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GAUGING DISASTER

How Scientists and Victims Watched Helplessly



Agence France-Presse

Tourists try to rush to safety before the tsunami hit the Hat Rai Lay Beach in Thailand. The water had receded before the deadly wave struck.

By **ANDREW C. REVKIN**

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It was 7 p.m. Seattle time on Dec. 25 when Vasily V. Titov raced to his office, sat down at his computer and prepared to simulate an earthquake and tsunami that was already sweeping across the Indian Ocean.

He started from a blank screen and with the muted hope that just maybe he could warn officials across the globe about the magnitude of what was unfolding. But the obstacles were numerous.

Two hours had already passed since the quake, and there was no established model of what a tsunami might do in the Indian Ocean. Ninety percent of tsunamis occur in the Pacific, and that was where most research had been done.

Dr. Titov, a mathematician who works for a government marine laboratory, began to assemble his digital tools on his computer's hard drive: a three-dimensional map of the Indian Ocean seafloor and the seismic data showing the force, breadth and direction of the earthquake's punch to the sea.

As he set to work, Sumatra's shores were already a soup of human flotsam. Thailand to the east was awash. The pulse of energy transferred from seabed to water, traveling at jetliner speed, was already most of the way across the Bay of Bengal and approaching unsuspecting villagers and tourists, fishermen and bathers, from the eight-foot-high coral strands of the Maldives to the teeming shores of Sri Lanka and eastern India.

In the end, Dr. Titov could not get ahead of that wave with his numbers. He could not help avert the wreckage and death. But alone in his office, following his computer model of the real tsunami, he began to understand, as few others in the world did at that moment, that this was no local disaster.

With an eerie time lag, his data would reveal the dimensions of the catastrophe that was unfolding across eight brutal hours on Sunday, one that stole tens of thousands of lives and remade the coasts of the Asian subcontinent.

For those on the shores of the affected countries, the reckoning with the tsunami's power came all but out of the blue, and cost them their lives. It began near a corner of the island of Sumatra, and ended 3,000 miles away on the East African shore.

For the scientists in Hawaii, at the planet's main tsunami center, who managed to send out one of the rare formal warnings, there was intense frustration. They had useful information; they were trained to get word out; but they were stymied by limitations, including a lack of telephone numbers for counterparts in other countries.

For Colleen McGinn, a disaster relief worker in Melbourne, Australia, the developing crisis would send her off on an aid mission that she could not have comprehended and that United Nations officials have projected to be the greatest relief effort ever mounted.

For others like Phil Cummins, an Australian seismologist, what was happening made all too much sense. He had grasped the dangers a year earlier, and in 2004 had delivered a Powerpoint presentation to tsunami experts in Japan and Hawaii.

"It really seems strange now to see the title," Dr. Cummins recalled yesterday. "Tsunami in the Indian Ocean - Why should we care?"

Hawaii: Helpless Warners

He wore two beepers, in case one failed. Both chirped.

It was a languorous Christmas afternoon, with his girlfriend away and nothing to do, and Barry Hirshorn, 48, was asleep. As a geophysicist, he was used to having his rest interrupted. Almost daily, earthquakes announced themselves somewhere, usually modest nuisances, and off went his pagers.

It was just after 3 p.m. in Honolulu, nearly halfway around the globe from where the earth was trembling. Mr. Hirshorn worked at the Pacific Tsunami Warning Center, a stubby cinderblock structure set in a weedy plain in Ewa Beach. He was one of five staff scientists entrusted with the big task of alerting Pacific countries and the United States military to deadly tsunamis.

"I knew it wasn't tiny," he said. "Probably over a 6." The messages on his beepers indicated alerts from two far-apart seismic monitoring stations, meaning the quake had power.

Shrugging into a shirt, he hopped onto his "duty bike," and pedaled the several hundred yards to the center, operated by the National Oceanic and Atmospheric Administration.

Stuart Weinstein, 43, was already at a terminal in the windowless operations room, staring at the thick blue seismic lines that signaled an "event." "This is a big earthquake," he recalled thinking. "Maybe a 7."

Dr. Weinstein began pinpointing the location. Sliding into the seat beside him, Mr. Hirshorn waited to calculate the magnitude. Within minutes, they concluded it was a quake of 8.0 magnitude.

More data arrived, and they reworked their calculations. But they stayed with 8.0.

At 3:14 p.m., 15 minutes after the earthquake struck, they issued a routine bulletin announcing an event off Sumatra with a magnitude of 8.0. It added, "There is no tsunami warning or watch in effect." This referred to the Pacific.

The bulletin alerted perhaps 26 countries, including Indonesia and Thailand, though it did not go to other coastal areas of the Indian Ocean, for they were not part of any warning system.

Next, the men tackled a slower but more precise means to measure an earthquake, using waves that pierce the earth's mantle rather than simply the initial waves. They got an 8.5, a marked difference in possible threat. "Uh oh," Dr. Weinstein said.

It was 3:45 and time to call the boss: Dr. Charles McCreery stood in a friend's living room a few miles away, delivering a gift after a brunch at his sister-in-law's. His 4-year-old twin daughters were hoping that he would soon assemble their new bicycles.

Dr. McCreery, 54, said a fresh bulletin should go out, reporting the higher magnitude and mentioning the chance of a tsunami near the epicenter. But he and his colleagues doubted that an 8.5 quake would unleash a far-ranging "teletsunami" that could traverse an ocean and wipe out villages.

Once the second bulletin left, at 4:04 p.m., there was little more that their machines could confide, unless tsunamis crossed the Indian Ocean and entered the Pacific. They had no sea monitors in the Indian Ocean.

Dr. Weinstein scrolled the Internet. They tuned in CNN on television. Only in the same way that most of the world learned, from news reports, did the three men come to see the ghastly reality, the widening tsunami paths and the lethal coastal destruction.

A wire dispatch at 5:30 told them that Sri Lanka had been pounded. Their spirits drooped. "More are going to die," Mr. Hirshorn said.

Their instinct was to somehow tell more, to warn the region that it would continue, to reach people who could clear beaches. But how? Mr. Hirshorn recalled a tsunami expert he knew in Australia, called and got an answering machine. He left a message. Someone phoned the International Tsunami Information Center, asking if they knew people in the stricken region. The center simply had no contacts in this distant world.

At 7:25, an e-mail message from Harvard's seismology group reckoned the earthquake at 8.9. Now they understood why such a monster tsunami had been unleashed.

They continued to scramble to reach countries that could still escape death, but they were reaching into a void. Around 10:15 p.m., they did speak to the United States embassies in Mauritius and Madagascar, which promised to warn Somalia and Kenya, not yet hit, but it is unclear what came of this.

Their day ended, engulfed in gloom. "Part of me said I wish it had occurred in the Pacific, because we could have saved an awful lot of people," Dr. Weinstein said. "We felt terrible that we couldn't get the messages to where they were most needed."

Japan: Looking On

The seismograph at the Matsushiro Seismological Observatory, about 110 miles northwest of Tokyo, is buried inside a mountain tunnel. The tunnel had first been created as an alternative headquarters for the country's imperial military during the final years of the war in the Pacific, and scientists saw it had advantages for recording as precisely as possible tremors in the earth: protection from the effects of temperature and wind.

"Our job is to identify the epicenter and the size of earthquakes all over the world," said Masashi Kobayashi, an official at the observatory. "There are many observatories recording the earthquakes in the vicinity of Japan, but this observatory is the only one in Japan for observing the earthquakes of the world."

And Mr. Kobayashi said he did not mistake the significance of what got recorded deep inside the mountain on Sunday.

"I got surprised," he said.

The recording showed an earthquake with a magnitude of 8.

"In the vicinity of Japan," he said, "that size is recorded only once in several years to 10 years."

Mr. Kobayashi said he had calculated the location, as well as the magnitude of the quake. "I reported it is west of Sumatra island, including the latitude and longitude," he said.

And with that, he said, he realized something else.

"When I found it was in the ocean," he said, "I thought the first thing to worry about was a tsunami."

There has been over the last several days, as the death count from the earthquake and tsunami has steadily climbed to more than 100,000, much discussion of whether enough was done by scientists and government officials around the world to relay word of the possible peril millions of people suddenly faced.

There have been accounts in newspapers of officials in Indonesia and Thailand and Malaysia struggling to comprehend the threat and get out warnings. All agree that, whatever people's intentions or capabilities, no sufficient warnings were transmitted that might have limited the toll at some of the hardest-hit places.

What Mr. Kobayashi did with his information, and concern, is not entirely clear. In an interview, he said he had made his reports to headquarters. It is not clear what, if anything, his superiors did.

Asked directly if he thought his reports led to any movement toward issuing a warning about a tsunami, Mr. Kobayashi said, "My job is to decide the size and the location of the earthquake epicenter, so it is beyond my job to answer that question."

Indonesia: First Losses

As deputy mayor of Banda Aceh, Aceh Province's most bustling town, Muhammad Kadir was about the closest thing the townspeople had to an alarm bell when the tsunami hit Indonesia.

Elected to office as an elder statesman of sorts, the 76-year-old Mr. Kadir had hurried Sunday morning to a seaside market at the tip of the island of Sumatra for emergency supplies after the initial earthquake struck. It was at the market, a few minutes later, that he said he had looked far out to sea and noticed something strange: the waterline was dipping off to the sides and rising furiously in the middle.

"The water separated, then it attacked," he said. "I've never even seen anything like it in the movies. I couldn't imagine anything like it."

After spotting the raging waters, Mr. Kadir raced through the town banging on doors and shouting into a local mosque. "I told people the water was getting higher and higher - get out," he recounted.

His mad dash was the closest many people on Sumatra would come to an early warning system. Before the waves subsided, more than 43,000 people in the Aceh region alone - many of them women and children unable to resist the violent waters - would perish.

"The water was coming too hard, too fast," Azwar Muhammad, a local resident, said. "This was God's destiny."

As a separate set of mammoth waves hurtled across the Indian Ocean in the opposite direction, due west, Amir Khan, a strapping 30-year-old off-duty police officer, relaxed in his home in the town of Kalmunai on the east coast of Sri Lanka.

Mr. Khan, like every other local government official, was enjoying a day off and completely oblivious to the walls of water surging toward Sri Lanka when he heard what sounded like a low-flying helicopter. Some in Kalmunai remember the ocean's abruptly changing colors from green to a dark, menacing black, as if it were filled with oil. Others remember the water turning white with foam. All recall the first wave's shape: a 10- to 12-foot-tall wall of water.

Mr. Khan shouted, "Run! Run!" to his parents and siblings and bolted out of his house, sprinting as fast as his strong, young legs would carry him. His 68-year-old father and 50-year-old mother stayed in the house. As water engulfed them, they grabbed onto a ceiling beam and were able to survive.

His three sisters-in-law were less lucky. Two ran but drowned in the water. A third remained in the house and drowned as well.

Three subsequent waves, each larger and more powerful than the last, obliterated the neighborhood and reached 700 yards inland. The waves ripped sturdy, one-story brick homes off their foundations, snapping four-inch-thick brick walls into small chunks. It picked up cars and swept them hundreds of yards inland. It reached the rooftops off one-story buildings, ripping off gutters as it surged passed.

Kalandar Umma, a 60-year-old grandmother, was found clinging to the upper branches of a tree. She had no memory of the waves or how she got there. Nineteen members of her family died, including one son, five granddaughters and two grandsons, including an 18-month-old boy.

Local officials, unsure what had happened, ordered people to go to high ground. Groups of stunned municipal employees, schoolteachers and retirees began searching for bodies. In the first day alone, 1,824 bodies were recovered and buried behind a local mosque. Local government officials quickly lost control of the process, with families burying relatives as soon as they discovered them.

Advance notice of the wave's approach would have saved thousands of lives, according to officials and residents. Baheera Sahariban, a waiflike 25-year-old mother, said she had easily been able to carry her 18-month-old son to safety from her house, which sits only 15 yards from the ocean. The reason: a warning.

"Someone helped me," Ms. Sahariban said, as she gently cradled her son. "Someone said, 'Run away.' "

Australia: A Call to Aid

At 6 p.m. Sunday in Melbourne, Colleen McGinn was having tea in her backyard patio with a man she had met recently in an emergency first aid class. It was a year to the day that Oxfam, the relief organization that Ms. McGinn worked for, had gotten the call about an earthquake in Iran that would kill 26,000.

Today, it was again Boxing Day, a national holiday in Australia, and it was her turn to be on call. She knew anything could happen. She hoped nothing would. But she kept her cellphone near. Then the phone rang.

"I hate to bother you," the caller said. It was Marlene McIntyre, one of the bosses at Oxfam, who also happened to be her friend. "But there has been an earthquake."

"Very funny, Marlene," Ms. McGinn said, chuckling. "Merry Christmas to you, too."

"No, this is real," Ms. McIntyre said. "There has been an earthquake and a tsunami. Sri Lanka was hit, we were hearing."

It was six hours after an undersea earthquake off the Indonesian island of Sumatra had set off one of the worst natural disasters in recent decades. Ms. McGinn, who was born in Indonesia but raised in Athens, Ohio, had worked previously in Sierra Leone, the Balkans and Afghanistan, dealing with war victims and refugees.

Those were man-made disasters. This would be different. This was nature, and the marathon of tackling people's misery had just begun.

"I need a ride," she told her friend, instantly enlisting the young man, a potential date, into a relief aide. Off they went, on his motorcycle, along the beachside highway, driving as the sun set to the nearby home of her boss at Oxfam, Chris Stewart. The global Oxfam emergency response machine needed to be put into motion. It was up to these two women to start the engine. Now.

Out came the emergency contact list, and the chain of calls began: East Asia regional manager, South Asia regional manager, the agency executive director. The list went on.

But even while they were working the phones, the news coming from the television and Internet started to turn darker and darker.

The would-be date turned into a decent assistant.

"We need a better map," she told him. "We need another map."

The telephone calls continued for hours, fueled by pizza and coffee that was ordered. Day had become night. But as darkness fell, what had at first appeared to be a probably deadly, but at least isolated incident - impacting perhaps just Indonesia and Sri Lanka at first - was turning into an incomprehensible catastrophe.

"This is unbelievable," Ms. McGinn said, pausing to look up at the television. "All the countries in the Indian Ocean have been hit. This is massive. Oh my God."

Across the world, in New York, there was a similar growing sense of dread.

Jan Egeland, the United Nations' emergency relief coordinator and under secretary for humanitarian affairs, is a 46-year-old Norwegian whose boyish looks and shock of chestnut hair falling across his forehead would become familiar to millions of television viewers around the world as he reported on the global relief effort.

He had been lying in bed in the midtown Manhattan apartment where he lives with his wife and two daughters when his telephone rang at 7 a.m. New York time, bringing him the first word of tsunami. Mr. Egeland and his colleagues at the United Nations offices in Geneva sent emergency relief teams to the Maldives, Sri Lanka and Indonesia, the first countries to request help, right away and began to consider additional countries as they learned more about the geographical extent of the damage. Teams would soon be added for India, Thailand and Malaysia.

"We were not even close to understanding the true enormity of it," he said. "The initial indication was that a few hundred were affected."

Ms. McGinn and Ms. Stewart would wrap up their initial round of calls sometime before midnight in Melbourne. Monday would be another day of telephone calls, as work was now under way by different Oxfam offices to prepare an IL-76 cargo plane, packed with 27 tons of emergency supplies that would soon take off for Sri Lanka and Indonesia.

Water tanks, pumps and taps to set up emergency drinking water would all be included, as would latrine slabs to build emergency bathrooms.

Ms. McGinn would soon be boarding a plane herself to fly to Sri Lanka, leaving Melbourne on Tuesday, for the trip across Asia to the dead zone. Her father had been in Indonesia at the moment of the earthquake, although not near the affected part of the country. Still, she had not heard from him.

It was not long after she landed at the airport in Colombo, Sri Lanka, that it was clear what that phone call on a gorgeous day after Christmas had spelled: fields of misery and devastation unlike any she had ever seen.

First, as she approached the seaside community of Batticaloa, it was simply the crowds of people standing outside schools and other government buildings, which had been transformed into shelters. Then it was roads clogged with emergency vehicles and trucks. And then it was a stretch of coastline where there was such utter chaos it was unclear how and where the work should begin.

Boats sitting upturned on land, far from the shore. A major bridge had been lifted off its supports, twisted and then thrown like a toy. Whole swaths where houses once stood were now flat, wide-open land, the ground strewn with debris. People milled around, eyes glazed over with fear and despair. To top it all, this was the rainy season, so it was pouring.

"I never seen anything like this," Ms. McGinn said.

The only option was to begin work, unloading trucks that had arrived with relief supplies, everything from clothes and instant noodles to soap. It was quite a distance she had traveled from that lazy evening sipping tea on the patio in Melbourne.

California: A Scientist Explains

As soon as Kerry Sieh, an earthquake expert at California Institute of Technology in Pasadena, heard the reports on Sunday of the earthquake and tsunamis in the Indian Ocean, he knew exactly what had happened.

He was preparing for his next trip to Sumatra, the island hardest hit by the tsunami. He had spent a decade there and on nearby islands, cutting slices out of coral heads with a chainsaw to read traces of past seismic upheavals, and to look for hints about future quakes.

Most of his colleagues who study undersea earthquakes were focused on even more violent fault lines closer to the developed world, those off Japan and the Pacific Northwest and the island arc of the Aleutians in the far North Pacific.

Like them, Dr. Sieh was consumed with what he could learn about the dynamics of the earthquake factories called subduction zones. But the archives he mined existed only in the coral off Sumatra. "It's tucked away in a corner of the world that just doesn't have much scientific traffic," he said.

In the calcium carbonate coral layers, he could read the seafloor's history. Deformations of the layers showed when the seabed beneath had been shoved upward, plunged down or tilted.

So the mechanism of the earthquake that had just occurred was familiar. The offshore plate of rock underlying the Indian Ocean normally slides relentlessly under Indonesia, like the disappearing belt on an airport walkway, descending into the earth's mantle to be consumed and recycled.

In places, this process was smooth. The junction between that ever-shifting India plate and the plate under Southeast Asia was "greased," he said. But there were places where it was stuck.

In 1797, 1833, 1861 and now again long stretches that were stuck sprang free. In each case, the rock had built up tension in the intervening decades, as the greased sections continued to shift, leaving the stuck part behind, just as an archer's bow flexes when drawn.

At some point, the force is too great. Friction is overcome. The stuck section gets to catch up, in seconds making up for a century of lagging behind, and if the plate is moving up or down, that energy is transferred pistonlike to the incompressible water above.

The energy unleashed in a 9.0 quake, as this one would ultimately come to measure, is roughly the amount that would be unleashed if it were possible to create a bomb made of 32 billion tons of TNT and set it off.

As the news media calls began flooding in, Dr. Sieh began to recount the mechanism he knew so well. It would be two days and nights before he would have time to turn on a television and witness the consequences of the upheaval. It was likely that a fresh distortion would be etched in the corals. It was certain that a region and people he had grown to love had been ripped asunder.

Australia: International Inertia

The possibility of tsunamis arising in the Indian Ocean had not completely escaped international attention. During the 1990's, an obscure United Nations group, the International Coordination Group for the Tsunami Warning System in the Pacific, periodically considered the extension of tsunami alert systems to parts of the globe outside the Pacific, including the Caribbean and Indian Ocean.

At a meeting of the group in Lima, Peru, in September 1997, for example, its members had considered proposals to expand the network to the Indian Ocean, particularly because of Indonesia's tectonic activity. Nothing concrete happened.

Among the scientists who kept up a restrained but insistent pressure was Dr. Phil Cummins, a seismologist with Australia's geosciences agency. He continued to gather and present evidence that an Indian Ocean tsunami was inevitable, although unpredictable in terms of timing, and posed a grave threat to many countries. He met with no ill will, but with considerable inertia, he said.

"Just look at the name," he said. "The international body designed to coordinate international tsunami-related activity is mandated as a Pacific entity."

Dr. Cummins cited details from dusty records kept by the Dutch colonists in Indonesia and from Dr. Sieh's coral studies that great 19th-century earthquakes in the 1,200-mile arc of faults west of Sumatra had generated destructive ocean-spanning waves.

He made his case in October 2003, at a meeting of the international tsunami group in Wellington, New Zealand, when he pushed for formal expansion of the international network into the Indian Ocean.

The group rebuffed him, saying, in the stiff language of meeting minutes, that any such expansion could occur only if an overarching governing body dealing in global oceanographic issues formally redefined its "terms of reference."

In the meantime, it voted to establish "a sessional working group to prepare a recommendation to establish an intersessional working group that will study the establishment of a regional warning system for the Southwest Pacific and Indian Ocean."

Dr. Cummins prepared a position paper at that meeting laying out his arguments. He used a computer model similar to that used by Dr. Titov in Seattle to study how tsunamis spread from the great Sumatran quake of 1833.

He simulated the quake in a mathematical simulacrum of the ocean, and simulated waves radiated until they struck as far north as eastern India and all around western Australia. The Sumatran shore east of the fault was devastated, and a directional pulse of energy, resulting in higher waves, splayed westward like a shotgun blast.

At the time, the images of those reconstructed virtual waves must have seemed like yet another computer analysis, predicting yet another potential disaster that might or might not occur in this, or the next century.

Now, the reconstructions, so similar to what happened last Sunday, carry a disturbing weight.

Kenya: A Last Victim

Capt. Twalib Hamisi was sitting in his office at the Port Authority in Mombasa, Kenya, when word of the curious water first reached him. A staffer had phoned to report unusual movements in the main port there.

"The tide was supposed to be falling, but it was rising," Mr. Hamisi, the harbor master, recalled. "I went to the water, and we saw it moving really fast. I thought a pipe might be broken in the port."

It was about 1 p.m. Sunday, and he decided to call other ports in Malindi and Lamu, where workers reported similar water movements. "It was like seeing the sun setting in the east," he said. "The tide was crazy. The water wasn't following the rules."

Then, Mr. Hamisi said, the minister of foreign affairs phoned to report the heavy damage in Asia.

After realizing the direction the waves were headed, Mr. Hamisi called the Port Authority director. "I said: 'We have a problem. We have to institute our emergency plan.'"

The emergency plan was intended for things like oil spills or fires, not tsunamis. But it was all they had. The police were informed to evacuate beaches. The news media were called to spread the word. The local authorities were mobilized up and down the coast. Radio messages were sent to commercial fishing vessels and ships. For the wooden dhows that are so common in Kenya and that lack radio communication, the looming danger was spread by word of mouth.

At Jomo Kenyatta Beach in Mombasa, there were thousands of people packed on the sand. The police made announcements at first, and then armed riot policemen moved in to relocate people away from the water.

"It was Sunday, so the beaches were full of holiday makers," Mr. Hamisi said.

At Hemingway's Resort in Watamu, a plush seaside hotel, employees who heard of the storm on television began working the phones. They called the Port Authority, but the person who answered the phone there did not seem overly alarmed. They called the Kenyan Navy, where someone agreed to investigate. They tried to track down a British professor who someone said was an expert on the wave patterns off the Kenyan coast.

Frustrated and fearful, Hemingway's staff began evacuating guests to a parking lot half a mile from the coast.

Further north, Mabeya Mogaka, the district commissioner in Malindi, was spreading word of the dangerous seas as well. "I ran out and told people not to panic but to be aware," he said.

The beaches were virtually deserted, he said. But not everybody got the message that danger was near. There were still people swimming when the waves began to churn with more force.

One of them was Samuel Njoroge, 20, a mechanic from Nairobi who was in the water with his uncle and was swimming for the first time. He was about 10 feet from the sand when the waves became rough. His relatives describe what happened next: Samuel was pulled under. His uncle grabbed him but was also pulled under. Eventually, Italian tourists who were swimming nearby got both men to shore.

But Samuel had already taken in too much water. More than seven hours after the tsunami hit land in Indonesia, some 3,000 miles away, Samuel became Kenya's only confirmed storm-related death.

"We are in shock," said Peter Mwanji, a relative who visited the mortuary on Thursday to claim Samuel Njoroge's body. "We are still trying to understand how this storm could have taken him. He was so excited to see the ocean and to swim in it. He was so happy. Then he was gone."

Seattle: A Final Picture

Back in Seattle, around the time that the beaches of East Africa were being swept by the great pulse of waves, Dr. Titov was close to finishing his fresh-minted model for simulating Indian Ocean tsunamis.

He hit enter on his terminal keyboard, and the computer began calculating numbers.

As the real tsunami was spending its last destructive power, his virtual tsunami began. It burst out like a shotgun blast from the epicenter of the quake, focused due west from the fault line.

By 4:28 a.m. Sunday morning, the simulation had run its course, and Dr. Titov posted his work on the Web and stumbled home, knowing, but still not knowing since he had seen no news, what had happened.

Like everyone else, he became transfixed by television images of heaving seas and devastation, with one difference, he said: "It feels like I have already seen it."

Reporting for this article was contributed by Eric Lipton in Washington, Eric Lichtblau in Indonesia, Marc Lacey in Kenya, N. R. Kleinfield in New York, David Rohde in Sri Lanka, Yasuko Kamiizumi in Japan and Michele Kayal in Hawaii.