

December 25, 2007

A CONVERSATION WITH HARINDRA JOSEPH S. FERNANDO

On the Ground and in the Water, Tracing a Giant Wave's Path

By [CLAUDIA DREIFUS](#)

TEMPE, Ariz. — Next to the office of Harindra Joseph S. Fernando at [Arizona State University](#) is a 107-foot-long wave tank that can mimic oceanic motions.

“This tank is one of the most wonderful pieces of equipment I have,” said Dr. Fernando, 52, the director of the Environmental Fluid Dynamics Program at Arizona State. “It’s amazing.”

After a tsunami swept across the Indian Ocean in 2004 and killed an estimated 300,000 people in Indonesia, Thailand and Sri Lanka, Dr. Fernando used his amazing piece of equipment to determine why the wave was so lethal.

He and colleagues confirmed that human activities at southern Asian seashores — like coral poaching, dune destruction and mangrove harvesting — had made a natural disaster even more deadly.

As the anniversary of the Dec. 26 tsunami neared, Dr. Fernando, an American born in Sri Lanka who goes by the name Joe, described using a combination of science and local reporting to create a clearer picture of the disaster. An edited version of a three-hour conversation follows.

Q. Where did you go for your vacation in the summer of 2004?

A. I took my wife and kids to a seaside resort in the southeastern part of Sri Lanka, to a place called Yala. At the end of the holiday, we took a hired car back to Colombo, the Sri Lankan capital. As we drove along the coastal road, we found ourselves stuck behind two trucks hauling tons of coral, taken, apparently, from nearby reefs.

When my wife asked our driver about this, he explained that dynamiting the reefs was a cottage industry in the region. He said that local people mined the reefs and sold the coral to be ground up and used as an ingredient in house paint. “Blasting the reefs is not legal,” he said. “But people do it.”

This was disturbing. But I didn’t think long about it.

Q. When did you think about it again?

A. Six months later. Right after the tsunami. Immediately afterward, Dr. Philip Liu of [Cornell](#) asked me to join an international team traveling to Sri Lanka to gather scientific information on the height and reach of the wave.

The region I was assigned to study, coincidentally, was the same part of the island the family had vacationed

in during the summer.

Q. What did you see there?

A. Severe damage, though inconsistent damage. At Peraliya, near to where the family had encountered those trucks with coral, the tsunami had swelled to a height of 30 feet and surged inland for more than a mile. There, it inundated a passenger train, the Ocean Queen, killing about 1,700 people. Yet, only three miles away, in Hikkaduwa, the wave came ashore with a height of about nine feet and barely grazed the beach. Why such differences?

I asked a fisherman at Peraliya, "Why was the inundation so severe right here?" He said, "Possibly the coral might be the issue, because this is largely a coral-mining area."

From my fluid dynamics background, I knew he was making sense. If you take friction from a flow, it moves faster.

At Yala, where we'd stayed, I saw evidence of another type of beach-barrier destruction. The resort had been flattened to rubble; 175 people died there, including two friends from California. The owner told us how they'd taken down a sand dune so that all rooms could have an unobstructed view of the ocean. I returned to Arizona, convinced that human activity had magnified the disaster.

Q. So now you had a working theory. How did you prove it?

A. By employing a mixture of science and, believe it or not, journalism. A few weeks after I returned, the BBC asked me to consult on a documentary on the tsunami. With their funding, we hired divers to go underwater at eight different sites around the island, including Peraliya.

Q. In other words, you used this remarkable research technique — you looked!

A. Exactly. And the divers came back with pictures that were very clear. In the areas where there'd been a lot of inundation, there were no, or few, corals left.

Here at my lab at Arizona State, we have our very nice wave tank, which permits us to run waves at different speeds and heights and then measure the effects under controlled conditions.

So we made tsunami models with simulated coral reefs and then without them. What we saw was that where the coral was gone, the surging water increased by a factor of three or more.

At Princeton, Michael Oppenheimer's research group took the idea further with sophisticated computer models, which substantiated my laboratory experiment. The research together has shown that when you cut down the coral reefs, or dunes or mangrove forests, you make a jetway for waves, because you have less bottom friction, and that lets the water through.

Q. Would you advocate a ban on coral mining?

A. Absolutely. Everywhere, not only in Sri Lanka. Once you start mining corals, you reduce beach defenses. If

you have a tsunami or the more common event, a storm surge, the reef will help protect the land.

Q. Are you saying that a lot of the deaths in the tsunami were preventable?

A. In Sri Lanka, some of them. In Indonesia, you couldn't have done much, because the tsunami was triggered by a 9.3 underwater earthquake near Sumatra. The quake was so close and so overwhelmingly powerful that beach defenses wouldn't have mattered. But in Sri Lanka, manmade problems made things worse.

Q. Have there been reforms because of your research?

A. My studies became very popular. Sri Lankans became very interested. A 1981 law against coral poaching is now being stringently enforced.

Before the tsunami, there was a lot of toleration of coral poaching. It was almost thought of as a legitimate economic activity. Since the research, when people poach, citizens will catch them and call the police. When I went to Sri Lanka last year, I saw a billboard near Peraliya that read, "Let's refrain from mining corals that control beach erosion."

I never thought people would take this seriously.

Q. Few scientists ever get to see their work have a direct impact on policy. What does that feel like?

A. I was born in Sri Lanka and I never thought I could make a contribution this way. I didn't think I could do science that changed policy. Till the tsunami, I thought all I could do was to train students, which I did.

Of course, the research was associated with natural disaster, which is sad. But these are the types of problems that scientists should be helping with. Right now, I'm working a lot on the "heat island" effect, asking why air temperatures in cities like Phoenix and Colombo are about 8 degrees warmer than in surrounding areas. On a different project, funded by the U.S. Navy, we're figuring out how wave action contributes to how land mines get buried in conflict areas. This can save a lot of lives. These are important questions, though they are also practical.

Many scientists are so engulfed in their own little area of fundamental research that they don't want to directly embrace practical knowledge. That's one barrier that I was able to break.

Copyright 2007 The New York Times Company

[Privacy Policy](#) | [Search](#) | [Corrections](#) | [RSS](#) | [First Look](#) | [Help](#) | [Contact Us](#) | [Work for Us](#) | [Site Map](#)