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The Lonely Battle to Save Species on a Tiny Speck in the Pacific

As Tern Island, a former military outpost in the Hawaiian archipelago, falls apart and harms turtles, birds, seals and more, scientists wonder what's next

A nesting Hawaiian green sea turtle, or *honu* in Hawaiian, struggles while trapped in a hole in the sea wall on Tern Island in 2014. This female was rescued, but in 2021 at least seven females died after being trapped on the island. Joe Spring / NOAA Fisheries

By Joe Spring

Associate Editor, Science

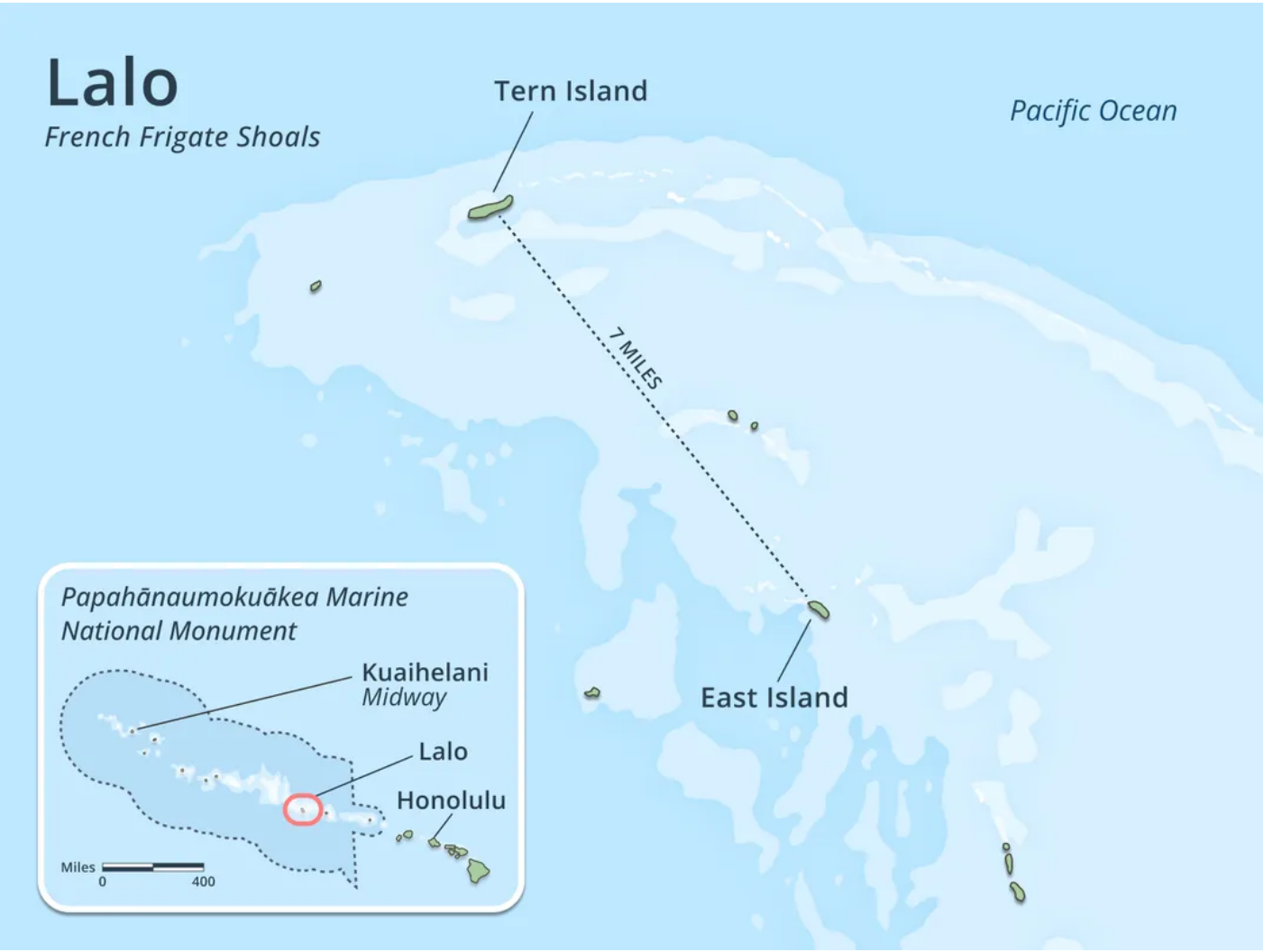
In May of 2021, Brittany Clemans and Lindsey Bull, two sea turtle biologists in their 20s, were walking around Tern Island, an incredibly remote block of land in the middle of the Pacific Ocean, when they came across a Hawaiian green sea turtle. She had crawled onto the island the night before to nest and wandered into a hole in a metal wall, likely on her way back to the water. Her front end had made it through, but the widest part of her shell got wedged in. She couldn't back up, and she'd flailed her flippers so hard trying to move forward that the rusting steel had scratched the sides of her carapace. She was lethargic. The afternoon heat threatened her life.

The two scientists were at the heart of the largest protected area in the United States, Papahānaumokuākea Marine National Monument in Northwestern Hawaii. The monument's 583,000 square miles are filled with reefs and atolls, and Tern Island is at the northern edge of an atoll called Lalo, which has a crescent-shaped reef with a curve of about 20 miles. Like other islands in the area, Tern used to shape-shift with the storms and tides, and birds, seals and turtles easily moved around its sloping shores. But in the 1940s, the Navy turned Tern into a pit stop for planes flying between Hawaii and Midway Atoll. It built the island into the form of an aircraft carrier, dredging more than 55,000 dump trucks' worth of coral from the shallows, flattening it into a runway about a half-mile long and 350 feet wide, rimming most of it with a sea wall.

That sea wall became an enormous hazard for the island's wildlife. Almost 80 years of storms have now rusted and wracked it into jagged spires and open holes, so that portions look like a witch's fingers or like Swiss cheese.

Animals swim, fly or crawl through cuts or holes, and are often unable to escape. Other entrapment hazards lurk, including old buildings that are falling apart and concrete structures that are cracking open. The Navy and then the Coast Guard occupied Tern Island until 1979, and the Coast Guard and Air Force left discarded batteries and electrical equipment leaking toxic contaminants.

Until about a decade ago, the U.S. Fish and Wildlife Service (USFWS) had a permanent field station on Tern Island, with groups of scientists studying and rescuing its seabirds, turtles and seals all year round. But a 2012 storm damaged the housing and operations facilities. From that point on, a skeleton crew of scientists has been venturing to the island to study sea turtles and seals during field seasons that sometimes stretch from late spring to early fall.



Lalo, also known as French Frigate Shoals, is a coral atoll that lies within the boundaries of Papahānaumokuākea Marine National Monument in the Pacific Ocean. Emily Lankiewicz

More than 300,000 seabirds of 18 species make their homes on Tern and other nearby islands. Critically endangered Hawaiian monk seals give birth on the shores. Sharks and fish of every color swim in the shallows amid corals the size of La-Z-Boys and kitchen tables. More than 90 percent of the sea turtles in the Hawaiian Archipelago, which stretches for roughly 1,500 miles, nest on the atoll.

The chance to spend time on Tern is exhilarating. But the work is exhausting. Every night that field season, Clemans and Bull surveyed the island from roughly 9 p.m. to 7 a.m., crossing back and forth across the soft sand—walk, crawl, squat, bend, think, crouch, walk. The biologists labored in the dark, as

that's when the turtles emerged from the surf and crawled up on land to lay their eggs. Trekking roughly 11 miles a night, they looked for the pregnant female turtles and then numbered them, tagged them and measured them. In the afternoon, they walked around the island once more looking for animals in danger.

When Clemans and Bull found the trapped female sea turtle that afternoon, they moved carefully. The animal could injure them with a powerful flap from her front flippers or by landing on their feet; she likely weighed 200 pounds or more. If physical harm came to one of them, a boat rescue was at least a few days away. They lifted the turtle onto her right side and scooted her forward until she was able to crawl to the water. The biologists felt relief, but concern. "She slowly swam away, and I do remember we discussed, 'OK, there is a possibility we might [later] find her washed up,'" Clemans later tells me. "'She might die.'"

Two hours later, they found another turtle flipped on her back beneath a rusted sea wall that stood a foot or more above the beach. Seeing the ocean so close, the turtle had likely taken a chance and crawled over the edge, nose-diving into the sand and then flipping on her carapace. "I knew immediately she was dead," says Clemans. "There was no movement. Flies were everywhere."

"You could see indents in the sand where her flippers had been trying to flip herself over," adds Bull. "And she just couldn't flip."

The researchers were sweaty and worn out. They had only slept four or five hours that day in their hot tents after patrolling the beaches the entire night, but they performed a necropsy, the animal equivalent of an autopsy. They determined the turtle was a healthy female, full of eggs and ready to nest. She had likely swum hundreds of miles to this atoll, the place of her birth, to

bury her eggs. “Just finding her dead after getting that far, which is so, so discouraging,” says Bull, “it definitely beat down on our team morale.”

Three days later, the turtle they had rescued earlier that afternoon washed up dead, too.

A nesting Hawaiian green sea turtle lies on her back after crawling off Tern Island’s sea wall and nose-diving into the sand below before flipping over. This turtle, which fell off the wall in 2014, was rescued.
Joe Spring / NOAA Fisheries

A young Hawaiian monk seal was found behind a section of Tern Island's sea wall in 2022. The endangered marine mammal was luckily able to find its way out. Shannon Vasquez / NOAA Fisheries (Permit #22677-02)

By July, Clemans and Bull were clocking 80 hours of work a week. One morning, Bull came back from a survey after working 16 or 17 hours the day and night prior. She walked into the office tent, put her backpack down, turned the light on, and then tripped over the strap of her pack. She stumbled down on her knees, and then her body just gave out. She fell face-forward and clipped the side of her head on a metal chair before falling on her back and hitting her head on the plywood floor. On top of her sleep deprivation, now a concussion.

It took a research ship three days to get to her. During that time, the other biologists woke her up, asked her questions and carried out reflex tests with her hands. Once on the boat, it took another three days to get her to the island of Kauai for medical treatment. She told the doctor about the job, how little she slept and for how long. He responded, “That’ll drive you crazy.”

I know the truth to that statement. Right after working on the islands of Lalo, I lost my mind.

When I first told folks in 2003 that I was headed out to a small, remote atoll to study sea turtles, some wondered what would make me want to do such a thing.

For starters, I grew up with nine siblings and two parents, mostly in a three-bedroom house in Winona, Minnesota. My parents had one room, my brother Frank and I had another, and everybody else younger was in the third room. In high school, right before Frank went off to college, my dad said, “Congratulations, you’ll have your own room.” Which was weird, since he wasn’t usually the congratulatory type. Soon after, I found a single bed shoved into the downstairs room we used as a sort of pantry with a thin curtain hung over the doorway. My new bedroom had a refrigerator, canned and dry goods, and—in a sign of how square I was in high school—my dad’s liquor stash that didn’t even tempt me.

When we weren’t crammed at home, we piled ourselves into a van for road trips. We most often visited the ocean, camping on Padre Island, Texas, or crashing in hotels in Myrtle Beach, South Carolina. Highlights included seeing dolphins swimming in the surf. Once, in grade school, Frank and I came across a small shark caught by a fisherman with a rod and reel. We carried it into the ocean and held it while walking forward until it swam off.

My family played football and Frisbee, but in quieter moments, I would go alone to the beach and sculpt large sand models of dolphins, sea turtles and sharks. I grew to appreciate nature, but a key moment pushed me toward the value of science. In middle school, when I saw some friends biking behind a truck that was spraying our town for mosquitos, I ran out to play with them in the mist. My mom yelled at me to stop and told me the spray was poison. The next day she gave me Rachel Carson's *Silent Spring*, the 1962 book that famously chronicled the dangers of DDT and other pesticides, forever changing the environmental movement. My mom knew I would slough off her warning, but giving me a story with evidence would ensure that I never ran after such a truck again.

So a lot of reasons led me to take a job roughly 450 miles from civilization to study Hawaiian green sea turtles for the USFWS and National Oceanic and Atmospheric Administration (NOAA). A love of science. A longing for privacy. A sense of adventure, particularly tied to the ocean. Though I had previous experience as a herpetologist in the Caribbean and California, this would be my most isolated stint as a scientist.

I arrived on Tern Island in May 2003, with another biologist on a three-hour flight in a small plane over the open ocean. As the runway appeared below, the pilots put on their helmets. Surprised, I looked to my colleague, who explained it was in case birds crashed through the windshield. Upon making our descent, the dark expanse covering the island rose up and spread out; more than a hundred thousand birds amassed into a dark cloud. The plane yawed left and right, dipped and climbed to avoid the flocks, churning my stomach like a roller coaster. Upon landing, the deafening cries of the birds weren't even the strongest offense to the senses; the rancid smell of guano hung thick in the air.

An aerial view of Tern Island in 2006 Joe Spring / NOAA Fisheries

A sooty tern flies over Tern in 2006. Nesting sooty terns blanket the ground beneath it. Joe Spring / NOAA Fisheries

A red-footed booby rests on a bush on Tern Island in 2006 as birds fill the sky behind it. Birds on Tern nest in bushes, on the ground and in underground burrows. Bushes were destroyed by Hurricane Walaka when it hit the island in 2018. Joe Spring / NOAA Fisheries

On Tern, I spent time learning from, and sometimes helping, the seabird and seal biologists, but I primarily focused on the nesting turtles on nearby East Island, an 11-acre bump of dead coral and sand covered in a handful of bushes and some low-lying vegetation. I counted the mothers so authorities knew how many nested every year, tagged them so they could be identified when they nested again and took photos to document any notable injuries or afflictions. (Sea turtles sometimes grow tumors, more often when swimming in bays with excess nutrients and little ocean mixing.) I lived out of a tent and traded shifts with another biologist every three to seven days or so. When I traveled back to Tern, I crunched my data and slept in housing

that was walled off from birds and cooler than my tent. My duties on East were much the same as Clemans and Bull's on Tern, and they usually lasted from early evening to midmorning the following day. A daily journal, which I still have and referenced for this article, chronicled the ups and downs of the routine. Looking back upon my writing two decades later, I'm transported back to how thrilled I was to snorkel with manta rays with wingspans that dwarfed mine and how startled I was when a wedge-tailed shearwater flew into my shoulder, fell to the ground and leisurely waddled off.

My first night on the island was May 22, 2003—18 years to the day before Bull and Clemans found that dead turtle. I had studied the reptiles before, in the U.S. Virgin Islands, but became much more adept at deciphering what stage of nesting they were in. When nesting, female turtles make sand pits a foot or two deep, then carefully scoop sand with their hind flippers to make chambers for their eggs. Once a turtle lays about 100 eggs, she pats sand gently over them and then throws sand with her front flippers to disguise the nest under a mound. I often witnessed mothers showing incredible tenacity; some had entire flippers bitten off by tiger sharks, and others exhibited fresh wounds with bones extending out. But the turtles didn't let the injuries stop them from digging, sometimes all night.

My work required tenacity, too. I walked through so much soft sand over the summer and squatted and crouched and crawled so much that I lost close to 20 pounds, despite treating every day like a carb party. The duties often ran straight through the night, so I took short food breaks, drinking cold cans of soup and chili. I made coffee doused with chocolate syrup and ate packages of Chips Ahoy and Oreos.

Life and death packed every day. Fledgling birds flew off the island at dawn. Sometimes, they dropped in the surf just feet away from where I stood, and ten-foot-long tiger sharks jumped out of the shallows to eat them. When sea turtles crawled ashore at night to dig holes and lay their eggs, they might

crush the eggs of ground-nesting seabirds or collapse the homes of burrow-nesting seabirds. Male seals cruised along the shoreline for mates. Females gave birth to their pups on the beach, leaving their placentas in the sand. Blood and sex and splattered yolks were the norm.

Hawaiian green sea turtles bask on the shore of East Island late in the afternoon in 2006. Joe Spring / NOAA Fisheries

A Hawaiian green sea turtle lays about a hundred eggs on average. Joe Spring / NOAA Fisheries

A Hawaiian green sea turtle covers her nest early one morning. Joe Spring / NOAA Fisheries

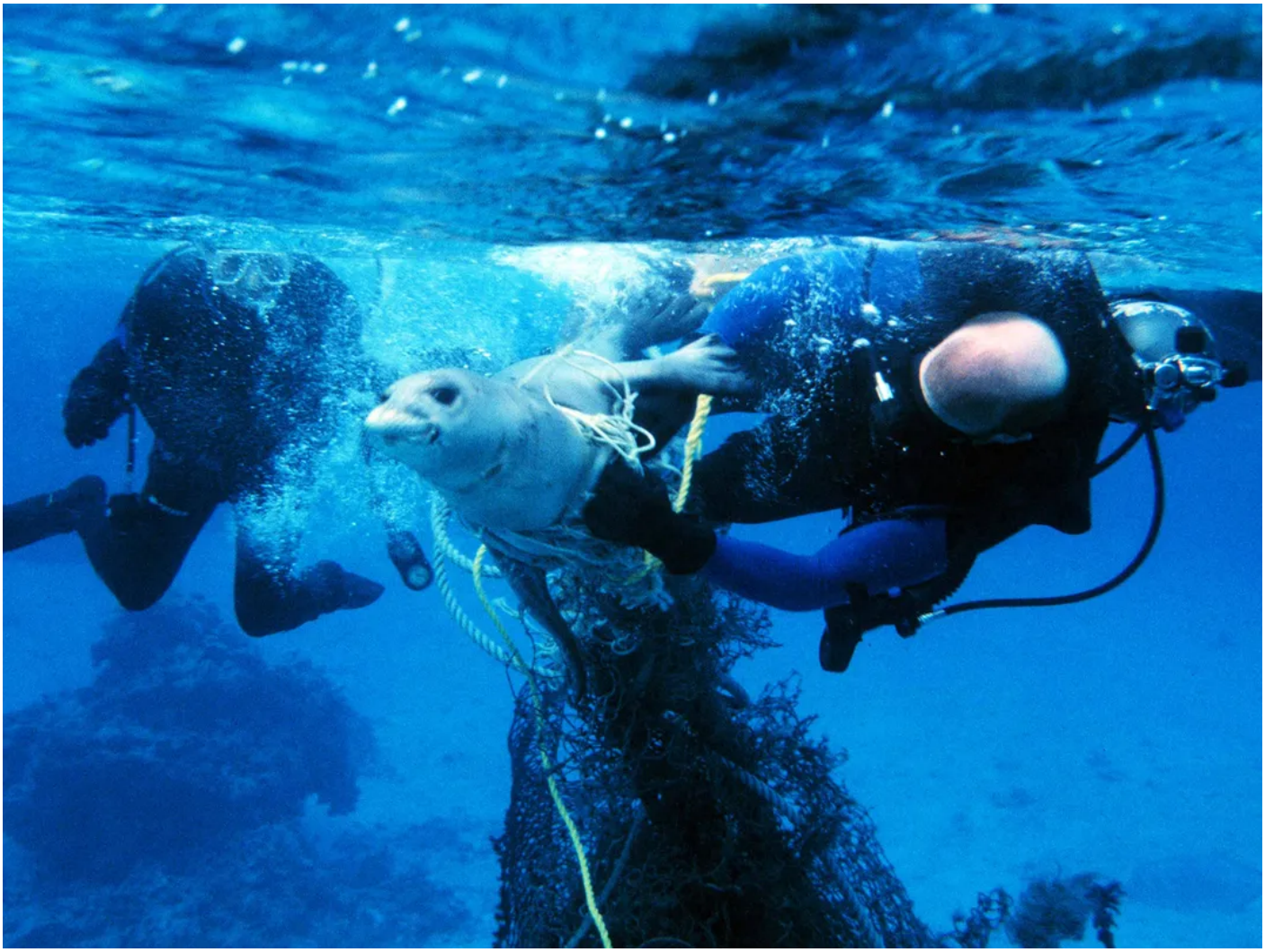
A hatchling green sea turtle crawls toward the ocean. Joe Spring / NOAA Fisheries

"The trash here is crazy," reported my journal entry from my first night on East. Washed-up nets, bottles, buoys, fishing line and broken, weathered, colorful bits of plastic lined the shore. The plastic nets and line posed a significant threat to the turtles and seals, who could easily become entangled in them and die. Since 1982, scientists have documented more than 300 entanglement incidents of Hawaiian monk seals, of which only 1,500 or so remain in the wild. Many more instances likely go undetected. Globally, at least 354 different species have been found in similarly entangled states.

On my dusk walks around the island, I played my part to make a dent, collecting debris and piling it near my camp for later removal. But the trash didn't just wash ashore. It came by air, too. Once, while I was walking on Tern's runway with a seabird biologist, we came across a dark brown mass of crud about the size of a child's drinking cup. Frans Juola, the researcher, explained that black-footed and Laysan albatross chicks, seabirds with wingspans stretching more than six feet, sometimes regurgitated their stomach contents to get rid of undigestible bits.

As Juola looked at this bolus, as the mass is called, he found bits of plastic and a roughly three-inch-long hook, thick as a chick's neck, with a metal line attached. A parent had swallowed the hook while at sea, then flown home to this island and regurgitated the sharp object to its chick, along with the debris. The chick, in turn, had coughed it up. Not all chicks were able to rid their stomachs of foreign objects. They often died, and amid their bones were the large, colorful clumps of weathered plastic—lighters, bottle caps, fishing line—that filled their stomachs. Scientists studying the chicks in Hawaii in the 1980s found that 90 percent of them already had plastics in their guts. The problem has gotten more severe, and scientists estimate that 99 percent of all seabird species will ingest plastics by 2050.

A pile of fishing nets gathered from the beach and shallows by researchers sits on Tern Island in 2014.
Joe Spring / NOAA Fisheries



Workers wrestle to free an entangled Hawaiian monk seal at Lalo, or French Frigate Shoals, during a marine debris survey and removal cruise in 1997. Since 1982, scientists have documented more than 300 entanglement incidents of Hawaiian monk seals. Ray Boland, NOAA / NMFS / PIFD / ESOD CC By-SA 2.0

Marine debris washes up on the shores of Lalo’s islands daily. Joe Spring / NOAA Fisheries

When albatross chicks die and their feathers blow away, researchers often find their guts filled with plastic debris. Parents pick up the debris while feeding in the open ocean and unwittingly transfer it to their offspring. Dan Clark / USFWS / Public Domain

Though the plastic brought me down, so many natural events surprised me that first year. When snorkeling off Tern and around the refuge, I spied large, three-foot-long fish called jacks; whitetip reef sharks; eels; and, among the corals, loads of small, colorful creatures, from squirrelfish to nudibranchs. On East, a molting monk seal smelled worse than sweaty, pungent gym socks. A brown noddy landed on my head and performed a tap dance. Sea turtles threw sand into any exposed crevice in my body. Floating albatross feathers, the aftermath of attacks by sharks, stuck to my skin as I emerged from the ocean after a bath. Slimy guano bombs from birds smacked my head and back.

Both East and Tern were packed with wildlife that migrated away in summer and fall. On East, the turtles dug so many nests that by the end of the summer the island looked like a mogul run. Their hatchlings erupted out of the sand by the hundreds at night. On Tern, tens of thousands of seabird chicks sat less than a foot apart from each other on the ground, just waiting to lose their down and take to the skies.

By the end of the season, my sugar-fueled work had helped identify more than 200 nesting turtles, a big uptick from the 67 that had been found nesting on the island in 1973. The government's 1978 listing of the green sea turtle under the Endangered Species Act had helped, though the animals were far from recovered and retained their "threatened species" status. When I had time, I helped turtles whose hind flippers had been bitten off by sharks by digging nests for them. Turtles became entangled in copper wire left in the ground by the Coast Guard, who had used East as a long-range navigation station in the 1940s and 1950s. I cut the animals free and pulled up the metal.

After spending four consecutive research seasons on Tern and East Islands, I was away from 2007 to 2012, having taken a job at *Outside* magazine before writing as a freelance journalist. In July 2013, I made two brief pit stops by ship to Lalo to check sea turtle nesting on its islands.

Though Tern had been falling apart since the 1970s, many damages had been mitigated by USFWS staff. But in December 2012, a powerful storm hit the island. Damaging winds, possibly over 100 miles per hour, destroyed the boat shed and tore the walls off the barracks before generating enough flying debris to kill or injure more than 200 birds, of which many had to be euthanized. Nine days after the storm, the staff were rescued. Tern would not host scientists year-round again. Dedicated biological surveys that had

spanned decades stopped. Buildings fell apart. Walks to look for entrapped animals ended.

I spent just enough time on Tern the next summer to see the remains of the barracks. Rooms with walls ripped off were exposed to the ocean. Seabirds perched and nested on exposed metal frames, hanging wires and shelves where, one biologist pointed out, books about seabirds used to sit.

The next year, in 2014, I returned to study sea turtles again. The destruction of the barracks meant USFWS had nowhere to house researchers for year-round surveys, and damage to the runway made it more difficult to quickly evacuate the island before powerful storms. NOAA still funded tent-based seasonal surveys of sea turtles and seals in warmer months.

The morning we arrived, field station manager Meg Duhr and I walked the island. Half the runway was covered in vegetation. We began a survey at the northwest end of Tern and came to a section called the Bulky Dump. Beginning in at least the 1970s, the sea wall here had started to fail, and the Coast Guard threw down debris as a defense against the ocean. Inside the rusted and bent sea wall, broken-up chunks of concrete, wires and all sorts of mechanical equipment were piled up. Water intruded into the mess. Seabirds, such as brown noddies and frigatebirds, perched on the concrete and metal. Fish darted in and out.

Noddies nest on the battered infrastructure of the barracks on Tern Island in 2013. Joe Spring / NOAA Fisheries

Noddies nest on a foosball table in the barracks on Tern Island in 2014. Joe Spring / NOAA Fisheries

A frigatebird rests on a rusting metal bar near the Bulky Dump on Tern Island in 2014. Joe Spring / NOAA Fisheries

Duhr pointed. “There’s an old propane tank,” she said. “There’s an old generator part.” Environmental Protection Agency scientists and engineers I’d talked to before coming out there suspected the debris leaked lead and PCBs into the environment. They wanted to conduct more advanced sampling and monitoring of Tern under Superfund authorities, which can result in a designation that forces the parties responsible to clean up the contamination or reimburse the EPA for such work. They were worried the contaminants might be combining with the microplastics on the beach and in the water—and making their way into the guts of creatures that unwittingly ate them.

We moved along the north end of the island, where the ocean had rusted the sea wall into spires. Duhr said in the winter, when no one was on the island, powerful waves would sometimes push juvenile turtles through cracks between the spires and onto the sand. Sometimes they crawled back to the water, but we saw the skeleton of a juvenile drying in the middle of the island.

I kept the same nightly schedule and logged data before surveying for trapped animals in the morning. On one walk, I found a female sea turtle trapped in a hole in the sea wall. With lead monk seal biologist Shawn Farry and a few other scientists, I created temporary barriers to prevent entrapments, but waves busted down some, and sand piled up next to others, allowing turtles to crawl over them and get stuck. Later that season, I found a turtle on her back who had crawled off the edge of the sea wall, nose-dived into the sand and flipped, thrashing her flippers, one of which was bloody and injured from the fall. I crouched beside her and turned her over. She crawled into the surf and swam away.

When the sea turtle hatchlings emerged from their nests, some, rather than crawl toward the moonlight reflecting off the ocean, scampered toward the remaining bright white patches of the runway, where they would dry out and die. We all took turns collecting the youngsters in the morning and releasing them on the beach. We collected dozens if not hundreds during the field season, but once we left in September, no one would be on Tern to help them out. We listed all of the entrapments and sent the information to be shared between NOAA and USFWS authorities in Honolulu.

My favorite seabirds on the island were frigates—with their seven-foot wingspans, they are amazing aerial acrobats. One flew up and screeched at me every time I approached within ten feet of his roosting bush. On a different atoll, I once watched a frigate land on a biologist's head to rest. One time, on Tern, a male frigate swooped down and snatched expensive

polarized sunglasses off of my face with its beak, soared out over the ocean, flew back over a bush packed with roosting seabirds and dropped the specs in the middle of them.

A frigatebird rests on an abandoned wooden structure on East Island in 2014. Joe Spring / NOAA Fisheries

I often found frigatebirds in the sea wall gap. Sometimes I climbed down to get them out. In August, I tried to lift one out while holding onto the rusted fence with one arm. Part of the sea wall broke, and I fell into the metal debris. I lifted the bird out and put it carefully down on crushed coral. A day later, I found it dead in the same spot.

Working on the islands was thrilling as always, but more exhausting than ever. In my earlier stays, I would exchange regular shifts with another biologist, traveling back and forth from Tern to East, where we each labored alone, splitting up the task of tagging sea turtles. But in 2014, I did the sea turtle surveys alone all season and spent up to 14 straight nights all by myself on East. And when I returned to Tern, the nights of sleeping in cool, walled-off bedrooms were no more, as the buildings had been destroyed. On a satellite call, my boss and mentor George Balazs, who had worked on East beginning in the 1970s, warned me not to push myself too hard.

A short time after my arrival, I witnessed more than 470 turtles basking on the shore—most of them female, a sign that hundreds more would nest than I had ever seen before. Several nights on East saw more than 100 turtles, and I moved swiftly to cite their behavior in my notebook and measure and tag them. The demands—walk, crawl, squat, bend, think, crouch, walk—wore me down. I often noticed lightning storms on the horizon, alighting the clouds like bulbs in the color of grape sherbet. Pretty, yes, but I was the tallest thing on the island, and carrying long metal calipers.

When needed, I broke from my routine to help trapped turtles. One turtle dug herself a pit where a fishing net had been buried. Her efforts to throw sand left her entangled in debris. The plastic was wrapped around one front and one hind flipper, and left her struggling. I cut and removed the five-foot section of net from around her flippers and carried it back to camp.

Black-footed albatross chicks rest on East Island in 2014. They will lose the down on their bodies and heads as they grow. Joe Spring / NOAA Fisheries

A tiger shark swims in the waters of Papahānaumokuākea Marine National Monument. Koa Matsuoka, 2015 / Papahānaumokuākea Marine National Monument CC By-SA 2.0

A tiger shark breaches the shallows near East Island to eat a black-footed albatross in 2006. Joe Spring / NOAA Fisheries

In my journal, I noted that I was sleeping two to five hours a day on East, after my all-night shift had ended. I mostly dozed under a canopy tent, which offered coverage from the sun but let the trade winds cool me down during the heat of the day. Some days, the tarp on the canopy tent would come untied, flap loudly in the wind and wake me. Chalking that up to poor ropemanship skills, I kept practicing my knots, but the tarp issue continued unabated. Then, one day, I woke up around noon and saw, just past the cot, three juvenile masked boobies—yellow, white and black seabirds with wingspans of five feet—were pulling at the rope with their beaks, loosening the knot. I watched in amusement, then, worn out, fell back asleep.

Back on Tern, my sleep patterns were no better. With no barracks where I could catch up on sleep, the heat and the sound of seabirds often kept me up. The albatrosses clacked and whistled. The boobies whistled and honked. The wedge-tailed shearwaters “wooed” to each other. The sooty terns called in a chorus of deafening tones that sounded like “wide awake, wide awake.” As Clemans later puts it when I talk to her about her experience, “Working at night is hard enough when you sleep in a nice, dark, cool, quiet room during the day. But when you have to sleep in a hot, sticky tent surrounded by thousands of squawking birds, that can test your sanity for sure.”

During the second week of August, authorities in Honolulu let us know that three tropical storms threatened to turn into hurricanes and come our way. The military helped evacuate biologists from several other remote atolls in Papahānaumokuākea Marine National Monument, but those of us monitoring species in Lalo had the old warehouse on Tern to hole up in, so we stayed. Three of us went to East to take down my camp and had to wade through water packed with floating Portuguese man-of-wars to load the boat. All of us got stung, but one researcher took the brunt of the pain when one of the animals drifted up his board shorts.

The storms missed us, and soon I was back on East, where piles of plastic had washed ashore. One morning, I spied a moving clump of fishing line the size of two fists. A turtle hatchling had crawled into it and was wrapped up. I carefully untangled the youngster and put it down, and it crawled into the surf.

It felt good to help, but I couldn’t do right by every animal. One night, a nesting turtle crawled back toward the surf with a large hook stuck in her front flipper. I ran with my multitool to take it out, but the sharp object was driven in deep. I couldn’t yank it out before she hit the water.

By the end of the summer, more than 800 turtles had nested on East, a record for the island. To find them in the dark, I used a small flashlight and all my senses. I looked for moonlight reflected off wet shells. I sniffed the air for the smell of turned-over soil. I felt the sand thrown by mothers on my skin. I listened for the calls of birds that indicated a turtle was bothering its rest. To work them all up, I moved constantly.

But after my time on East was over, I didn't turn off. I couldn't sleep, even after switching to a more normal nighttime routine. A ship took me from Tern to Midway Atoll, then a plane to Honolulu and then back to the mainland, in Denver, to walk my sister Margaret down the aisle. From there, I met with representatives of the EPA in San Francisco—to share what conditions were like on Tern and because I planned to write about their research on microplastics—before returning to Hawaii to finish up my own work. Sleep still eluded me, and my mind began flickering into a manic state. Increasingly, short episodes interrupted my sanity.

It's hard to explain the period that followed. Rather than focusing on finishing up my work and resting, I went on frenzied research tangents. I became obsessed with investigating government testing related to biological weapons in remote areas and wondered if that happened on Lalo. I looked into Smithsonian efforts sponsored by the Army to conduct research on the atoll. I made weird connections between those efforts and my experiences that I wouldn't have accepted in a steady state. Did experiments take place on Lalo? Did weaponized bacteria persist in the animals there?

In that manic state, I flew to New York, where my brain convinced me I would uncover more information that would verify my conspiratorial thoughts. I used a pay phone to make calls and acted like authorities might have been following me. My brother Paul, who was recording an album in the city, thought I was acting weird but didn't know exactly why, and he

shrugged it off. One day, on his suggestion, we visited the Metropolitan Museum of Art to see a painting by one of our great-grandfathers.

But when we got to the Met, my mind raced out of control again. I refused to leave a Greek and Roman art gallery. Confused, my brother and his girlfriend at the time left me there. I started examining vases and sculptures in detail. My mind scanned frantically for patterns and signs. Clear as day, the ancient artists' use of animals seemed to show that the creatures were gods, and that now our modern society was taking down those gods. Adrenaline rushed through my body as my thoughts blitzed between objects in the museum, events in my life, and scenes from movies and stories. What was I supposed to do next?

When the museum closed, I ventured outside, my mind still manic. A street performer playing "Gonna Fly Now" from *Rocky* seemed like a sign to run. Clad in jeans, an oversize white T-shirt and brown wingtips, I hit the East River, stopping at a fence and looking at my phone. A man was running toward me; was I being followed?

A text from one of my brothers happened to have the word "jump" in it, and that was enough to make me climb over the fence and leap maybe 30 feet down into the river, still fully clothed with my phone and wallet in my pockets.

As I swam north toward an island called Mill Rock, I waved at people looking out onto the river. I remember noticing that Manhattan was surrounded by a wall, just like Tern. The current swirled in places, and though I felt heavy, I was also on a high. Close to Mill Rock, a boat that I think was helmed by either the police or the Coast Guard approached, and a life preserver splashed next to me. Worn out, but still excited, I grabbed it and was lifted on board. The boat brought me back to Manhattan, where I was loaded into

what was likely an ambulance. Workers shrouded me in towels and asked me what I was doing. I said I just wanted to go for a swim.

First responders took me to a hospital, where I was guarded until my brother arrived. He eventually convinced me to sign a form to transfer me to a psychiatric hospital. I weighed about 160 pounds, down from my usual 190. The weight loss had occurred mostly on East, but I also wasn't eating much because of my mania. Health workers kept the door to my room open, and big dudes guarded it through the night. Laces had been taken out of my shoes and drawstrings out of my shorts. Privileges, like wearing my normal clothes, were taken away. I tried to escape by opening windows when I thought no one was looking.

I didn't share much with any of the psychiatrists there, because I still thought I was being pursued, though I hadn't yet determined exactly who was following me or why. Family showed up and brought me cheesecake every day to help me gain my weight back. I ate it, but only after looking for signs about what to do based on the arrangement of mangos and strawberries on top of the dessert.

After about a month of counseling and therapy and drugs, I was released and diagnosed with bipolar disorder. I eventually got a job in California, but I stopped taking my meds and lost my mind again. I got another job, but I went into a deep depression, missed weeks of work, couldn't function properly and got fired. I moved to my mom's basement in Minnesota and regularly slept 20 or more hours a day. My medication made me drowsy and likely slowed my metabolism, but I had to take it if I wanted to recover.

In October of 2018, my state had dramatically improved, and I was working at a small Minnesota conservation magazine when I got an email from Frans Juola. East Island had been destroyed by a storm. "A powerful hurricane wiped out this remote Hawaiian island in a night. It was a critical nesting

ground for threatened species," read a headline in the *Washington Post*. Hurricane Walaka directly passed over Lalo as a Category 3 storm and destroyed the island. Only a couple slivers of sand remained above water.

I emailed former co-workers for more info and was mostly left with questions. What would happen to the animals that bred and nested on East? Would more animals move to Tern and get trapped?

Here's what today's researchers tell me about the islands where I once worked long, sleepless nights: East is no longer stable enough for field research over an entire season. And since Walaka wiped out East, more seals and turtles have sought out Tern, placing them in danger of new threats. Take the endangered Hawaiian monk seals, or *'ilio holo i ka uaua* in Hawaiian. With more than 200 seals, Lalo harbors a crucial 20 percent of Papahānaumokuākea Marine National Monument's seal population.

Prior to Hurricane Walaka, almost a third of the monk seal pups were born on East, and another third were born on the nearby island of Trig, which went completely underwater in September 2018, just before East did. With those islands dramatically diminished, mother seals were forced to smaller islands where their pups were more susceptible to drowning in high surf or being killed by sharks. Other mothers moved to Tern. "Monk seals still need to haul out. They still need to have pups. They still need someplace that's safe," says Charles Littnan, the science and research director covering this area of the Pacific for NOAA. "And when all of the other real estate is disappearing, the best place for them is Tern Island—that has a whole lot of danger for them to navigate."

A Hawaiian monk seal takes it easy on the beach. Koa Matsuoka, 2015 / Papahānaumokuākea Marine National Monument CC By-SA 2.0

Hawaiian monk seals often give birth on small islands where their pups are susceptible to drowning or shark attack. Jim Stilley / NOAA Fisheries (Permit #22677-02)

In 2022, two Hawaiian monk seals rest on Tern Island near the Bulky Dump, where a crew headed by the Environmental Protection Agency found unacceptably high levels of PCBs. Leah Kerschner / NOAA Fisheries (Permit #22677-02)

The greatest threat to the seals on Tern is that decaying sea wall. Farry has found seals trapped in holes and cracks of every sort in the wall, and under mechanical junk likely tossed out by the Coast Guard. In one stressful situation in 2019, Farry tells me, he and his colleagues found a seal pup 40 feet into a narrow section of double sea wall that rose about five feet above it. Sand prevented the pup from going lower. A beam prevented it from going higher—and the biologists from lifting it out. The tide was rising. “It really entered my mind that this pup might drown in front of us,” Farry tells me. Biologists spent an hour prodding the animal and shoveling sand out

from beneath it so that it could move to a wider section of sea wall. Once it did, researchers lifted it out.

The animal was lucky. In records that date back to 1989, more than a third of documented cases of monk seal entrapments have occurred since 2017. “If islands continue to disappear and seals continue to shift to Tern Island,” says Littnan, “this could be a disaster for seals at French Frigate Shoals [a.k.a. Lalo].”

The situation for turtles is even worse. Scientists think Tern has become their primary nesting spot due to the reduced size of the other islets remaining at Lalo, though they don’t have hard numbers because they can’t do surveys on East. But in 2019, researchers looked at tagged sea turtles and saw animals that only ever nested on East Island coming ashore to nest on Tern. During that season, biologists helped two to three trapped females a week. “We would do night surveys all night long, and then from sunrise till eight o’clock we were just trying to move turtles,” says Marylou Staman, a biologist who spent three seasons on Lalo. “That was incredible. It was exhausting.”

In previous seasons on Tern, female turtles often clustered their nests on the south shore of the island, where bushes and vegetation proliferated, and soft sand allowed them to dig deep chambers. With those natural markers wiped away by the 2018 hurricane, the turtles crawled further inland, where the storm had spread a thin layer of sand over the runway. They dug through that layer and less than a foot or so down hit compressed coral as hard as concrete. Normally the females would dig two feet or more down to lay their eggs. Now, after hitting rock, many turtles abandoned their shallow nests and moved somewhere else to dig again. Sometimes they dug and abandoned such nests for days on end. But not all of the turtles abandoned their efforts. Some dropped their eggs in the shallow pits, and the embryos likely cooked from being too close to hot surface sand.

The competition for space between different species on Tern also ramped up. Before East was hit by Walaka, roughly 4,000 black-footed albatross, 1,000 Laysan albatross and thousands of other birds nested there. Beth Flint, a supervisory wildlife biologist with USFWS who has worked on Lalo since 1980, suspects many of those seabirds crammed onto Tern. She says the increase in turtles and seabirds has likely led to more crushed eggs and chicks. And during the 2019 field season, more than 30 birds got trapped in the sea wall.

Aside from all those entrapments, an invisible danger lurks on Tern: the decaying electrical equipment the military left behind. Before the storm hit, a crew headed by the EPA sampled and monitored Tern for contaminants. They found unacceptably high levels of lead and PCBs. The area with the greatest pollution was the Bulky Dump, that spot where I saw so much debris in 2014.

The Coast Guard contracted a company to do cleanup on the island in the early 2000s, but it apparently did not retrieve everything. PCBs are endocrine disruptors and can be mistakenly accepted by the body as hormones—causing tumors, birth defects and other developmental disorders. USFWS resource contaminants specialist Lee Ann Woodward tells me in an email that almost all of the animals tested on Tern have been contaminated.

So what will be the fate of Tern Island?

Field biologists who have worked there for decades say the island should be returned to a natural state.

My former boss George Balazs, a sea turtle scientist who still actively studies the animals after retiring from NOAA's Pacific Islands Fisheries Science Center, argues it's time to take down the sea wall. "Remove it," he says.

“Don’t level it and throw in the ocean. You’ve already thrown enough stuff in the ocean. Let’s get rid of it properly with modern equipment.”

The Navy wouldn’t directly answer my questions about whether it would help pay for the possible removal of the structure. “The Department of the Navy no longer has ownership over Tern Island,” it stated in an email. “For questions about the status of Tern Island please contact the Department of Interior/U.S. Fish and Wildlife Service.”

I got a similar deflection when I wrote to the Coast Guard, asking if it planned to finish cleaning up the contaminating debris it left on the island decades ago. “Tern Island is held as property of the Fish and Wildlife Service who is a federal agency,” its lawyers responded. They tell me that the current owner is responsible for any cleanup, “even if the contamination was done by another federal agency prior to the current federal agency.”

Jim Woolford, former director of the Office of Superfund Remediation at the EPA, disputed this, telling me that the Coast Guard should in fact be contributing to the cleanup. “Nowhere in CERCLA [the Comprehensive Environmental Response, Compensation and Liability Act, a.k.a. Superfund,] does it say that for federal facilities only the current owner/operator is the responsible party,” he writes in an email. But he adds that no progress would be made without pressure from the public, environmental groups or a congressional delegation. “It really has to happen at a very high level,” says Woolford. “And once it gets that attention, things can move pretty quickly.”

The USFWS is still working with other agencies on a plan, according to Jared Underwood, the agency’s superintendent for Papahānaumokuākea Marine National Monument. But the agency has just about $1 million annually to spend on all lands and waters in the monument, and it can only allot about 10 percent of that to Tern. Experts say that cleaning up the contamination on Tern will run between $2 million and $3 million. Fixing the degrading

infrastructure and sea wall will run in the tens of millions of dollars, if not more. For any sort of meaningful action on that anytime soon, Underwood says, USFWS is looking for support from other sources, including possibly appropriations from Congress.

Climate models project that the ocean may rise by two to three feet, or more, around Tern Island by 2100. And hurricanes like Walaka may become more powerful and possibly more common at Lalo as the planet warms. “So the long-term picture for these islands is bleak, though not entirely hopeless,” says Chip Fletcher, a climate scientist at the University of Hawaii at Manoa who visited East in 2018.

I asked Todd Bridges, who until this February served as the U.S. Army’s senior research scientist for environmental science and is now with the University of Georgia, how the island could be protected in the absence of the sea wall. Bridges—who led a U.S. Army Corps of Engineers initiative called Engineering With Nature—tells me that a spectrum of interventions could be used to bolster the island. One solution would be to dredge sand to build the island up. Another might be accomplished in the water, engineering the reef around the island to protect it more from wave action.

Perhaps the geologist with the strongest connections to Lalo is the University of Hawaii’s Haunani Kane. The Native Hawaiian is a navigator who first visited the atoll as a 20-year-old, arriving on a voyaging canoe guided only by the stars and other environmental cues. She returned to Lalo more than a decade later, in the summer of 2018 with Fletcher, to study East Island and its relationship to sea-level rise.

Before dredging sand and modifying reefs, Kane thinks scientists need to understand more about the natural relationship between islands and reefs. “The last thing you want to do is manipulate and engineer the system in a way that takes away its natural resiliency as well,” Kane says. In 2021, she

and her team saw the island come back to about 60 percent of the size it had been before Hurricane Walaka nearly wiped it off the map in 2018, though it's less stable and a shadow of its former self. Reefs grow and then degrade to become sand and chunks of rock that build islands up.

For Native Hawaiians, Lalo is a cultural resource as well as a natural one. "It's a place where we believe our *kupuna*, or our ancestors, go as we transition into the next realm," Kane says. "We view these islands as not just a place, but as a place of our ancestors, and we view the islands as our ancestors themselves."

Pelika Andrade, a Native Hawaiian intertidal, watershed and cultural researcher who sits on the reserve advisory council for the monument, tells me that the atoll was a bucket list run for a generation of fishers, including her grandfather. She sees what has happened to Tern as indicative of the problematic nature of colonialism. "There's a reason why there's so much distress in the system, because historically this is the repeat, right?" she says. "Set up something, but the plan of taking it down? There's no long-term plan. And then there's kind of like an abandonment that happens, and others are tasked to take care of the mess."

Researcher Kevin O'Brien is one of the people trying to take care of that mess. He arrived on Tern in October 2020, after a season when the island had been empty of biologists due to the Covid-19 pandemic. O'Brien had formed a nonprofit called the Papahānaumokuākea Marine Debris Project to collect ocean trash, but he traveled to Tern to address degrading infrastructure scattered across the island by Hurricane Walaka. He brought along a crew that included a welder, a metalworker, some former construction workers, heavy equipment drivers and a handful of biologists. He also brought a skid steer, a utility vehicle, a trailer, jackhammers, generators and several metal-cutting tools. They found numerous dead seabirds stuck in the sea wall and dozens of hatchlings that the sun had

dried into jerky. During that trip and one earlier in the year, workers found seven trapped dead adult turtles.

O’Brien’s team cut eight large holes in the sea wall so seals and turtles could escape. They jackhammered concrete to break up gaps where sea turtles could get stuck, and they built a fence to prevent turtles from crawling to an area of the island where the animals could get trapped. They cut up lumber, cables, fiberglass, roofing, a 20-foot shipping container, three derelict boat trailers and other material that was thrown across the island. After ten days, they carted 82,600 pounds of garbage off Tern, clearing hurricane and marine debris from almost 22 acres of land. Though USFWS and NOAA served as partners, O’Brien’s crew did what government agencies had been unable to organize and complete alone.

The carcasses of two Hawaiian green sea turtles that were trapped behind the sea wall decay on Tern Island in 2020. Kevin O'Brien / Papahānaumokuākea Marine Debris Project

A dead booby hangs in the sea wall at Tern Island in 2020. James Morioka / Papahānaumokuākea Marine Debris Project

Eight workers with the Papahānaumokuākea Marine Debris Project and three workers with the U.S. Fish and Wildlife Service stand amid the 82,600 pounds of debris they removed from Tern Island in 2020.
Dan Link / USFWS

But the nonprofit left with a lot unaddressed. The barracks, warehouse and generator shed—which had leaking batteries and fossil fuels—were falling apart. More than 100 pieces of large black pipe meant to serve as barriers to crawling turtles were scattered about the island. All of those things could injure or kill more wildlife, especially if another storm comes through.

O'Brien knows that his efforts were just stopgap measures. Too many large and evolving hazards exist. In 2021, even after his helpful work, juvenile green sea turtles became trapped nine times, and nesting turtles were trapped at least 50 times. At least seven of those adult females died.

Seabirds and critically endangered Hawaiian monk seals were also trapped by hazards on the island.

In 2022, the rate of entrapments was just as bad.

Considering the toll this work takes on researchers, and the overwhelming forces at work, why does Tern Island matter? After all, the place is just a pinprick on a wall-sized map of the world.

It matters because this tiny speck in the ocean has a far-reaching influence. Many of the animals birthed there bring benefits to habitats far away. Take the sea turtles, who migrate hundreds of miles to the main Hawaiian Islands, where they feed on algae and keep coastal ecosystems in check. All over Waikiki, signs and brochures advertise expeditions to snorkel with the marine giants. Souvenir shops feature sea turtles on cups, flip-flops, magnets and more. The animals, known as *honu* in Hawaiian, also factor prominently into Native culture. To determine how to best protect this important species, authorities take into account what scientists find out about the nesting population size on Lalo. And seabirds on Tern roam even farther, providing important services as far as the waters off California and Alaska, including fertilizing the land and ocean with their guano, thus spurring the growth of plants, coral reefs and phytoplankton at the bottom of our food web.

Of course, I am personally invested in Tern's long-term viability. While there, I interacted daily with resilient but vulnerable animals struggling against human threats that added a degree of difficulty to their survival. And perhaps I see connections between Tern's damaged state and my own once damaged state.

During my darkest time in the psychiatric hospital, I was lost, out of my mind and illogically scared. I was surrounded by others in similar states—and worse ones. Patients babbled incoherently, melted down while imagining unseen threats and gazed off despondently in the lowest conditions of their lives. In the middle of all of this, overburdened health care workers tended to them.

One of those health care workers stood out—a small Jewish woman in her 60s named Karen Wald Cohen. She was energetic and engaging, and often wore outrageously colorful outfits—oranges and pinks and yellows and rainbow-themed get-ups—that burst amid the bland scrubs and socks many patients wore. She went up to depressed patients sitting alone and shared personal stories. She quietly reasoned with and talked down grown men half her age and twice her size during angry outbursts.

In my worn-down state, I thought there was something weird about her, but I liked it. I didn't realize this then, because everyone inside kept telling me to focus on myself, but I now realize that her actions were some of the bravest exploits I'd ever witnessed. In some ways, her efforts to care for severely disturbed people weren't all that different from the efforts of researchers on Tern trying to free thrashing animals. She worked as the last line of defense against much larger societal problems.

Karen took care of all of us, even people whose own families had written them off as lost causes. Aside from my visits with my family, my conversations with her, where she shared sketchy stories from her life and hilarious episodes capped by her boisterous laugh, were the most healing parts of my stay.

One day, Karen strolled down the tiled hallway wearing an almost completely black outfit. I think the bottom of the dress was frilly and layered, like a tutu, and she had on large black leather boots. Little shiny dots were

scattered about her outfit, but in my confused state, the blackness threw me. It was not just that it was a weird get-up for one to wear into a psych ward, but it also didn't fit with her normally colorful outfits and personality.

Months later, when recovering in Minnesota, I got an unexpected letter in the mail from Karen. It was something she didn't have to send; I was no longer in her care. I opened the envelope and pulled out a card, pitch-black on the outside, with scattered shiny dots.

The card reminded me of the nights I'd spent on the islands of Lalo. In the deep blackness of the sky, unmarred by light pollution, stars glimmered from horizon to horizon. Rarely seen celestial phenomena stood out. One night on East, I rounded the northwest corner of the island and saw an arch extending up from the ocean. A moonbow—as big as any rainbow, with white gradations instead of colors—interrupted the darkness.

Humans rarely get to experience nights like the ones I had on Tern and East Islands, but any researcher who has spent time there will tell you that our species is worse off without those experiences of awe. We're connected to all the teeming species that venture out from those distant islands, and their struggles with plastics, ruins and disappearing land are more and more becoming our own.

It can be difficult to work in a remote environment where such threats are so stark, to fight them and think about them on a daily basis, without succumbing to exhaustion or even madness. But scientists keep going back, year after year, because they believe it's worth it. Like me, they hope that telling the world about the devastation happening in the middle of the Pacific Ocean will help people everywhere realize what we can save.

Or, as the message inside of that card from Karen read:

It takes darkness to see the stars.

Joe Spring

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