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Cover Story**Reefing the Benefits**

Scientists blend Fijian coral reef conservation project with an economic development initiative and drug discovery research.

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by Jane M. Sanders

IN THE SOUTH PACIFIC islands of Fiji, coastal villagers are beginning to reap much-needed financial benefits from conserving the beautiful tropical environment they treasure as a family heirloom, but must depend upon for income.

In a unique project that combines environmental conservation, economic development and drug discovery, researchers from the Georgia Institute of Technology are collaborating with the 250 or so villagers of Tagaqe and the [University of the South Pacific](#). They are exploring Fijian coral reefs, while working to both protect them and generate income for islanders. The project is funded primarily by the Fogarty International Center at the [National Institutes of Health](#) (NIH).

Instead of breaking off one-foot pieces of live coral reef substrate – called “live rock” – for sale worldwide to the saltwater aquarium industry, villagers planted a crop of synthetic rock that becomes naturally covered by desirable algal species. Villagers harvested their first crop earlier this year. The project, devised and negotiated by the researchers, is intended to reward villagers now for conserving the reef they need to make a living in the future – including potential income from the discovery of drug compounds in reef organisms. Other Fijian villages are interested in starting similar efforts, researchers say.

photo by Make Liku Movono, courtesy Univ. of the South Pacific



In a conservation project led by Georgia Tech researchers, villagers in Tagaqe, Fiji, planted a crop of synthetic coral reef substrate, called live rock, that becomes naturally covered by desirable algal species. They harvested their first crop earlier this year. [\(300-dpi JPEG version - 863K\)](#)

“The villagers in Tagaqe have been enthusiastic about the project,” says Georgia Tech Professor

of [Biology](#) Terry Snell, who helped lead the conservation effort in Fiji. “They want to conserve the reef so they can pass it on to their children so they can make a living in the village.”

photo by Make Liku Movono



Villagers in Tagaqa, Fiji, planted a crop of synthetic coral reef substrate, called live rock, that becomes naturally covered by desirable algal species. They harvested their first crop earlier this year. ([300-dpi JPEG version - 775](#))

The project calls for villagers to keep half of the profits and reinvest half to start another crop. A U.S. aquarium supply company, [Walt Smith International](#) (WSI), which has operations in Fiji, is buying the synthetic rock and marketing it as a “green” product to individual and public aquariums around the world. Tim Mcleod of WSI says the company had been interested in moving toward cultured instead of collected live rock as a way of limiting environmental damage and serving a client base that might naturally want a more environmentally friendly product. WSI had been exploring culture methods when Mcleod learned of the NIH-funded environmental conservation and research project.

Studies at the University of the South Pacific have shown that the organisms that live on cultivated rock are as effective as those on live rock in purifying aquarium water.

In fact, the new [Georgia Aquarium](#) in Atlanta is using the cultivated rock in its exhibits. Founder Bernie Marcus says, “This is a great way to promote conservation of coral reefs, help generate the economy for local villagers of Fiji and provide the aquarium with valuable ‘green’ live rock.” An added benefit is the possible discovery of new drugs in Georgia Tech studies of Fijian coral reef organisms, Marcus notes.

Research on these organisms holds significant potential for the discovery of new drugs, including antibiotics and anti-cancer agents, researchers believe. In particular, reefs in tropical, less developed countries, such as Fiji, hold the greatest promise because of high species diversity and the tendency of organisms in these habitats to fight back against predators, competitors and pathogens by evolving chemical defenses, explains Georgia Tech Professor of Biology Mark Hay, the project’s principal investigator.

But species are being lost at dramatic rates as live rock is harvested and reefs are damaged by environmental stress and the effects of overfishing. Researchers are evaluating the effects on the Fiji reef as part of this project.

“As species are lost, we also lose the ability to discover disease cures that they may hold,” Hay

photo courtesy of Terry Snell



Georgia Tech Associate Professor of International Affairs Kirk Bowman, center, and Professor of Biology Terry Snell, right, met with Chief Ratu Timoci Batireregu, leader of the Fijian village of Tagaqa, to help negotiate an agreement for a coral reef conservation project there. Leading the negotiations was collaborator Bill Aalbersberg (not pictured), a chemist and environmental policy expert from the University of the South Pacific in Fiji. ([300-dpi JPEG version - 884K](#))

explains. “To prevent that loss, we can't just say, ‘preserve the reefs,’ to the locals who must depend on these reefs for food and for income to provide more than the bare necessities of life. Thus, we are trying to connect the value of the drugs discovered with efforts and rewards for conservation of biodiversity.”

courtesy of Tim McLeod, Walt Smith Intl.



After about 11 months, cultured live rock was colonized by Fijian coral reef organisms. ([300-dpi JPEG version - 708K](#))

Financial benefits to the villagers from drug discovery may occur many years later – or even not at all if no drugs are marketed – but the project to grow synthetic rock on the reef rewards villagers now for conservation, Hay notes.

The project is a collaboration orchestrated by Snell, Hay, Associate Professor of [International Affairs](#) Kirk Bowman and Assistant Professor of Biology, Chemistry and Biochemistry Julia Kubanek. They joined forces with Professor Bill Aalbersberg, a chemist and environmental policy expert from the University of the South Pacific in Fiji, to negotiate

the agreement with Tagaqe Chief Ratu Timoci Batireregu in summer 2004.

“In Fiji, the inshore ecosystem – reef, mangrove, lagoon and sea grass – is under the management control of small, traditional groups whose progeny will benefit by their wise management,” Aalbersberg explains. So the chief’s support was a necessary condition for the live rock project, and he officially granted it during a traditional ceremony in which researchers and villagers drank kava, a mild medicinal drink made from the root of a native Fijian tree.

“The amazing thing was how clued in the chief was,” Aalbersberg recalls. “Normally, we talk months and months making sure the project aims are understood, especially that there are no funds for capital improvements. With Ratu Timoci Batireregu, everything he said and wanted was exactly in line with our aspirations and approach.”

About \$2,000 in funds from Hay’s professorship endowed by Harry and Linda Teasley was used to purchase 5,000 pumice “blanks” that were suspended on wires above the shallow reef flat and lagoon of Tagaqe’s fringing reef to prevent ecosystem damage. The synthetic rocks were then naturally colonized by seaweeds and reef invertebrates. These 8-inch live rocks were ready for harvest and sale after about eight months.

Based on the positive outcomes of their initial efforts, the researchers were awarded a renewal of their NIH grant this fall to extend their research and conservation efforts for four more years.

photo courtesy of Terry Snell



Georgia Tech Associate Professor of International Affairs Kirk Bowman (in white shirt, back row) and Georgia Tech graduate students visited with Chief Ratu Timoci Batireregu, leader of the Fijian village of Tagaqe, during a coral reef conservation project there in summer 2004. ([300-dpi JPEG version - 901K](#))

Plans call for similar reef conservation projects in five other Fijian villages. Also, Bowman hopes to start an adopt-a-coral program so tourists in Fiji and concerned people around the world can make a donation to have a piece of coral planted in their name on the reef. The proceeds from these plantings will be used for coral reef conservation in Fiji.

Researchers are optimistic about the continued success and expansion of the live rock project in Fiji. "If we get this started in numerous coastal villages, there will undoubtedly be some that prosper better than others, and these 'locally grown' best practices can be evaluated for the various situations where each works best, and the different villages can learn from each other regarding different methods, harvest frequencies, etc.," Hay notes.

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