

REEF LINE

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CORAL NURSERY PROGRESS

By Craig Quirolo

The Reef Relief Coral Nursery established at Western Sambo Reef after the 1998 Ground Hog Day Storm stabilized 49 pieces of broken Elkhorn coral (*Acropora palmata*). Elkhorn lacks the ability that other coral species have to slough off sediment that may accumulate on it. Elkhorn coral flourishes in the shallow, high energy zones of coral reefs, where the wave action keeps it clean. When a storm-damaged fragment of Elkhorn coral is rolled around and the living tissue settles face down in the sand, the chances of survival are slim. The Coral Nursery project was able to successfully salvage pieces of storm damaged coral that had little hope for survival.

Harold Hudson, restoration biologist for the Florida Keys National Marine Sanctuary (FKNMS), designed the *Acropora* rosette method that was utilized to stabilize fragments of Elkhorn for the Reef Relief Coral Nursery.

One of the biggest lessons that we learned from this project is the need for rapid response to storm events on the coral reef. Coral recovery is increased when the broken fragments are stabilized shortly after they are broken.

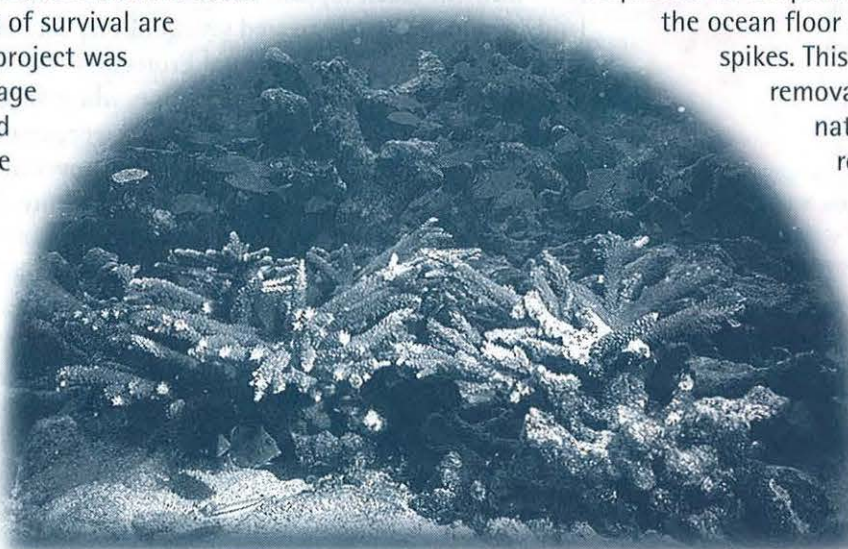
Little did we know that this first attempt at creating a Coral Nursery was only a test. The aftermath of Hurricane Georges left a legacy that has not been fully acknowl-

edged to this day. Rock Key Reef lost the majority of its living Elkhorn coral as well as the rare Fused staghorn (*Acropora prolifera*) that was flourishing there. Well over 50% of the Elkhorn coral at Western Sambo Reef has been lost.

All of the *Acropora* rosettes in the coral nursery were scheduled to be transferred to a nearby grounding site by a FKNMS restoration team. Because of this Reef Relief was requested to temporarily secure the rosettes to the ocean floor using large stainless steel spikes. This would allow for easy removal of the pads. Unfortunately the transfer of the rosettes never happened and they were left to face the brunt of

Hurricane Georges precariously attachment to the ocean floor. Until the wrath of the Hurricane Georges 90% of the coral fragments in the nursery

CONTINUED ON PAGE 7



This image of the rare Fused staghorn coral (*Acropora prolifera*) was taken after Hurricane Georges; it had survived the hurricane. This is one of the only remaining colonies at Keys reefs. The impacts from Tropical Storm Mitch were very severe on the Elkhorn coral (*Acropora palmata*) at Rock Key Reef as well. Reef Relief has extensive chronological data covering this area and it indicates that the entire area was severely damaged as a result of the three major storms in 1998. Photo by Craig Quirolo.

Reef Line

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dedicated to

"Preserve and Protect
Living Coral Reef Ecosystems
through
local, regional and global efforts."

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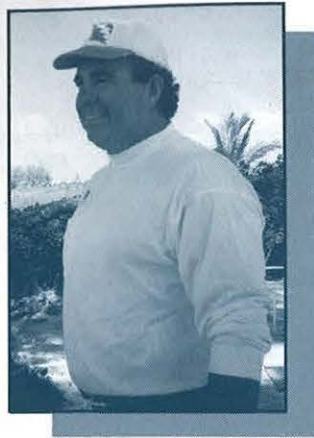
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From the President's Desk

BY DR. BRIAN LAPOINTE



I have just returned from Negril, Jamaica, where I participated in The Negril Coral Reef Preservation Society's (NCRPS) 8th annual workshop, "Protecting Jamaica's Coral Reef Ecosystem," held Friday, February 12th, 1999 at Swept Away Resort. Participants engaged in open discussions on the status of Negril's coral reef ecosystem. The conference focused on Coral Reefs, Water Quality, and Human Survival Issues and had as its primary objective the presentation of the results of our robust one-year coral reef and water quality monitoring study. This unique study involved advanced research that specifically links land based nutrient sources with their ecological consequences on coral reefs. Data presented and resultant discussions provide a unique case study on the issues of the global nitrogen overload problem, expressed locally in Jamaica within the boundaries of the Negril Marine Park.

The Honorable Easton Douglas, Minister of Environment and Housing opened the conference in a compelling speech: "Nutrient levels in the coastal waters of the Negril Marine Park exceed the thresholds established by the scientific community for healthy coral reef development. As a result of an overabundance of nutrients at Negril's coral reefs, they have become eutrophic and harmful algae, rather than living coral, dominates the reefs. The sources of these harmful nutrients in our coastal waters include run-off from nutrient laden topsoil, fertilizer run-off from hillsides and agricultural lands and inadequately treated sewage. Every major river within the boundaries of the Negril Environmental Protection Area receives agricultural run-off, especially from sugar cane production, where fertilizer use is ongoing."

Participants at the workshop included representatives from a broad cross-section of the community, including government ministers from Environment and Housing, Tourism, Agriculture, Fisheries, Tourism Product Development Company, Natural Resources Conservation Authority, representatives of United States Aid to International Development (US AID) and the United Nations Environment Program (UNEP).

Dr. James Porter, (University of Georgia and member of Reef Relief's Scientific Advisory Board) presented the results of working at 5 shallow reefs within the park. His study involved the training of NCRPS rangers in USEPA coral reef monitoring techniques. Permanent markers, situated 20 meters apart, were located on 5 stations and underwater counts of coral species, disease, and sea urchin (*Diadema*) density were made within each 20 meter transect. The transects were then videoed and images transferred to digital data files on CDROM. The digital images were then counted using random point counts and the data examined for patterns of coral species richness and percent cover of benthic communities. Results showed that coral diversity and abundance increased significantly as one moves away from the Long Bay area at Negril. Dr. Porter also noted that the highest percentage cover of the reefs is macroalgae, not coral. "Negril is known for its spectacular coral formations and crystal clear water. Now some reefs have less than 5% coral cover, down 75% from their historical condition. The way I look at it is water quality and environmental

CONTINUED ON PAGE 15

the Keys are in our hands

BY DEEVON QUIROLO

Aftermath of Hurricane Georges

Word is that we lost over 200,000 stone crab traps as a result of Hurricane Georges. All those traps have contributed to the abundance of debris along the Keys shoreline. The county trucks are still picking up piles of land-based debris created by the storm and the Lower Keys are still reeling from the loss of affordable housing and the employees who previously lived in this area. We have participated in a few community clean-ups; the one at Boca Chica yielded lots of the usual glass and bottles, foreign items and plastics, in addition to traps, buoys and other fishing gear.

CORAL BLEACHING AND DEATH COULD BE EARLY WARNING OF ENVIRONMENTAL CHANGE, CORNELL ECOLOGISTS WARN

ANAHEIM, CALIF.—The dying corals of the Florida Keys could be an early warning of tough times ahead for the planet's environment, Cornell University ecologists worry. The reason: Hundred-year-old corals are succumbing to diseases they previously survived.

Increasing global temperatures and worsening pollution, the ecologists say, could place so much stress on ecosystems that organisms of all kinds will face new challenges.

"When we see corals that have persisted for hundreds of years suddenly die from opportunistic infections, we have to wonder what has changed in their environment," says C. Drew Harvell, Associate Professor of Ecology at Cornell, and Reef Relief Scientific Advisor.

Harvell organized a session, "Diseases of the Ocean: A New Environmental Challenge," at the annual meeting of the American Association for the Advancement of Science (AAAS) today (Jan. 22) to bring together leading microbiologists, ecologists and pathologists to evaluate the environmental threats from disease in the ocean. Speaking in the session was Kiho Kim, a postdoctoral research associate with Harvell at Cornell, who reported on an unusual disease in Florida Keys corals.

Kim said that monitoring of sea fan corals in the Keys, where up to 40% of sea fans are infected by a fungal disease and many have already died, suggests that lower water quality and higher ocean temperatures stress corals and increase their susceptibility to disease. He said the Florida findings support a growing consensus among scientists worldwide that as ocean ecosystems become degraded they will offer more favorable places for disease outbreaks and the emergence of new pathogens.

"We didn't begin our study of sea fans to monitor death and destruction," Harvell said. "Originally, we were interested in the natural disease-resistance properties of corals, such as the anti-bacterial and anti-fungal chemicals they produce, because some of those compounds may be useful in human medicine. That

Actions to Improve Water Quality

Since our last newsletter, the Key West City Commission has passed our cesspit elimination ordinance and the No Discharge Zone resolution for all Key West waters which extend out 600'. This is great news and we thank the city commissioners and the city attorney for their good judgment. Special thanks to Jack Teague of the Monroe County Health Department for his cooperation in formulating a workable enforcement process for the cesspit ordinance. City Utilities Director David Fernandez initiated the cesspit effort; he is involved in the big job of retrofitting the leaky city sewer lines to eliminate the salt water intrusion and raw sewage overflows. As he runs new sewer lines throughout the city, this legislation provides the authority to require new sewer hook-ups for existing buildings that are not hooked up to the central sewage system. Once we rid the city sewer lines of excess salt water, the effort to reach advanced wastewater treatment through a biological treatment process will be the next priority.

CONTINUED ON PAGE 14

CORALATIONS

Post Hurricane Georges Reef Restoration

*Do or do not ... There is no try
— Yoda*

The news from CORALATIONS, our friends working to protect Puerto Rico's coral reefs, is that a group of their Conservation Youth Corps participants are assisting their team leader Gustavo Pabon in a mini-coral reef restoration study on the island of Viequez. Small fragments of finger coral (*Porites porites*) broken by storm waves were re-attached to shallow dead portions of the reef using hydraulic cement. Students are learning valuable underwater monitoring technique while being cautious not to harm their subjects. This project began in November and already sees interesting results. Corals re-attached in Damsel fish territory are suffering farmer fish damage. Corals reattached and now brushed by over-growing sea grasses have shown no growth, possibly indicating how sensitive the coral animal is to touch—even non-human. Algae and animals were observed in and around grooves in the new cement one week after the finger coral fragments were "planted" and coral polyps are healthy all the way down to the concrete base. Youth Corps participants will continue to monitor the restoration for years to come. Special thanks to Capt. Richard Barone, Dr. Barbara Baker, and Dr. Edwin Hernandez for their technical support of this project.

Water Quality Efforts

CORALATIONS' Mary Ann Lucking has been busy. Since October '98, she and others have worked to stop extensive land clearing association with the reconstruction of the road to Zoni Beach on Culebra. The FEMA funded work resulted in extensive damage to dry forest habitat and protected wetlands and construction was stopped in January '99. Go Mary Ann!!

The action-oriented group is also spearheading efforts to put up three bi-lingual signs indicating "no take" areas and provide coral reef tips for access areas to Marine Fishery Reserve areas and watchdogging community development plans for Culebra. Mary Ann is also visiting Washington D.C. along with Attorney Cindy Gines, and Sarah Peisch from Alianza Ambiental Puertorriquena to focus on urging the USEPA to take action against the continued permitting of primary sewage discharges into coastal waters of Puerto Rico. Good luck. To contact CORALATIONS, write Amapola 14, Suite 901, Isla Verde, PR 00979 or phone/fax 787-791-7372 or e-mail corals@caribe.net.

Green Turtle Cay Project



Key West's sister city, Green Turtle Cay, located just east of Great Abaco, in the Bahamas, is the site for Reef Relief's first Bahamas project—a cooperative effort with the Green Turtle Cay Foundation, Linton's Cottages—owned by Dr. & Mrs. Brian Lapointe, Cape Air, the Edith & Curtis Munson Foundation, and residents of the island. Green Turtle Cay is home to a coral reef ecosystem comprised of coral reefs, seagrasses and mangroves which fringes much of the coastal areas. The Abaco barrier reef extends from Hole in the Wall on the south end of Abaco Island north past the Pelican Cays Land and Sea Park, Marsh Harbor, and north of Green Turtle Cay to Walker's Cay. The reef is from 3–7 miles wide and 2–15 meters deep. Conch and fish are staples of this island community and hawksbill turtles, green turtles, and loggerhead turtles nest on the coastal beaches.

Director of Marine Projects Craig Quirolo will train local divers on Green Turtle Cay to install reef mooring buoys so that boaters and divers have an easy alternative to anchoring on the fragile coral reefs surrounding this beautiful island. The Reef Relief team arrived on the island in November, 1998, and began planning efforts with a community workshop that described the project and solicited input on where the buoys should be installed. Reef Relief's DeVon Quirolo began an educational effort with a coral reef presentation to the two elementary school classes on the island. The team returned in March to sound the bottom for the buoy locations and begin further studies. The buoys will be installed later this summer once the components have been ordered and shipped to Green Turtle Cay.



The Reef Relief Team at Green Turtle Cay. (l to r) Bill Alevison, Craig Quirolo, Brian Lapointe. Photo by DeVon Quirolo.

Reef Relief President Brian Lapointe, research associate with Harbor Branch Oceanographic Institution, and Craig Quirolo began a video monitoring program for the island with permanent transects from Green Turtle Cay to offshore coral reefs that will enable them to assess conditions and determine the percentage cover of corals, seagrasses, macroalgae, octocorals and sponges. Dr. Lapointe's water quality monitoring program includes taking water samples at these same sites over time and analyzing them for low level nutrient concentrations, chlorophyll a, turbidity and salinity. This baseline will help identify land-based sources of pollution.

Dr. Bill Alevison, Reef Relief's fisheries expert, is involved in siting the locations for placement of "Reef Balls" that are being generously donated by the Reef Ball Foundation to establish additional coral reef habitat. "Reef Balls" are a unique design by Todd Barber of pH-balanced concrete structures that attract coral growth, fishes and other marine organisms.

Reef Relief is seeking tax deductible matching donations to cover project expenses. For more information, contact Reef Relief.

Cuban Coral Reefs

The final report of a survey of coral reefs in Cuba is now available. A Reef Relief team led by Craig Quirolo surveyed the Arcifes Colorados, located adjacent to the Archipelago de los Colorados on the northwest coast of Cuba in June 1998. This was the second year that Reef Relief has gathered information as part of a cooperative agreement with the Cuban Institute of Oceanography to survey all Cuban coral reefs over a five year period.

"This coral reef ecosystem is just south of and very similar to that of the Florida Keys, yet it has not been widely studied. We hope that coral reef researchers around the world will utilize the information we gathered to enhance studies that teach us more about coral reefs, and how we can protect them—in the Florida Keys, in Cuba, and around the world," noted Craig Quirolo.

Quirolo and his wife, DeVon sailed the entire length of the archipelago and took slide images and video transects of the shallow coral reefs at Bahia Honda, Cayo Paraiso, Cayo Levisa, and Cayo Jutias. The results may be previewed online at www.reefrelief.org (visit our *International Projects* section) and are also available in a multimedia package that contains a 62 page color report containing slide images, notes from the log of the *Stormy Weather*, and various charts depicting the course of the expedition, as well as seven CDROMS containing the slide images in high resolution and five video tapes containing eight 60 meter transects with indexed time counts of the coral reef surveyed.

The cost of the complete multi-media package is \$300; the 62 page color report only is \$75; the 7 CDROMS alone cost \$175, and the 5 VHS tapes cost \$75. For more information or to order the 1998 Reef Relief Cuba Expedition Report, contact Reef Relief at reef@bellsouth.net or call (305) 294-3100.



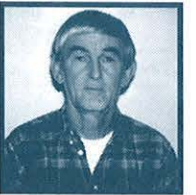
Reef Relief has a new partner for educational projects in the Florida Keys. We are delighted to announce that we will be working with the South Florida Water Management District on an exciting multi-media endeavor to integrate these key educational concepts into our efforts: water supply planning and development for the Florida Keys; water conservation in the Keys; ecosystem restoration of the Everglades as it relates to freshwater supply of Florida Bay and the Keys marine ecosystem; retrofitting the current water management system (the "Restudy") specifically as it relates to water flow into the Everglades, Florida Bay and the Keys; freshwater impacts to coastal estuaries—specifically those in the Everglades and Florida Bay; and individual responsibility for water pollution prevention.

These educational concepts will reach Keys residents and visitors through the following strategies:

- ✱ Discover Coral Reefs School Outreach Program for 4th grade students at 6 Lower Keys public schools.

Reef Doctor Harold Hudson Receives Award

Harold Hudson, Restoration Biologist for the Florida Keys National Marine Sanctuary, and member of the Reef Relief Scientific Advisory Board, was among a team receiving the U.S. Department of Commerce's Silver Medal. Commerce Secretary William M. Daley handed out the awards in November, 1998 in Washington, D.C.

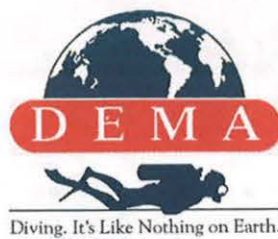


Hudson earned the honor for helping restore a coral reef near Mona Island, Puerto Rico, last year. The reef sustained damage from a ship grounding and subsequent salvage operations. The 326-foot *Fortuna Reefer* grounded off the west coast of Mona Island in July 1997. The vessel injured a barrier reef that extends approximately 10 miles from the eastern end of the island along the southern coast and around to the northwest. The reef is populated with large, branching old-growth Elkhorn coral. The NOAA team helped assess the damage, map out a plan to save much of the coral, secure a legal settlement to fund the restoration work, and coordinate the coral rescue operation. The restoration involved removing the largest broken pieces of branching Elkhorn coral from the sea floor and reattaching them before they succumbed to winter storm damage. Emergency restoration reversed the major impacts of the grounding by reestablishing the physical structure of the coral reef community and reducing coral mortality.

Harold is our hero and the designer of the *Acropora rosettes* used for the Coral Nursery at Western Sambo Reef. "Harold Hudson has saved more living coral than anyone else I know," noted Craig Quirolo. "The millions of tiny coral polyps saved by Harold Hudson would applaud him if they could."

- ✱ New educational materials for educators, students and the public.
- ✱ A teacher workshop for Monroe County educators to be planned as a full day event on May 8th at Pigeon Key.
- ✱ Internship program for Florida Keys Community College students and out of town college students.
- ✱ An expanded Key West High School Mentoring Program led by Reef Relief's Joel Biddle and Michael Blades.
- ✱ New displays for the Reef Relief Environmental Center & Store.
- ✱ Website expansion to incorporate new materials and programs with links to the new homepage for the SFWMD Keys office and their headquarters website.
- ✱ Reef Awareness Week—July 25–31st with a Water Resources Partnership theme.
- ✱ Participation in other Special Events.
- ✱ Reef Line to be provided to more county-wide educators.
- ✱ Re-distribute existing supplies of *Tips for Ecofriendly Living* to all vacation rentals in the Keys.
- ✱ Produce and air radio public service announcements for all Keys stations with water conservation tips.

This new initiative provides a great opportunity to look at the total watershed in South Florida, how it can affect our quality of life and that of the natural environment. More importantly, hopefully we will all learn more about how to reduce harmful impacts—some of them upstream and some in our own backyards—on Florida's coral reef ecosystem. We hope you'll join us in this new adventure. Remember, we all live downstream.



DEMA SHOW '99

by Michael Blades



Joel Biddle (l) and Michael Blades (r) man the Reef Relief booth at DEMA '99.

This year's annual DEMA (Dive Equipment & Marketing Association) convention was held in New Orleans and Reef Relief was an active participant for the third consecutive year. Reef Relief staffers Michael Blades, Joel Biddle and Paul Johnson along with volunteer Christina Benson attended the DEMA Show '99. Once again DEMA donated booth space which provided an opportunity to reach thousands of divers and dive industry representatives. Our display featured our Coral Nursery project and the

newly released Cuba expedition report as well as educational materials and an opportunity to sign our Everglades protection petition. We collected hundreds of signatures and many divers took the opportunity to join Reef Relief. Our booth also attracted luminaries such as marine wildlife artist Wyland and renowned oceanographer Dr. Sylvia Earle who each stopped by to offer support and to learn of our recent activities.

The DEMA show also offered an opportunity for Reef Relief to meet with representatives from the numerous marine conservation organizations who

attended the show. A coalition of groups met and discussed the current state of conservation as it relates to the dive industry. The meeting resulted in an open letter to the dive industry which was signed by nine conservation organizations including American Oceans Campaign, The Cambrian Foundation, Center For Marine Conservation, CORAL—The Coral Reef Alliance, Dolphin Cove, PADI's Project Aware, REEF, Reef Ball, Reef Relief and Starfish Reef Builders Ltd. The letter was presented at a well attended press conference as well as delivered directly to leaders of the dive industry.

AN OPEN LETTER TO THE DIVE INDUSTRY:

A healthy dive industry depends on a healthy environment. As DEMA members, we applaud DEMA's recent initiatives to improve the dive industry and offer our strongest support. We welcome the opportunity to join fellow DEMA members in strengthening and growing the dive industry, but we strongly recommend that one simple truth not be forgotten as the dive industry moves forward: If we want the dive industry to grow, we must invest in the environment.

A primary business objective for DEMA is to keep divers diving. What motivates divers to keep diving? Interesting things to do and see underwater.

In A PADI survey, 91% of divers identified "the dive experience"—what they saw and did underwater—as the most important element in the choice of diving destinations. Similarly, in the recent Bulldog Drummond report, the vast majority of divers surveyed indicated that they dove to explore the underwater world; to learn about and appreciate the beauty of aquatic habitats.

Our coalition of conservation organizations represents tens of thousands of divers and snorkelers committed to healthy aquatic environments. On their behalf, and on behalf of millions of other divers and snorkelers who care about the underwater environment, we the undersigned organizations, propose two simple, low-cost actions to keep divers active and protect the environment:

- We encourage DEMA and its members to support a wide range of

diver activities that help the environment such as fish surveys, reef monitoring and underwater cleanups. These activities keep divers diving, make them feel good about their underwater experiences, and improve our understanding and the health of the underwater world. Furthermore, we recommend that the dive industry support education and awareness programs designed to educate divers and snorkelers about the health of aquatic environments.

- We recommend that DEMA and its members support the creation and management of marine protected areas, such as marine parks and reserves, where divers can enjoy the underwater world. Divers want to dive in a healthy aquatic environment; without protection, many of these areas are disappearing fast.

As DEMA members, we are committed to guiding and supporting the dive industry reach these objectives. We have the expertise and willingness to do so, and look forward to partnering with DEMA and its members to ensure that the dive industry play an active role in preserving and protecting the environment.

While many DEMA members are already doing their part to help protect the underwater environment in their dive destinations, we encourage the industry to increase their commitment to maintaining the health of their businesses by maintaining the health of their aquatic environments. Everyone in the dive industry must realize that protecting their waters is just smart business.

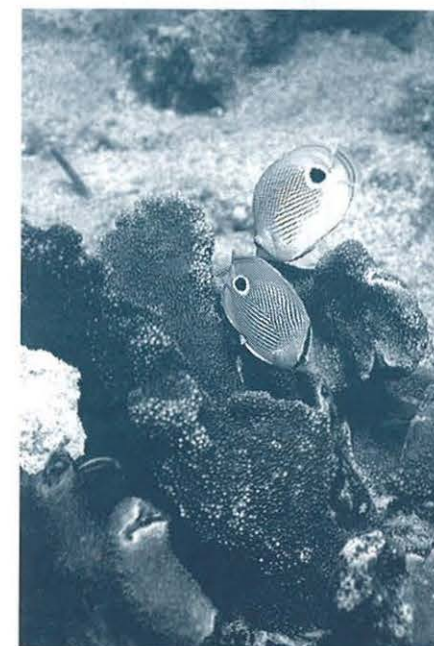
We are all in this together...and together we can make a difference: helping the dive industry to grow while protecting our waters for current and future divers.

We look forward to working with all DEMA members to make this vision a reality.

CORAL NURSERY

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were responding favorably and exhibited new growth. Shortly after the hurricane Reef Relief volunteers located all of the fifteen *Acropora* Rosettes. Nine pieces out of forty nine survived, an 80% mortality. With a renewed effort 54 new coral fragments (victims of Georges) were stabilized on the old *Acropora* Rosettes by the Reef



Relief team, this brought the total number of subjects to 63. However, even the small cement welds were considered temporary. In the wake of the hurricane there were so many damaged pieces of Elkhorn coral at Western Sambo reef that I surmised that we needed at least fifteen more rosettes at this site. We had assembled 32 additional coral fragments in the staging area only to learn that we were denied permission to increase the size of the Nursery. It was

beyond our comprehension why we could not save any more coral, this order came from the supervisor of the FKNMS. We were using a FKNMS design. We had communicated every day with FKNMS biologists. We had the dive team on the site with cement pads waiting for approval. Because we had already shuttled 32 pieces of broken coral to the

staging area I felt that we owed it to these pieces of coral to do more than let them die. In a "last ditch" type of effort we cemented these pieces to a nearby boulder outcropping that apparently withstood the hurricane. The comparison of these fragments (elevated above the sea floor) attached to the boulder, to the growth of the

fragments on Rosettes (located on the sea floor) is very interesting. We will be releasing this study toward the end of the summer.

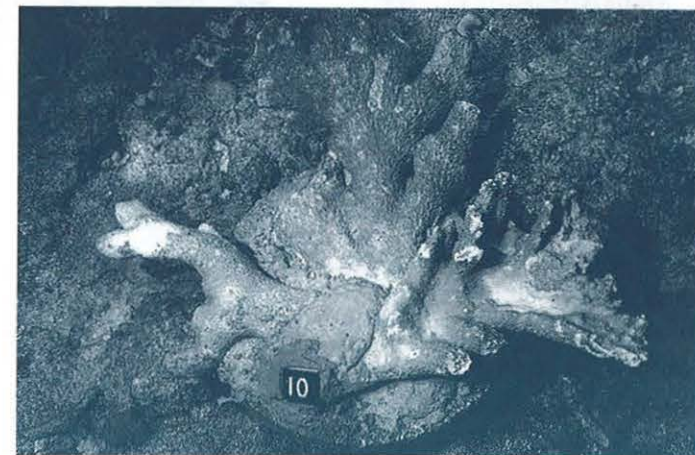
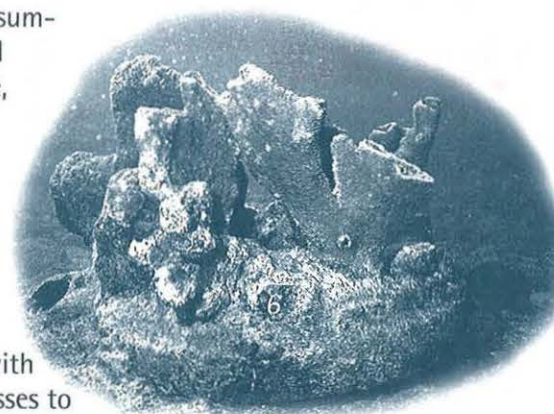
On November 3, Tropical Storm Mitch passed over the Keys once again disturbing the already compromised coral reefs. Three Rosettes disappeared and are assumed buried in rubble. All of the coral fragments attached to the boulder survived and appear to be in excellent health.

The Lower Florida Keys

was not the only place where Elkhorn coral was lost this past summer. The coral reefs in Belize, the second longest coral barrier reef in the world, took a severe hit from Hurricane Mitch, with substantial losses to their shallow Elkhorn coral. Because this could represent a major loss to the extent of this species in the Caribbean Basin, it is imperative that we protect and save as much of it as we possibly can. Coral nurseries should be established throughout the Caribbean and the old dogma of not doing so because we are manipulating nature disregarded. We are manipulating nature every day in numerous ways through source pollution. Volunteer participation in widely-supported coral restoration programs should be encouraged and permitted. The

current policies discourage interested parties from getting involved.

We are currently reviewing all of the video recordings and still images from the Elkhorn coral zones at Western Sambo and Rock Key (that are part of the ongoing Reef Relief Photo Monitoring Survey) to determine the loss of coral in those areas after the three major storms of 1998. Preliminary indications suggest that massive losses have been sustained by the Elkhorn (*Acropora palmata*) on these reefs.



Coral Nursery photos by Craig Quirolo.

Education & Outreach Update

BY MICHAEL BLADES



Already they have been active in the community participating in a number of post-hurricane clean-up activities. They have also been instrumental in helping during recent beach clean-ups at Boca Chica Beach and Garrison Bight.

Reef Relief recently participated in the Ocean Celebration held at the Dolphin Research Center. Hundreds of Monroe County students were able to enjoy conservation education and activities from more than 20 organizations dedicated to protecting the environment including Reef Relief. Thanks to Peggy Sloan of the DRC for organizing this event. A new volunteer, Alicia Stevenson, worked hard creating an activity and a display just for this event. Alicia has been volunteer-

ing two days each week in our offices. Already, she has created new displays for our center and been an enormous help to our staff. She will soon be planning our Earth Day effort.

Many volunteers have contributed to our success. I would like to especially thank Theresa Foley who has been serving as volunteer coordinator. Her hard work in revamping our volunteer program has eased the burden on our staff. Thanks also to volunteers Adrianna Hirtler, Pieter DeBoer, Michele Boettger, John Cornwell, Jody Weber, Benjamin Campbell, Gary Elston, Alain Chabert, John Butler, Dennis Weislick and India Weber.

Thanks to a committed core of volunteers, Reef Relief has been able to continue to expand efforts to reach into the community and educate people about the myriad of problems facing our reefs, as well as the potential for solutions. The outreach program may not seem as exciting as programs such as the coral nursery program, photo-monitoring or international projects, but it is critically important. As the new millennium approaches, we as a society need to make some fundamental changes in our way of life. We need to develop a greater sense of conservation with a focus on a sustainable lifestyle. Our education program hopes to bring this message to as many people as possible.

We have recently expanded our involvement with the Key West High School Mentor Program. This year both Joel Biddle and myself are serving as mentors to small groups of students interested in pursuing careers in the environmental field. We work the students throughout the year, helping to prepare them in the basics required to complete a resume, job inter-

view and other skills. Working closely with these students has proven to be a rewarding experience and congratulations go out to Dom Santana and the staff at Key West High for such an excellent program.

There are other promising things happening at Key West High School. This year, for the first time there is an environmental club. H.O.P.E. (Helping Others Protect Our Environment) formed by Celine Shakti Assouline that has over 70 student members.



Key West High School H.O.P.E. club members volunteered for beach clean-ups at Boca Chica Beach and at Garrison Bight. Shown here are students (l to r) Vivian Tapia, Melissa Garcia, Renee Philips, Christina Stout and Shakti Assouline along with David Perkins their teacher and sponsor. Photo by Michael Blades

Ten Simple Ways To Make A Difference or, You Are What You Eat

revised/reprinted from the Center for Biodiversity Conservation Newsletter

1. Choose organic products because they are healthier for you.
2. Buy produce that is grown locally.
3. Buy produce that is in season.
4. Avoid eating over-exploited species such as swordfish, shark and conch, or purchase nursery-bred seafood; shrimp trawls harvest 10 pounds of bycatch for each pound sold and some threaten sea turtles and dolphins.
5. Draw on the Earth's biodiversity; eat a variety of foods.
6. Eat foods that are low on the food chain; they are healthier for you and take fewer resources to produce.
7. Buy products with minimal packaging.
8. Choose paper or plastic shopping bags, not both; or better yet, carry your own bag; avoid plastic if they are not recycled in your community and then re-use or recycle all bags.
9. Minimize your food waste; live simply so that others may simply live.
10. Precycle. Make environmentally-sound decisions before you buy such as buying in quantity; avoiding single serving containers, etc.

Volunteers Needed

Would you like to do something for the reef besides just send in your money? Many opportunities are opening up for volunteers to perform a wide range of services that help Reef Relief, the reef and encourage water quality efforts around the country. Reef Relief has long depended upon a core group of dedicated volunteers to assist the small staff of the organization in carrying out dozens of projects every year that benefit the reef.

An organized effort is underway to increase the number of volunteers and find more opportunities for involvement in Reef Relief's environmental activities. Please consider donating your time and energy.

In Key West, volunteers are needed to plan and run special events such as beach or harbor cleanups, Reef Awareness Week activities and teacher workshops. Other volunteer jobs involve assisting in Reef Relief's headquarters with public and community outreach, and in the Reef Relief store. People are also needed to distribute educational and membership materials to dive shops, resorts and local businesses throughout the Keys.

If you are interested in helping, please contact us by requesting a volunteer form via mail, email or fax.

Reef Relief Adds Volunteer Coordinator

Volunteering to help out at Reef Relief has become a bit easier since Theresa Foley, a Key West based writer, has taken on the role of Volunteer Coordinator for the organization. Foley is a volunteer herself, and has been working to recruit more people to help Reef Relief carry out its mission.

"The core group of volunteers at Reef Relief is much smaller than it could potentially be," says Foley. "We know there are many people in the community who care about the environment and want to see more done to clean up the water and improve conditions at the reef. I'm trying to organize things so that we can match volunteers with jobs that need to be done."

Reef Relief's volunteer



based activities will be increased and the staff workload will be improved as the volunteer program expands. If you are interested in volunteering, come by Reef Relief headquarters and fill out a volunteer form, or contact Theresa Foley directly at 305-292-9166 or email: theresafoley@compuserve.com.

Reef Awareness Week Set for July 25-31, 1999

Reef Relief has set the last week in July, 1999, for its annual week-long schedule of events to heighten awareness and protection for Keys coral reefs. This year's theme is Water Resources, in cooperation with the South Florida Water Management District. Planning is underway for Reef Awareness Week, which will include the annual membership meeting, board of directors retreat, a luncheon talk at Cheeca Lodge, art events, book signings, an environmental film festival on local television, and a daily menu of other special events. Last year's sand sculpture contest was great fun! So plan on coming down to the Keys and getting involved. For more information, contact Reef Relief.

Reef Education for Visitors to the Florida Keys

A time proven method of educating residents and visitors of the Keys to protect our fragile marine environment is once again available. The Lower Keys Region site brochure for the Florida Keys National Marine Sanctuary has been produced, printed on recycled paper and distributed throughout the Lower Florida Keys. This cooperative venture between Reef Relief and the Florida Keys National Marine Sanctuary will complement a similar brochure being produced for the Upper Keys.

The new brochure includes all of the information contained in Reef Relief's educational

brochure, Florida's Coral Reef Ecosystem, in a multi-lingual English/ Spanish format. This is our key educational piece for visitors and residents and includes information about the coral reef ecosystem; tips for divers, snorkelers, boaters and fishermen; and more. It is the most widely distributed and most popular educational brochure in the Florida Keys.

The brochure has been expanded to include all of the sanctuary regulations, a map containing the zones, a list of the locations of vessel pump-out facilities and boat ramps, navigational markers and charts for each of the reefs with mooring buoys. 200,000 brochures were printed for distribution this year and the first distribution has been completed, thanks to Reef Relief's Michael

Blades, a team of volunteers, and sanctuary staff. It is provided to hundreds of locations, including all the hotels, motels, resorts, guesthouses, chambers of commerce, visitor information

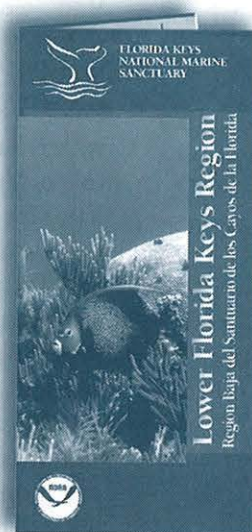
centers, educational facilities, marinas, dive shops, bait and tackle shops, sport and commercial fishing interests from Key West to Marathon, in addition to many educational venues, special events, school programs and information packets that are mailed out by both Reef Relief and sanctuary staff. Many hotel-

iers put the brochure directly in the rooms or hand them to their incoming guests in their welcome packet, or provide them to special groups prior to their arrival.

The Lower Keys Region site brochure was made possible

through the financial support of the Florida Keys National Marine Sanctuary, West Marine Products, CORAL—the Coral Reef Alliance, the Key West Aquarium, the Community Foundation of the Florida Keys, American Express, Old Town Resorts, Key West Hotel Motel Association, PADI's Project AWARE (Aquatic World Awareness Responsibility Education), Marriott's Casa Marina Resort, the Blue Marlin Motel and Best Western Hibiscus Motel.

Fundraising is still underway to produce 200,000 copies of the Upper Keys version. To date, supporters include the Herbert W. Hoover Foundation, West Marine Products, American Express, CORAL, Key Largo Resorts, Cheeca Lodge, and the Florida Keys National Marine Sanctuary. Check out the online version on Reef Relief's website, located at www.reefrelief.org, in the Educational Materials section. For more information or to receive a copy, contact Reef Relief.



CREATURE FEATURE

LOGGERHEAD TURTLE

Loggerhead turtles are huge sea turtles with heads so big that, when they come up to the surface to breathe, their heads look like the tips of logs sticking out of the water! Powerful jaws crush clams, lobsters and other crustaceans. An estimated 14,000 females nest in the southeastern United States.. A loggerhead turtle produces about 100 eggs at a time. They leave their water world, crawl slowly across beaches to bury their eggs in soft sand. Hatchlings are about two inches long and, when they emerge from their eggs, large numbers scurry across beaches to the safety of the sea. Only one or two will survive to become adults.

Adult loggerheads can weigh up to 350 pounds. Loggerheads are strong swimmers and have been known to travel well over 1,000 miles during a ten month period. Drowning in fishing net and habitat loss threaten these magnificent animals.



Photo by Craig Quirolo

Goings On at The Center & Store

BY JOEL BIDDLE



This winter, the Reef Relief Environmental Center & Store has received visits from a variety of different groups. As usual, each group received free educational materials, video presentations about the reef, and tours of the Center & Store. Groups included visits from Sea Camp, the Mel Fisher Museum, and Dade County Girl and Boy Scout troupes, among others.

In December the Collier County Audubon Society asked me if I could adapt the video presentation I provide students and groups into a slide show format and come to Naples, Florida. I was happy to comply. I also gave the same presentation to the Elder Hostel Program—an on-going program sponsored by Barry University. The shows went so well that we decided to make it part of our educational outreach program. Additionally text and slides are being made available in our store and on the internet for sale to all who are interested in making presentations within their community and other educational purposes. This, along with the Reef Relief Teacher Kit and the Reef Relief Teacher Guide, provide all the elements needed for educators interested in presenting coral reef ecosystem curriculums for all ages.

Planning for this year's School Outreach program is underway page. Our efforts will extend to over 400 fourth graders from public schools in Monroe County who will have tours of the Center & Store and video presentations about the reef. They will also visit the reef aboard the Glassbottom Boat, *Discovery*, and receive follow-up talks in their respective schools about how reefs can be saved. We want to extend extra special thanks to the South Florida Water Management



The Reef Relief team includes (l to r) volunteer Alicia Stevens, new Environmental Center & Store staffer Sarah Zimm and Store Manager Mutzee Hiller. Photo by Michael Blades.

District and *Discovery* Glassbottom Boat Tours, for making this event more exciting and inclusive than ever.

In recognition of sea turtle nesting season coming up, our display case will sport a sea turtle theme with educational information about protecting endangered species. In addition, the Reef Relief Center & Store is now offering a wide array of turtle gifts, from floating turtle candles and books about turtles, to turtle pins and turtle plush toys. Turtles rule the day at Reef Relief. So don't be shy, Come on Down! And... think turtle to save a turtle!

All of us at Reef Relief would like to welcome Sarah Zimm, who will be assisting Store Manager, Mutzee Hiller, in representing the Center & Store. Sarah recently moved from California to Key West. In California Sarah worked with at-risk and incarcerated students in an art-outreach program. "I am glad to be a part of Reef Relief" says Sarah, "I learn something new everyday and I feel like I'm contributing to help save the reef, rather than just watching it waste away." So welcome, Sarah, to our team!

In closing I would like to thank Evelyn Russell for her kind contribution to Reef Relief in memory of her son, Preston "Pete" Sergeant Russell who lived and loved life here in the Florida Keys.



We have a wide selection of turtle wear at the

REEF RELIEF

Environmental Center & Store.

stop in at 201 William Street

open 9am - 5pm daily

or, visit our online environmental store at www.reefrelief.com

Don't be a knucklehead, dress like a loggerhead!

Reef Relief Fish Book For Kids Now Available

Reef Relief's Bill Alevizon is happy to announce the publication of *The Reef Relief Book of Coral Reef Fish*, a learn-and-color volume with young (ages 3-12) readers and artists in mind. Twenty full-page drawings of common reef fishes for kids to color are provided, each accompanied by brief but informative descriptive text designed to catch the attention of young reef explorers. Full-color miniature illustrations of the fishes included are depicted on the back cover. The book retails for \$6.95, and is available now through the Reef Relief store, or website.

The text passages were written by Dr. Bill Alevizon, a scientific advisor to Reef Relief and expert on coral reef fishes, and the original illustrations drawn by Ruth Rasche, a talented artist who also serves as senior editor for a major publisher in Gainesville, Florida. A portion of the revenues derived from all retail sales of this book (through our outlets or otherwise) will be used to support Reef Relief.

Cayo Carnival Nets Funds For Coral Reef Conservation

Planet Hollywood in Key West hosted a reception for Reef Relief's Cayo Carnival sponsors and volunteers in December at which time Cayo Coordinator George Murphy announced that the annual Reef Relief fundraising event held November 21, 1998, netted over \$30,000, including a \$2000 donation from Planet Hollywood. The funds will be dedicated to continuing efforts to protect the coral reefs of the Florida Keys.

Murphy noted, "We are very grateful to all our sponsors, especially First State Bank, Kelly's, American Eagle, Hogsbreath Saloon, the Bottlecap, Bacardi, Hooters, BFI, Rio Crystal, Premier Beverages, Buquebus, and Bell South Mobility. I want to thank all of the restaurants, suppliers and volunteers who stepped forward this year to become a part of our annual party, which was dedicated to celebrating the International Year of the Ocean. It takes a whole island to throw a really great party and Key West has lived up to its reputation for doing just that. Thank you all!"

The funds will support the local work of Reef Relief, including the Coral Reef Conservation Program—a multi-media awareness and educational effort throughout the Florida Keys that includes the "Discover Coral Reefs" School Outreach Program for local school students, the Reef Relief Teacher Guide, advocacy for improved water quality, the educational website at www.reefrelief.org, newsletters, brochures and educational programs for residents and visitors, and operation of the Reef Relief Environmental Center & Store in Key West, one of the only public facilities in the world dedicated to learning about the coral reef ecosystem, Coral Nursery Project, the Coral Photo Monitoring Survey, and International Projects.



Top: First State Bank was a major sponsor this year and even provided their famous 'sea-cow' for the Kids Korner. Above: JD Mettler and Amy Horst, sporting the commemorative Cayo volunteer tee celebrating the International Year of the Ocean, have worked the front gate at Cayo for the past several years. Right: *The Fins* were the headline entertainment at this year's event, which also featured *Bill Wharton*, *The Sauce Boss & The Ingredients*, *Hugo*, *Duarte & The Full Sail Band*, and *One World*.



Jimmy Buffett and his fans and friends continue to support Reef Relief's efforts. Recently, Parrot Heads in Paradise, the national parrot head club held their annual "Meeting of the Minds" convention in Key West. They were kind enough to donate a portion of proceeds raised during the event to Reef Relief. Other regional Parrot Head Clubs have also made donations. In fact, a local Key West Parrot Head Club has recently formed and already they have offered to volunteer with us. Jimmy's Margaritaville stores have continued their long-time support, here Reef Relief Project Coordinator Michael Blades accepts a contribution from Margaritaville's Gaye Walton.

Be a Sea Fan! Recruit a New Reef Relief Member Today!

BY DR. CHUCK OLSON

The true strength of any non-profit organization—the one factor that determines its ability to make significant achievements—is its membership...and nowhere is this more true than at Reef Relief. Year after year, ranging from major events such as Reef Awareness Week and Cayo Carnival to seemingly small things such as stuffing envelopes and answering the phone, our members and volunteers give generously of their time and resources.

However, despite the countless hours donated by our dedicated corps, there are certain things that require financial resources. Fortunately, Reef Relief has enjoyed great support from a loyal, mostly local membership who see our work each and every day. Especially exciting is the growth of our membership—both locally and nationwide—through word of mouth. This important increase in membership has allowed us to accelerate our education, scientific and advocacy work to new levels. *This needs to continue.*

We're asking each and every Reef Relief member to reach out and recruit one new Reef Relief member this month so that next month we can double our accomplishments. So please, take a moment right now while this issue of Reef Line is in your hands, and write the name of a prospective new member across the top of the page. Then when you are finished reading this issue, get it into that person's hands (maybe with a note from you encouraging them to join). Or, you could fill out the membership form that is part of this newsletter and send it into us with that person's dues for the next year.

Our Education Program Needs Your Help

As you probably know, Reef Relief has for many years been a leader in coral reef conservation education. Our projects and programs range from educating children in our Discover Coral Reefs program to informing policy makers in our Action Alerts to interacting with visitors to Key West in our Environmental Center. However, as the additional need for this type of work grows, so does its costs.

We're asking all Reef Relief members to consider making a special gift this year for our Education Program (or, if you've decided to

give a gift membership, memorial donation or other special donation, to earmark it for our educational efforts).

Recent Gifts and Grants

In the 4th Quarter of 1998 and the beginning of the 1st Quarter of 1999, numerous grants were received to further support our conservation, education and advocacy work.

Several longtime friends of Reef Relief again stepped forward with critical funding to continue or expand core programs. The **George B. Storer Foundation**, one of the strongest supporters of conservation efforts in the Florida Keys, awarded us a grant for our Strategic Fund to be applied to the projects and programs "of highest importance and urgency." The **Curtis and Edith Munson Foundation** also continued their support for 1999 with a grant for Marine Projects. The Munson Foundation has been a principal sponsor of Craig Quirolo's photomonitoring Survey and much of his breakthrough research is due to this support. The **Richard Lounsbery Foundation**, another great friend of Reef Relief, again provided important funds for our conservation, education and scientific work.

These repeat grants, in addition to providing critically-important funds, also were further illustrations of the validity of our work. These foundations receive far more requests for their funds than they can ever fulfill and we are proud that they found our work worthy of continued support.

Late 1998 and early 1999 also saw new foundations and corporations making first time grants to Reef Relief, with many being in response to either word of mouth from our longtime friends and supporters or through what they saw on our website (www.reefrelief.org). The **Ernest Stempel Foundation** was one such donor who was so impressed by what they gleaned from our website, that they initiated an unsolicited grant of stock which they matched with an additional grant of stock at years end.

Grants were also received from the **Mostyn Foundation**, longtime supporters of marine conservation and from **The Foster Family Foundation**, who made a generous gift for our Key West Environmental Center (*Editor's Note:* The Environmental Center suffered considerable damage due to last fall's

hurricanes and tropical storms and a "repairs account" has been established for those who wish to help us fix up this very important educational facility.) As this issue went to press we received word from the **Hoover Foundation**, a prestigious supporter of conservation, that they would provide capstone funding for the Upper Keys edition of our marine sanctuary educational brochure.

One of South Florida's premier governmental conservation partners, the **South Florida Water Management District**, recently announced that they were issuing a grant to Reef Relief through their Water Resources Educational Partners Project. This important grant will fund a wide array of educational projects, programs and activities including the Discover Coral Reefs School Outreach Program, an Environmental Education Teacher Workshop, our Intern and Mentor Programs, public service announcements, and the expansion of the Reef Relief website.

Not to be overshadowed by these institutional donors are the many individuals who made important contributions to Reef Relief in the past several months. Very generous gifts have been received for nearly every Reef Relief project and program. As is Reef Relief's policy, we do not print the names of these individual donors (unless they give us specific permission to do so) so as to protect their privacy. To all those who gave so generously to us in recent months, thank you.



Photo by Larry Lipsky

Larry Lipsky Memorial Fund

In March, 1999, many Florida Keys residents and family members mourned the loss of Larry Lipsky, an underwater photographer who resided in the Islamorada area and gave generously of his images of coral reef creatures to Reef Relief. To create a legacy to Larry's love for the ocean and all its creatures, the Larry Lipsky Memorial Fund has been established at Reef Relief by family members. Contributions to the memory of Larry's indomitable spirit will be dedicated to ongoing Reef Relief programs to protect the coral reefs of the Florida Keys. For more information, contact Reef Relief.

The Keys Are In Our Hands

...CONTINUED FROM PAGE 3

The Key West Commissioners also passed legislation that will require marine operators to help improve water quality through the new Vessel and Docking Ordinance. It requires use of vessel pump-out facilities or acceptable alternatives such as a dry composting toilet, incineration device, or city sewer line hook-up for houseboats. The Florida Clean Vessel Act prohibits vessels from discharging sewage in state waters, but allows chemically-treated discharges, which could prove more harmful to the coral reef environment than raw sewage. Enforcement has been limited and many Keys commercial charterboats have been dumping their sewage directly into the ocean for years. The good news is that we are making great strides and many boats are beginning to use pumpout facilities.

After researching the subject, we learned that a municipality cannot pass laws for commercial vessels that are more restrictive than federal or maritime laws. However, Key West can seek a complete prohibition on discharging sewage by following a process that began with city approval. The next step is to provide an application for approval by the governor. The governor must then recommend that the U.S. Environmental Protection Agency Administrator declare city waters to be a No Discharge Zone, enforceable by the U.S. Coast Guard. Key West should meet the qualifications, which include having adequate pump-out facilities. More are slated for installation and a mobile pump-out barge is now available to any boater on call. We will assist the city through the process.

More Science on Sewage

Recent studies by Dr. Joan Rose and others have once again confirmed that virus and pathogens are being found in the canals and nearshore waters of the Keys and the culprit is inadequately-treated sewage. Before we must close our beaches because of the health threat, county-wide action must be taken to clean up nearshore waters.

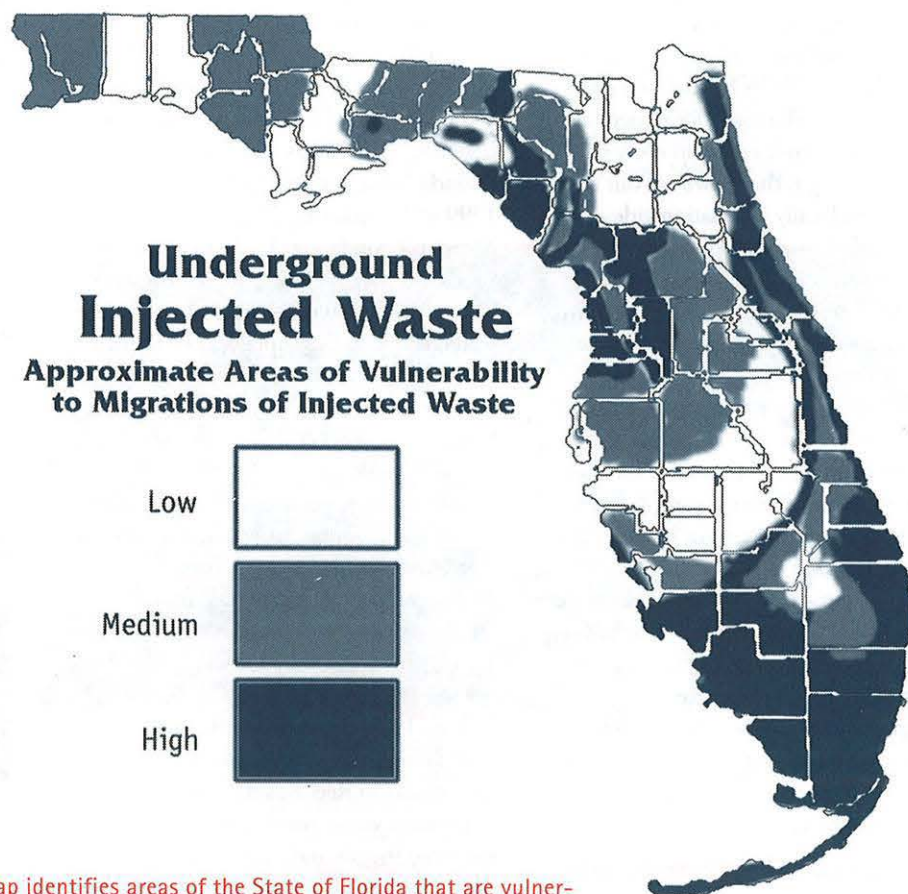
Keys-wide

County Commissioners have recently approved exemptions to stop enforcement action for properties with illegal cesspits if the area is scheduled for construction of regional waste treatment facilities. The Department of Community Affairs is watchdogging the effort to be sure that the facilities are made available in short order. The savvy residents of Cudjoe Key have organized and petitioned to be hooked up to the Key West Resort Utilities plant. Reef Relief is recommending that dry composting toilets be used, however an approved method of using graywater for irrigation to accompany the toilet is yet to be approved for use in the county and that is the sticking point.

Everglades Update

The controversial plan to restore the Everglades will be reviewed by an independent scientific panel. The move was partially in response to a letter from six prominent biologists, including E.O. Wilson and Gene Likens who criticized the plan as "deeply flawed." The biologists asked for a review from an independent scientific body, but Secretary of Interior Bruce Babbitt is proposing to establish only an oversight panel responsible for reviewing implementation of engineering plans. In addition, the establishment of the panel will be allowed only if it does not delay the plan's implementation.

President Brian Lapointe commented, "We've been down here watching the harmful effects of flawed policies for almost a decade now. It's great to finally see this problem getting the attention of such imminent scientists. Now that they have joined our call for policies based on sound science, there is a ray of hope for the future health of the linked ecosystems of South Florida."



This map identifies areas of the State of Florida that are vulnerable to leakage from underground injection of waste from deep injection wells. Yet the State continues to permit the installation of such wells which allow the migration of waste to coastal waters. The porous limestone substrata of the Florida Keys is especially at risk due to the widespread use of shallow injection wells which deliver nutrients to nearshore waters in a matter of hours. In addition, aquifer storage areas anticipated as part of the Everglades Restoration Project must be approached with caution to guarantee the safety of fresh water needed by the ecosystem and for drinking supplies. Reef Relief recommends that all injected waste be stripped of harmful nutrients prior to injection. Adapted from the FICUS website (www.ficus.usf.edu/exhibits/injection).

From the President's Desk

...CONTINUED FROM PAGE 2

health are pocket book issues. Negril hard corals equal hard currency."

My presentation began with an overview of the nutrient threshold model that explains why harmful macroalgal blooms on coral reefs. Next, we presented the initial design of the integrated coral reef and water quality-monitoring program for Negril that specifically linked nutrients from various land uses on the watershed to macroalgal blooms on downstream reefs. Our results showed that the reefs are on average above the nitrogen thresholds for macroalgal blooms, explaining why Negril's reefs have become dominated by macroalgae. This has traditionally been blamed on overfishing, although there has never been any scientific proof of that. The nitrogen was high year round on both deep and shallow reefs, whereas the phosphorus concentrations significantly increased in rivers and streams and groundwaters on the watershed and throughout the entire Negril Marine Park. The nitrogen is always high because it is constantly being transported by the groundwater. Salinity data from a site called Sands Club showed that fresh water from groundwater discharges is affecting reefs several kilometers from shore.

My videos illustrated that macroalgal blooms on deep and shallow reefs were different. Halimeda, a calcareous algae, dominated deep reefs off Green Island and Little Bay, compared to shallow reefs that were dominated by fleshy macroalgae, such as *Sargassum*, *Dictyota*, *Cladophora*, and *Chaetomorpha*. Rainfall and nutrient data indicated that the massive blooms of *Chaetomorpha* on the shallow reefs of Orange Bay were initiated by phosphorus enrichment, apparently linked to "soak aways" (cesspits) on the adjacent watershed and possibly other sources, such as fertilizers.

I then pointed out how special radioisotope studies can be used to fingerprint the actual source of nitrogen contributing to algal blooms. The monitoring data revealed that 15N ratio in macroalgae at Davis Cove, North Negril, Long Bay and Little Bay were linked to sugarcane fertilizers, in comparison to macroalgae in South Negril and to a lesser extent Ironshore, where they were associated with sewage nitrogen.

The watershed monitoring data illustrated how different land uses enrich the rivers and streams in the area. In the low salinity areas where there are fresh water inputs, there were higher levels of nitrogen and phosphorus. All four subwatersheds produced data that salinity was inversely correlated with nitrogen and phosphorus, showing the importance of enrichment in all to nutrient delivery on downstream reefs. Both phosphorus and nitrogen concentrations on the Davis Cove subwatershed were significantly higher around canefields, showing the nutrient enrichment associated with fertilizers on cane fields in the Davis River

that flows out to the reef. In the South Negril River subwatershed, the high phosphorus concentrations in the estuarine portion of this study area are linked to the considerable sewage inputs from "soak away" pits, squatter communities without sanitary conveniences, inadequately treated sewage outfalls, and livestock on the river bank.

The NCRPS studies provided multiple lines of evidence linking human activities on land to degradation of the reefs. Dr. Barry Wade, of Environmental Solutions, Ltd. noted, "I would like to congratulate the ncrps and all those who are associated with putting on this seminar. Just to put a little bit of perspective on the situation, to say that ncrps has gathered what we who were working in Kingston Harbour several years ago took almost a decade to do. I congratulate you for that, but I think it is very important to say that time is of the essence. What we are seeing is that we are in the exponential phase now, and once we are in that phase, we have to act quickly, so it is not good enough to just identify the problem, we have to come up with solutions quickly and put them in place. We hope that we don't make the same mistakes in Negril as we have made in Kingston Harbour and elsewhere—to talk the subject to death, to study it to death, while the reefs are dying."

Presentations in the afternoon focused on escalating beach erosion in Long Bay. Fishermen reported that despite "no take" zones in four fish nursery bays within the Park within the past two years, they see little or no improvement in their fish stocks. Green Islanders who increased the mesh size on their fish traps from 1 to 1½ inches report that since they changed over to the larger mesh size, they have caught no fish for over a year. Their perception as "Guardians of the Sea" is that land based pollution is creating an environment that is totally undesirable for the fish.

Katy Thacker, of the NCRP, highlighted the fact that rapid deterioration of the coral reefs in the Negril Marine Park is reducing the ability of the reef to protect the shoreline from erosion. Informal studies by the Society indicate that some areas of the beach have lost as much as 30 feet or more of sand during the past three years alone. Gillian Cambers (University of Puerto Rico Sea Grant) made a presentation in the afternoon entitled "Coping with Beach Erosion," which paralleled the plight of Negril with that of the West Coast of Barbados, where beach erosion is a major problem.

A general consensus from all was that greater effort must focus on real solutions. "I wish to use this occasion to underscore my Ministry's total commitment to the cause and to assure you that we, on our part, are taking all the steps necessary to give you the regulatory and other support which will be needed to achieve the task of saving the reefs and improving the water quality of Negril," stated Minister Douglas. With that type of commitment from the Government of Jamaica, we can begin designing clean up strategies for Negril.

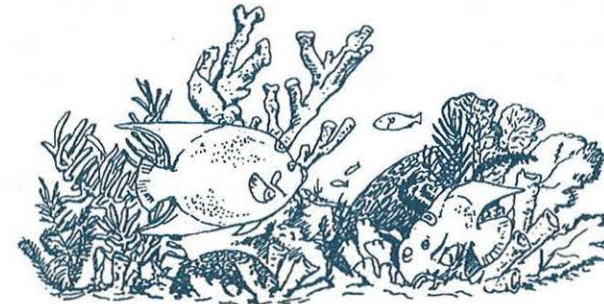
Reef Relief Wish List

- ⌘ Sponsor for the Discover Coral Reefs School Program
- ⌘ Sponsor for Reef Line
- ⌘ Computer parts or system for design and web site publishing (56K modem, large size monitor, graphics tablet, lots of ram—Mac or pc)
- ⌘ Dependable Color Printer
- ⌘ Laptop computers
- ⌘ 35mm SLR camera equipment

Surf's up—WWW.REEFRELIEF.ORG

We have been busy adding a significant content to our website. Visit the "What's New" section for links to all the material recently posted, thanks to the expertise of Patrick Desmond with help from Alison Alpert & Assitech. Notably, two of Marine Projects Director Craig Quirolo's Photo Monitoring reports have been uploaded: the report on the 1998 Expedition to Cuba and the Report on the Coral Nursery Project (see cover story). Each of these reports include 100's of underwater photographs of the changing reef in these two areas, as well as detailed descriptions and mission logs of each of these projects. We have also been working to develop online versions of our various printed educational materials and added text to the endangered species section. The new Lower Florida Keys Sanctuary Site Brochure (see page 10 of this newsletter) is now available online, in both English and Spanish.

While you are surfing, please visit our Online Environmental Store, which features photos of many of the great products available in our terra firma store. The store accepts secure credit card orders for products or to become a Reef Relief member.



REEF RELIEF®

Mailing Address:
Post Office Box 430, Key West, Florida, 33041

Environmental Center & Store
201 William Street, Key West, Florida 33040

Email: reef@bellsouth.net
www.reefreelief.org



Be a Sea Fan!



REEF RELIEF® relies on memberships, contributions, and volunteer efforts. Join our grassroots effort to save the reef.

Membership/Contribution Form

- ☐ Yes! I want to be a Sea Fan and join REEF RELIEF.

My contribution of \$20.00 entitles me to a one year membership, the quarterly newsletter REEF LINE, a window decal, bumper sticker, and all membership privileges.

- ☐ Yes! I want to be a Contributor to REEF RELIEF's coral reef conservation programs.

My contribution of \$_____ entitles me to all membership privileges and a certificate of appreciation.

- ☐ Yes! I want to be a REEF RELIEF Sponsor!

My donation of \$_____ (minimum \$500) entitles me to all membership privileges, recognition in the newsletter, and a certificate of appreciation.

All contributions tax deductible to the fullest extent of the law. REEF RELIEF has been granted 501(c)(3) status by the UNITED STATES INTERNAL REVENUE SERVICE

- ☐ Yes! I want to Volunteer to help REEF RELIEF in coral reef conservation.

Indicate areas of interest: (education, marine projects, advocacy, special events). Note any special skill you have to offer: _____

Name _____

Address _____

City/State/Zip _____

Telephone _____

Credit Card Number _____ Exp. _____
(or make checks payable to Reef Relief)

(Please copy and mail this form)

Protect Living Coral



Printed on Recycled Paper