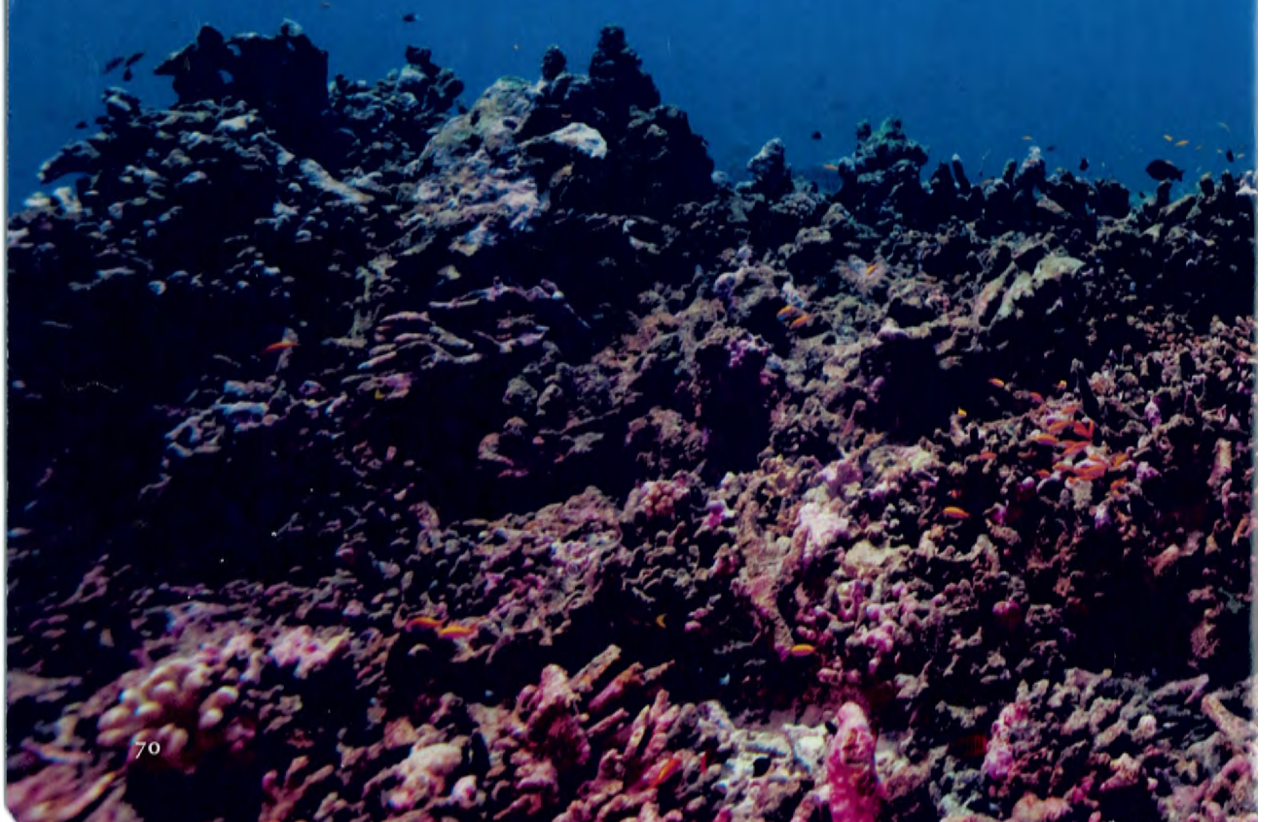
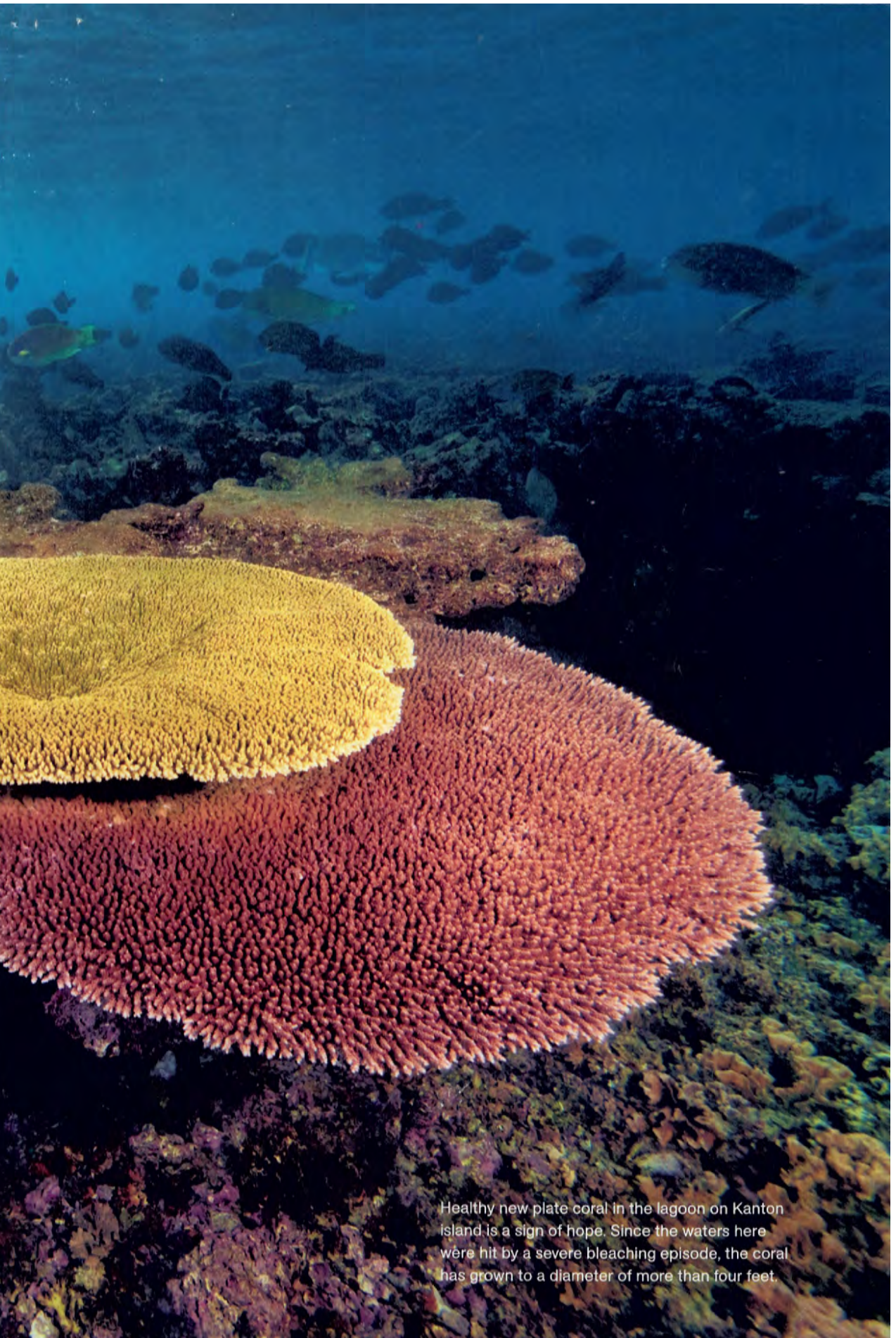
PHOENIX RISING

After a rare bleaching disaster, the reefs of the Phoenix Islands bounce back.



A green turtle glides over a wasteland of dead coral near Kanton island in the central Pacific. Before water temperatures spiked here in 2002-03, this reef was brimming with life.

On a mission to feed, yellowfin surgeonfish crowd the water at Nikumaroro. Although the atoll lost many corals, it kept an abundance of grazing fish that help reefs recover by keeping them clean.



Healthy new plate coral in the lagoon on Kanton island is a sign of hope. Since the waters here were hit by a severe bleaching episode, the coral has grown to a diameter of more than four feet.

By Gregory S. Stone

Photographs by Brian Skerry

The heavy iron anchor and chain tumbled noisily into the water. We lowered two red skiffs from our research vessel, loaded our diving gear, and sped off toward the lagoon. After a five-day sail from Fiji to Kanton island, we were anxious to see if reefs here had survived a rare ocean disaster—a lethal spike in the temperature of local seawater. During the El Niño of 2002-03, a body of water more than 1°C (1.8°F) warmer than usual had stalled for six months around the Phoenix Islands, a tiny archipelago in the central Pacific. We'd heard that the hot spot had severely bleached the region's corals. As I descended toward the lagoon floor, I was hoping things weren't as bad as we'd been told.

As I settled down beside the reef, I saw dead coral everywhere. What had been flourishing, overlapping, overflowing brown and auburn plates of corals were now ghostly, broken reminders of their former beauty. When I'd first visited the Phoenix Islands a decade ago, these reefs had supported numerous species of hard corals, as well as giant clams, sea anemones, nudibranchs, and great populations of fish, from blacktip reef sharks to parrotfish to bohar snappers. Because the islands have remained undisturbed for so long, they'd largely avoided overfishing, pollution, and other harmful impacts of modern civilization. But they hadn't been able to avoid climate change, which most scientists believe amplifies El Niños.

Not ready to accept this setback, I was heartened to see lots of reef fish and vibrant corals growing up through the rubble—early signs of recovery. Was it possible that the reefs of the Phoenix Islands, like their mythical namesake, were rising from the ashes of a terrible warming?

TEN YEARS AGO, I'd flown to Tarawa, capital of the Micronesian country of Kiribati, which includes the Phoenix Islands, to meet with government officials. At the time, the airport terminal was no bigger than a house, open-air with a thatched roof. I was met at the fisheries ministry by David Obura and Sangeeta Mangubhai of CORDIO, an Indian Ocean conservation organization, who had helped me carry out the first systematic underwater surveys of the Phoenix Islands. An ancient air conditioner rattled away in the meeting room as we presented a slide show to the ministers of fisheries and environment, showing them scenes of sharks, flourishing coral, and dense clouds of colorful fish. Accustomed to the degraded reefs closer to their towns and villages, the ministers and their staff were as amazed as we had been at the "like new" reefs of the Phoenix Islands.

"Do you realize, Greg, that you're the first scientists who ever bothered to come tell us what they learned in our waters?" said Tetebo Nakara, then minister of fisheries.

During our subsequent talks with government officials, we found out that a fourth of Kiribati's income ($17 million in 2000) came from selling access to their reef fish, sharks, tunas, and other wild marine resources to nations such as Japan, South Korea, and the United States. In return for a commercial fishing license, a foreign company paid about 5 percent of the wholesale value of anything they took out of Kiribati waters.

I asked Nakara if Kiribati might consider receiving a payment in lieu of the access fees to leave the fish in the water. That way, it would receive badly needed income, but its underwater haven would be preserved. Without living reefs, these islands could rapidly erode. He smiled and said, "This could be good for Kiribati"—as long as his nation could keep receiving income from the "reverse fishing license." Anote Tong, Kiribati's president, enthusiastically backed the project and has since led it to fruition.

Formally declared a reserve at the 2006 Convention on Biological Diversity in Brazil, the Phoenix Islands Protected Area (PIPA) was expanded two years later to become what was then the world's largest marine protected area. At 157,000 square miles, it was nearly as big as California. But many questions remained: How could Kiribati put a fair price on its marine life? Where would the money come from? Who would police such a vast reserve?

To address such questions, I enlisted the

Frigatebird chicks await circling adults on Rawaki, one of 33 islands in the sprawling nation of Kiribati. Last year the Phoenix Islands Protected Area in Kiribati (map) became the largest World Heritage site.

help of Conservation International (CI), which in 2001 had created the Global Conservation Fund to protect rain forest and other habitats through a similar strategy. Receptive to the idea, the Kiribati Parliament created the PIPA Conservation Trust with trustees from the New England Aquarium (NEA), CI, and the government of Kiribati, and fund-raising began for a $25-million endowment.

NOW I'D RETURNED to Kanton with David Obura and Randi Rotjan, a coral expert from NEA, and other scientists to assess the impact of the El Niño event. The bleaching had killed all the coral on the lagoon floor, but almost half appeared to be growing back—the fastest recovery any of us had ever seen. The reason seemed clear: abundant fish. When coral bleaches, seaweed can grow out of control, stifling reef recovery. But fish eat the algae, keeping it from smothering the coral. Because fish populations had been protected here, the reefs remained surprisingly resilient even after suffering one of the worst bleaching events ever recorded.

As oceans continue to absorb the impacts of human activities and of climate change, we'll need more large protected areas like PIPA to help ecosystems survive. The oceans are our life-support system. There's never been a more important time to take care of them. □

Gregory S. Stone is chief scientist for oceans at Conservation International. Brian Skerry's photos of Japan's ocean wilderness appeared in November.

MAP: SAM PEPPLE, NGM STAFF

A school of Pacific steephead parrotfish (left) graze on dead coral at Kanton island. "You can hear them going *crunch, crunch, crunch,*" says Greg Stone, a diver and marine scientist. Because Kanton sits near the Equator, the island rarely experiences big shifts in meteorological conditions. But the El Niño of 2002-03 raised water temperatures here by more than 1°C (1.8°F) to as high as 88°F in some places, killing all the coral in the island's lagoon. Once coral dies, seaweed can take hold and grow on top of dead reefs, making resettlement by new coral difficult. That's where parrotfish come in: By grazing on algae, these and other herbivores keep the reef free of seaweed, enabling pink coralline algae to take hold and form a substrate for new coral. The four-saddle grouper (below) passes over the candy-pink algae on which new coral will grow.

Hovering briefly over the photographer, feet tucked up beneath its belly, a frigatebird comes in for a landing on Rawaki. Hundreds of thousands of birds lay their eggs on the island.

A shy and elusive fish, a Napoleon wrasse (right) at Orona island is a good omen for the marine reserve. Sought after by restaurants in China, Napoleon wrasses are typically fished out early when reefs are targeted. A 20-pound wrasse might be worth a thousand dollars in China. The fact that these fish are so abundant here means that the reef system is still relatively intact. Even without counting the vast open-ocean and largely unexplored deep-sea regions in the reserve, it shelters more than 800 fish, bird, and coral species, including 120 species of hard corals, such as the leafy formation (below) at Enderbury Island. Because of this, the reserve may serve as a model to restore reef systems elsewhere. "The Phoenix Islands are what the oceans were like a thousand years ago," scientist Stone says, "and what they can be like a thousand years from now."