



THE BAT MAN TAKES A STAND

Mexican biologist Rodrigo Medellín Legorreta is fighting political headwinds to preserve his country's natural heritage—and his own legacy

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JUAN PABLO AMPUDIA/VII

CALAKMUL BIOSPHERE RESERVE ON MEXICO'S YUCATÁN

PENINSULA—The mother bat screeches furiously as Rodrigo Medellín Legorreta grips her, a thumb under her chin to prevent her razor-sharp teeth from sinking into his gloved hand. “These creatures are feisty. They are witty,” he says. “And when they do manage to bite you, you scream, and you curse.” With the creature subdued, he gently pries a furry bulge from her chest. He hands the baby woolly false vampire bat (*Chrotopterus auritus*) to Ángel Torres Alcántara, an undergraduate on his first field trip to El Hormiguero, a Maya temple ruin at the base of the Yucatán Peninsula in southeastern Mexico.

On a broiling day in late June, Torres Alcántara and two other students in Medellín Legorreta's research group at the National Autonomous University of Mexico (UNAM) set to work weighing and measuring the five bats they captured from a roost inside a temple chamber. Torres Alcántara spreads one of the baby bat's wings on a rubber mat as a Ph.D. student, Mónica Izquierdo Suzán, punches out a snippet of skin for DNA analysis. A more experienced Ph.D. student, Javier Torres Cervantes, deftly inserts a tiny radio transponder under the bat's scapula for identification the next time it's captured. The aim is to understand how this carnivorous species—the second largest bat in North America—is coping with habitat fragmentation and climate change. “They're good indicators of the state of the forest,” Medellín Legorreta says.

Medellín Legorreta doesn't just study bats; he fights for them. The 65-year-old conservation biologist may be best known among peers for helping bring the Mexican lesser long-nosed bat (*Leptonycteris yerbabuena*) back from the brink of extinction. Also known as the tequila bat because it often feeds on the nectar of the agave plants used to make that spirit, it became the first mammal delisted in Mexico, thanks to a recovery plan he devised.



Construction of the Maya Train has created a 100-meter-wide gash in the forest of the Yucatán Peninsula (first image), fragmenting habitat and threatening archaeological sites such as Becán, Mexico (second image), critics contend. JUAN PABLO AMPUDIA/VII

But Medellín Legorreta has ranged well beyond bats: spearheading programs to protect wintering grounds for monarch butterflies, for

instance, and to secure habitat corridors for jaguars. “He’s one of the most well-rounded biologists in Mexico,” says Hesiquio Benítez Díaz, a biologist with Mexico’s National Commission for the Knowledge and Use of Biodiversity (CONABIO). In 2019, the National Geographic Society anointed Medellín Legorreta its seventh explorer-at-large, putting him in the company of marine biologist Sylvia Earle, who took the deepest untethered sea walk, and oceanographer Robert Ballard, who found the wreck of the *Titanic*.

Lately, Medellín Legorreta’s activism has put him on a collision course with Mexico’s government and president, Andrés Manuel López Obrador. “In my lifetime, I haven’t seen an administration with less interest and less concern for the environment than this one,” he fumes. In 2020, López Obrador’s administration drained CONABIO’s budget, sapping the agency’s power to guide conservation projects and policies. Then, in March, the government’s plan to save the vaquita, a critically endangered porpoise, was deemed so woeful by the Secretariat for the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) that it levied massive sanctions on Mexico’s wildlife trade. In response to international pressure, Mexico last week announced an expanded protection area for the vaquita.

Medellín Legorreta’s personal *bête noire* is the Maya Train, a \$30 billion rail line and tourism project in the Yucatán Peninsula championed by López Obrador as a bonanza for an impoverished region. Medellín Legorreta and others contend that the project, now under construction, **is fragmenting rainforest habitat and will harm scores of species.**

“It’s tough to be a conservation biologist in Mexico these days,” Medellín Legorreta says. A longtime member of Mexico’s delegation to CITES, he was tossed off it in December 2022 in retribution, he believes, for his unabashed critiques of the Maya Train. He had served on the delegation’s animals committee since 2000, guiding governmental actions to protect mako sharks, iguanas, and Mexican crocodiles. Last year, he says, his

cellphone was targeted with Pegasus, software the Mexican government has used to spy on journalists, human rights activists, and dissidents. “He’s one of the few that has taken a risk by raising his voice,” says conservation biologist Valeria Towns Alonso, a former student of Medellín Legorreta’s who is now with Pronatura Noroeste, a nongovernmental organization. “He’s a man of principles.”

Despite the political headwinds, Medellín Legorreta hasn’t given up on his homeland. “We’ll save as much of our biodiversity as we possibly can,” he says. “We won’t go down without a fight.”

MEDELLÍN LEGORRETA’S PASSION for wild things was kindled at a very young age. “I was an odd little kid,” he says. “My first word wasn’t ‘mama.’ It was ‘flamingo!’” He memorized every scrap of information about animals he could lay hands on. By age 12, he’d become infatuated with the idea of appearing on a popular TV game show called *El Gran Premio*. His mom persuaded a show producer to give Medellín Legorreta a tryout and in 1970, he became the first child to appear on the Saturday evening quiz show, which offered cash prizes. He made it to 32,000 pesos (then about \$2500) before tripping up on a complex question about mammal classification.

One person who happened to tune in that evening was Bernardo Villa Ramírez, the founder of mammalogy in Mexico and a professor at UNAM, Mexico’s most prestigious university. Villa Ramírez tracked down the precocious kid and invited him to hang out with working biologists. One afternoon, another UNAM mammologist handed Medellín Legorreta a Waterhouse’s leaf-nosed bat (*Macrotus waterhousii*). “It shook me inside,” he recalls. “This is exactly the moment when I felt, ‘I’m never looking back. This is what I’m here for.’” As he drifted off to sleep each night, he’d recite in his mind the ABCs of bat genera. “A” for *Artibeus* (a genus of fruit bats). “B” for *Bauerus* (a single-species genus, Van Gelder’s bat), and so forth.

Millions of bats emerge every evening from the “bat volcano,” a cave in the Calakmul Biosphere Reserve in Mexico that had been threatened by the Maya Train until it was rerouted. JUAN PABLO AMPUDIA/VII

Medellín Legorreta turned the room he shared at home with an older brother, Mario, into a menagerie. He kept a kinkajou, a cat-size mammal from the rainforest also known as the honey bear, as well as less cuddly companions—including a rattlesnake curled up near the door. “Mario was not happy about that.” (He endured and went on to be a popular singer of romantic ballads.)

Then there were the 10 common vampire bats (*Desmodus rotundus*) that Medellín Legorreta, then 14, captured south of Mexico City and brought back to the family bathroom. He fed them cows’ blood from a farm run by UNAM’s veterinary school, which he kept in ice cube trays in his family’s freezer. He thawed one cube for each bat every evening. The bats were messy eaters. “It was like a Hitchcock movie!” Medellín Legorreta recalls.

His parents were too distracted to put up a fuss, Medellín Legorreta says. His father had his hands full running an ice cream factory, and his mother was a professional opera singer. The youngest of five, Medellín Legorreta was essentially raised by his sister Enriqueta, who was 9 years older. Enriqueta, later a UNAM-trained surgeon and environmental activist, indulged her like-minded little brother, buying him his first microscope and shuttling him to UNAM.

HESQUIO BENÍTEZ DÍAZ NATIONAL COMMISSION FOR THE KNOWLEDGE AND USE OF BIODIVERSITY

Although his bat obsession distracted Medellín Legorreta from his schoolwork, he eventually buckled down and earned a biology degree from UNAM. One of his earliest papers was on the predatory behavior of woolly false vampire bats, which he kept at home and fed, sustaining them on live mice. “I would fall asleep to the sweet sound of bones being crushed,” he says with a smirk. “This was the level of sickness in my mind.”









DRIVING WEST FROM El Hormiguero toward the Calakmul Biosphere Reserve, the road wends through ceibas, strangler figs, and sapodillas, a

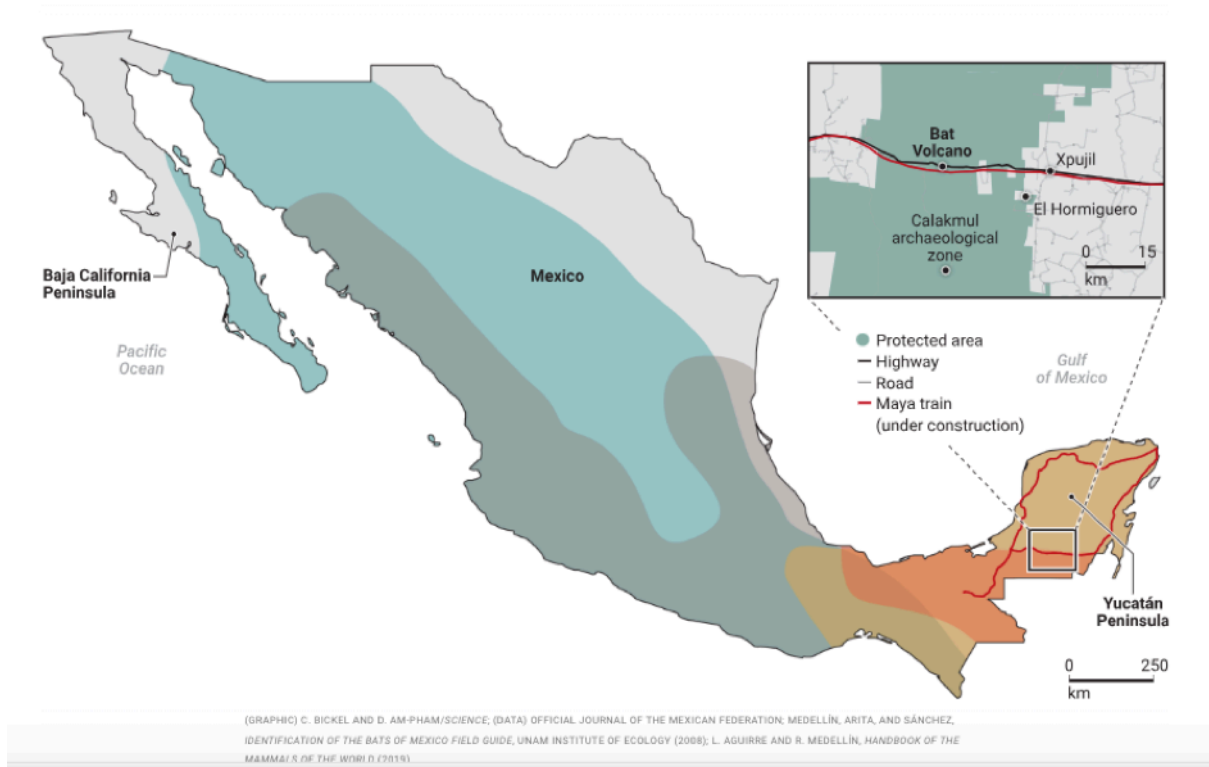
tree prized since Maya times for its chicle gum. Ocelots and jaguars prowl the forest, and spider monkeys and black howlers agitate the canopy. Then the road crosses a gash, 100 meters or so wide, extending to the horizon in both directions: the future route of the Maya Train. “The wound in the forest is very long and very deep,” Medellín Legorreta says. “They’re destroying a vast area of primary rainforest. And for what?”

For economic growth, according to López Obrador. The Maya Train, named after the region’s Indigenous people, aims to transport more than 40,000 passengers daily across 1500 kilometers. All told, the United Nations Human Settlements Programme estimates, the project will create upward of 1 million jobs. But they’ll come at a cost. In 2019, Mexico’s National Council on Science and Technology warned that the train would threaten at least 10 protected natural areas and nearly 1300 archaeological sites.

Bat territory

Bats are the focus of Rodrigo Medellín Legorreta’s research and conservation efforts. He helped bring the lesser long-nosed bat, or tequila bat, back from the brink of extinction. Now, the conservation biologist is puzzling out how North America’s two biggest bats—the woolly false vampire bat and the spectral bat—manage to coexist on the Yucatán Peninsula and how they will cope with climate change and forest fragmentation due to the Maya Train.

Bats drawn to scale	 <i>Leptonycteris yerbabuena</i>	 <i>Desmodus rotundus</i>	 <i>Chrotopterus auritus</i>	 <i>Vampyrum spectrum</i>
Range				
Common name	Lesser long-nosed bat	Common vampire bat	Woolly false vampire bat	Spectral bat
Food sources	Agave nectar and cactus fruits	Mammalian blood	Insects and small vertebrates	Insects and small vertebrates
Mass	15–25 grams	25–40 grams	75–96 grams	134–189 grams



Map of Mexico showing the ranges of four bat species. The lesser long-nosed bat's range covers most of the mainland and some of the Baja California peninsula in the west. The common vampire bat's range is in the south of the mainland. The woolly false vampire bat and the spectral bat have smaller ranges, both contained mostly to the Yucatán Peninsula in the southeast, where the Maya train construction is taking place. An inset map shows where the train construction cuts across a protected area, directly by Bat Volcano and Xpujil, and within ~30km of El Hormiguero and Calakmul archaeological zone.

(GRAPHIC) C. BICKEL AND D. AM-PHAM/SCIENCE; (DATA) OFFICIAL JOURNAL OF THE MEXICAN FEDERATION; MEDELLÍN, ARITA, AND SÁNCHEZ, IDENTIFICATION OF THE BATS OF MEXICO FIELD GUIDE, UNAM INSTITUTE OF ECOLOGY (2008); L. AGUIRRE AND R. MEDELLÍN, HANDBOOK OF THE MAMMALS OF THE WORLD (2019)

Medellín Legorreta has won a few concessions from Maya Train planners. For instance, the original route through the Calakmul reserve crossed one end of a vast cavern, dubbed “the bat volcano,” that’s home to about 3 million bats of eight species. Every evening at dusk, most of the resident bats emerge from the cavern’s mouth in a tornadolike swirl and fan out in search of prey. Alarmed that the rail line’s construction could partially collapse the cave, “I started bitching and fighting,” Medellín Legorreta says. Project managers planned to shift the route north—but that would have taken it through prime jaguar habitat, Medellín Legorreta says. He complained again, and now the train will pass 2 kilometers south of the cave.

Another casualty of López Obrador's disregard for environmental protections is CONABIO. The agency, founded in 1992, maintains rich databases on species abundance and distribution. It once wielded outsized influence on biodiversity policy. But last year, after cutting its budget, López Obrador's administration stripped the impoverished agency of its autonomy and took control of it. "For this administration, ecology is a nuisance, nature is a nuisance, the knowledge and protection of biological diversity is a nuisance," laments ecologist José Sarukhán Kermez, who resigned as CONABIO's head last year. CONABIO "was such a positive shining light," Medellín Legorreta says. "Now, it's hopelessly degraded."

López Obrador has dismissed Medellín Legorreta and other critics as "pseudoenvironmentalists." That jab resonates with some academics who are uncomfortable with Medellín Legorreta's celebrity status; environmental luminary David Attenborough dubbed him "the bat man of Mexico" in a 2014 documentary. Colleagues either love him or hate him, Benítez Díaz says. "He's controversial, he's explosive, he's very passionate," he says. "He's like a rock star, so he generates envy in the scientific community," adds UNAM biologist Luis Zambrano González.

Zambrano González, too, has been an outspoken critic of the Maya Train, and he contends that even though he and Medellín Legorreta have failed to stop the project, "we are winning by losing." Many Mexicans, he says, now have a better understanding of the Yucatán's biodiversity and why it should be preserved.



A student feeds diluted mango juice to a bat captured in a mist net near the El Hormiguero archaeological site in Mexico. JUAN PABLO AMPUDIA/VII

Despite this reputation, Medellín Legorreta prefers collaboration over confrontation. One big success has been working with tequila and mezcal distillers to conserve the tequila bat, which had landed on Mexico's endangered species list after surveys in the 1980s found only a handful left in areas that once were home to thousands.

The tequila bat feeds on the flowers of the agave—a kind of succulent—and pollinates them. Wild agaves stockpile sugars for decades before depleting their energy reserves in a single flowering event before they die. Tequila and mezcal distillers harvest the plants before they flower, converting the ample sugars into alcohol—thus depriving tequila bats of the nectar they rely on. Many distillers “have completely forgotten their partners, the bats,” Medellín Legorreta says. By cultivating the shoots of mature plants instead of allowing them to flower and propagate on their own, they are risking their own livelihoods: The shoots are genetic copies of the parent plant, so over time the agave's genetic diversity has shriveled. A 2001 study found that tens of millions of agave plants in central Mexico were clones of

just a handful of individuals. Agave clones are more vulnerable to disease; in a 2011 die-off, about 40% of distillers' agave fields were blighted.

In 2014, Medellín Legorreta persuaded seven producers in Michoacán state to allow 5% of their agave fields to flower, enabling tequila bats—which fly up to 100 kilometers in a single night—to pollinate the plants and boost their genetic diversity in the process. About 300,000 bottles a year of tequila and mezcal now bear a “bat-friendly” label.

Medellín Legorreta also relies on homegrown allies: a legion of former students, some of whom now work in government. In a rare promising development on Mexico's environmental frontlines, the National Commission of Natural Protected Areas is drafting plans to create 200 protected areas across the country. The head of its priority species division, José Eduardo Ponce Guevara, is a former student, and mentor and mentee are working together to ensure that the sites have robust management plans.

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But Medellín Legorreta can't contain a few criticisms, saying some of the proposed protected areas "are absurd." One would encompass the entire upper Gulf of California, too big to be adequately protected, he says. At the other extreme is a proposed 5000-hectare national park for jaguars in the northern Yucatán. "That's like one-tenth the range of a single male jaguar."

As Medellín Legorreta battles to safeguard Mexico's biodiversity from domestic threats, he is forging new alliances abroad. In January 2020, he founded a research and conservation network called Global South Bats, and in the coming weeks he will launch Global South Cats. The initiative will bring together conservation biologists from several countries, who have struggled to work together in the past. "A big problem we have in

carnivore conservation is that everyone is very territorial, and everyone has huge egos,” says Shivani Bhalla, executive director of Ewaso Lions, a nonprofit in Africa. “With Global South Cats, you’re basically putting away your egos and really committing to a united effort.”

The project aims to reduce conflicts between big cats and people by preventing the felines from preying on livestock and pets. Medellín Legorreta says it was inspired by an innovative rescue of Australia’s northern quoll. This kitten-size marsupial had developed a taste for cane toads, imported from Central America decades ago to control beetles that were decimating sugarcane. But the toads produce a toxin that was killing quolls. About 15 years ago, Australian scientists designed a kind of aversion therapy. They injected cane toads too small to kill a quoll with thiabendazole, an antiparasitic agent that induces nausea, and fed them to captive juvenile quolls. The nausea left an impression: When released into the wild, the quolls were more likely to avoid bigger, lethal toads. “Think of it like eating a bad shrimp. Just the idea of eating another shrimp is really repulsive,” Medellín Legorreta says.

To see whether jaguars could be similarly duped, he and wildlife veterinarian Ivonne Cassaigne, a former student of his now with the nonprofit Primero Conservation, started a few years ago with a jaguar near Cancún, Mexico. It was attacking dogs at a local dump. Cassaigne “waited until the jaguar killed a particularly large dog that it didn’t finish eating,” Medellín Legorreta says. She then spiked the carcass with thiabendazole. The next night, the jaguar finished the dog—and as far as they could tell, never harmed another one. They have since trained five other jaguars to avoid cattle, goats, and sheep.

The strategy “has huge promise for big cats,” says Natalie Schmitt, a conservation geneticist at McMaster University who studies snow leopards in Central Asia. She has joined forces with Medellín Legorreta and Global South Cats, which will soon trial taste aversion in jaguars across Latin America, leopards in Africa, and tigers in Central Asia.



To study the diet of woolly false vampire bats, Ph.D. student Javier Torres Cervantes collects remains of their prey (first image)—feathers and wings, bones and fur—from a roost inside temple ruins at El Hormiguero (second image) in Mexico. JUAN PABLO AMPUDIAVII

UNDER A STARRY SKY in the Calakmul reserve, as unseen frogs chirp and insects trill, Medellín Legorreta patiently works to untangle a bat caught in a mist net. Lit by a headlamp, the hamster-size bat has a tuft of bristly hair under its nose and tiny eyes tucked close to its ears. Although this Wagner's mustached bat (*Pteronotus mesoamericanus*) isn't putting up a fight, Medellín Legorreta winces. "Arthritis in my right hand," he says. "My wife tells me, 'You've taken too many bats out of nets.'" At least 10,000, he estimates.

Tonight, Medellín Legorreta's quarry is North America's largest bat: the spectral bat (*Vampyrum spectrum*), which has a wingspan of up to 1 meter. "*Vampyrum* are really rare. We hardly know anything about them," he says. Unlike many bat species, *Vampyrum* bats form monogamous pairs and live with their offspring in trees. In 2014, he embarked on a long-term study to learn more about their presumed range in the southern Yucatán. He offered a \$1000 reward to anyone who could point him to a roost. "Four months later, I had five roosts and a big hole in my pocket."

Ever since, Medellín Legorreta and his team have been tagging and tracking *Vampyrum* bats and woolly false vampire bats, which roam the same woodlands in this corner of the Yucatán. "I want to know exactly what allows these two species to coexist," he says. It may come down to differing hunting styles. *Vampyrum* bats prey mostly on birds they find by smell, whereas the woollies swoop down on rodents they hear rustling on the forest floor. But Medellín Legorreta worries the two heavyweights may come to blows as forest fragmentation worsens and climate change brings further warming and prolonged droughts. "What would happen if there's a shortage of roosting sites?"



Ancient Maya temples, like this one at a site called El Hormiguero in Mexico, are perfect roosts for bats, providing shelter, warmth, and darkness. JUAN PABLO AMPUDIA/VII

As Medellín Legorreta and his students wait, in vain, for a *Vampyrum* to snag in a mist net tonight, he peppers his students with pop quizzes and questions about their research plan. “I’m an intellectual vampire,” he says. “I thrive on discussing ideas with these kids.” The banter is laced with humor, but his tone sharpens when a student blanks on a species name, or is too clumsy freeing a bat from a mist net. “If you come to him with a research problem, you have to bring at least one possible solution. He’s not going to solve your problems for you,” Izquierdo Suzán says.

Medellín Legorreta is counting on these disciples to take up his mantle. “It’s late in my life and late in my career. I need to be very strategic about what I want to accomplish and what I want to leave behind as a legacy.” Undoing the damage wrought by López Obrador’s administration, Medellín Legorreta says, could begin as early as December 2024, when the next president is inaugurated. (Mexico’s presidents are limited to a single 6-year term.) Revitalizing CONABIO will then become a top priority, he says.

But that looming struggle seems far from Medellín Legorreta's mind at this moment in the enchanting rainforest of Calakmul. "My entire life is a dream," he says, eyes closed. "I have to tell you, I'm one of the happiest people I know." His eyes snap open. "Inside, I'm still that 12-year-old boy holding a bat for the first time," he says. "There are so many things I want to learn."