



CHALLENGE

Protecting the world's coral reefs from bleaching caused by global warming. The coral reefs provide a home to about 25 percent of all marine life.

SOLUTION

JMP® is used to explore, visualize and share the data to locate the largest coral reefs and to monitor water-quality variables. SAS® helps calculate the extent of bleaching in reef tracts.

RESULTS

Significant coral reefs, and more than a million species of plants and animals that live there, are protected.

MORE INFORMATION

www.nature.org

www.jmp.com

The Nature Conservancy

Protecting precious coral reefs

If you call Kenosha, Wisconsin, home, you might not be concerned just yet about coral bleaching. Quite a few folks in Florida are, though, and for good reason.

Just off the coast of Florida is the North America's only shallow-water coral reef, stretching up from the Dry Tortugas to St. Lucie Inlet in Martin County. Coral bleaching, a product of global warming, is increasingly threatening the Earth's coral reefs, one of the most biologically diverse natural systems. Some estimates suggest that more than half the world's coral reefs could be gone within the next quarter-century.

According to The Nature Conservancy, coral reefs provide a home to more than a million species of plants and animals, or about 25 percent of all marine life. Almost a third of all fish are found in the reefs, and the chain reaction of destruction may threaten many more—which should cause some alarm to the Kenoshan who enjoys a nice piece of mahi mahi.

For Floridians, the tolls of reef loss are more immediate and more severe. The reefs serve as natural breakwaters, moderating wave action, especially important during massive storms. Reefs are essential to the state's fishing industry. And the beauty of the reefs are crucial to the tourism industry in attracting snorkelers and divers.

Rowena Garcia is the manager of the Conservancy's South Florida Marine Conservation Program. Along with a number of other organizations, government agencies and universities, TNC has been conducting the Florida Reef Resilience Program, an effort to develop management strategies for better protecting Florida's reefs. An important aspect of this work is studying the extent to which coral bleaching is occurring, and SAS and JMP software are both playing a key role in this study.

Corals often respond to stress by expelling the algae that live within their tissues and that are the source of their coloration, revealing their skeletons.

“I particularly like JMP’s dynamic visualization. JMP allows me to watch the values of water-quality variables change over time. This allows me to detect seasonality in the data and to detect any outliers.”

Michael McManus

“The bleaching itself is not a major problem,” says Garcia. “Corals have always bleached. The problem is when they bleach severely. When they do that, they die, and the reef dies. That’s what we’ve seen when there have been severe bleaching events – events almost unanimously acknowledged to be the result of warming ocean waters.”

“Using this weighting component, we can calculate the prevalence of bleaching for the entire reef tract.”

Rowena Garcia

During the hottest days of summer, Garcia and her colleagues go out into the Atlantic to survey the corals. The University of Miami has established a framework that divides the reef tract into zones. The coral within each zone is then surveyed by researchers who gather data on the extent of bleaching, the size of the individual corals and the abundance of corals within each zone.

“Based on previous mapping,” Garcia explains, “we look at how many corals and their variability in a particular zone, and that determines how many samples we take. It’s a weighted design. SAS software is then used to do statistical analysis of that data. Using this weighting component, we can calculate the prevalence of bleaching for the entire reef tract.”

These data tell the research team which species of coral and which individual reefs have been more resilient since previous surveying.

JMP software is used as an exploratory tool to determine where the largest corals are found.

Garcia particularly likes JMP’s data-sharing functions: “I really like that you can send a script by e-mail—with data tables with charts embedded—and someone else can see very clearly what you’ve done. And you can then have an interactive discussion.

“It’s clean, polished, very professional-looking. And it was easy to learn—but at the same time very powerful.”

Senior aquatic ecologist Michael McManus—a colleague of Garcia’s at the Conservancy and on this project –says he too relies on JMP for interactive exploratory data analysis.

“I particularly like JMP’s dynamic visualization,” he says. “JMP allows me to watch the values of water-quality variables change over time. This allows me to detect seasonality in the data and to detect any outliers.”

Another Conservancy colleague, Meaghan Johnson, has been using JMP in her staghorn coral restoration project to compare genotypes and also in looking at survivorship in particular zones. The mid-channel areas in which Garcia and her colleagues have been conducting their research have traditionally had very little protection.

“We have big and important corals here and we need to protect them,” Garcia says.

In the interest of full disclosure, we wish to note that John Sall, Co-founder and Executive Vice President of SAS, is on the Board of Directors of The Nature Conservancy and is a major contributor to that organization. In fact, JMP software was donated to the Conservancy for use with this project and others.



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