

# **REEFMONITOR.ORG**

## **PURPOSE AND MISSION STATEMENT**

### **WHY CHECK THIS WEBSITE?**

Coral reef systems worldwide are in big trouble. Huge coral and fish losses are occurring each year due to human-generated stresses on the environment. Because this ecosystem type grows so slowly, it will take more than 60 years to recover from even present conditions, and unfortunately no stemming of loss is in sight. Parts of the Caribbean, for example, have experienced a loss of more than  $\frac{3}{4}$  of the coral cover that was present in the early 1970s. Without healthy reefs, the homes and nurseries of many species and their futures are at risk and may be severely compromised.

### **OUR MISSION STATEMENT**

It is the goal of Reef Monitor to help in resolving the crisis of coral reef ecosystems through research and education. We accomplish this by performing field and laboratory experiments internationally, by training students in this realm and by disseminating knowledge on the subject via publications and this website. We are a small-scale but dedicated program deeply concerned about our underwater world and committed to a more enlightened and caring human stewardship in it. Our work has been in progress since 1997, and this website is a newly formed facet of it. We sincerely hope our website will be informative, useful to you and beneficial to coral reef ecosystems.

### **SPECIFIC RESEARCH AIMS**

We must determine exactly what is and is not damaging and destructive to coral reef ecosystems and the fish populations inhabiting them. An important step in the research process toward this end is to establish reference baselines for unstressed conditions in order to assess stress impacts on coral reefs and their inhabitants. This will require determining basal levels of cortisol for parrotfish populations inhabiting largely undisturbed coral reefs in a number of geographic locations (such as Caribbean, Hawaii, Bahamas). A second crucial step will be experimental exposure of fish to environmental stressors, one at a time, in order to develop a priority list of detrimental factors. Finally, we must reduce and eventually eliminate these real threats in a manner prioritized by their impact.

### **PRESENT STUDIES**

It is well documented that the hormone cortisol, secreted by the adrenal glands, is a good measure of stress in mammals. Our research group has established that cortisol is also a reliable indicator of stress levels in parrotfishes, which are a common type of reef fish worldwide. We have demonstrated that parrotfishes are stress-hormone (cortisol) responsive to chronic stressful conditions such as underwater noise, thermal shifts and elevated nitrate levels in the water. Finally, we have developed and tested a method in both field and lab conditions for collecting fish fecal samples as a noninvasive source for routine measurement of cortisol. Thus, our preliminary studies have led to a reliable cortisol-endpoint technology for stress monitoring. We have applied this technology to the mapping of parrotfish stress levels in bays around St. John, U.S.V.I. In 1999, we found significantly higher cortisol levels in human-populated bays vs. undeveloped bays. This difference has

sustained across testing performed from 2000-2005. This U.S.V.I. project is ongoing, with a continuous annual monitoring of parrotfish stress.

We have also begun a study to assess basal cortisol and its variability in parrotfish fecal samples across fishes, sites, days and months in several locations off the island of Abaco in the Bahamas. This is an important part of a regional cortisol mapping process. Once a baseline is developed, additional sites with and without coastal development will be considered. Site choices are based on discussions with commercial dive operators, other researchers familiar with the area and local inhabitants. We collect only fish fecal samples, and care is exercised to not disturb the reefs and their inhabitants.

## **PLANNED STUDIES**

In light of our findings of fish stress associated with human coastal development, we have formulated our next set of studies to establish a priority list of factors contributing to stress. This set of studies will employ captive fishes in beach-side aquaria containing ocean water continuously pumped in from near the reef where the fish were captured. This eliminates the common problems of water quality and fish transport stress/mortality. We will administer known environmental stressors one at a time to these fishes after they have adapted to the captive environment, allowing time for the fishes to return to pre-stress state (based on cortisol monitoring) between stressors. Determination of relative priority of a given stressor in terms of need for reducing its environmental impact will be based in descending order on cortisol response (amount and duration) to a given stressor. All fishes will be returned to their home reef upon completion of a given study.

## **EDUCATION**

A crucial component of this project is its videographic and photographic documentation. The value of such a record is multi-faceted. It permits dissemination of the findings well beyond the scientific community, serving as an educational tool, a resource for addressing environmental issues and a vehicle for garnering continued economic support for endeavors in this arena. Our second goal is to provide selected references and updates of research in this field at this website and via links to other relevant websites. A third important educational goal of our program is to provide a coral reef field education/training opportunity for high school and college students, local and otherwise, as field research assistants. Both the help they provide and the knowledge they gain can be invaluable. Their involvement will contribute to the development of a firm foundation for this cortisol-based stress indicator for fishes and possibly for coral reef well-being in general. Finally, by providing student exposure to the complex and beautiful realm of coral reef ecosystems, we can commit future generations to the protection and sustenance of this amazing resource.