The world's coral reefs are dying. Scientists in the Bahamas are searching for a chance for their survival

17 December 2019, by Steve Johnson

Credit: CC0 Public Domain

Wetsuit still zipped up to his neck from an earlier dive, Ross Cunning stands amid dozens of chunks of coral in the saltwater live well on board the Coral Reef II, the research vessel owned by his employer, Chicago's Shedd Aquarium.

He's a research scientist by trade, but his tools at the moment are decidedly low-tech. Cunning has zip ties. He's got long-line clips, the quick-release fasteners used on deep-sea fishing rigs. Temporarily oblivious to his Bahamian coastal surroundings or the steady rocking of the 80-foot boat, he is attaching the live coral fragments to the rungs of ladderlike structures he and his team made out of PVC pipe and cord.

Metaphorically, the animals are canaries in the climate-change coal mine. Literally, they are staghorn coral, each about 5 inches long, each destined to be moved via the racks to an open-ocean underwater nursery as part of the researcher's experiment to identify the hardiest, most heat-resistant corals, knowledge made desperately necessary by Earth's ever-hotter seas.

"Half of these go back down. Half go to Bimini on the rack," Cunning says, referring to the island closest to Florida where Bahamian waters are warmest in summer, coolest in winter.

As he and his fellow scientists perform this hopeful conservation work, looming off the boat's starboard side, maybe 1,000 yards away, is a tableau almost too perfect in its dark symbolism: a hulking power plant that supplies electricity to New Providence, the Bahamas' most populous island, and the mammoth oil tanker tethered just off the island to feed it.

They are reminders of why Cunning's work is vitally important and why it is profoundly challenging. Despite knowing better, people in the past half-century have only accelerated their burning of fossil fuels. The oceans are already warming rapidly—absorbing more than 90% of the extra heat the planet now produces—and even if humans radically change their behavior tomorrow, they will continue to warm.

The result is an existential crisis for coral. Many scientists fear the shallow-water varieties that form reefs may not survive the century. Coral reefs build up over centuries but can die in just two successive summers of abnormal heat. With such temperature spikes and the resultant coral bleaching events increasing in frequency, reefs may become the first of the planet's major ecosystems to disappear. That threatens not only the astonishing biodiversity that gets coral reefs called the "rainforests of the sea," but also the up to a billion people worldwide who depend on the benefits reefs provide in seafood and tourism.

In the face of these threats, Cunning—like scores of fellow scientists in the burgeoning field of coral research—feels particular urgency about his work. It pits their best efforts and expertise against earthly odds steadily rising against them, and at stake is the prospect of a world without coral.

"As we're literally watching these ecosystems collapse before our eyes, we're all realizing we have to do something," says the 35-year-old South Loop resident, hired by Shedd for his coral expertise a year ago. "We can't just sort of stand by, and we can't rely on more traditional conservation approaches like marine protected areas. We can't just say, 'No fishing over here, and the reef is going to be fine.'

"Climate change reaches every reef on the planet. And so I think people are realizing that we have to do everything we can."

On its own, a coral is not a charismatic animal. It hardly seems capable of having accomplished so much in its time on Earth. Yet this animal related to jellyfish and sea anemones created the planet's largest living structure, Australia's Great Barrier Reef, and it and other reefs host more than a quarter of ocean life despite occupying less than 1% of the marine environment.

The Shedd scientist holds up one of the creatures he is about to transplant to the nursery off the southwest tip of New Providence. It looks like a skinny, craggy, red-brown rock—a segment of sugar candy made with rusty water, perhaps, or a particularly gnarly crab leg.

"The white tip on the end is the growing portion," he says, pointing to the small, fleshy, mouthlike circle. "It's called the apical polyp"—the polyp at the apex. "And it's growing in both directions. And then you can see another branch forming."

Staghorn coral grow fast and, historically, they grew easily. They were once one of two dominant reef-building corals in the clear waters surrounding the more than 700 islands that make up the Bahamas, where the Shedd centers its oceanographic research.

When they thrived, these coral were magnificent builders whose structures not only supported ocean life but protected coasts from hurricane impact. As the live polyps at the animals' growing tips and the algae that live symbiotically within them drew nutrients from the sun and water and stretched ever outward, the skeletons behind hardened into calcium carbonate and became reef structure and, eventually, softened again into sand.

Now the staghorn in this region is at about 3% of its former abundance, a National Oceanic and Atmospheric Administration report estimates. While earlier devastation occurred due mostly to pollution and disease, now warming oceans and the resultant bleaching are the No. 1 threat to this already critically endangered species.

"We've lost so much of the staghorn coral," says Cunning. "In Bimini, for example, where we're heading next, there's only two known genetic individuals of staghorn coral there that we've been able to find."

Cunning readies five racks of the staghorn, 60 specimens, that he and fellow divers will carry down, 40 feet below the ocean surface, to the coral nursery below.

As these animals are watched and measured to test their resilience in coming years, perhaps among them will be the hoped-for "supercoral," a specimen whose genetics are so sturdy it can help this vital and surprisingly complex creature survive the coming crisis years and make it out the other side.

Cunning—precise like his neat red beard, more analyst than poet—doesn't like to talk about "supercorals," although it is one of the drastic remedies science is now seeking.

"I try to avoid saying it," he says. "It's kind of a loaded term"—imprecise and, as he adds, "reductionist." He thinks it's important to forge ahead by doing the science. But he does allow himself a small note of celebration.

"After this next dive, this nursery will be fully populated and complete, which is exciting," he announces.

Minutes later, holding his dive mask to his face with one hand and one of the ladders lashed with live corals in the other, he walks off the boat's back platform, one baby step into the beautiful, fragile, changing waters.

It was at the Great Barrier Reef that Cunning developed his love for coral. He grew up in Indianapolis, but his undergraduate semester abroad from Duke University took him to Australia, to a scientific research program centered on one of Earth's natural wonders.

The students split their study time between reef and rainforest, he recalls, and for him it was an easy pick.

"We were out on the Great Barrier Reef learning about these ecosystems while we were snorkeling all day every day," he recalls. "I learned to scuba dive there and was just blown away by coral reef ecosystems. I was just absolutely fascinated and decided to make a career studying them."

Graduating Duke with a biology and environmental science major, he went on to earn his Ph.D. in marine biology and ecology from the University of Miami. Fellowships to continue his coral studies followed at the Hawaii Institute of Marine Biology and then at UMiami again.

His research has mostly been about the relationship between coral and the algae that live within them, especially on the impact that heat can have. A May study he headed was, he says, "an opportunity to deliver a more concrete conservation message." It found that a major Port of Miami dredging project to accommodate supersize container ships had killed over half a million coral within a quarter-mile of the channel, a significant loss in the state that hosts the continental United States' only close-to-shore reef tract. The state's reefs had already diminished by about 70% since the 1970s.

So when the Shedd advertised for a coral researcher to round out its Caribbean research team, Cunning was a strong candidate. He had been looking for an academic posting, he says, but he loved the idea of being able to continue doing hard science in an institution also trying to communicate that science directly to the public.

"I didn't think studying corals would bring me back to the Midwest," Cunning says, with a chuckle.

The aquarium is one of Chicago's most popular tourist attractions, but few of the nearly 2 million annual visitors realize that it is more than a menagerie and spends more than $3 million annually on its field research team. The Shedd's applied-science efforts have been refocused in recent years under CEO Bridget Coughlin, herself a Ph.D. in applied biochemistry, to have one group studying local freshwater aquatic life and the second working in the Bahamas, an independent country spanning some 600 miles to the east of southern Florida.

Their tight lens on Bahamian marine life takes advantage of the Miami-based Coral Reef II, commissioned by Shedd in 1984 for the collection of marine life to display back in Chicago but long since repurposed for science, a conversion mirroring the change zoos and aquariums have made toward conservation. This group of salt-water researchers was already studying creatures along the food chain from conchs to iguanas to groupers to sharks. Adding coral at the low end made sense, Coughlin says, because of coral's huge significance in the marine environment and to the Bahamas and as a climate-change bellwether.

"It's a great marrying of something the public understands—coral bleaching, temperatures of the ocean rising—and a great scientific endeavor," Coughlin says. "What we do on site (is) to engage people with animals and then extrapolate it to out in the wild and how Shedd can contribute to the solution."

Cunning's aha moments on the Great Barrier Reef came early in this century, before many people fully realized the threat posed by diminishing atmospheric protection from the sun. Now the Australian reef system, as the most famous coral reef in the world, has become a different kind of teaching tool, one whose decay is chronicled in an attempt to awaken the public to the coral crisis.

Now it is routine, too, to find pictures in news stories about the crisis captioned "dead coral reef," morose tableaus where there are no more colorful fish and exotically shaped coral, only scuzzy, opportunistic algae covering the bumpy, defeated skeletal remains.

The scientific studies and reports about vanishing coral and hotter waters around them are piling up, and even the typically dry titles of such writing hint at the situation's urgency. "Unprecedented 3 years of global coral bleaching, 2014–2017." "Risk-sensitive planning for conserving coral reefs under rapid climate change." "Decadal changes in heat tolerant coral symbionts." The last is a working title for one of Cunning's current coral studies.

The 2017 documentary film "Chasing Coral" won an Emmy. It's by the same people who made "Chasing Ice" five years earlier and similarly chronicles a quest for a vanishing resource fundamental to the planet. (It's on Netflix.)

At the Shedd Aquarium's Wild Reef exhibit, a $40-plus million spectacular homage to the diversity reefs engender that opened in 2003, you'll read that the challenge to coral reefs comes mostly from pollution and other direct human impacts. Global warming gets mentioned only in a small and more recently made section of the exhibit that talks about the science the aquarium supports; one of Cunning's tasks upon returning from his research trip is to further update that section.

But even as the science accumulates and filters out into the public more steadily, it can still be hard to get people to pay attention at the level of engagement scientists say the issue demands.

"I think people just don't understand the importance of the ocean. It's completely 'out of sight and out of mind,' " says Richard Vevers, an adman-turned-ardent conservationist who is one of the stars of "Chasing Coral."

"This is the first time in human history where we've been on the verge of losing a planetary scale ecosystem, and it is arguably the most diverse one on the planet and one of the most valuable," says Vevers, who runs his 50 Reefs initiative out of Rhode Island, aiming to funnel conservation efforts into reefs that might be salvageable. "But it's the first one because they (corals) can only really cope with about 1.5 degrees centigrade ocean temperature rise before you've lost almost all of them."

By 2014, half of the world's coral reefs—and, again, almost all the staghorn corals of the Bahamas—had been lost already, to a combination of disease, pollution, overfishing and heat stress, explained Mark Eakin, coordinator of the NOAA's Coral Reef Watch program, in a 2017 online seminar.

Then came the three-year global coral bleaching event, an unrelenting assault on coral's ability to respond to stress that shocked even the most pessimistic scientists because of its unprecedented duration.

In bleaching, live coral turn white in a reaction that looks like shock, and is. The coral react to the perceived crisis of too-high temperatures by expelling the algae that live within them and give them color and help them feed. They can often recover from single bleaching events, but when the white-outs happen repeatedly, many will die.

The local impact in the Bahamas has been obvious, says Shelley Cant-Woodside, director of science and policy for the Bahamas National Trust, a local NGO advising Bahamian government on conservation policy.

"Almost every year we're reporting coral bleaching whereas before it would have been once every five years, every 10 years," she says. "More and more after each bleaching event, you are seeing areas where the majority of the coral cover has gone. Then it gets dominated by algae. Reefs where you had towers of elkhorn coral and staghorn coral, where you used to have these mushroom forests, have basically become rubble. Once they die, there's nothing really continuing to grow. When hurricanes come they flatten it out a bit. It becomes this downward spiral."

Globally, the first widespread bleaching event came in 1983, the result of an El Nino weather pattern that pushed exceptionally warm waters into the temperate, shallow zones where reefs develop. Then came one in 1998, and then again in 2010. But they were only precursors to the events of mid-decade.

"The 36-month heatwave and global bleaching event were exceptional in a variety of ways," says the 2018 NOAA report titled "Unprecedented 3 years of global coral bleaching, 2014–2017." "For many reefs, this was the first time on record that they had experienced bleaching in two consecutive years."

Many South Pacific reefs experienced their worst-ever bleaching, and "reefs in the northern part of Australia's Great Barrier Reef that had never bleached before lost nearly 30% of their shallow water corals in 2016, while reefs a bit farther south lost another 22% in 2017," it continues.

"All told, more than 75% of Earth's tropical reefs experienced bleaching-level heat stress between 2014 and 2017, and at nearly 30% of reefs, it reached mortality level."

And as a baseline, even before heat spikes, global ocean temperatures are about three-quarters of a degree warmer than a century ago, NOAA's Eakin said in the web seminar.

By 2050, he said, "90% of the coral reefs around the world are going to be suffering from the kind of heat stress that causes bleaching on an annual basis, and that's just not sustainable. If coral bleaching keeps happening over and over, it's like having forest fires come through where forest fires have already come through."

In the face of such facts, doomsday thinking is hard to avoid.

The Atlantic two years ago, right after the series of bleaching events, published an article headlined, "How Coral Researchers Are Coping With the Death of Reefs: The drumbeat of devastating news can take its toll on the mental health of people who have devoted their lives to coral."

But scientists, too, can rally against repeated stresses and find reasons to be optimistic. All the dire forecasts "do not necessarily take into account the fact that coral may be able to acclimate or climatize or have some innate resilience," says Andrea Grottoli, president of the International Coral Reef Society and professor of earth sciences at the Ohio State University. "So being able to identify resilience is critical."

The goals are, in a sense, modest: "to act as a bridge," she says, "and maintain enough reef ecosystem function so that by the time we do get climate change under control and conditions on reefs start to improve, there's enough reef, there's enough coral there, to propagate them going forward."

Coral conservation and restoration efforts "have not always been guided by science," she says, but thanks to a growing body of research like Cunning's, "that gap is narrowing."

And there is little choice because, as Grottoli puts it, "doing nothing ensures complete failure."

So pretty much wherever researchers study coral, there is work taking place to restore reefs, to identify resilient animals, to breed them more efficiently and get them to grow more quickly.

"There is a very intense sense of urgency around these activities," says Cunning, "There is a lot of hope, otherwise people wouldn't be doing it."

The sun is out and the Caribbean is calm on this October Tuesday, a perfect afternoon for strapping on the scuba gear. A dive boat from a local Sandals resort has settled in between the Coral Reef II and the oil tanker, likely offering its dive tourists a look at an oft-visited wreck, a boat sunk on purpose for the Bond film "Never Say Never Again," and at a jaw-dropping bit of underwater geography.

"That's the wall right over there, the Tongue of the Ocean. It dips off to six-and-a-half thousand feet right there," explains Hayley-Jo Carr, a native Brit and longtime dive instructor-turned-full-time coral conservationist with the Perry Institute for Marine Science, one of the Shedd's local Bahamian partners.

Almost directly below the aquarium's vessel, the Perry Institute's Reef Rescue Network has established the coral nursery where Cunning's transplanted staghorns will be placed. It's a tranquil, sandy, almost featureless location that gives no clue of the great precipice looming nearby. The nurseries themselves are as DIY as the transport racks Cunning built: This one is a stand of 11 floating trees made of white plastic PVC pipe anchored to the ocean floor. Each tree holds 50 fragments of staghorn coral dangling from the branches via fishing line, waiting for the moment when they will be moved to an existing reef in hopes of re-establishing staghorns in these waters.

Cunning, Carr and a third diver, Valeria Pizarro, a research associate at the Perry Institute originally from Colombia, kick downward, then spend the next half-hour moving the fragments from the ladders onto the trees. Viewed from a snorkeler's distance at the surface, they look like farm laborers who happen to have compressed air tanks on their backs.

As they work, a Caribbean reef shark sashays slowly by, not showing much interest in the science or the people conducting it. The divers tag each coral specimen, measure it, and take a picture so there will be a baseline for comparison as local divers chart their growth in coming months and years. They use waterproof note-taking devices that resemble an Etch-A-Sketch children's toy.

"Got corals up. Took corals down. Measured corals. Photographed corals," Cunning, back on board, explains to a colleague. "Now we're done."

This is the conclusion of one round in an elaborate game of musical chairs. The design of Cunning's "big reciprocal transplantation experiment," as he puts it, has seen him move 570 coral chunks among four locations.

"We want to find which corals are going to do the best as our oceans warm," Cunning says. "That's the big advantage of being able to spread these identical coral fragments across this big temperature gradient. Transplantation on this scale to my knowledge has not been attempted before."

"It makes it a unique trip," adds John Parkinson, the University of South Florida marine biologist working with Cunning on the research. "The idea of moving corals around big distances, you can't fake."

It's possible to do such an experiment, the scientists note, precisely because the Shedd—unlike virtually any of its peers—maintains its own boat.

The Coral Reef II is more plow horse than show pony, but even if it can't run fast, it can run steady and it can run in relatively shallow waters.

The big boat hosts two motorboats that buzz out to reefs or other daily research locations. All across the main deck are a range of live wells, small tanks that can hold live specimens. On this trip, with only the biggest wells toward the back in use to ferry the staghorns around, those on the port side serve as storage tanks for extra diving gear.

Time on such a vessel is precious and Cunning and the others on board are making full use of this two-week trip.

Earlier, he and the team took biopsies of coral on a set of reefs off of Lee Stocking Island, in the Exuma Islands archipelago to the east of New Providence, snipping tissue samples as they dove and depositing them in individual plastic envelopes for later study. They did this because 24 years before, one of the scientists who was on board earlier—Andrew Baker, who was Cunning's doctoral thesis adviser at Miami—had sampled the same reef.

"We collected the same number of the same species of coral from the same reef," Cunning says. "We now have fully comparable datasets."

Having such an apples-to-apples comparison is a rarity, and it will allow Baker and Cunning to determine whether the corals' algae have changed over that time period: "Has there been any increase in thermally tolerant symbionts?" he asks. In other words: Are the algae and their coral hosts adapting to warmer waters on their own?

A third, ongoing project, is, in essence, a coral sampling extravaganza. Taking DNA biopsies whenever he gets the opportunity, which the divers do by using a very specific human cosmetic device to snip no more of the polyp than a parrotfish might bite off, Cunning is building a database of coral from across the Bahamas, specimens that he will bring back to Shedd and analyze in the on-site genetics lab, in part to track what he calls "genetic flow."

"We use Revlon Gold heavy-duty toenail clippers," he says with a smile. That brand seems to hold up best to being used underwater.

Also on board is Shedd researcher Andy Kough, taking advantage of the fact that spiny lobsters, one of the species he studies, can be found in the vicinity of corals. "My normal move is conchs," says the effervescent Kough, who shares an office with Cunning back in Chicago, "but since (Ross) is going to reefs, lobsters love reefs."

While the captain, first mate and cook take care of everyone's seafaring and nutritional needs, a Shedd aquarist who grew up in Oak Park and two University of Miami graduate students help the Shedd scientists; the latters' deep orange "UMiami Scientific Diving" swim shirts are the envy of most everyone aboard. Shayle Matsuda, a University of Hawaii doctoral student originally from Evanston, joined the trip to conduct his own research on corals.

And the Shedd's dive program manager, Amanda Weiler, is aboard, too, supervising the dives, recording tank pressure levels and the like, as she is on hand to do, she explains, on any dive-heavy trip.

"The Shedd was, like, my dream growing up," Matsuda tells her.

"Mine, too!" Weiler, a native of Spring Grove, Ill., exclaims. "Wild Reef was my 'aha' moment."

There are 13 people aboard, not counting two visiting journalists and a PR representative, and the 14-or-more-hour days move in a steady rhythm of breakfast, dives, lunch, dives and more dives, dinner and then, at night, pulling out the laptops to record data collected during the day.

On Tuesday evening, after the corals have been transplanted off of New Providence, the boat begins the journey around the island to anchor overnight to the west, near the Exumas, a location particularly popular with tourists who have boats because of the protected marine national park and the sheer number of islands to visit.

Dinner—flank steak, gnocchi with peas, buttered carrots and cherry cheesecake, all prepared in the boat's galley—has been cleared, and the boat is underway. As the diesel engine thrums below decks, the laptops come out. Carr is doing a Facebook post on behalf of the Perry Institute. A crossword book somebody brought gets passed around.

A researcher copying underwater photos via the cabin's sole desktop computer shouts, "Dendro!"

"Dendrogyra is very rare and endangered in Florida," explains Parkinson, the USF professor, "but there's a lot of it here. We get excited."

The common name of dendrogyra cylindrus is pillar coral, for the way the species grows upward, like clusters of cactus. On a Shedd research trip to the Exumas in the spring, Cunning says, he saw a group of dendrogyra that he calls "probably the coolest coral colony I've ever seen.

"It was by far the largest individual pillar coral colony I've seen—like, by orders of magnitude," he later elaborates. "It would probably take five minutes to swim all around it. I had no idea they could even get that big."

He biopsied it, of course.

In light of the challenges facing coral, such notes of encouragement take on magnified importance. Cunning mentions the big news that the Florida Aquarium, in Tampa, recently announced it had successfully induced pillar coral to spawn in captivity.

It was a world-first that could be crucial in saving the species from extinction, said Roger Germann, the former Shedd executive who now runs the Florida Aquarium, in announcing the breeding success.

The scientists on board have been encouraged, too, they say, by the release of "Chasing Coral" and the positive reception it's received. "I think most people know," says Matsuda. "They know what coral bleaching is, whereas 10 years ago ... "

But hanging over everything is a throbbing question.

It will be explained in stark terms later, in a phone interview, by Phillip Dustan, a veteran reef scientist at the College of Charleston who worked with famed oceanographer Jacques Cousteau in the 1970s and was featured in "Chasing Coral."

"They want to replant the reef and regenerate the reef?" Dustan says. "That'll be great until it gets hot again, and then they'll die."

On board the Coral Reef II, the researchers are all too aware of this dilemma—that maybe in the most narrow-eyed analysis the action that will do coral the most good is to devote all of one's efforts to slowing down the planet's warming.

Carr frames it directly. Research and conservation efforts like her organization's Reef Rescue Network around the Bahamas and Cunning's efforts to find heat-resistant coral are important, she says, to help the animals survive what is coming. "'It's a race to increase resilience," she says.

But, she says, "All of that is still in vain if we don't address climate change. We are one part of a huge research community. We're doing everything we can. But the (primary) thing that will save them is mitigating climate change."

The summer of 2019 was oppressive, the warmest she's experienced in a decade in the Bahamas.

"It was just too hot," Carr says. "We need to find that supercoral, right, Ross?"

The patch reef is more beautiful than its name would imply, a swirling oasis of life centered on a mobile-home-sized coral mound in the clear waters of the Yellow Bank, a rarely navigated region between the Exumas and New Providence.

Cunning spotted these reefs from a small airplane last year. He knew he wanted to return and visit them up close because "they're in the middle of a very large, shallow bank where the water can heat up more quickly than the deeper waters surrounding it," he says. "But despite those higher temperatures, the area is full of these patch reefs.

"If they've been adapting to this warm place for a very long time now, we can essentially ask them, How did you do it? We can query their genomes and now start to understand genetically how they have adapted to live in warmer places."

But as Wednesday morning breaks he has to wait to even get there because these can be treacherous waters, precisely because of the patch reefs. The boat's captain won't move into their vicinity until the sun is high enough that he can clearly see the coral heads below the ocean's surface.

"I love the fact of, How many people do you think have ever been to these random little specks of reef?" says Kough, Cunning's Shedd colleague. "Probably not many."

As the boat waits on the sun, the scientists ready their instruments. In addition to taking biopsies for DNA samples, Cunning and the team will also plant devices, known by their "HOBO" tradename, that periodically log water temperatures and can be retrieved later.

And they will test a new, $30,000 device on loan from its German manufacturer that uses light to measure coral health non-invasively. About the size of two two-liter soda bottles end-to-end, it will be aimed at coral to take readings and, as one scientist put it, "see if we can figure out a metric to see if they're bleaching before they bleach."

Cunning talks with his fellow divers as the sun reaches the necessary height and the vessel begins picking its way toward the target reefs.

"Your mission will be to find a patch reef," he tells Brendan Wylie, the Shedd aquarist from Oak Park, who cares for coral in his job at the aquarium.

"Should I care to accept it," Wylie responds, quoting "Mission: Impossible."

"You have to accept it," says Cunning, laughing. As lead researcher on this trip, he is in charge of the science, just as the captain is in charge of the boat. "So find 20 to 30 samples and deploy a HOBO."

In a few minutes, Kough steps into the room, excited. "Patches!" he announces.

They are called patch reefs because they dot the sandy sea floor like adornments sewn randomly onto a jacket. Almost as soon as Coral Reef II can drop anchor—being careful not to strike a reef—Cunning and three other divers are down under, giving their target a thorough exam.

"The corals on the Yellow Bank looked pretty good," Cunning will say later. "They were nice reefs. They had high coral cover, maybe 40% or even higher. There's still a pretty good diversity and the corals were healthy there," not actively bleaching like the team observed in some earlier dive areas on the trip.

There are no staghorn, but here and on nearby reefs are almost two dozen other coral species, most prominently the mountainous star coral and the mustard hill coral, unimpressive in its lumpen, yellow appearance but known to be one of the most stress-tolerant of Caribbean corals.

Around them is a seemingly thriving little biosphere. Tucked into a sort of cave is a spiny lobster, the target of the Bahamas' biggest fishing industry, identifiable by its spotted body and hide-and-seek nature. The sponges that resemble badly-thrown pottery are called, naturally enough, vase sponges; glazed in earthy green and scattered atop the reef, they look like the early days of someone's new craft hobby.

Gloriously striped little fish dart in and out of the hollows, their quickness a reminder of their place in the food chain. Looking like a particularly maladapted school of fish themselves, Cunning and his fellow black-suited divers move more slowly, pinching and probing, on their way to collecting 146 DNA samples from four such reefs. Their exhaled breath rises in silver bubbles, breaking at the surface 15 or so feet above and just a few kicks away from the back platform of the research vessel.

Swimming around this reef is like getting a window into a time when coral reefs were abundant and relatively unthreatened. This one has been chosen to offer its secrets to scientists who would protect it for the future. But it is, again, a speck in the ocean, a patch applied to a very big problem.