BAT CONSERVATION INTERNATIONAL

bats

ISSUE 3 • 2024
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BAT WEEK
October 24–31

A TALE OF Three Caves

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Community-driven conservation in Kenya strives to protect an Endangered species

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Photo: Karel de la Cruz Victoria

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ON THE COVER: Kaboga Cave was purchased by Bat Conservation International (BCI) in 2024, and is now managed by BCI's Kenyan partners, Angaza Vijiji. The cave is a refuge for bats, including Hildegarde's tomb bat *(Taphozous hildegardeae)*.

Image: Karel de la Cruz Victoria

off the bat

A few words of introduction from your friends at Bat Conservation International

Building a Better Future for Bats

Reflecting on an exciting new partnership and BCI's latest efforts to deliver global conservation

by Mike Daulton

This October, we are launching an exciting new partnership with Discovery Education and the LEGO Group's *Build the Change* program, which inspires kids to find creative solutions to the world's most pressing problems. This year, the program will feature a world-class virtual experience filmed and designed by Discovery Education and the Build the Change team, that highlights Bat Conservation International (BCI)'s work.

With our combined reach, students across the U.S. will be engaged to help us build a better world. The program will highlight BCI's work to protect Bracken Cave Preserve, fight white-nose syndrome, and save Endangered species like the Florida bonneted bat (*Eumops floridanus*). Students are encouraged to provide ideas for solving conservation challenges while building a future where threatened species are safe, and nature is protected.

While the world's students give their creative solutions, BCI will work to protect the world's most Endangered bats. One of our stories in this issue highlights the vital work of BCI and our partners in Kenya to protect the Endangered Hildegarde's tomb bat (*Taphozous hildegardeae*). The species is one of the world's most Endangered and has only been recorded in Kenya and Tanzania.

While most of its cave roosts in Kenya have been lost, we know of three caves supporting 70% of the species' global population, emphasizing the need to save this bat from extinction. Kaboga Cave was just purchased by BCI, ensuring its permanent protection.

We are also working with the Fikirini community in Kenya to protect another Hildegarde's tomb bat population threatened by deforestation. We are finding solutions that protect some of the world's most Endangered bats.

As we are inspired by future bat conservationists and collaborate with partners around the world to protect bats and their habitats, we take a moment to appreciate bats and, of course, celebrate Halloween. This year, for Halloween and Bat Week, we encourage you to follow the lead of the world's youth and do all you can to support the global effort to protect bats, conserve nature, and build a better world.

The future needs all of us.

Mike Daulton
BCI Executive Director

BAT CONSERVATION INTERNATIONAL

Bat Conservation International (BCI) is a 501(c)(3) organization dedicated to protecting bats and their essential habitats around the world. A copy of our current financial statement and registration filed by the organization may be obtained by contacting our office in Austin, Texas, below, or by visiting **batcon.org**.

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Visit BCI's website at **batcon.org** and the following social media sites:
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BCI traveled to Fiji to gather with partners and finalize the Nakanacagi Bat Sanctuary Management Plan, as well as meet with the Permanent Secretary for the Environment in Fiji.

CAVES

Fiji Formalizes First Protected Area for Bats

Nakanacagi Bat Sanctuary Management Plan finalizes protection of vital roost

In late July, Bat Conservation International (BCI) and partners gathered in Fiji to officially launch the Nakanacagi Bat Sanctuary Management Plan. Nakanacagi Cave is the last known maternity roost for the Endangered Fijian free-tailed bat (*Mops bregullae*), which has faced threats like human disturbance, habitat destruction and degradation, hunting, and cyclones.

A series of events finalized the protection of this vital Fijian roost and the land surrounding it, making it the first protected area for bats in Fiji. Key partners include the National Trust of Fiji, Nature Fiji, Rainforest Trust, and the Nakanacagi community. The Fijian free-tailed bat is known to live in just two South Pacific islands in Fiji and Vanuatu. In late 2024, BCI will travel to Vanuatu to search for more roosts.

Photos: Horizonline Pictures

STATE OF INDIA'S BATS

Representatives from 22 institutions met in Bangalore to assess conservation and research priorities for India's bats.

Photo: Arjun Menon and Tikily Tayeng

State of India's Bats Report

Conservation groups gather in Bangalore to assess conservation and research priorities

In June, Bat Conservation International (BCI) and partners met in Bangalore to hold the State of India's Bats workshop. Led by BCI India Program Manager Rohit Chakravarty, Ph.D., and Regional Director for Africa and South Asia Isabella Mandl, Ph.D., the workshop brought together 33 participants representing 22 different institutions. The conservationists worked together to draft the first conservation plan for India's bats in 22 years, which organizers envision will become the guiding light for Indian bat research and conservation for the next five years.

EDUCATION

Inspiring Creativity

Virtual Field Trip shares the wonders of bats and encourages innovation

Bat Conservation International (BCI) is partnering with the LEGO Group and Discovery Education to "Build the Change" for bats this fall. Launching during Bat Week, this exciting Virtual Field Trip will allow students to learn about and immerse themselves into the lives of bats. Students will travel virtually to important bat locations around the U.S., including Bracken Cave in Texas and the Florida bonneted bat's urban habitat in Miami, while learning from subject matter experts like BCI staff members and partners. As part of the Virtual Field Trip, students can develop and share creative solutions to help solve bats' challenges.

The Virtual Field Trip launches Oct. 29 at 1 p.m. ET. Learn more at **buildthechange.discoveryeducation.com**.

Celebrate Bat Week

October 24-31, 2024

BAT WEEK

Find a Bat Week event near you at **batweek.org**

Bats can range in size from tiny bumblebee bats to flying foxes with six-foot wingspans. They are the only mammals that truly fly (though some glide), so it's fitting we have an entire week to celebrate these amazing animals during Bat Week, October 24-31.

Bat Week celebrates these vital members of the ecosystem that eat insects, disperse seeds, and pollinate many crops and other plants. It also raises awareness of the numerous threats they face, including habitat loss, human development, and climate change.

Explore fun and educational Bat Week activities at **batweek.org/educate**

To get involved, explore the directory of events on the Bat Week website, and be sure to check out the educational resources, including the Bat Brigade Comic Book, Junior Cave Scientists Activity Booklet, Bat Week Cookbook, printable posters, bat origami, videos, and more.

Photo: PITOON KITRATANASAK/Shutterstock.com

Painted woolly bat (*Kerivoula picta*)

PROTECTING BATS

Petitioning for Protection of Painted Woolly Bats

Listing would make the sale of species illegal in the U.S.

Painted woolly bats (*Kerivoula picta*) are a striking orange-and-black species found in many locations throughout Asia. Because they are so beautiful, they are often taken from the wild to be used in the ornamental bat trade as taxidermy for home décor.

With declining populations around the globe, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species lists the species as Near Threatened. Two United States conservation groups, Center for Biological Diversity and Monitor Conservation Research Society, recently filed a legal petition with the U.S. Fish and Wildlife Service to protect the species under the Endangered Species Act. If the species is listed, it would become illegal to sell the species in the U.S.

Bat Conservation International supports these efforts and encourages our members to avoid purchasing taxidermied bats. While many sellers are told the animals are ethically sourced, there is no way to verify this, and they are frequently the result of unsustainable harvesting.

BCI MEMBER

Member Spotlight

Inspired by the nighttime acrobatics of bats

Growing up in Anderson Mill, Texas, Michael Williams spent summer nights playing games under the streetlights. One memorable evening, during a spirited ball game, Williams noticed bats swooping at objects he and a friend threw into the air. Fascinated by their interactions with these wild creatures, they spent hours experimenting and theorizing about bat behavior.

Years later, while visiting Austin, Williams encountered bats emerging from under Congress Avenue Bridge. The sheer number of bats and their coordinated flight left a lasting impression, reinforcing his fascination with bats.

Now living near San Antonio, Williams's passion for bats deepened during a family visit to Bracken Cave. Watching thousands of bats emerge while answering his children's curious questions, he saw the magic of these underappreciated pollinators through their eyes. This lifelong appreciation led him and his wife, Amy, to support Bat Conservation International, ensuring these incredible creatures are protected for future generations.

Michael and Amy Williams

Photo: Ella Williams

SPECIES study

There are 1,400+ species of bats in the world. This is one of them.

Fijian Free-tailed Bat

Single maternity roost pivotal to species survival

By Lindsay Lee Wallace

Photo: Horizonline Pictures

Nakanacagi Cave is the only confirmed maternity colony of Fijian free-tailed bats.

bat stats

Binomial
Mops bregullae

Family
Molossidae

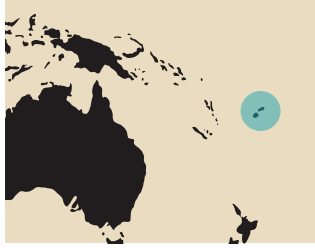
Colony Size
An estimated total of 2,000 to 7,000 bats remaining

Weight
16 to 22 grams

Diet
Insectivore

Status
Endangered

Region
Fiji and Vanuatu



In 2016, Bat Conservation International (BCI) and the Rainforest Trust began a project alongside the National Trust of Fiji, NatureFiji-MareqetiViti, and the Nakanacagi community of Vanua Levu, Fiji, to protect the habitat of the Fijian free-tailed bat (*Mops bregullae*). Also known as the Fijian mastiff, this insectivorous bat is threatened by habitat loss due to industry and climate change, tourism practices, and hunting. After years of careful coordination and collaboration between Fijian experts and community members and the BCI team, Jon Flanders, Ph.D., Director of Endangered Species Intervention, describes the Fiji project as "a phenomenal success story."

It was especially important that the project succeed, because Nakanacagi Cave is the only confirmed Fijian free-tailed bat maternity colony. The team hopes to discover another maternity roost in the only other country where this species has been recorded. To do that—or perhaps discover a new species of bat—BCI is undertaking a project this autumn nearly 750 miles away in the neighboring country of Vanuatu.

Photo: Bat Conservation International

Uncovering a new species?

The Fijian free-tailed bat is already considered Endangered but has been kept off the Critically Endangered list thanks to the belief that the species was also present in Vanuatu. However, scientists think the sustained separation between these two populations may have led Vanuatu to diverge into its own distinct species.

"Over time, the populations are isolated, and there isn't much gene flow so that they can become different species," says Melquisedec Gamba-Rios, Ph.D., Regional Director, Latin America and Caribbean.

If the Vanuatu bats are indeed a unique species, that fact will indicate that the range and population of the Fijian free-tailed bat are far more limited than was previously understood. Flanders says this distinction could have "huge implications for their conservation status."

To answer what Flanders calls the "million-dollar question," the team in Vanuatu will use acoustic lures, which produce a squeaking and clicking designed to pique the bats' interest and draw them out by sounding almost—but not quite—like a regular bat social call. Because the Fijian free-tailed bat tends to fly higher up in the air, luring them down to ground level gives the team the best chance of catching them.

Then, the research team will conduct a morphological comparison—basically a "spot the difference"—between the bats in Fiji and those in Vanuatu. The team will also gather DNA via wing biopsies for comparison and record the bats' sounds to evaluate acoustic differences. Finally, the team will begin pinpointing where the bats might be roosting.

"If we're getting bat calls two hours after emergence, then we know there's no roost near there," Flanders says. "If we're starting to get calls 20 minutes before emergence, we know we're close to a roost."

Research could also help reveal more about the bats' diet, which could go a long way in conversations with surrounding communities about the benefits of protecting the Fijian free-tailed bat. For farmers in particular, a bat population that helps cut down crop-hungry bugs can be a blessing.

Community collaboration

As with any conservation effort, the Vanuatu project involves extensive collaboration between international team members and the communities surrounding the bats' habitat.

"No conservation effort, no matter how good the science is, would work without the people," Siteri Tikoca said during a webinar. Tikoca is a BCI Student Scholar and a Ph.D. candidate at the University of Adelaide, where her research is focused on the Fijian free-tailed bat. She was a key player in the Fiji project and will travel to Vanuatu with the rest of the team.

"We're happy and proud to say that we've been working with the local people and the farmers from the very beginning, and we continue to work with them," Tikoca says.

Gamba-Rios emphasizes that working with local communities is the best way to gather accurate information and ensure the longevity of conservation projects. Simply put, he says, "It's their area, their land, their cave, and their bats."

BCI and partners will travel to Vanuatu this fall, hoping to discover another maternity roost of the Fijian free-tailed bat—or perhaps a new species entirely.

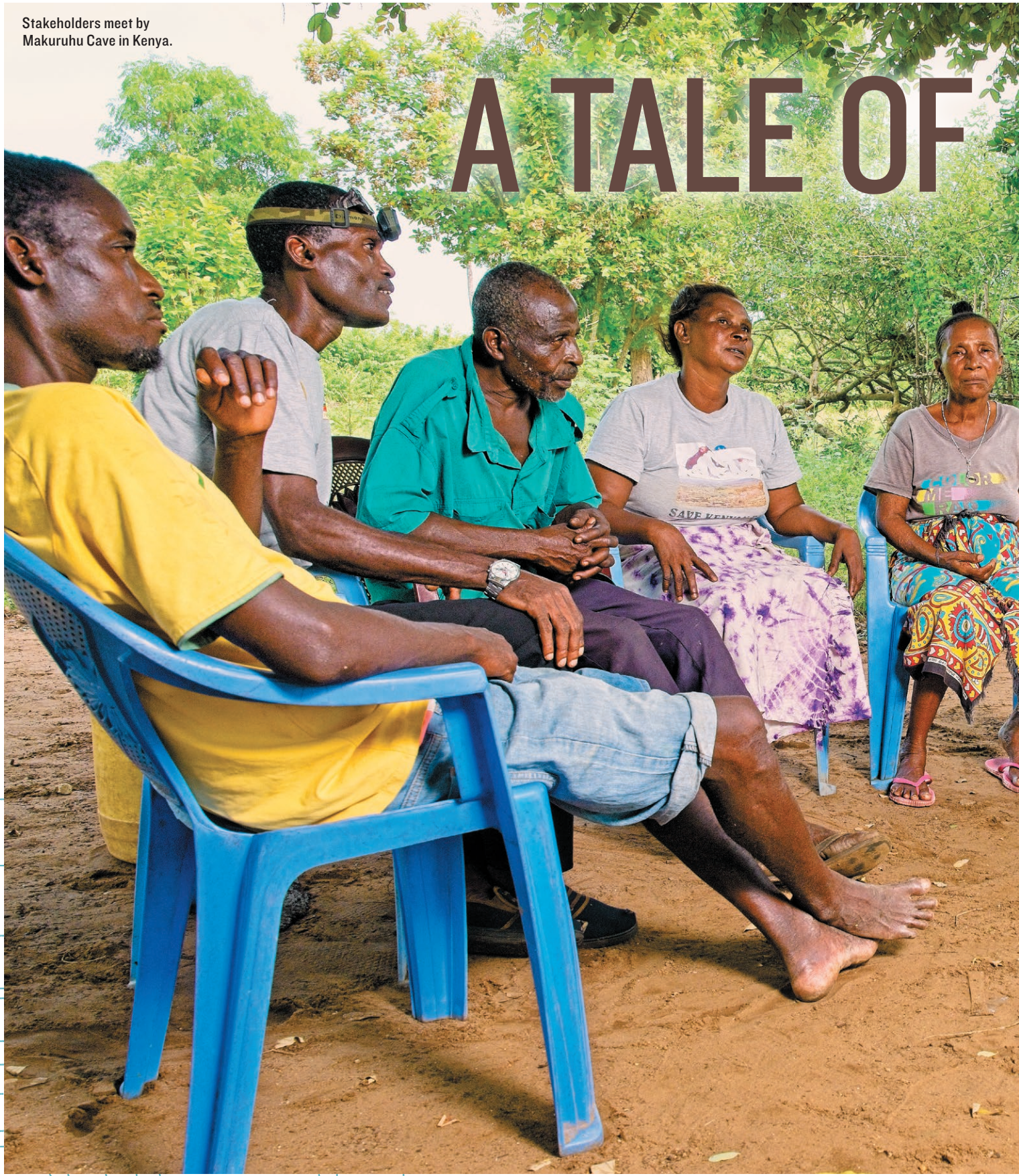
While conservation efforts are important, Gamba-Rios points out that the opportunity to prioritize conservation is a luxury available to those who already have their basic needs met. Many of the communities he has worked with are seeking financial stability and prosperity, especially those significantly impacted by climate change, as Vanuatu has been.

"Working with communities to understand their needs and reality is critical," Gamba-Rios says. "Then we can identify the conservation approach we can do hand-in-hand with them."

Protecting bats in Vanuatu—whether they're Fijian free-tailed bats or a new species—will require understanding them within the larger context of the community. The team hopes to learn more about this incredibly elusive bat through this strategy.

"One of the fun things is just how little we know about it," Flanders says.

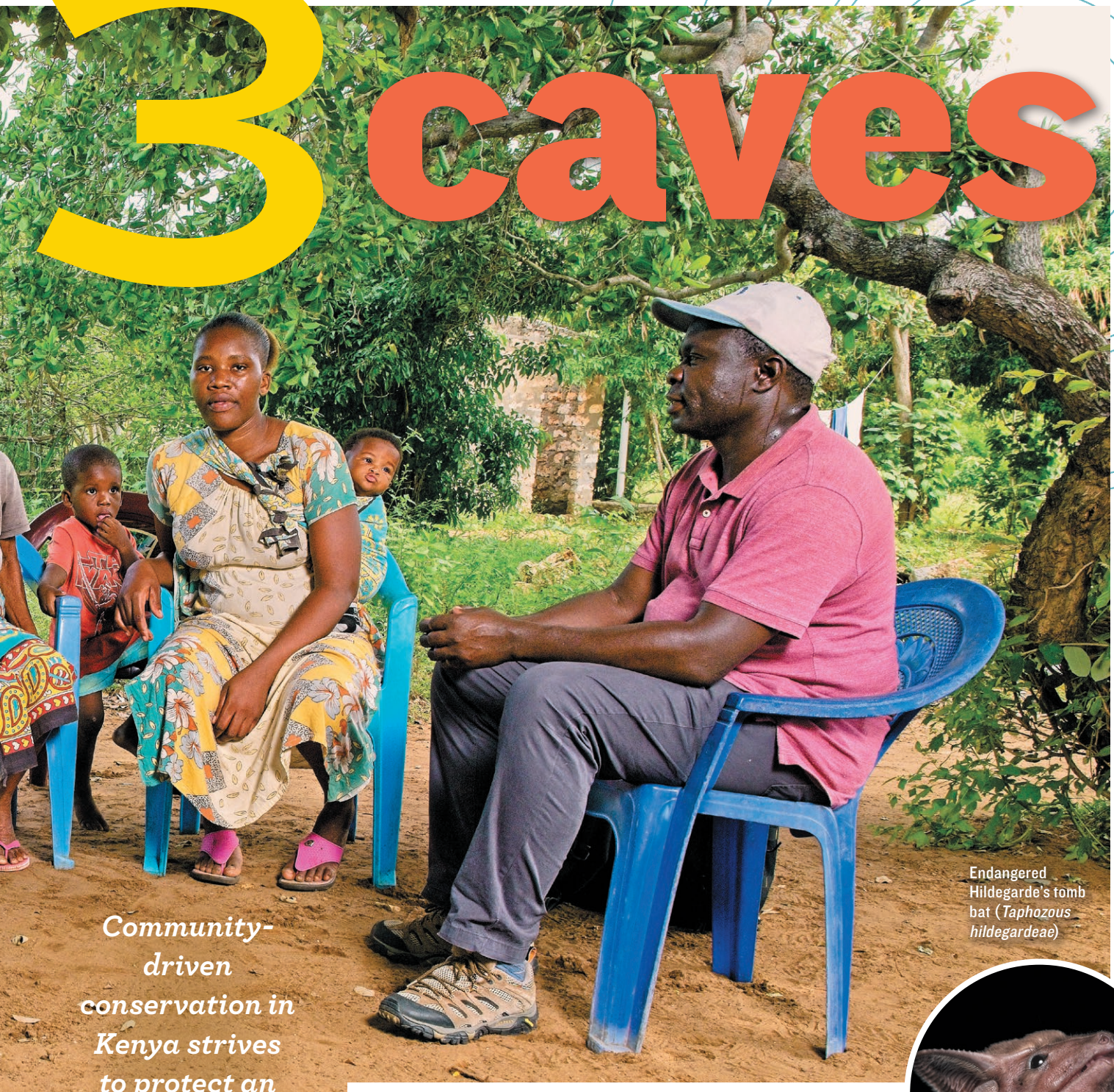
A TALE OF



Stakeholders meet by Makuruhu Cave in Kenya.

Photo: Karel de la Cruz Victoria

3 caves



Community-driven conservation in Kenya strives to protect an Endangered species

By Stefanie Waldek

Forget the Big Five animals safari-goers seek out, like lions and elephants. It's all about bats in coastal Kenya—or at least it should be. All along Kenya's Indian Ocean shoreline are coral caves that bats love to use as roosting sites. Their numbers are so high they comprise up to 27% of Kenya's mammals. But as it goes with many ecosystems around the world, habitat loss threatens the resident species, including the Endangered Hildegarde's tomb bat (*Taphozous hildegardeae*).

Endangered Hildegarde's tomb bat (*Taphozous hildegardeae*)

Photo: Karel de la Cruz Victoria

Since 2022, Bat Conservation International (BCI) has been working with local bat experts, including conservation biologist David Wechuli, Ph.D., BCI's Kenya Program Manager, and Paul Webala, Ph.D., senior lecturer in wildlife biology at Maasai Mara University in Narok, Kenya, to protect three cave sites in coastal Kenya: The Tswaka Giant Three Sisters cave system in the south, and the Kaboga and Makuruhu caves in the north.

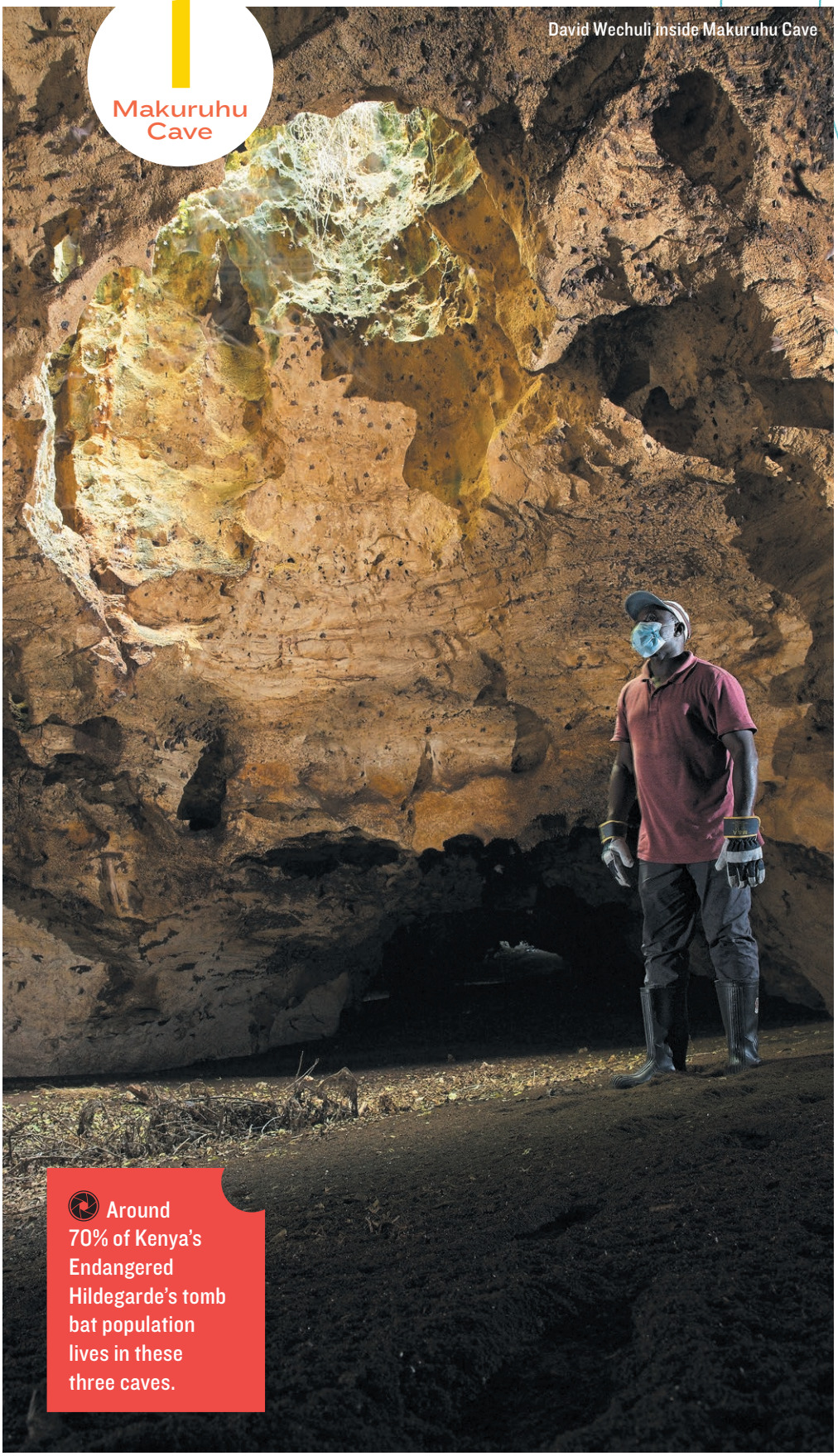
"The three caves that we're working on have about 70% of the Kenyan Hildegarde's tomb bat population in them," says Isabella Mandl, Ph.D., Regional Director, Africa and South Asia. While Hildegarde's tomb bat can also be found in coastal Tanzania—the species is endemic to the region—very little is known about that population. That's why protecting the colonies we know about in Kenya is crucial.

While all three cave sites face habitat loss, there are two different reasons. At Makuruhu and Three Sisters, deforestation is a major problem. At Kaboga, urban development is encroaching upon the cave. "So, we have to find solutions for the same setup but in completely different contexts, which makes this project very interesting," Mandl says.

Habitat loss from deforestation and development

Webala started working with the bat colonies in Kenya's coastal caves in 2012. "At the beginning, there were a lot of forests around those caves, and human activity was very minimal," he says. "Today, the forests are gone. They've been cleared." As insectivorous bats, the Hildegarde's tomb bats forage in forests and woodlands—without trees and shrubs, they're losing their feeding grounds.

At Makuruhu and Three Sisters, this deforestation is largely due to the local communities, who are



David Wechuli inside Makuruhu Cave

Around 70% of Kenya's Endangered Hildegarde's tomb bat population lives in these three caves.

Photo: Karel de la Cruz Victoria

Photo: Karel de la Cruz Victoria

Hildegarde's tomb bat (*Taphozous hildegardeae*) in flight.

not acting maliciously, but seeking a way to survive off the land. "At Three Sisters, for instance, the community has been clearing the forests to grow subsistence crops like corn. And they have a lot of deforestation because they require firewood and timber for building and furniture," Mandl says. A secondary issue derived from agricultural deforestation is guano harvesting. Since guano is an effective fertilizer, the communities have been entering the caves—thus disturbing the bats—to collect it for their crops.

At Kaboga, however, the habitat loss is due to development. "The entire coastline is incredibly touristic with people coming for the beach. There's a lot of tourism development happening, especially in the north, close to the city of Watamu," Mandl says.

Unfortunately, that's where you'll find Kaboga. While the cave was once on private land, the property has been subdivided and sold to private developers, many of whom are building hotels.

Because the development happened so rapidly, BCI needed to move quickly to protect Kaboga; the organization purchased the parcel of land surrounding the cave. For

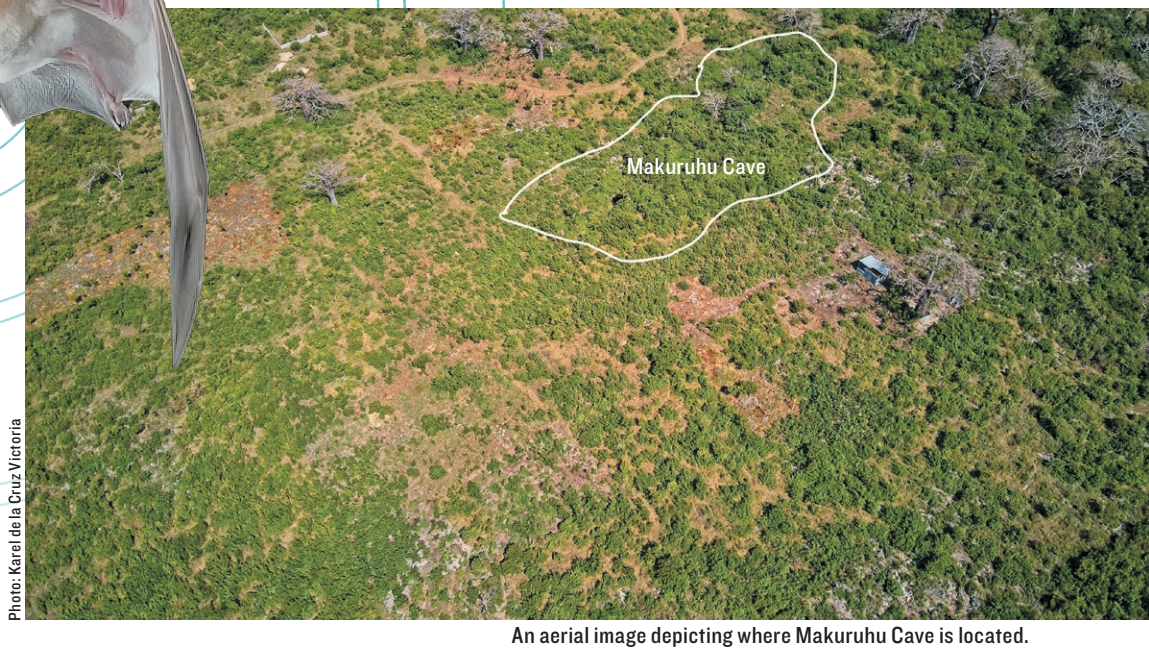


Photo: Karel de la Cruz Victoria

An aerial image depicting where Makuruhu Cave is located.

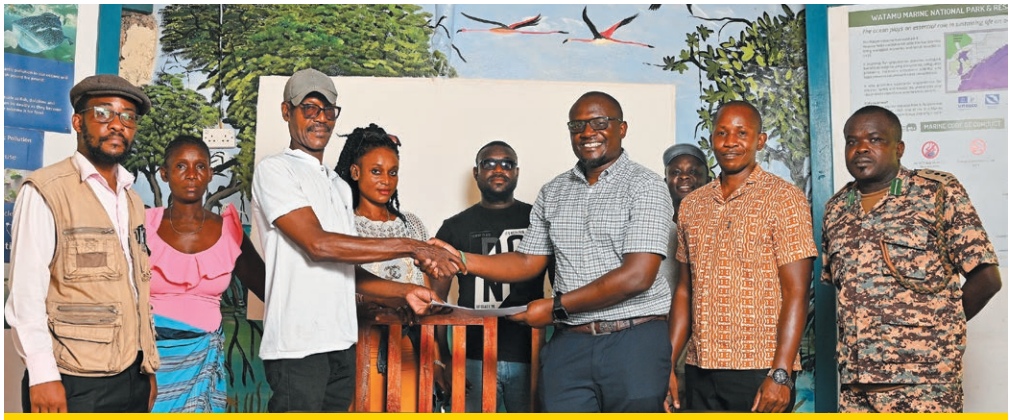


Photo: Karel de la Cruz Victoria

The purchase of Kaboga Cave was finalized in 2024.

"If Bat Conservation International didn't buy the land, the likely scenario would have been that the cave was destroyed. That would have been an extreme disaster."
—Paul Webala

All about Angaza Vijiji

Nonprofit works on Kenyan cave conservation

Founded by Evarastus Obura, who now serves as the organization's CEO, Angaza Vijiji is a Kenyan social enterprise that develops and promotes sustainable practices among underserved rural communities. The nonprofit's projects include promoting nature-based enterprise, food and nutrition security, advocating for sustainable tourism, and mentoring future conservation leaders, as well as encouraging young people to learn about sustainable development.

The organization initially focused on promoting biodiversity conservation education among schools and communities in western Kenya, but Obura's encounter with Paul Webala, Ph.D., at a conference sparked a years-long collaboration focusing on bat conservation. Now, Angaza Vijiji is working with BCI to manage and protect the Kaboga Cave near Watamu.

"We work with communities to promote participatory learning and action for sustainable conservation of threatened bats through education and empowerment," Obura says. "We build local capacity to enhance action for long-term conservation of bats and other biodiversity at the local level. This helps to establish pathways for sustainable conservation of bats through livelihood and conservation approaches. It's more than just introducing them to Endangered species. We look at it holistically. How do we break down the science? It's also critical for us to seriously consider the opportunity for enterprise. These bats can create opportunities for livelihoods."

While the cave was once on private land, the property has been subdivided and sold to private developers, many of whom are building hotels.

this project, BCI partnered with Kenyan nonprofit Angaza Vijiji. This social enterprise works to develop sustainable practices in rural communities, which will co-manage the land with the community.

"If BCI didn't buy the land, the likely scenario would have been that the cave was destroyed. That would have been an extreme disaster," Webala says. But while the cave might be protected, the surrounding foraging grounds are quickly disappearing, so the bats are still at risk.

Involving the community

"There's a lot of mystery and folklore about the bats, but if the community understood the significance of those caves and the roles bats play in the ecosystem, maybe they wouldn't be destroying the vegetation where the bats could flourish," Webala says.

At Makuruhu, the local community has been open to bat education. "We've been working very closely with the landowner and the local community members," Wechuli says. "We educate the community about the bats' roles in the ecosystem, from pollination to elimination of disease-carrying insects." And these discussions have been working—the community has signed an agreement to join BCI's conservation initiatives, which simultaneously offers them protection from rampant land-grabbing. "If you don't have official papers in Kenya, someone else can just come and claim your land," Mandl says. "We're currently helping to get the original landowners' official paperwork done so that they can actually prove it's their land."

The local community at Three Sisters has also been highly receptive to conservation efforts. But BCI's involvement here isn't just

The BCI team exploring Kaboga Cave in coastal Kenya.

Photo: Karel de la Cruz Victoria

Because the development happened so rapidly, BCI needed to move quickly to protect Kaboga; the organization purchased the parcel of land surrounding the cave.

The BCI team meets with local partners in coastal Kenya.

Photo: Karel de la Cruz Victoria

Photo: David Wechuli, Ph.D.

"Local communities are the primary stakeholders in our bat conservation project and crucial to our success. The local community's involvement will build a sense of ownership and responsibility, improve the project's effectiveness, and promote sustainability."
—*David Wechuli*

limited to the bats. "We are also looking at the other side of the coin: the livelihood of the community members. How do they survive?" Wechuli says.

If conservation efforts mean reducing agricultural deforestation, there must be alternatives to support the community. "We're helping the community sector have green enterprises that also benefit the landscape and the bats," Mandl says. "For example, tree nurseries, where they can grow their tree saplings but also sell the excess." Wildlife tourism to see bats is another option to develop the local economy. "But we want to make sure that the tourism is sustainable, that it doesn't disturb the bats," Mandl says. "We still need to work with the community to get this idea to a level where they can benefit from it from the tourist side, but we know the bats are safe."


African trident bat (*Triaenops afer*)

Photo: Karel de la Cruz Victoria

Community efforts, however, look a touch different at Kaboga. With the local community, the issues remain largely the same. "The major challenge is awareness about the bats," says Evarastus Obura, Founder and CEO of Angaza Vijiji. "The negative connotations of the bats are changing because we've run programs in schools and set up local action groups. We've seen significant progress."

Where things differ, however, is with the developers—these are outsiders coming into the area.

> "There's a need to not just focus on the locals, but also on the people coming in to establish enterprises."
> —*Evarastus Obura*

"There's a need to not just focus on the locals, but also on the people coming in to establish enterprises," Obura says. "Some of the developers I've met are progressively thinking, and they understand when you tell them about the bats' contributions ecologically." His current action plan is to continue his outreach, and he says, "establishing a formalized conversation that would help us understand how we could have a win-win for both parties."

What's next for coastal Kenya

BCI will continue to develop best conservation practices at all three caves in the coming years, providing the local communities with the tools for long-term sustainability. "Local communities are the primary stakeholders in our bat conservation project and crucial to our success," Wechuli says. "The local community's involvement will build a sense of ownership and responsibility, improve the project's effectiveness, and promote sustainability."

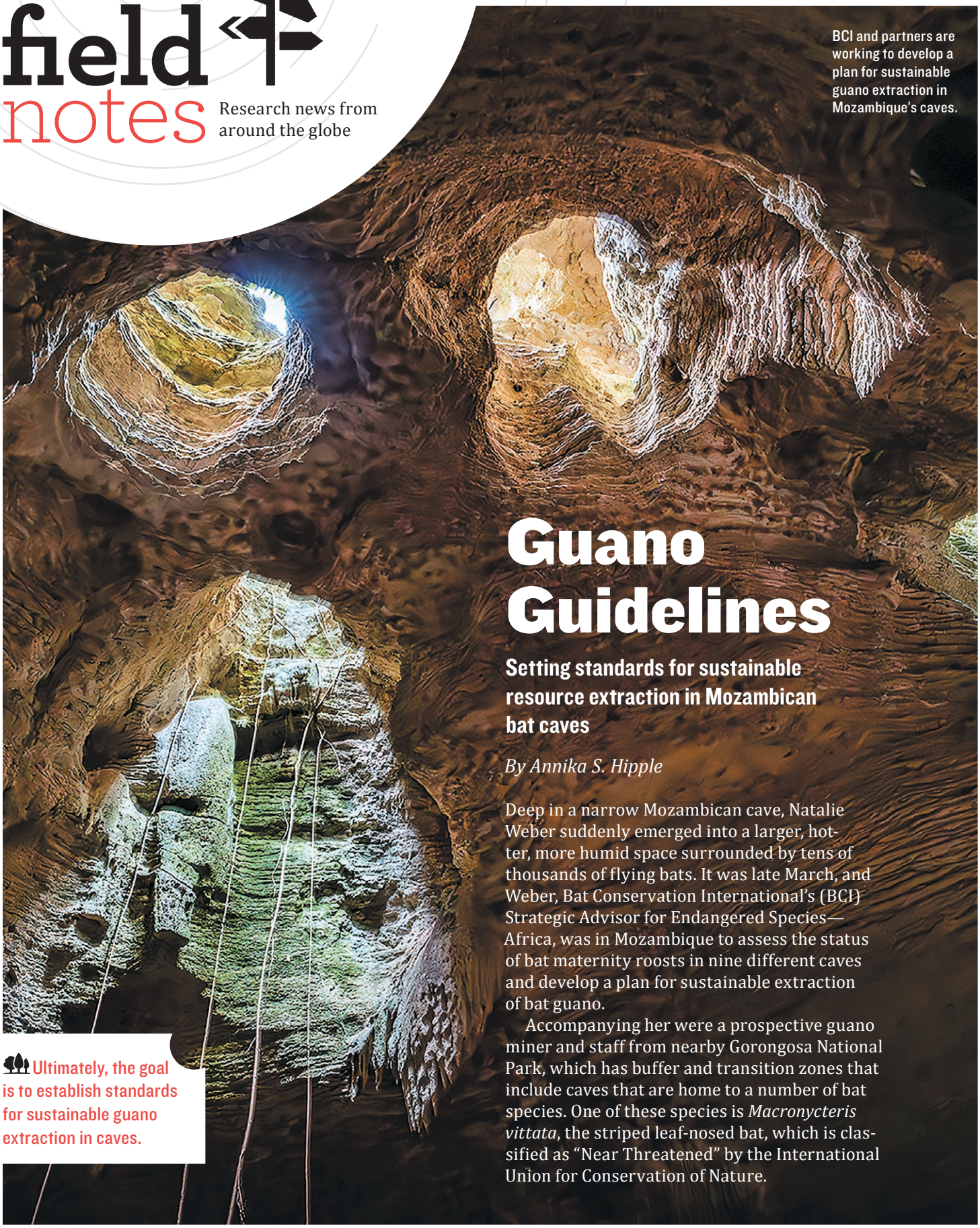
In the near future, that means continuing education efforts and discussions with the local community and creating worldwide awareness. A film crew will visit Kenya this fall to document the ongoing work and share it with a wider audience. "This project will put Kenya on the map for bat research and conservation in the region, especially if the areas are formally protected and conserved by and led by the local communities," Webala says. "This is just the beginning. We hope to use this as an example to venture into other areas and protect more bats."

Ali Toya explains the importance of bat conservation to community members.

Photo: Karel de la Cruz Victoria


Paul Webala inside Makuruhu Cave.

Photo: Karel de la Cruz Victoria



BCI and partners are working to develop a plan for sustainable guano extraction in Mozambique's caves.

Guano Guidelines

Setting standards for sustainable resource extraction in Mozambican bat caves

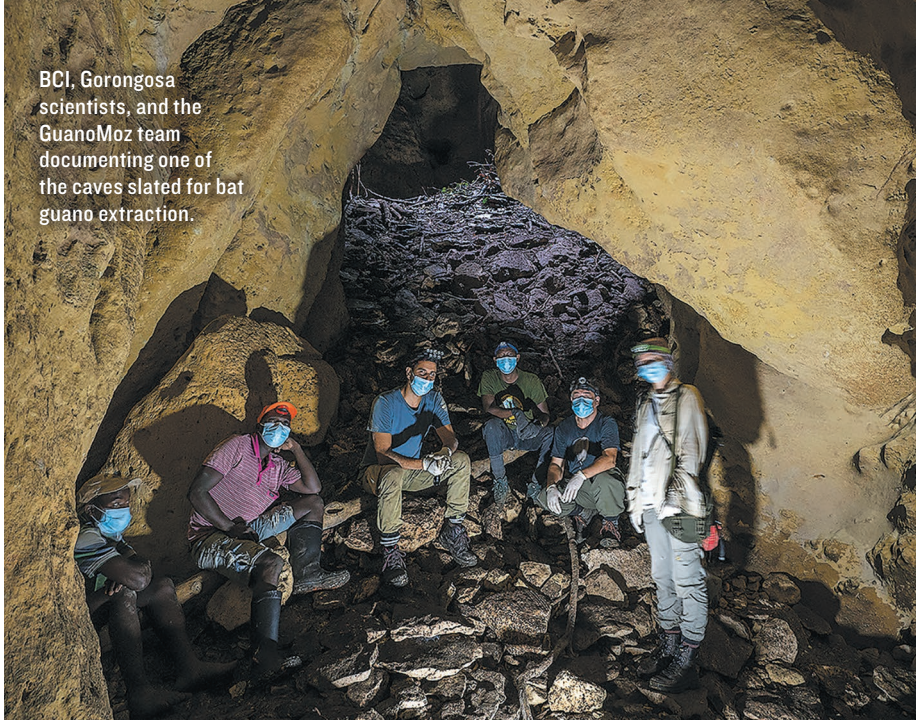
By Annika S. Hipple

Deep in a narrow Mozambican cave, Natalie Weber suddenly emerged into a larger, hotter, more humid space surrounded by tens of thousands of flying bats. It was late March, and Weber, Bat Conservation International's (BCI) Strategic Advisor for Endangered Species—Africa, was in Mozambique to assess the status of bat maternity roosts in nine different caves and develop a plan for sustainable extraction of bat guano.

Accompanying her were a prospective guano miner and staff from nearby Gorongosa National Park, which has buffer and transition zones that include caves that are home to a number of bat species. One of these species is *Macronycteris vittata*, the striped leaf-nosed bat, which is classified as "Near Threatened" by the International Union for Conservation of Nature.

Ultimately, the goal is to establish standards for sustainable guano extraction in caves.

Photo: Piotr Naskrecki, Ph.D.



BCI, Gorongosa scientists, and the GuanoMoz team documenting one of the caves slated for bat guano extraction.

Photo: Piotr Naskrecki, Ph.D.

Balancing resources

An essential food source for various invertebrate species, bat guano is also a popular fertilizer. One challenge for BCI and its partners is determining the rate at which bats produce guano versus the rate at which it is being extracted and how its removal influences a cave's temperature and humidity. The two "hot caves" identified during the study were excluded from the extraction to protect the bats that use those caves. The caves would likely be impacted by guano extraction since the process may increase the size of the cave's opening. Once extraction has begun, staff from Gorongosa will visit the caves regularly to check monitoring equipment and any impacts of guano extraction on the caves.

The opportunity to monitor these particular caves presented itself when the guano mining company GuanoMoz requested assistance in implementing scientists' recommendations for minimizing the impact of the extraction operations on bat populations.

"As far as we're aware, this is one of the first times it's been attempted to figure out if there is such a thing as sustainable guano harvesting," says Isabella Mandl, Ph.D., BCI's Regional Director for Africa and South Asia.

One challenge for Bat Conservation International (BCI) and its partners is determining the rate at which bats produce guano versus the rate at which it is being extracted and how its removal influences a cave's temperature, humidity, and, thus, bat populations.

Sustainable guano extraction

Determining how much guano can be sustainably removed without affecting the cave ecosystem is critical. "There have been no trials, no studies on this before, so our suggestion would be to go with half of the guano layer first," Weber says. "Then we'll see if this works for the bats and everyone. In an ideal world, we would have had 12 months of monitoring data even before the first extraction because we can also expect seasonal patterns."

Mandl points out that trying to define sustainability within this context is a challenge. "If you take out loads of guano, there's always a risk of knocking the ecosystem out of balance. We just don't know to what extent," Mandl says. "It's a unique opportunity, but we have to be very aware of the reality that guano harvesting will have an impact. This project allows us to figure out what the impact could be and how we could potentially minimize it."

Ultimately, the goal is to establish standards for sustainable guano extraction in caves. "We want to make sure that the conditions to allow for recovery of the guano deposits would be protected," Weber says. "That means we need the bats. We need other organisms that can survive in the caves even though extraction is happening so that the ecosystem stays healthy and intact."

Leaf-nosed bats (*Hipposideros caffer*) emerging from a cave.

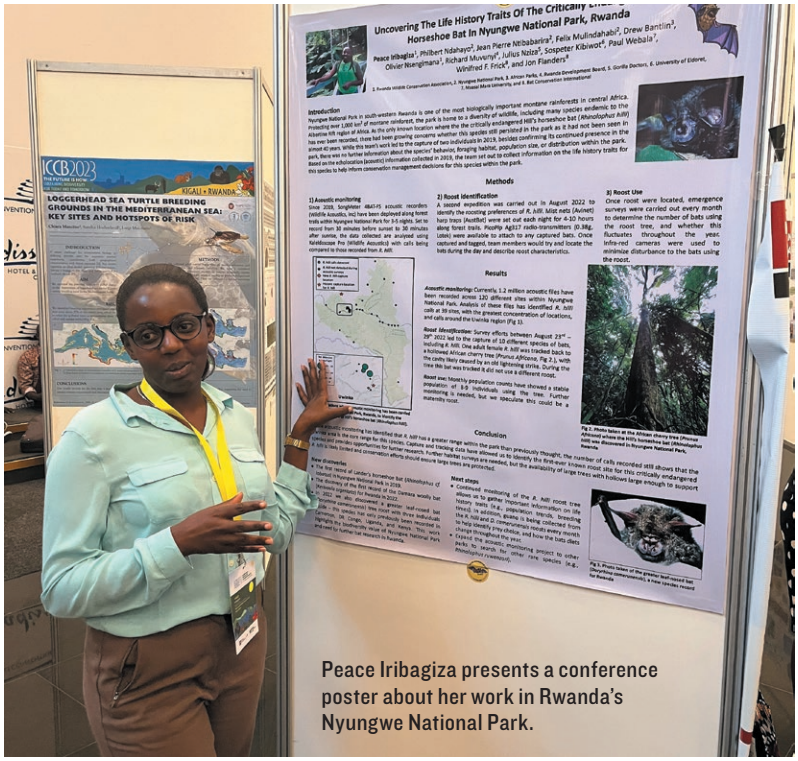
Photo: Piotr Naskrecki, Ph.D.

> "If you take out loads of guano, there's always a risk of knocking the ecosystem out of balance. We don't know to what extent. It's a unique opportunity, but we have to be very aware of the reality that guano harvesting will have an impact. This project allows us to figure out what the impact could be and how we could potentially minimize it."
> —*Isabella Mandl*

A Rising Star in Rwandan Bat Conservation

Meet Peace Iribagiza

By Annika S. Hipple



Peace Iribagiza presents a conference poster about her work in Rwanda's Nyungwe National Park.

Photo: Jon Flanders, Ph.D.

When Peace Iribagiza was a small girl growing up in eastern Rwanda, bats would often get into the roofing of local houses. Some frustrated people killed the bats, but Iribagiza's mother sought a different solution.

Following a neighbor's advice, she closed off entrance holes while the bats were out foraging and hung foul-smelling plants to discourage them from returning. It worked, and for young Iribagiza, the incident sparked an interest in bats that grew into a passion and, ultimately, a career.

As part of a bachelor's degree in zoology and conservation, Iribagiza wrote her thesis on the straw-colored fruit bat (*Eidolon helvum*), a species under threat in Rwanda due to loss of habitat and bat-human conflicts. In 2022, she began working with Bat Conservation International (BCI) and the Rwanda Wildlife Conservation Association (RWCA) in a joint position focusing on bats. Later that year, she had the opportunity to participate in the multinational expedition in Nyungwe National Park, during which scientists from RWCA, BCI, and partner organizations successfully identified the roost site of the Critically Endangered Hill's horseshoe bat (*Rhinolophus hilli*), as well as that of another rare bat species, the greater leaf-nosed bat (*Doryrhina camerunensis*).

"Acoustic monitoring was one of the powerful tools that helped us find the roost of the Hill's horseshoe bat," Iribagiza says. After the expedition team downloaded the calls, Iribagiza analyzed them following training from fellow expedition member Jon Flanders, Ph.D., BCI's Director of Endangered Species Interventions. Iribagiza has continued to monitor the Hill's horseshoe and greater leaf-nosed bat roosts and analyze seasonal dietary patterns by studying guano samples.

> Iribagiza has trained park rangers in western Rwanda's Gishwati Mukura National Park to carry out acoustic monitoring work.

Acoustic monitoring and conservation in Rwanda

Together with Flanders, Iribagiza has trained park rangers in western Rwanda's Gishwati Mukura National Park to carry out acoustic monitoring work. "I'll be doing the acoustic analysis to see the species diversity within the park and also if there are any other rare or Endangered species roosting within the park, for us to be able to design conservation measures," she explains.

> "Acoustic monitoring was one of the powerful tools that helped us find the roost of the Hill's horseshoe bat."
> —*Peace Iribagiza*

RWCA is also conducting acoustic monitoring in Rwanda's largest wetlands and Ramsar site, the Rugezi Marsh, to study the species diversity of bats, birds, and amphibians. Marsh rangers deploy acoustic sensors throughout the marsh and download the data, which Iribagiza then processes and analyzes for species identification and future establishment of a call library for bats of Rwanda. She is also involved in a study of the vulnerable cave-roosting Harrison's large-eared giant mastiff bat (*Otomops harrisoni*). She coordinates RWCA's team of Bat Conservation Champions, who monitor a roost of the straw-colored fruit bat, documenting population fluctuations and threats.

The greatest challenge in her work, Iribagiza says, is people's negative beliefs about bats and lack of awareness of their crucial ecosystem roles. "One of my goals is to raise awareness on the national level," she explains.

Iribagiza hopes to become widely known as an expert on her country's bat species. "If they say, 'bats of Rwanda,' someone hears 'Peace'," she says with a laugh. With her passion and ever-expanding research skills and knowledge base, it's surely only a matter of time before the name Peace Iribagiza becomes synonymous with bat conservation in Rwanda.

BCI crew members Ethan Sandoval, Nick Disessa, Brianna Mann, and Zasha Welsh join Gila National Forest Service packers Victor Alcorta and Aaron Huerta (right) to prepare to load horses and mules for travel into the Aldo Leopold Wilderness.

Photo: Dan Taylor

Healing the Land

Restoration efforts in designated Wilderness require old-fashioned transportation

By Fiona Tapp

Landscapes across the American West are increasingly susceptible to severe wildfires, which pose a significant threat to the habitat of many wildlife species, including bats. The Aldo Leopold Wilderness within the Gila National Forest has been particularly affected by these fires, including the massive Black Fire in 2022 that scorched 325,000 acres, devastating critical riparian zones that provide essential water and foraging resources for bats.

The human-caused Black Fire was the second-largest wildfire in New Mexico history. It burned so hot that it stripped vegetation off the landscape. A severe monsoon season followed and exacerbated the problem.

"The watershed couldn't assimilate that amount of water anymore because the forest wasn't there, which eliminated a lot of good habitat for bats, fish, and other wildlife," says Bat Conservation International (BCI) Restoration Team Lead John Moeny.

BCI's Habitat Protection and Restoration Program has intensified its efforts to safeguard and restore bat habitat in these areas, supported by a five-year agreement with the Gila National Forest. These projects include reseeding the burned landscape and restoring watersheds.

Motorized equipment is forbidden in the remote project site due to its status as designated Wilderness, so BCI is using a traditional method to access the site and transport equipment and supplies: horses and mules.

A day in the life: Habitat restoration teams

Team members work in eight to 10-day stints, and all the equipment needs to be itemized and weighed before loading the mules. Horses are ridden by the packers, while mules carry the gear. Reaching the site takes a full day of hiking. Once the team reaches the site, they make camp, to be their home for the next 10 days.

Reaching the site takes a full day of hiking, and team members work in eight to 10-day stints.

Mornings start at sunrise with breakfast at camp before the crew hikes up the canyon for an 8 a.m. safety briefing and review of the day's work plan, which could include cutting and planting willows, moving rocks, or building structures in the stream.

"We do what's called process-based restoration," Moeny says. "It essentially attempts to mimic what would have been the stream process pre-fire or pre-disturbance. So, for instance, we often mimic what beavers would have done on the landscape."

Scientists have recently begun looking into the relationship between beavers and bats. Beavers' dams create pooled bodies of water that provide vital sources of drinking water for bats. They also help raise the water table, which greatly benefits riparian vegetation, which is the most important bat foraging habitat in the southwest.

After eight to 10 hours of work, the team returns to camp. Despite the challenging work, Moeny says the project is incredibly rewarding. "It's feel-good work for sure. We see the tangible benefits of our work," Moeny says.

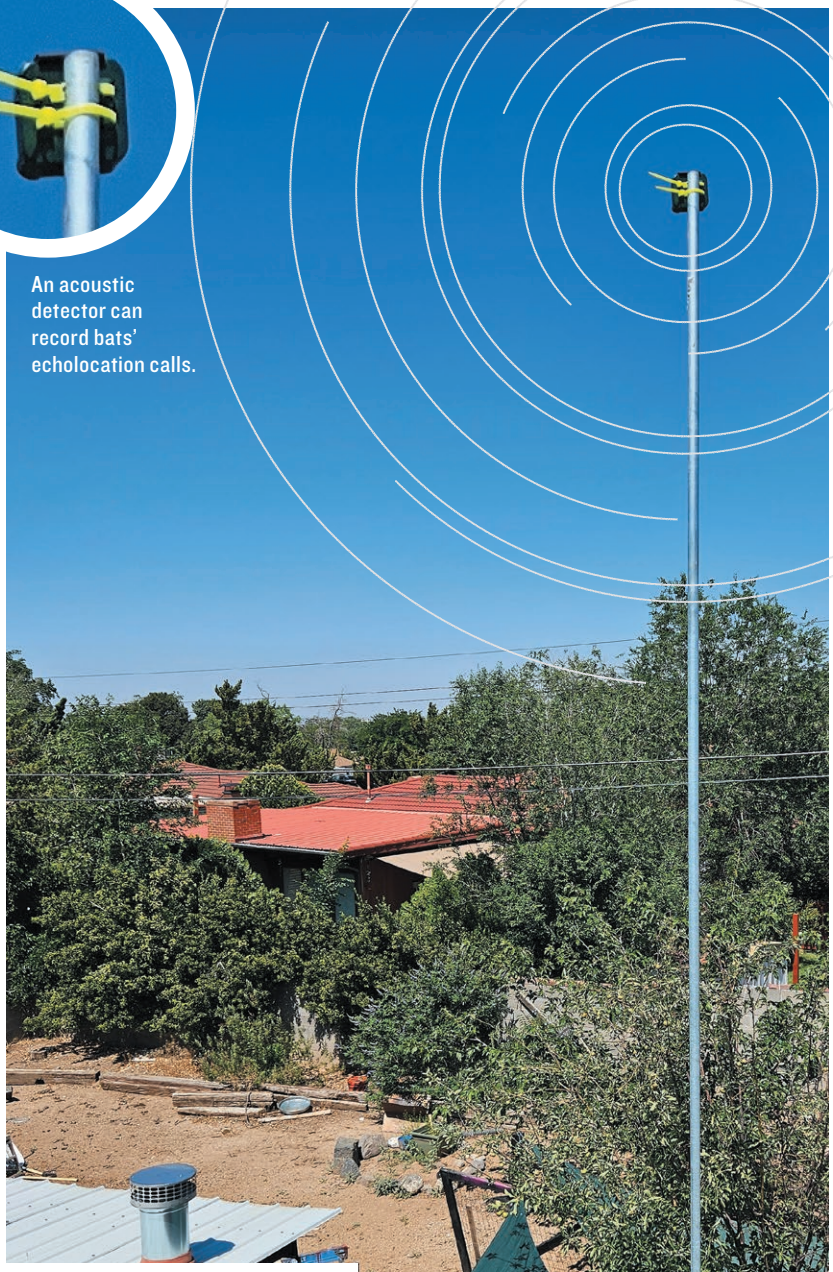
Those benefits include noticeable regrowth of willows and new pooled areas providing habitat for beavers, bats, fish, and other wildlife. Moeny says this will benefit an entire ecosystem.

"We're doing it for bats, but it's a holistic idea that if you do a project that is good for bats, it's going to bring a lot of benefits for other organisms, wildlife, water quality, and the overall watershed condition," Moeny says.

Bringing Bat Science to Your Backyard

Community science for all

By Stefanie Waldek



An acoustic detector can record bats' echolocation calls.

It's just a few minutes past midnight on Jan. 1, 2024, and the first bat detection in North America has already occurred—in frigid Alberta, Canada. Yes, while some folks are toasting the New Year with champagne, others across the continent are listening to acoustic bat monitors.

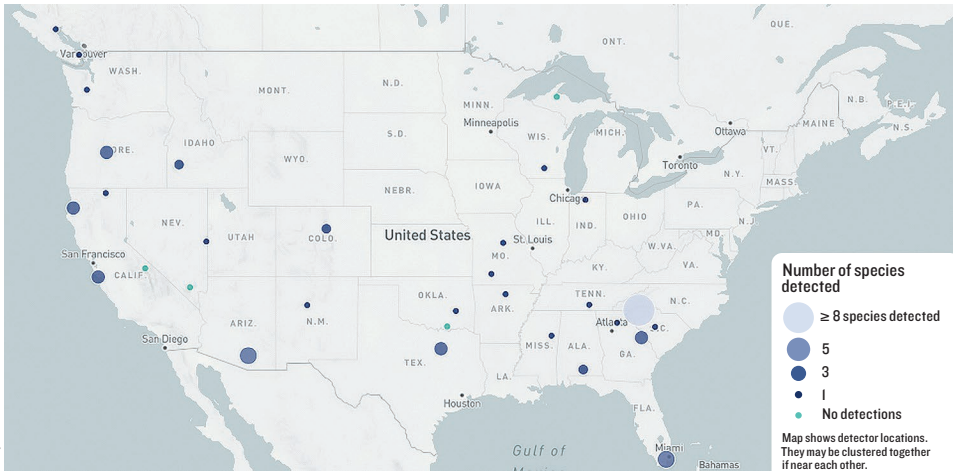
Run by United States Forest Service Ecologist Ted Weller, #FirstBat is a challenge to detect the first bat of the year in each U.S. state and Canadian province; Weller's goal is to collect as much data possible for his publicly accessible Bat Acoustic Monitoring Portal, or BatAmp. Even though competition is fierce among #FirstBat participants, coming in second, third, or 27th is still a valuable contribution to the database.

"What I'm trying to do is figure out where bats are migrating," Weller says. "The richer our data, the better we'll be able to show these migratory patterns."

Animals that are easily identified visually often have robust citizen science programs for data collection—look at programs like eBird or Happy Whale, for example. But bats pose several challenges, making programs like #FirstBat somewhat rare.

First, many species are nocturnal, making visual identification difficult. Second, even in daylight, bats can be tricky (or impossible) to identify

NUMBER OF SPECIES DETECTED



Map: Ted Weller

Photo: Adam Hevey

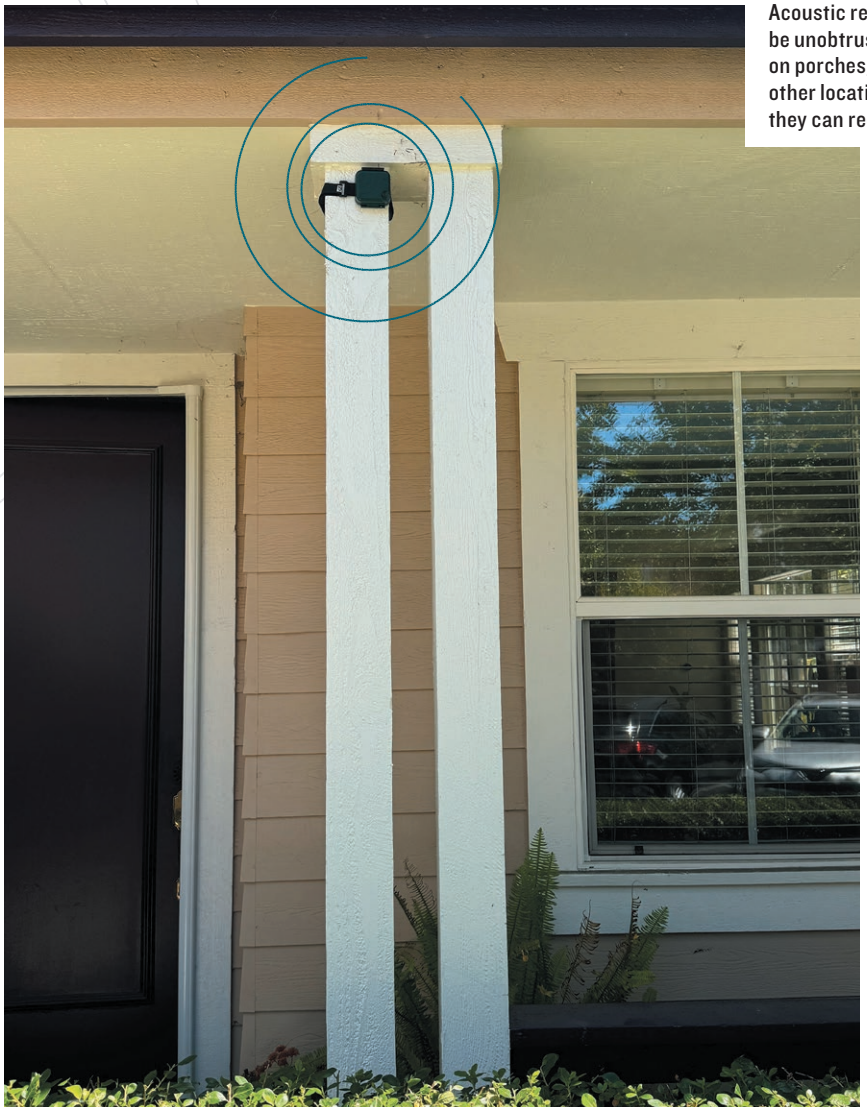


Photo: Gina Barton

Acoustic recorders can be unobtrusively mounted on porches, roofs, and other locations where they can record bat calls.

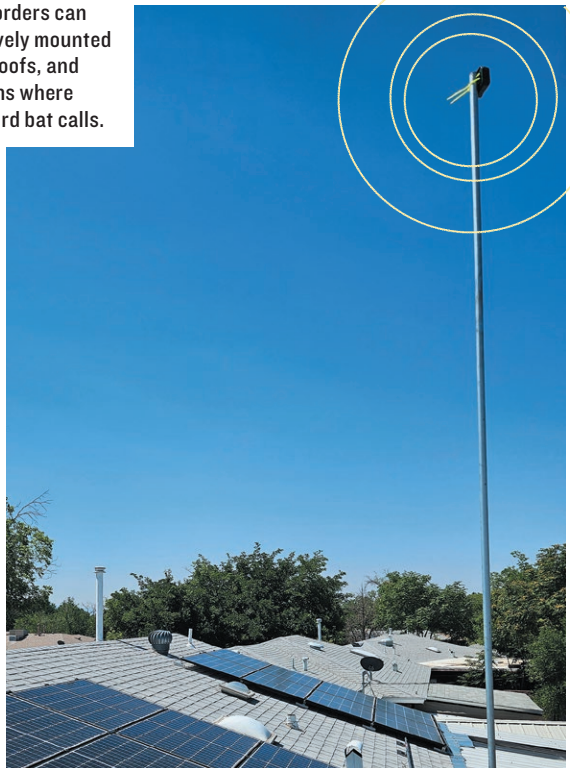


Photo: Photo: Adam Hevey

by sight alone. One of the most reliable ways to identify bats is to listen to their echolocation calls with an acoustic detector. However, that's a tool most people don't typically have lying around in their garage.

Community science for bat conservation

Bat Conservation International (BCI) is researching the scalability of community science programs for bat detection. This summer, BCI Conservation Research Coordinators Jessie Bunkley and Kathy Gerst, Ph.D., hosted a pilot program for a backyard bat survey, working with small groups across the Southwest and Pacific West.

"We want to create an experience that's meaningful to people and inspires them to learn more about bats, to care more about conservation, and to see themselves as scientists."
—Jessie Bunkley

"We want to figure out how best to engage with the community using a passive acoustic monitoring approach and, at the same time, contribute substantially to the North American Bat Monitoring Program database," Bunkley says. "One of the advantages of community science is people can survey on private lands that agency biologists would otherwise not have access to. Maybe we can fill some data gaps in urban and suburban places."

Two hurdles facing such community programs are access to bat detectors and the cost and time it takes to analyze the recordings. "If you set out a detector for a week, you're collecting thousands and thousands of sound files," Gerst says. One of the goals of the backyard bat survey pilot program is to navigate these challenges and develop solutions. "The ultimate vision is that anyone anywhere can participate," she says.

As BCI works to move the program beyond the pilot phase, Bunkley points to the program's ultimate goal. "We want to create an experience that's meaningful to people and inspires them to learn more about bats, to care more about conservation, and to see themselves as scientists," Bunkley says.

POETRY AND IMAGES

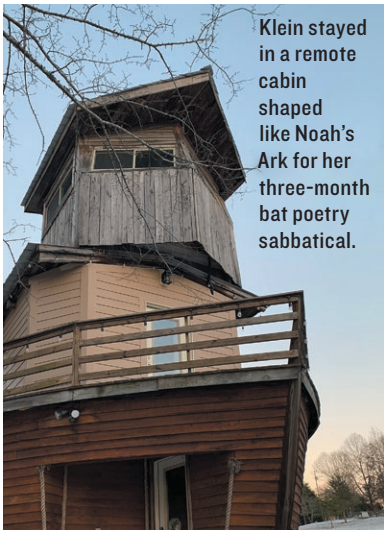
Bat Poet

One woman's quest to write a poem about every bat species on Earth

By Kristen Pope

Rabbi Zoe Klein has written over 500 poems about bats, with over 900 more to go. Klein is on a mission to write a poem about each bat species on Earth, a constantly shifting goal as new species are identified.

After more than 25 years serving as Rabbi at Temple Isaiah in Los Angeles, Klein, a Bat Conservation International (BCI) member, decided she wanted to bring a long-held dream to life: writing a poem about every mammal on Earth. Initially, she envisioned penning poems about giraffes, zebras, and cats, but she soon realized bats make up more than a quarter of the world's mammal species. She's loved bats since childhood, so that is where she started.



Klein stayed in a remote cabin shaped like Noah's Ark for her three-month bat poetry sabbatical.

Photo: Zoe Klein

Taking a three-month sabbatical in late 2023 and early 2024, Klein found a remote cabin in Tennessee shaped like Noah's Ark and thought it would be the perfect place to work on her project. Starting with verses about Temminck's tailless fruit bat (*Megaerops ecaudatus*) and its relationship with figs, her first batch of poems included tube-nosed bats, leaf-nosed bats, and flying foxes.

Travel through poetry

For each poem, she read about the bat, looked at photos, and even listened to podcasts. She learned about each species' ecosystem, including the local flora, fauna, and geography. She says getting to know each species felt like a spiritual practice, almost like a trip around the Earth.

"Studying bats takes you to almost every nook and cranny around the world, from the caves in Borneo to little archipelagos, to crypts and mineshafts and abandoned churches," Klein says. "You just travel all over the world."

Zoe Klein has written more than 500 poems about bats, and she plans to write a poem about every bat species on Earth.

Photo: Zoe Klein

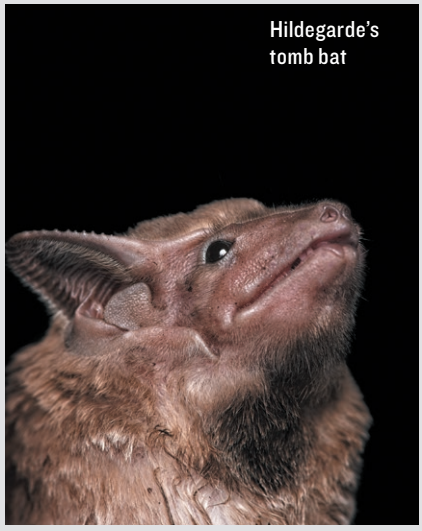
Klein has written more than 500 poems about bat species, with more than 900 to go.

Her collection includes iambic pentameter sonnets, villanelles, limericks, haikus, and poems that are several pages long. For the *Hipposideros* bats—whose diet can include beetles—she based each poem on a song by the human band The Beatles. Each poem was designed to spark curiosity while being accessible, rhythmic, and fun.

When she initially embarked on the project, Klein feared she would run out of material about the bats, but now she's finding herself tempted to write multiple poems about species. She's still writing away, with more than 900 poems before she moves on to her next group of mammals.

Next up? *Rodentia.*

Here are several of her poems.



Hildegarde's tomb bat

Photo: Karel de la Cruz Victoria

hildegarde's tomb bat (*taphozous hildegardeae*)

Excerpt:
this is a love
story between
my little harem
and me.
it takes place in
a kenyan cave by
the indian sea.
there i declare
abounding love.
(times three.)

To read more of Klein's poems, visit **zoespoetryark.com.**

Photo: Dan Logen

Wahlberg's epauletted fruit bat

wahlberg's epauletted fruit bat (*epomophorus wahlbergi*)

a song of ripening:
the transformation of a tree
takes place with grace and subtlety.
it integrates sunlight and showers,
drinking the clouds into its flowers.

there's nothing more enlightening
than to be present for the ripening!

its fragile petals slowly morph
into green fists grasping a core.
i circle the grove night after night
patiently checking with each flight

until the fruit begins to deepen,
showing the pulp's begun to sweeten.
i wait for these hard hearts of stone
to soften when they are full grown.

there's nothing more enlightening
than to be present for the ripening!

if i'm inattentive, i'll have missed it,
impressions where the sun has
kissed it,

others who waste all their time rushing
miss the magic of a tree's blushing,

metamorphizing its phenotype
as all its fruit become dark and ripe.
it's an enchanted time window
as these bombs of nutrition grow

before their skin bursts and explodes
dispersing the tree's dna code
to mulch into the forest loam.
i am patient. i do not roam.

i wait until the precise moment
before the juices start to ferment,
that point when the tree's fully bedecked in
luscious and mushy, blushing and beckon-
ing bundles, oh the ripening!

there's nothing more enlightening
than to be present for the ripening!

Photo: Richard Du Toit_Minden Pictures

peters's epauletted fruit bat (*epomophorus crypturus*)

some bats like to cluster
to keep each other warm.
but if they get too close to me,
i'll jab them with my thumb.
i do not intend to hurt them
or do them any harm.
give me a radius of space
and closer do not come.

Peters's epauletted fruit bat (*Epomophorus crypturus*) hanging upside down

Photo: Dan Logen

Mauritian tomb bat

mauritian tomb bat (*taphozous mauritianus*)

mama mauritian tomb bat,
remember when i was young?
when i was a baby tomb bat,
and to your breast i clung?

mama mauritian tomb bat,
remember when i grew?
i learned to fly but didn't want
to let go holding you.

mama mauritian tomb bat,
remember what you said?
"too big for my breast but you can
cling to my back instead."

and so i climbed upon your back,
mauritian tomb bat mama.
you assured me i could stay that way
as long as i did wanna.

then one day i was ready
to venture off on my own.
oh mama mauritian tomb bat,
i am now on my own.

mauritian tomb bat mama
roosting in babalala...
i hope i see you again mama,
smiling in babalala.

thank you mauritian mama,
you were my magic carpet.
you kept me safe from trauma.
you were my soothing blanket.

thank you mauritian mama,
you gave of yourself in profusion.
nature did give me these wings,
but you taught me how to use them.

bat chat
A conversation with a noted expert

Brazilian Bats

Barros leads cave conservation work in Brazil

By Jill Robbins


Jennifer Barros, Ph.D.

Photo: Chris Gallaway/Horizonline Pictures

Jennifer Barros, Ph.D., is Bat Conservation International's (BCI) Brazil Program Manager, and she is responsible for leading BCI's cave conservation initiative in the massive country. With more than 3 million square miles of land, Brazil is the world's fifth-largest country by area. The country contains more than 23,000 caves—some of which provide habitat for bats.

Barros works with local communities, nonprofits, and government agencies across Brazil to protect and enhance critical roost sites for Endangered bat species throughout the region.

We caught her for a few minutes above ground to inquire about her work.

Tell us about BCI's work in Brazil and specific challenges.

We have four Endangered species nationally, three of which are threatened because they are strictly related to caves—*Natalus macrourus*, *Furipterus horrens*, and *Lonchophylla dekeyseri*. We also want to protect caves with large colonies in Brazil, usually formed by species from the genus *Pteronotus*. These species form what we call hot caves—the high number of bats and the huge amount of accumulated guano can increase the temperature in these caves and create a unique and important ecosystem that is key for the survival of these species.

Of the more than 23,000 caves in Brazil, only around 20 are known as hot caves. Protecting caves with Endangered species and large colonies is a priority and guarantees protection for other species.

Most of the caves we want to protect are in private areas. We work with the landowners to access their properties and see if they will protect and preserve the caves and bats. Brazil is a huge country, and we need lots of resources and time to travel to the caves, which are sometimes not that easy to access.

What are some Brazil-specific threats to bats?

The main threats to caves and bats in Brazil are mining and the destruction of their habitats. Mining companies' main interests are limestone and iron ore. Huge areas are being mined, destroying many important caves. It is crucial to guarantee the protection of the caves that we know have Endangered species and large colonies.

Brazil contains more than 23,000 caves, including approximately 20 "hot caves."

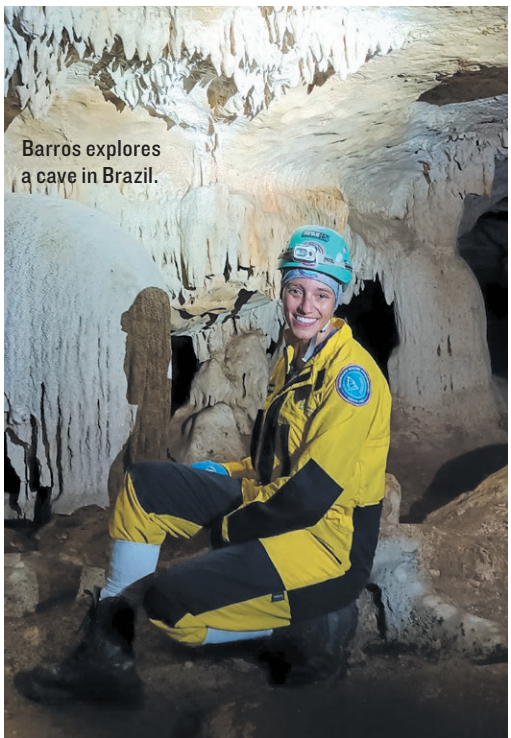

Barros explores a cave in Brazil.

Photo: Eder Barbier

What challenges do you face when communicating with people about bats?

Usually, people who don't know bats don't like them much. I like to help people change their minds about these incredible animals. It's great to show people that there are different species with different roles in the ecosystem and show them pictures and videos from inside the caves. We also work with different bat researchers here. We do fieldwork together and help each other with different activities, which is great, as science and conservation work better together.

I'm sure there will be challenges with bureaucracy, resources, and people in the project's next phases, but I'm also sure that when we get the caves protected, the challenges we overcame will be worth it.

Photo: Laraine McKinnon

Taylor Rienhart shared bat knowledge with her community to earn her Girl Scout Gold Award, the organization's highest honor.

Girl Scout Champions Bat Conservation

Gold Award project focuses on awareness and education

By Fiona Tapp

Taylor Rienhart, a dedicated Girl Scout from the San Francisco Bay Area, recently earned her Gold Award, the highest accolade a Girl Scout can earn. Her project, a multifaceted initiative aimed at bat conservation, showcased her passion for environmental science and animal conservation.

Rienhart's project included several key components to foster awareness and support for local bat populations. One of her primary aims was to educate the public on bats and help dispel common myths. To do this, she created an informative poster and table of interesting activities that are displayed at the wildlife education center at Friends of Edgewood Natural Reserve and through the creation of an educational Instagram account. Her campaign aimed to counter negative perceptions of bats by sharing engaging, informative content about their ecological roles and local species.

"My idea was to create this positive media campaign that would educate people about local bats," she says. "I developed 30 different Instagram posts that were educational, fun, and interactive."

Restoration and education initiatives

Another significant aspect of Rienhart's project involves habitat restoration. She partnered with the San Francisco Bay Bird Observatory to remove invasive Australian saltbush on Bair Island, part of the Don Edwards National Wildlife Refuge. This invasive plant disrupts local ecosystems, reduces biodiversity and, consequently, the availability of insects that bats rely on for food. Rienhart met U.S. Secretary of the Interior Deb Haaland during one restoration event. Haaland praised Rienhart's efforts and gave her a special challenge coin.

In addition to her hands-on conservation efforts, Rienhart led educational bat walks at Don Edwards National Wildlife Refuge. These walks, integrated into the Refuge's Twilight Walk program, educated the public about bats' ecological importance. Rienhart answered questions and encountered many common myths that people still hold about bats.

> "My idea was to create this positive media campaign that would educate people about local bats. I developed 30 different Instagram posts that were educational, fun, and interactive."
> —*Taylor Rienhart*

"A lot of people thought that bats are blind," she says. "There are a lot of people who have misconceptions about bats. Concerns about them being vampires were surprisingly prevalent."

Rienhart also took on the practical task of building bat boxes. She taught a group of Girl Scouts, aged 8 to 11, how to construct these boxes. Now, the completed boxes provide roosting sites for bats on Stanford University's campus.

A lasting impact

Throughout her Gold Award project, which required a minimum commitment of 80 hours, Rienhart collaborated with numerous experts and organizations, including Bat Conservation International (BCI). She is also part of a team providing input for a new community science program that BCI is piloting, further cementing her role in the broader conservation community.

Rienhart's dedication to bat conservation and her comprehensive approach to her Gold Award project not only highlights her leadership and commitment but also makes a lasting impact on her community. Her work ensures that bat conservation efforts will thrive in the Bay Area long after her project is complete.

Follow Taylor's bat-focused Instagram at **instagram.com/bat.edu_taylorsgold**.

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Photo: FlamingoImages/Getty