Appreciating the role of bats in our everyday diet

BATS BRING treats

SPOTLIGHT ON: MEXICAN LONG-NOSED BAT

CELEBRATING BAT WEEK WITH BCI

AN EXPERT Q&A ON BAT MYTHS IN JAPAN
CONSERVATION THAT ENDURES
A decision today. A promise for the future.

Legacy Circle
Members, their families, friends and executors often have personal stories at the heart of their decision to include BCI in their estate planning. Some recall bats in the night sky over a summer camp or remember the sounds of bats chittering around a family porch. Others are armchair adventurers who follow bat conservation through the photos and stories in our magazine. What they have in common is a lifelong love of unsung heroes—and an awareness of bats’ role as Earth’s nighttime caretakers.

Contact us today. Tell us your story. Live your life knowing that your legacy gift will fund conservation that endures. Let every bat in the night sky be your monument.

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THE BAT-APPROVED DIET
Through pollination, seed dispersal and pest control, bats play a vital role in many of our everyday foods.

OFF THE BAT
BCI Communication Manager Micaela Jemison offers a plan to help bats reclaim Halloween.

SPECIES SPOTLIGHT
A BCI favorite, the Mexican long-nosed bat is a conservation priority species in North America.

BAT CHATS
A pair of Japanese bat researchers breaks down the common bat myths of their native land.

MAKING A DIFFERENCE
Recognizing the many generous friends and members who supported BCI this past quarter.

BAT KIDS
Bat-themed coloring templates created from some of history's most famous bat illustrations.

ON THE WING
BCI visits the Smithsonian's rare book collection and finds early bat references in priceless texts.

FEATURE
THE BAT-APPROVED DIET

NEWS & UPDATES

BAT SIGNALS
BCI news and conservation updates

FIELD NOTES
Research news from around the globe

ON THE COVER
Forget the storybook myths; bats' true connection to Halloween comes in the form of pest control for cocoa trees.
Taking back Halloween

By MICAELA JEMISON

The holiday season is fast approaching, and with it comes that annual fall event perhaps most associated with bats: Halloween. While many among us enjoy the witches’ cackling and pumpkins on every street corner, the scary—and often inaccurate—connections made between our furry friends and the spooky holiday can dishearten even the most optimistic bat supporters. That’s why we here at BCI are determined to reclaim Halloween for bats by celebrating the actual, unique connections between the world of these fascinating flying mammals and our own.

Both the young and young at heart strongly associate Halloween with delicious fall foods and, of course, candy. It seems nearly every food staple receives the Halloween treatment at this time of year, from pumpkin-flavored coffees to candy corn cookies. But to truly get into the Halloween spirit you don’t need to add artificial flavors. Many of our favorite treats, and more than a few basic staples sitting in your kitchen pantry right now, are already connected to this celebration through their natural relationship with bats.

These foods include rice, coffee, corn, numerous fruits and nuts, not to mention that most important of ingredients for our Halloween treats: chocolate. Bats act as unseen gardeners—or more specifically, pollinators, seed dispersers and pest controllers—for these and many other different foods from around the world.

To shed light on these facts, this Halloween BCI is launching a bats and food promotion to encourage people to spread positive messages about bats, support communities involved with bat conservation and inspire the next generation of conservationists. From creating and sharing bat-inspired Halloween recipes to beefing up on some batty food facts, you’ll find numerous ways to join this effort in this issue, online and through BCI’s social media.

This is the second year that Bat Week, Oct. 25–31, will be held to coincide with Halloween. To celebrate this annual event, BCI and our partners will be promoting a world record attempt to build the most bat houses in one day on October 31. (See page 3 for more and how to get involved.)

We have also partnered with Smithsonian Libraries to create a series of bat coloring templates based on the amazing bat illustrations found in the Smithsonian’s rare book collection. We hope to inspire artists of all ages with this remarkable selection of bat faces, which show us how diverse bats truly are.

Reclaiming Halloween for bats doesn’t mean we wish to take the fright out of the ghoulish night. We see Halloween as an opportunity to show the world the amazing diversity and value of bats, and to spread the word that if we don’t take conservation action now, we could lose these fascinating creatures. Now that’s a scary thought.

Micaela Jemison
BCI Communication Manager
A week to remember
This year’s Bat Week takes aim at the record books

In an attempt to set a world record for the “most bat houses built in one day,” the Bat Week team has rallied bat enthusiasts from all parts of North America. During the event, which will take place on Halloween, Oct. 31, as part of Bat Week (Oct. 25–31), participants will aim to build a record 5,000 bat houses across the U.S. and Canada.

Bat Week is an annual, international block of programs and media appearances designed to raise awareness for bat conservation worldwide. The team that organizes Bat Week includes Bat Conservation International, U.S. Forest Service, U.S. Fish and Wildlife Service, the Organization for Bat Conservation, Wildlife Acoustics, Lubee Bat Conservancy and the Save Lucy Campaign.

HOUSE PARTY
If you and your family would like to join in on the recording-breaking fun, find an event in your area at batweek.org. If you’re unable to attend, learn more about artificial roosts and find tips and resources for creating and installing your own bat house at batcon.org/bathouse.
Adopt-a-Bat grows

BCI adds three new plush toy options to program’s offerings

We at BCI are excited to announce the addition of three new members to our Adopt-a-Bat family: the spotted bat, Bechstein’s bat and the Mexican free-tailed bat. As part of BCI’s symbolic Adopt-a-Bat program, each donor who makes a contribution of $25 or more receives a stuffed, plush bat toy of the species of his or her choosing, along with a BCI adoption certificate and a complete profile of the selected species.

With its large pinkish ears and snow-white spots, the spotted bat (Euderma maculatum) stands out in real life and as a plush bat. This is one of the few bats whose echolocation sound is low enough to be heard by humans.

The silky brown fur and endearing little face of Bechstein’s bat (Myotis bechsteinii) makes it another must for any collection. The Bechstein’s bat is one of Britain’s rarest bats, though the fossil record suggests it was once the most common bat species in that country.

And of course, everyone at BCI has a soft spot for the Mexican free-tailed bat (Tadarida brasiliensis). After all, they make their summer home at our very own Bracken Cave, known as the largest colony of bats in the world.

Grassroots on a global scale

From Malaysia to Venezuela, BCI supports bats around the world

Since 1998, BCI has awarded more than $1 million in scholarships and small grants to more than 200 aspiring bat conservation leaders for projects in 40-plus countries. Our grassroots grants support the work of exceptionally talented students and professionals. These awards of $1,000 to $5,000 provide opportunities for further funding by attracting matching grants from other funding sources.

BCI grants especially encourage research and conservation projects to address the lack of basic knowledge regarding some species’ ecology, distribution and behavior.

BCI is proud to announce the five projects selected for 2015 grassroots grant funding:

1. Steps forward in the conservation of the Curaçaoan long-nosed bat (Leptonycteris curasoae) in Venezuela; Dr. Jafet Nassar, Venezuelan Institute of Scientific Research, Venezuela

2. A national assessment of the endemic and critically endangered Hill’s Horseshoe Bat (Rhinolophus hilli); Dr. Paul Webala, Maasai Mara University, Kenya

3. Project Pteropus: Interactions between flying foxes, plants and people on Tioman Island — Implications for conservation; Sheema Abdul Aziz, Rimba Research, Malaysia

4. Human-wildlife conflict mitigation in Malawi: Establishing a national bat helpline and roost-monitoring programme; Dr. Emma Stone, African Bat Conservation/University of Bristol, United Kingdom

5. Ecology and conservation of Guadalcanal’s monkey-faced bats; Dr. Tyrone Lavery, The University of Queensland, Australia

Learn about each project at batcon.org/grassroots.
Seven bat species in 26 U.S. states and five Canadian provinces have been diagnosed with White-Nose Syndrome.

**GRANTS**

**Fighting fungus**

**BCI and TNC co-fund critical research on White-Nose Syndrome**

For the second year, BCI and the Tennessee Chapter of The Nature Conservancy (TNC) are pleased to award $100,000 in funding to support critical research in the fight against White-Nose Syndrome (WNS). WNS is a fungal disease that has killed millions of bats to date and is the primary threat to North America’s hibernating bats. Together, BCI and TNC awarded three grants to solution-oriented projects that aim to identify and develop tools to control the fungus that causes WNS.

The three projects take complementary approaches to managing this fungus, *Pseudogymnoascus destructans* (Pd). The first project, proposed by Dr. Auston M. Kilpatrick of the University of California, Santa Cruz, seeks to optimize the treatment of infected bats using a bacteria as a biological control of the fungus. The second project, proposed by Dr. Joan Bennett of Rutgers, The State University of New Jersey, will test a fumigation compound as control for the fungal disease. The third project, proposed by Dr. Chris Cornelison of Georgia State University, builds on existing BCI/TNC-supported research. Cornelison seeks to optimize the production of another naturally occurring bacteria to enable its broad-scale use in treatments.

**WISH LIST**

**Target WNS at its source**

BCI believes that the best way to prevent White-Nose Syndrome is to manage the fungus that causes it. That is why we provide critical funding to research projects that seek to develop tools to control the fungus, *P. destructans*. You can help support critical WNS research by donating to BCI’s WNS Response Program at batcon.org/wns_donate.

**Social media success**

While all of us at BCI see beauty in every bat species, not everyone does. However, our recent Facebook post with the message that “Cuteness shouldn’t be the measure for conservation” resonated with an astounding 2.2 million people within 72 hours. BCI will continue to use social media to spread the bat conservation message to new audiences. You can help by sharing our posts on Facebook, Twitter and Pinterest.

“Cuteness” shouldn’t be the measure for conservation

#WeDeserveLove

Photo: Merlin D. Tuttle
There are 1,331+ species of bats in the world. This is one of them.

Mexican long-nosed bat

**Bat Stats**

- **Binomial**: Leptonycteris nivalis
- **Family**: Phyllostomidae
- **Colony Size**: 0 to 10,000
- **Avg. Forearm Size**: 57 mm
- **Diet**: Nectarivore
- **IUCN Red List Status**: Endangered
- **Regions**: Mexico and southern U.S.

Photo: Merlin D. Tuttle
An important nectar-feeding bat in need of conservation support

The Mexican long-nosed bat (*Leptonycteris nivalis*) is a nectar-feeding bat native to Mexico and the United States. Its characteristic elongated muzzle makes it well-adapted to feeding on nectar and protein-rich pollen. Its tongue, which can be extended up to 3 inches, allows it to reach deep down into flowers. Mexican long-nosed bats are the largest nectar-feeding bats in the New World; they are very strong, highly maneuverable fliers, and somewhat like hummingbirds, they are able to pause in flight to feed on the showy flowers of plants, such as the agave or century (*Agave spp.*) plant.

The Mexican long-nosed bat is classified as endangered in both the U.S. and Mexico. In order to understand this bat’s life history and recent decline, one must understand its feeding ecology. Although movement patterns are not precisely known, this migratory species is thought to move from central Mexico into northern Mexico each year, with part of the population crossing the border into Texas and New Mexico. This migratory pathway follows a “nectar corridor” as the bats migrate to follow the blooming periods of a number of agave and cacti species found in the region’s desert scrub habitats.

The Mexican long-nosed bat and a similar-looking species, the lesser long-nosed bat (*Leptonycteris yerbabuenae*), are the main pollinators of several agave species, including *Agave angustifolia* (one of the mezcal species), *A. salmiana* (pulque plant) and *A. tequilana* (tequila plant), and are renowned for their association with the tequila and mezcal that humans make from the agaves.

While both bats feed on agave species, coexist only in a small overlapping area. The Mexican long-nosed bat prefers higher, cooler places in parts of New Mexico, Texas and Mexico, whereas, the lesser long-nosed bat generally inhabits lower elevations in New Mexico, Arizona, Mexico and parts of Central America. Agave plants are the primary source of nectar for Mexican long-nosed bats, and although population declines are not entirely understood, some think they might be connected to a loss of food resources, through both changing land use and wild agave harvesting.

A loss of roosting sites is another factor thought to impact the populations of Mexican long-nosed bats. For day roosting, the bats depend on cool caves, crevices, abandoned mines, tunnels and old buildings. There is only one known mating site for this species: in the central Mexican state of Morelos.

In this cave, males and females gather during the winter, and in March females start migrating north. Females are then believed to give birth to one or two young each year. The young are born in northern Mexico during April, May and early June, then move further north with their mothers, following the blooming periods of the agaves and cacti. In Big Bend National Park in Texas, agaves begin blooming in mid-May at lower elevations and early June at higher altitudes. The bats arrive in Texas about a month after the flowering of agaves has begun and spend most of the summer there, before following the later-blooming agaves southward in late summer or early fall. Few adult males have been recorded in Texas and northern Mexico, as males and females segregate geographically, with males rarely appearing in the most northerly part of the species’ range. From late October to February, adult males and females congregate in the same cave in Morelos again to mate.

Many aspects of Mexican long-nosed bat biology remain a mystery to scientists and conservationists alike. Because of the species’ migratory nature and a lack of knowledge about its roosting sites, it is very difficult for conservationists to get accurate population estimates. To try to answer some of these questions, BCI is working with Dr. Rodrigo Medellín, coordinator of the Program for Conservation of Mexican Bats (PCMM) to search for additional mating sites for this species in central Mexico. While the search continues, BCI and the PCMM are working with community partners in Morelos to protect the only known breeding site for the species. BCI is also investing in identifying and protecting vital agave fields along the nectar corridor that Mexican long-nosed bats rely on for survival. While these are all important steps, a revised long-term recovery plan, with committed partners in both Mexico and the United States, is desperately needed. BCI is currently building an international collaborative team to come together to revise the science and commit to actions to help save this species.

![Photo: Alfredo Flores-Zaher](image)

**The Mexican long-nosed bat feeds on the showy flowers of the agave plant.**
Through pollination, seed dispersal and pest control, bats play a vital role in the health and availability of many everyday foods.
Nuts, as we all know, don’t come cheap. But sometimes you just have to have them: All brownies are good, but brownies with walnuts are especially so. And that fun-size Almond Joy from your kid’s Halloween candy stash? It just wouldn’t be the same without its eponymous nut.

In singing the praises of these tasty treats, we’d be remiss not to mention a key contributor that plays a surprising role in getting some of these nuts—and other foods—into your pantry. With all due respect to the honeybee, it’s the bat that deserves our thanks in many cases.

In California’s Central Valley, many nut-producing farms concentrate on a single crop, whether it be almonds, pistachios or walnuts. Sierra Orchards, for example, devotes 95 percent of its 450 acres to walnuts.

But what Sierra has that similar neighboring farms do not are flat, open-bottomed boxes, affixed to barns and tall steel poles. Each of these narrow plywood enclosures houses a group of 100 or so hungry bats, which stream forth every evening to hunt codling moth adults and larvae.

A Gambian epauletted fruit bat (Epomophorus gambianus) eats a fig on the go, thereby aiding seed dispersal.
Not unlike hummingbirds, some bats hover from flower to flower lapping up nectar, while showering each with pollen from other plants.

The codling moth is a major pest that feeds on walnuts. Uncontrolled, this same insect that drills holes into apples can destroy as much as 40 percent of a nut crop—a big problem for a state that produces 99 percent of America’s walnuts.

Sean McNamara, son of Sierra Orchards founder and owner Craig McNamara, says the farm’s bats are an integral part of the farm’s pest management strategy.

“They consume massive amounts of insects, more than any spray, smoke or mist could ever affect,” McNamara says. “The bats voraciously pursue them.”

Bats in North America are fairly small. At Sierra, the most common are the Mexican free-tailed bat (Tadarida brasiliensis) and the pallid bat (Antrozous pallidus), which weigh about half an ounce and an ounce, respectively. Still, they’re capable of eating up to two-thirds their bodyweight in insects per night; one pallid bat can eat up to 17 grams in one night, about the weight of three nickels.

That adds up fast. If each of the farm’s nine colonies of 120 bats were populated exclusively with pallid bats, they’d mow through four to seven tons of insects annually. That’s the equivalent to the weight of a school bus—in bugs—every single year. And that’s just one crop, on one farm.

The planet’s more than 1,330 known species of bats serve critical roles in bringing all kinds of food to the table, for humans and animals alike.

“Because they’re so secret, we really don’t know the extent of their impact,” says Rachael Long, a University of California cooperative extension advisor who has studied Sierra’s bats. “But encouraging biological control can only add resiliency to any system.”

Pollination: Bananas

After you polish off your next ice cream sundae, consider this: Every banana you’ve ever eaten is a hybrid clone. Modern bananas are parthenocarpic, producing fruit without the help of a pollinator.

That also makes them genetically stagnant, and thus more easily contaminated.

Having supplanted Gros Michel bananas, which were the standard in the 1950s, Cavendish bananas have dominated the banana landscape for decades. But the ubiquitous Cavendish is succumbing to a deadly fungal disease. Today, scientists and researchers are scouring the tropics for disease-resistant wild bananas that could...
IT'S NO TRICK: BATS BRING TREATS

Halloween is a time for scary costumes as well as fun food. Many people associate bats with the celebration’s scary side, given their nocturnal existence and mythical ties to storybook vampires. But did you know that bats have an even stronger connection to the yummy treat side of Halloween—as well as our everyday diets? It’s true: Bats help bring many of our essential and favorite foods to the table, including coffee, rice, spirits like tequila, numerous fruits and nuts, and, perhaps most important for Halloween, chocolate.

In fact, through direct and indirect pollination, seed dispersal and pest control, bats act as our unseen gardeners for many different plant-based foods around the world:

**POLLINATION**

**Bananas**
Bananas are an ancient group that evolved with bats, their pollinators, over 50 million years. Bananas evolved nocturnal flowering, a strong and characteristic odor, plus abundant nectar and pollen to attract bats worldwide.

**Guava**
The brown flower bat (Erophylla sezekorni) and the Greater Antillean long-tongued bat (Monophyllus redmani) pollinate guava plants.

**Agave Nectar/tequila**
Tequila is produced from agave plants that in the wild rely on bats as their primary pollinators.

**Other foods supported by bat pollination:**
durian

**SEED DISPERSAL**

**Cashews**
The Indian flying fox (Pteropus giganteus) disperses the seeds of the Cashew tree in the Madurai region of India.

**Papaya**
Many bats, including the Jamaican fruit bat, Great fruit-eating bat and Seba’s short-tailed bat, disperse the seeds of the papaya.

**Figs**
Figs belong to one of the largest groups of woody plants, with about 800 species of figs worldwide. As such, figs form a large part of the diet of many fruit-eating bats, which spread their seeds far and wide.

**Other foods supported by bat seed dispersal:**
guava, bananas, jackfruit and dates

**PEST CONTROL**

**Chocolate**
Economists estimate that without bats controlling pest populations, cocoa bean yields would fall by up to 22 percent.

**Sugar**
Scientists have found that several free-tailed bat species prefer to hunt in sugar cane fields, feeding on moth and beetle crop pests.

**Walnuts**
Bats forage in walnut orchards for codling moths and other pest insects. Scientists estimate that bats provide an economic value of $10 per bat per year to walnut farmers by protecting crops from potential worm infestations.

**Rice**
Bats eat the striped rice borer moth, providing Mediterranean rice farmers a minimum of USD$23 per hectare in savings in avoided pesticide use.

**Other foods supported by bat pest control:**
coffee, corn, pears, macadamia, cucumbers, almonds and pecans
By eating beetles, moths, mosquitoes and other agricultural pests, bats help increase crop yields and decrease the need for pesticides. Unlike modern commercially grown Cavendish bananas, predecessor varieties along with extant wild bananas do require pollination. This important fact explains the conditions under which bats have been romancing bananas for millennia. Pollen- and nectar-eating bats visit the fragrant, pendulous flowers of wild bananas, transferring pollen as they rub against each new flower. They forage, so the pollen they convey can come from many miles away, ensuring a diverse genetic exchange. “Many different species of bats are involved in pollination,” says Ivan Buddenhagen, a banana expert who studied bats in Sumatra after retiring from the University of California. “Bananas seem to be adapted to bats by the way the flowers emerge; bats and bananas probably evolved together.”

Cullen Geiselman, chair of the board of directors of Bat Conservation International, studies bat pollination and seed dispersal in the New World tropics. She notes that bats also genetically strengthen other important species, including baobab, durian and, famously, agave, the plant species from which tequila and mescal is made. “Many bats are specialized for moving pollen from plant to plant,” Geiselman says. “There are also probably a lot of plants no one has ever heard of that bats are pollinating. They are maintaining those wild populations.”

Seed Dispersal: Fig
What would you eat first from a plate loaded with figs, cashews and papayas? Tough call. You just know they’re all delicious. But it turns out that these three foods have even more in common: In the New World, all of them rely, in part, on bats to scatter their seed—ensuring their growth in optimal spots and helping to keep forests alive with a diverse mixture of flora.

Figs are particularly important. They’re easy targets for bats, which swoop in, snatch up a plump fruit, then perch elsewhere to devour the pulp. Seeds end up on the ground in one of two ways: spit out as a juiceless nugget, or via

A Peters’ dwarf epauletted fruit bat (Micropteropus pusillus) enjoys a piece of fruit.
airborne defecation. Like birds, bats go on the go, but unlike birds, bats cross open spaces without hesitation. So their guano deposits often land in areas in need of reforesting—sites where species like fig and piper readily colonize.

“Bats are the farmers of the rain forest,” Geiselman notes. “They fly so far, and can be good seed dispersers to help forests regrow. Humans might not notice if we didn’t have bats to disperse certain plants, but on the level of forest regeneration, many animals rely on that, not just people.”

**Pest Control: Cacao**

Deny it all you want, but it’s true: Chocolate is getting expensive. A fussy tree that grows only in a narrow band near the equator, *Theobroma cacao* seems to be increasingly plagued by a variety of problems—disease and climate change, among others—and supply suffers accordingly. So any additional stress, including crop reduction due to insect pests, drives prices even higher.

In Indonesia, the country that grows a third of the world’s cacao trees, University of Göttingen scientist Bea Maas questioned farmers on what was responsible for controlling insects in their pesticide-free plantations. “Birds” was the unequivocal answer.

Maas suspected bats had a greater role than anyone realized, and that birds received undue credit because of timing. Farmers simply observed more birds because they were active during the day, whereas bats are active at night.

Over a 15-month period, Maas and 46 local helpers set up mesh cages to exclude birds during the day in some areas and bats at night in others. By preventing natural pest control within these cages, insects could devour cacao leaves and buds at will.

Maas found that by excluding birds and bats, cacao yield on the plants in the cages was reduced by 30 percent, with bats accounting for 22 percent of that total. At today’s market cost, that’s a reduction of $520 per hectare; translated to the entire 1.6 million hectares of cacao in Indonesia, that’s a hit of $832 million.

“Bats have a tremendous effect,” Maas says. “Bat conservation is highly important for crop systems all over the world. It’s in the best interests of farmers, but also to people who depend on them for food.”

So the next time you sit down for a meal or dig into your favorite Halloween candy, consider that there’s a very good chance that bats, somewhere in the world, had something to do with how your food got there.

It’s one case where a fly-by-night operation has a very positive—and satisfying—conclusion.
Bat myths of Japan

Separating scientific fact from cultural fiction in the island nation

On the islands of Japan, word on the street has it that bats are pretty creepy. But was it always this way? Bat researchers Keiko and Yushi Osawa, who serve on the steering committee for The Bat Study and Conservation Group of Japan, help explain.

**Bats:** How do the Japanese view bats now?

**Yushi Osawa:** These days, bats are mostly ignored, and we have fewer items with bat designs. And of those designs, a lot represent the bat as a scary creature with exaggerated fangs and red eyes. More recently, though, we have had some good books and documentaries on bats that are helping to shape a more positive opinion about them. We have begun to see some more designs that separate bats from the traditional “creepy” animal groups, like spiders, snakes and centipedes. Bat figures, mascots and other various bat accessories have also become more acceptable among modern bat crafts.

**Bats:** Does Japan have a similar holiday to Halloween where bats are featured?

**Keiko:** There isn’t any traditional Japanese holiday that features bats. However, Halloween has been gaining traction in Japan over the last several years, so it is not uncommon to pass by a shop that creates bat-related designs with Halloween in mind.

**Bats:** Does the word for “bat” mean anything special in Japanese?

**Keiko:** In Japanese, the word for “bat” is “Koumori.” There are several possible explanations as to why bats were given this name. One explanation is that it originated from the word “Kawamori,” which means protecting rivers. A second option is that it came from the word “Kawahari,” which means skin is stretched between bones. But it is also logical to believe that it was derived from “Kawahori,” which means eating mosquitoes. Regardless, it is certain that people back in the day did not have a poor image of bats.

**Bats:** Surely it is not a myth that many Japanese bats are endangered, though. Are any of the Japanese bats threatened with extinction?

**Yushi:** Many Japanese bat species are threatened and some species might be on the brink of extinction. Of 37 bat species in Japan, three are listed as critically endangered, five are observed as endangered, one is considered vulnerable, and four remain near threatened. The main threats to Japanese bats are increased cave tourism and land development, which unfortunately result in habitat destruction.

**DUE EAST**

For more about bat conservation in Asia, visit batcon.org/our-work/regions/asia.

A Ryukyu flying fox (Pteropus dasymallus yayeyamae) in Japan.
In the grassy cornfields of Southern Illinois, bats are on the hunt for insects, and according to new research, farmers have a billion reasons to be grateful for it.

BCI-funded research recently published in the Proceedings of the National Academy of Sciences confirms that bats play a significant role in combating corn crop pests, preventing more than $1 billion in crop damages around the world every year. This figure is based on a two-year experiment conducted in cornfields near Horseshoe Lake in Southern Illinois by graduate student Josiah J. Maine and his adviser at Southern Illinois University Carbondale, Justin Boyles.

Maine conducted the experiment over the 2013 and 2014 growing seasons to test how corn fared with and without bats picking off various pests. To do this, he built “exclosures”—netted structures aimed at keeping bats outside of them and away from the corn. The exclosures were large; each enclosed crops in an area greater than
The value of bats’ pest-control services to agriculture in the U.S. alone is estimated to range from $3.7 billion to $53 billion a year.

Field notes

4,200 square feet and 23 feet high.

Keeping the bats out meant pests, such as the corn earworm, were largely free to wreak havoc on the corn crops. But bats are not the only predators of these agricultural pests. So to factor in these other variables, Maine went to great lengths to ensure that only bats were excluded by the structures.

“The exclosures had to be removed daily so birds could forage normally,” Maine says. “I arranged the netting so it could be slid on the cables to one end like a shower curtain. This way I could open the exclosures each day and close them each night,” before the bats took to the air.

In all, Maine built six exclosures, each of which was paired with a control plot where bats could forage as they normally would. This arrangement allowed him to directly compare pest abundance and crop damage between the exclosure and control plots.

“The main pest in my system was the corn earworm, a moth whose larvae cause billions of dollars’ worth of damage to corn, cotton, tomatoes and many other crops,” Maine says. “The larvae feed on corn ears, causing direct damage to yield, but they also can introduce an avenue for infection of the corn ear by fungi, which produce compounds that are toxic to humans and livestock.”

While bats were known to feed on the adult moth of the corn earworm, this is the first study to directly document that they consume enough of the moths to suppress larval populations and damage to corn.

After analyzing the results, Maine notes that he found nearly 60 percent more earworm larvae inside the exclosures—where they were protected from the hungry bats—than in the unprotected control areas. He also found:

- 50 percent-plus more corn kernel damage per ear in the corn inside the exclosures;
- that the damaging fungal growth associated with pests was significantly higher on the corn inside the exclosures; and
- that the toxins produced by the fungus were much more concentrated in the corn inside the exclosures.

“By consuming crop pests,” Maine adds, “bats have tremendous ecological impacts in crop fields. Based on the difference in crop damage I observed, I estimated that bats annually provide a service to corn farmers worth about $1 billion globally. Bats likely provide additional value to agriculture by suppressing toxic fungi and reducing necessity for costly insecticides.”

The implication of these findings serves as great news for agriculture and bat conservation alike, stresses BCI Executive Director Andrew Walker: “Corn is an essential crop for farmers on over 150 million hectares globally. This research shows that by protecting bat species and their habitats we are not only furthering conservation, but also helping to secure a vital food source for communities worldwide.”

Already, the symbiotic relationship between farmers and bats seems to be taking shape.

“I’ve had some interaction with the local farmers in Southern Illinois, and from what I can tell, they are very interested in the impact of bats on their farms, because it directly impacts their bottom line and the value of their crops,” Maine says. “My study provides strong support for the idea that bats provide valuable services to society.”

A-MAIZE-ING BATS

To read an abstract or full-text version of the research, visit pnas.org and enter the author’s name into the search box.
The other batman

A satiric newspaper article that fueled an incredible hoax

Well before Bruce Wayne started zipping up his Batman suit in 1939, the “man-bat” was already popping up in Western dialogue.

It started with a telescope. In 1834, British astronomer John Herschel owned the largest of its kind, measuring an impressive 20 feet in length. Equipped with his telescope and curiosity, Herschel dedicated many of his nights to the South African sky, writing scientific reports based on his findings.

But at the hands of Richard Adams Locke, Herschel’s factual reports quickly morphed into fantasy. In August of 1835, Locke published several stories in The New York Sun claiming Herschel had made a life-changing discovery—indeed, that life itself had made it to the moon. According to Locke, animals of all varieties could be found dotting the moon’s hidden meadows—cranes, oxen, even blue goats. But nothing proved more impressive than the man-like creature adorned with robust bat wings. Dubbed Vespertilio homo, or “man-bat,” the creature was a walking—and flying—fantasy, a myth made real.

Though written for the purpose of ridiculing some of the more extravagant astronomical theories of the day, Locke’s satirical series quickly gained traction. The hoax voyaged across oceans and continents, and helped launched The Sun as the most well-known newspaper in the world. The story became so widespread that The Sun’s owner forbade Locke from retracting the story. Instead, fantastical images were published alongside the print, feeding the public’s hunger for more on this intriguing “discovery” and perpetuating the myth further.

You can find out more about this and other imaginative tales, plus the scientific discoveries that inspired them, in the Fantastic Worlds exhibition at the Smithsonian National Museum of American History. To plan a visit, head to americanhistory.si.edu.
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We offer our deepest gratitude to the following individuals, families, corporations, foundations, and corporations for their generous support of BCI in the last quarter. Your donations help us protect bats and their habitats around the world. Thank you all for your leadership and encouragement.

Note: All donations are through Aug. 31, 2015.

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The many faces of bats

From wrinkled faces to enormous ears, bats have some of the most diverse and interesting faces in the animal kingdom. To celebrate the many faces of bats—and to add a new twist to your Halloween decorations this year—BCI has teamed up with Smithsonian Libraries to bring you a range of bat-face coloring templates taken from the pages of history.

Artists both young and young at heart can express their creative flair by adding unique colors to bat face outlines reproduced from some of the best illustrations in history. Each bat face is taken from Kunstformen der Natur (Art Forms in Nature), a landmark work in the field of naturalist illustration published in 1904 that contains 100 lithographic prints produced from naturalist Ernst Haeckel’s original sketches and watercolors.

Born in 1834 in Potsdam, Germany (then Prussia), Haeckel served as a professor of comparative anatomy and director of the Zoological Institute at the University of Jena. Kunstformen der Natur, which is considered one of Haeckel’s most iconic publications, helped popularize science among a broad lay audience of the time. Today, the work resides at the Smithsonian Biodiversity Heritage Library (BHL).

With Haeckel’s engaging bat faces as your starting point, draw on your own creativity and naturalist spirit to bring a personal touch of color to each page. And remember: Bats not only have many different facial features; they also come in many different colors. So don’t hold back!

getting started

1. Visit batcon.org/color to find a bat-face template or two that inspire you.
2. Follow the instructions to download and print as many options as you choose.
3. Grab some art materials—markers, crayons or even watercolor paints.
4. Create your own bat masterpieces!

In addition to displaying your creations for Halloween, be sure to share them with us. Just take a picture of your finished work and post it to Facebook, Twitter or Pinterest with the hashtag “#BatArt.” And don’t forget to tag BCI.
Our ever-changing knowledge of bats can be traced through historical records in scientific texts, many of which reside in the Smithsonian’s rare book collection. BCI staff and our board of directors recently had the honor of touring the Smithsonian Libraries and seeing many of these invaluable original books, some of which date as far back as the 15th century. Highlights included reading the first mention of the word “Chiroptera” in Johann Friedrich Blumenbach’s manual of natural history, *Handbuch der Naturgeschichte*, published in 1779, and absorbing Darwin’s descriptions and sketches of bat species in *The Zoology of the H.M.S. Beagle*, a record of his travels to parts of southern South America, Tahiti and Australia on the 1831–1836 voyage.
Get into the Halloween Spirit

Deck out the kids this Halloween with fun bat costumes, clothes and accessories from batgoods.com. From books to bat wings, batgoods.com has bat-themed products of all kinds. A portion of every sale supports the conservation work of Bat Conservation International.

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