings death and death that gives life.

Unfortunately, the growing audiences are beginning to play a part in the demise of the reefs, disrupting nature's fragile balancing act. The most offensive actions are those that impact the corals, the cornerstones of this impressive undersea empire. Corals are living organisms; architects and artisans in their own right, they are responsible for creating the massive coralline framework from which a multitude of other creatures make their homes. As with almost everything in the marine environment, corals also play a part in the intricate food web. Once consumed, their remains take a role by turning into the sands beneath our feet.

**An Undersea Drama Unfolds**

The many miles of reefs that adorn the waters off of the Turks & Caicos Islands have taken millions of years to become the massive structures that we now see. Layer by layer, these minute organisms have lived their lives to become the foundation for the next generation's growth. In the process, they have paved the way for the existence of much of the tropical marine world.

As if these magnanimous efforts were not noble enough, the corals also act as a natural barrier, protecting the land from stormy surges and waves. And as an aside, they have become center stage for our burgeoning tourism industry, attracting thousands to see the age-old reenactment of life in the undersea world. Millions of dollars are generated annually to see nature's free production, yet few are spent in the protection of this sustainable outcome.

Of most concern are our nearshore patch reefs--meaning those that can be accessed from the shore without the use of a boat. On Providenciales, the tourism hub of the Turks & Caicos, Smith's Reef and the Bight accommodate most of the pedestrian traffic. This is apparent in more ways than one. The effects of human impact are finally taking their toll. The corals appear literally battered and bruised with great gaps and white skeletons where once there was living tissue. Although still considered a snorkeler's paradise, the reefs are on the decline. Little by little, the cancerous process is crippling the growth of the reef system, resulting not only in fewer corals, but less of all the creatures that depend upon them.

Efforts have been made to try and slow this debilitating drama. In 1997, underwater snorkeling trails were installed on both reefs. The purpose of the trails is two-fold. The series of markers act to educate and guide snorkelers on the rules of reef etiquette while steering them on a path that has the least potential impact on the reef. By following the trail through deeper waters on the outer rim of the reef, snorkelers are less likely to traumatize the corals. This also tends to localize any impacts to a given area, protecting the more sensitive interior zones.

Although these efforts may have assisted in slowing the initial decline, the problems continue to intensify as more and more tourists arrive each year to snorkel these same two reefs. Another option has emerged in hopes of deferring the impacts. The alternative is the construction of an artificial reef in an area that is easily accessible for beachgoers. The alternate reef site should take some of the attention away from the other sites, thereby decreasing the potential number of impacts to the original reefs. Ever

escalating numbers of tourists may continue to overwhelm the limited reef accesses, but efforts to tourist pressures may help to offset a more rapid decline.

#### Giving Mother Nature a Helping Hand

Artificial reefs are man-made structures that provide surface area for corals and other encrusting organisms to grow while offering protective habitat for beautiful tropical fish and other prized species. In essence, they are a jump-start on nature's natural processes by supplying what would take many years of biological processes to accomplish otherwise in terms of structural formation.

What are they made of? Many people think that almost anything tossed into the ocean will eventually become an artificial reef. This is not necessarily true. Lightweight debris usually just ends up back on our shore. Substances that are corrosive will eventually break down, usually long before a natural hardened structure can be formed around the original structure. A number of products actually leach toxic chemicals into the surrounding environment, doing more harm than good. A final consideration is aesthetics. Few people are interested in diving or snorkeling on a site that resembles the local landfill or junkyard.

Today's technology advocates the use of prefabricated mold systems that utilize a concrete based system. Aside from maximizing surface area for sessile organisms and providing refuge for mobile animals, considerations for the design of these reef structures include stability, longevity and chemically balanced concrete.

The Reef Ball Development Group has devised a patented fiberglass mold system for the construction of artificial reefs. Reef Balls are hollow, dome-shaped structures designed to imitate the natural reef structure.

Each Reef Ball has its own unique hole sizing and placement, with the surface textured for enhanced settlement of marine life. The units are made with marine friendly concrete which has been combined with additives to create a super-strong, abrasion-resistant structure with a pH similar to ocean waters. They are engineered for underwater stability and longevity, and cause minimal impact to the surrounding area.

#### A New Attraction

Once deployed, the Reef Ball will begin to come to life through various natural processes. Almost immediately, fish and other mobile marine creatures will migrate into this new habitat in search of safe havens. Life will grow, consisting of a myriad of marine algae, will flourish within the first few months, nurtured by the inputs and outputs of the more mobile species. Corals and other invertebrates will begin to take hold soon after, creating a coraline castle for its colorful inhabitants. Each structure will be a unique creation, each with its own community of individuals, and the whole environment a balance of its parts.

Artificial reefs have been used for a number of purposes worldwide. With the decline of our natural reef systems, reef restoration has been one of the primary objectives. Other applications include using artificial structures to build more naturally productive and aesthetically pleasing breakwaters, or for enhanced fisheries production in a given area.

Here in Providenciales, we have used them as the base mounts for our underwater snorkel trails which provide educational information regarding coral reef ecology as well as conservation ethics and steps to take for reef communities. We have now expanded our use of the Reef Ball structures to furnish an alternate snorkeling site in an attempt to divert impact pressures from the other natural nearshore reefs to these artificial systems to rebuild and flourish.

The Reef Ball Coalition, [www.reefballcoalition.com](http://www.reefballcoalition.com), a non-profit organization, has taken the Reef Ball a step further. As with almost all things in this world, it costs money to build an artificial reef. The Coalition has come up with a plan that not only finances the construction of the reef, but provides the needed education through educational programs that teach participants about the importance of conserving our coral reefs in this manner that the new artificial reef is being constructed on Providenciales. The only cost to the Turks and Caicos is the use of the "Queen's Bottom" as they call it (or is it Princess Alexandria's?), where the Reef Balls are making their debut.

#### The Latest Release on Reef Relief

The new artificial reef is located just offshore from the beach access area known as Sculpture Junction at the intersection of Pratt's and Bight Road. This site was chosen due to its proximity to the upcoming Visitor's Center that will be directly across from the park entrance. Officials felt that the location was opportune for maximizing both public awareness about the reef and to educate visitors on reef conservation protection. Now that the new Visitor's Center is complete, reef educational information will be highlighted as part of the Center's interpretive display sections and actively promoted through the Center's education programs.

A small, naturally formed reef does exist in this area with several little coral heads scattered about. New artificial reef structures are being placed in arrays to the right of the main portion of the reef, to steer snorkelers around several of the existing smaller coral heads.

Each array is made up of eight to ten Reef Balls clumped together and within visual distance of each other. To date, 27 balls have been deployed in the area in three separate arrays. Each ball is approximately 18 inches in height and three feet at the base width, weighing approximately 350-500 pounds. A total of 100 Reef Balls clumped in 10-12 arrays, is anticipated to complete the Reef Discovery Site.

#### Setting the Stage

Making Reef Balls is fun and relatively easy, although certainly not what you would call a glamorous first step is to assemble the fiberglass molds. Reef Balls' patented mold system provides all the necessary ingredients with a step by step script to ensure all bolts, pins and wedges go in their proper places. The molds are used to make the hole placements, with a large polyform bladder for the center spacing. A solution of sugar water ensures that the molds pull apart easily.

Once complete, the molds are ready for the concrete mixture. This is where the job gets dirty and a lot of brute force. Obviously, the concrete needs to be mixed first, complete with special additives, and then attain a desired consistency of cake batter. The specially formulated mixture then has to be cajoled usually by banging the sides of the molds with rubber mallets, jumping on the pallet base or even a well placed kick or two in the side. (Swearing seems appropriate, but is not necessarily very effective, a scene reminds one of an aggression therapy session.)

Then it's intermission time. The molds can usually be pulled off after about 12 hours, but another couple of days are needed for curing before the balls can be put into the water.

Transporting the balls to the beach and down to water's edge takes the real True Grit, as in gritting your teeth as you strain to move the balls and ending up covered in sand and grit in the process.

Deployment is even more of a gas, literally speaking. Amazingly enough, these massive structures are deployed with the aid of the center polyform bladders. They are pumped up with the use of a scuba tank, then left to float out to the site. Remove the bladder valve and Whoosh!, they drop to the sea floor.

As soon as the first Reef Ball lands on the seabed, fish head for it. And so the process begins--it's now Nature's time to take over. Minute organisms will settle into the cracks and crevices of the textured surface and the ball will begin to grow. Although several years are needed for complete coverage, the Reef Ball is able to draw an audience of organisms immediately and will go through a number of transitional stages as it grows. The production itself is a world class premiere on ecology and how the environment can change.

#### Writing the Script

As with most projects of this nature, an enormous amount of time and effort was required to get it off the ground and in the water. Initial contacts concerning the idea for adding an artificial reef to the Princess Alexandra National Park were made in November of 1998. The paperwork process then began to obtain the necessary approvals from various Government agencies.

The first step was to submit an environmental impact assessment on the area under consideration. The goal would ensure that no negative impacts would result from the placement of the underwater reef structure. Biologically speaking, the artificial reef acts to enhance the local productivity, but in physical terms the goal is to ensure that there would be no erosion effects caused by the additional reef.

This report was then submitted through the National Parks Advisory Council, the overall agency responsible for such proposals. Two key personnel were actively involved in seeing the project paperwork through the Coastal Resource Management Project (CRMP) Manager, Mrs. Judith Lynn Campbell, and the Department of Environmental and Coastal Resources (DECR) Chief Scientific Officer, Mrs. Michelle Gardiner. Their help truly helped to expedite the process. Because the site is located on what is considered the "Queen's Shoals", Executive Council approvals were needed. The Ministry of Natural Resources very efficiently lobbied for approval with final consent for the project given in May of 1999.

#### Behind the Scenes

The next step was to organize the participant programs needed to finance the whole affair. The Reef Ball Coalition launched a marketing program to solicit individuals or groups interested in helping with the project. Their first approach was to organize holiday packages that would include two working days for fabricating and deploying Reef Balls. (The rest of the trip would be spent enjoying the sites and activities of the Islands.)

Unfortunately, this approach has not yet been successful for the TCI to date, but their environmental education programs have. In this scenario, schools or groups can incorporate a reef restoration element into their programs. Reef Ball Coalition staff assist in training students and teachers in the fabrication and deployment of the artificial reefs.

A dress rehearsal of sorts was held in June, 1999 to induct local partner, Marsha Pardee Woodring and her husband Mark Woodring, along with several volunteers, into the Reef Ball fabrication and deployment program. CRMP Conservation Wardens assisted in the project. Jerry Barber, father and co-founder of the Reef Ball Development Group, and son Jason Seeley, the representative for Reef Ball Coalition, directed the initial training program, the first 10 balls were deployed at the Visitor Center site.

The Coalition's marketing efforts finally came to fruition in November, 1999. The Living Classroom (LCF), [www.livingclassrooms.org](http://www.livingclassrooms.org), another non-profit organization, had been inspired by Reef Ball's success worldwide in reef restoration. Located in Baltimore, Maryland, LCF operates for the benefit of the community at large, providing hands-on education and job training, with special emphasis on at-risk youth and youth from diverse backgrounds.

The Foundation provides experience-based educational programs emphasizing the applied learning science, language arts, history, economics and ecology. Key objectives of all LCF programs are care development, cooperative learning, community service, elevating self-esteem and fostering multic exchange. Although the Foundation typically works out of their Maryland campus headquarters, the a marine education program, complete with its reef restoration aspects, would fulfill their key objec goals. Thus began the staging for the Summer 2000 Reef Restoration Programs.

#### A Stellar Performance

After many months of planning and preparation, the show was finally on the road and in the air. St arrived on June 30, 2000 for first of two intensive marine ecology programs. The Provo Marine Biol became home base for the kids and their chaperones, as they explored and experienced island life. program lasted for 14 days, with a total of 37 high school age students participating throughout th Four Turks Islanders, sponsored by scholarships from Bank of America, Living Classroom Foundatio Ball Foundation, www.reefball.com, and Coalition, and the Provo Marine Biology Center itself, had I roles in the programs, introducing their counterparts to life in the TCI.

The curriculum for the LCF Reef Restoration Programs covered a number of ecology topics based o marine environs. Although the focal point was coral reefs, students learned about the importance o seagrasses, mangroves, biological, physical and chemical processes and how they all interact to su flourishing reefs. They also learned much about man's interactions, most commonly seen as enviro impacts, and what they could do as responsible citizens to alter the negative responses.

"Learning by Doing" is the motto of LCF's programming, and the students did just that. Beyond dai kayaking and sailing excursions, the participants initiated an ongoing beach clean-up campaign for they encountered. The students were also responsible for developing a project geared toward teach about the importance of the marine environment. As the project had to be interactive, many were a game format that will later be transferred to the Internet or published for use in our local schools climax of their community efforts was the additions to our artificial reef project. A total of 16 additi Balls were added to the Visitor's Center Reef Discovery Site during the course of the summer sessi

All in all, the LCF Summer 2000 Reef Restoration Programs were a grand success, with stellar perf from all that participated. What will they remember about these islands beyond being mesmerized colors of the sea? Yes, the Turks & Caicos are truly beautiful by nature, but even more, that they a where good things actually do come to pass.

For all those that shared in this endeavor, stand up and take a bow. You are the future ambassado planet and you deserve a standing ovation for your talented and heartfelt efforts.

Encore! Encore!

The timing for completion of the Visitor's Center Reef Discovery Site is reliant upon obtaining more and physical assistance for the project. Participant programs are a prime example of how people ca actively involved in reef conservation efforts. The Reefball Coalition, in local partnership with the at article, Marsha Pardee Woodring, is actively pursuing the development of other such programs. Me Living Classrooms Foundation has already begun planning their Summer 2001 debut.

Proposals have been written to solicit sponsors for local schools in short "workshop style" programs kids can be literally immersed in reef conservation. Donors are also being sought to finance trail m: will add the educational component to the underwater artificial reef. Those who wish to assist in an above goals should contact the author via the information below.

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