Counting Bats
the Hard Way
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COVER PHOTO: BCI Founder Merlin Tuttle, with thousands of bats overhead, uses a rope for support as
he surveys the most important hibernation cave for endangered gray myotis (see Page 1).

Photo © Chris Anderson, BCI / 0010106

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We peered down into the gigantic sinkhole, tied our rope to a tree, and rappelled 25 feet (7.6 meters) to a rocky landing. Then we secured another rope to two metal bolts at the edge of a 97-foot (29.5-meter) pit, crept over the ledge, and descended into the cold darkness. Then the going got tough.

At least 1.5 million bats hibernate in Alabama's Fern Cave (top), but getting inside the cave to count them is a daunting challenge (above).
Surveying the bats of Fern Cave, by far the most important remaining hibernation site for the endangered gray myotis (*Myotis grisescens*), is not for the faint of heart or for inexperienced cavers. That’s why, despite its importance, this Alabama cave — a huge complex of exceedingly rugged passages — hadn’t been visited by a bat biologist since Bat Conservation International Founder Merlin Tuttle last conducted research there more than 25 years ago.

During his initial research in the 1970s, Tuttle estimated that more than half of the remaining population of gray myotis relied on Fern Cave for hibernation. As a result of his findings, he convinced the U.S. Fish and Wildlife Service to acquire and protect the cave as a national wildlife refuge in 1981.

Counting the bats currently hibernating in the cave would be critical in confirming what appears to be one of the most important bat-conservation achievements ever — restoring a species that experts had once predicted was doomed to extinction (*BATS, Summer/Fall 2002*). To determine the number of bats currently hibernating in Fern Cave and the health of the species in general, Tuttle planned the grueling but necessary task of conducting an inventory.

On January 20, 2003, Tuttle, along with BCI cave specialist Jim Kennedy, began the rough drive down a long, winding road to the cave. Accompanying the BCI crew were me and my husband, Steve Pitts, photographer Chris Anderson, and biologist Bob Madej. Pitts, a member of the National Speleological Society and volunteer for the U.S. Fish and Wildlife Service, is access coordinator for the cave and knows it better than almost anyone. He served as the guide through the maze of passages. I helped guide the group and carried critical equipment. Anderson would photographically document the cave’s importance for bats. Madej would gain experience needed for future monitoring.

*BATS* Founder Merlin Tuttle surveys seemingly endless gray myotis roosts in Fern Cave. The endangered bats hibernate throughout much of the complex cave, but counting them is a perilous task for biologists.
A group approach was required, given the weight of hundreds of feet of rope and other equipment that had to be carried a mile and a half (2.5 kilometers) up a rugged mountain before we even began the main challenge: Fern Cave's deep pits and intricate passages.

Fern Cave is vast beyond description. Over 16 miles (25 kilometers) of interlocking canyons, sprawling rooms, and deep, vertical pits run as much as 541 feet (165 meters) below the surface. Visiting this cave requires specialized skills in rappelling and rope climbing—not to mention expertise in negotiating tight crawls, ledges over 100 feet (30 meters) above the floor, and many other obstacles. Although parts of the cave are popular destinations for cavers, the hibernation areas are strictly protected from August 15 to April 15.

After rappelling to the bottom of the pit, we moved as quickly and cautiously as possible down a narrow canyon appropriately called the Refrigerator Passage. Chimney-effect winds of 41 to 45 degrees F (5 to 7.2 degrees C) made us wish we could move faster.

Suddenly, we rounded a corner and were greeted by huge clusters of gray myotis. They blanketed the limestone walls for as far as we could see. I really didn't expect to see bats this close to the entrance, since I assumed it would be too cold for them. Turns out the gray myotis really like temperatures in the low 40s (F), which makes Fern Cave an ideal hibernation most.

There are around 4,000 caves in Alabama, but this is the only one that combines the multilevel entrances and huge volume required to trap enough cold air for gray myotis hibernation. The bats come here from hundreds of miles around.

As soon as we passed through the Refrigerator Passage, hundreds of thousands of bats began waking up, a typical reaction for this species. Soon we were engulfed in a massive bat flight.

The sound of thousands of bat wings created a dull roar like a distant waterfall. In fact, there were times when we simply couldn't move for fear of hurting them. We crouched low while literally tens of thousands of bats passed within inches of us, often using a shoulder as a temporary landing site. Such a close encounter with so many bats was an awe-inspiring experience!

Tuttle and Kennedy estimated that just the first small section of cave, about 100 feet (30 meters) stretching from the entrance to the next large room, held some 200,000 bats.

Counting that many small animals seems almost as much art as science. You just can't count that many individuals. So they first estimate the number of bats in a manageable area—one square foot (929 square centimeters), for instance. Anywhere from 50 to 275 gray myotis can be packed into a square foot of roosting space. Then they estimate the total area where bats are roosting. You get a total by multiplying the number of square feet by the estimated number of bats per square foot. To better understand error rates, Tuttle and Kennedy didn't compare their counts until several days later. Then they averaged their numbers.
You may wonder how these counts could make much difference in conservation planning, given the number of bats that we certainly missed. It was obvious that the conditions at the entrance indicated that humans had not been disturbing them. Turtle’s counts at other entrances would not have been able to visit. Turtle indicates that the counts increased since the caves gained protection. The gray myotis has survived but needed more protection.

As the task was well illustrated in the sketches, they would not be needed. Turtle, relying on his sketches, was able to find the interior of the cave. The large room also contained many gray myotises, but these can be quickly exhausted if the bats are repeatedly disturbed. On average, bats lose approximately 50% of their body mass during hibernation, but this is much lower when feeding has been good. It is normal to wake up and sometimes change roosting locations within a cave before hibernation.

The temperature of hibernating gray myotises in Alabama’s Ten Mile Cave can be measured by Jennifer Pinkey in a cave from her work. She has been interested in bats and their long-term significance. Pinkey measures the temperature of hibernating gray myotises in Alabama’s Ten Mile Cave.
Churning the Food Chain

Frogs are food for bats in Central America, but they turn predator in Australia

by D. Bruce Means

“SOMETIMES YOU EAT THE BEAR, AND SOMETIMES THE BEAR EATS YOU.” That old cowboy adage acknowledges that nature can get a bit topsy-turvy: The diner and the main course occasionally switch places at the table. Such is the strange case of the predator-prey relationship between bats and tree frogs.
As a herpetologist, I was fascinated in the early 1980s by the discovery that a Central American bat (Trachops cirrhosus) feeds on tree frogs, and BCI Founder Merlin Tuttle’s superb action photographs of this behavior became etched in my mind.

But an ocean away, I found that prey can turn predator as I watched Australian tree frogs literally gulp down bats.

Two years ago, I contracted to make a documentary film about Australian snakes. I was especially excited at the prospect of filming pythons nabbing bats at the mouth of Bat Cleft, a maternity cave for the little bent-wing bat (Miniopterus australis) in Mount Etna Caves National Park in southern Queensland. I took my camera along in hopes of getting a few images to use in my lectures.

At the cave, at 7 p.m. sharp, the first bats begin spiraling upward, shooting out of the maw of the cleft and disappearing into the waning twilight. Ten bats shoot out. Twenty, fifty, then hundreds flutter around me, their wings touching my face and arms. Bat Cleft is so narrow that the bats must fly zigzag paths from one end of the cleft to the other to gain altitude before reaching the open sky. So many bats are trying to leave the maternity chambers 70 feet (21.3 meters) below that they interfere with each other’s flight. I hear the tiny, flickering sounds of hundreds of bat wings brushing against other bats and against the rough limestone walls. Countless bats stir a continuous wind in my face and create a low-pitched roar, like the “sound of the ocean” you hear in a conch shell.

Now come the predators. I slowly turn my head and see a small, dark-spotted python (Liasis maculosus), about 30 inches (76 centimeters) long, moving over the limestone boulders of the cramped side chamber where I wait. Sitting on one of the boulders that the snake passes is a big green tree frog (Litoria caerulea). The snake crawls in a straight line, reaches my book, crawls right over it without hesitation,
and comes to a stop on a jagged piece of limestone that’s jutting out into the cleft. It anchors itself on the rough rock, then stretches its head and half of its body out into the air of the abyss. Bats are making a sharp turn at this point, and some of them brush the limestone – and the snake. Soon the little python nabs one in the air by biting sideways when it feels a bat’s touch. It begins constricting the bat.

I feel a thud on my boot. The tree frog is moving forward, too. I look back and see another tree frog entering my small chamber from a crack in the limestone that leads to the outside world. Eventually, both frogs pass me and take up positions at the edge of the abyss. The first frog sits on a flat part of the spotted python’s rock, just inches from the snake.

In the frenzy of the emergence, many bats alight briefly on the limestone walls before renewing their upward progress. Some land on me and crawl across my chest. I remain frozen, trying not to interfere with their activity. There are so many bats that they can’t all fly through the cleft at once. A few land on the flat rock near the tree frog, which starts at them glumly as each bat flies off.

A different kind of snake appears on the left wall of the abyss, a skinnier snake, orange-brown, and longer than the spotted python. This is a brown tree snake (Boiga irregularis), a native of Australia that has wrought havoc on fauna of the mid-Pacific island of Guam. It has a bulbous head and red, reflective eyes. It takes up a stance similar to that of the second python: hanging from the sloping wall and dangling out into the air to intercept a bat. Soon it has back end of a little bent-wing bat hanging out of the mouth of a frog. I am astounded as I contemplate this predator-prey turnabout.

With some difficulty, I bend to photograph the frog, which sits facing me with the bat sticking out of its big mouth. The frog is not much bigger than the bat. About this time, one of the pythons has caught and constricted a second bat. Frog and python sit there, inches apart, eating bats. The frog makes three gulping movements and the bat disappears.

I return to the cleft two nights later. I hunker down in my cramped chamber and watch another green tree frog waiting patiently at the edge of the abyss. Spotted pythons and brown tree snakes come and go. Then, during the heaviest outpouring of bats, some of them drop onto the rock where the tree frog sits. One fallen bat struggles forward, directly toward the frog. A gaping mouth quickly opens and snaps shut, leaving the posterior of the bat protruding. The frog makes a swallowing movement and more of the bat disappears. Then the frog uses one hand to push the bat’s wing forward. Two more gulps and the bat is gone.

On three nights, I witnessed frogs eating bats a total of four times; snakes consumed at least 50 bats. Exactly what led this population of tree frogs to add bats to its menu is uncertain. However, the destruction of alternative roosts worldwide is forcing more and more bats to congregate in fewer locations, making them increasingly vulnerable to predators. Several of Mount Etna’s bat caves have been permanently destroyed. Thanks to the diligent efforts of local colleagues and letters from BCI and its members, several, including Bat Cleft, eventually won protection.

D. BRUCE MEANS is President and Executive Director of the Coastal Plains Institute and Land Conservancy in Tallahassee, Florida, and an Adjunct Professor of Biological Science at Florida State University in Tallahassee.
Giant Bats Face a Shrinking Forest

by Brent J. Sewall

Conserving Livingstone’s flying foxes on the Comoros Islands

There’s one!” Daoud cried, shielding his eyes from the sun. I jerked my binoculars up and followed the dark shape as it circled and rose from the valley below. With jet-black wings larger than any hawk I’d seen and distinctive black-and-rust fur, Daoud’s find was unmistakable. We had just caught sight of a soaring Livingstone’s flying fox (Pteropus livingstonii) — one of the largest, rarest, and most unusual bats in the world.
We were on an archipelago between northem Madagascar and mainland Africa in the western Indian Ocean. Eleventh-century Arabic explorers called these islands the Comoros Islands—Islands of the Moon—because of their basalt rock fields, cooled lava from a still-active volcano. The mountains of these islands are covered with lush rain forests, where Livingstone's flying foxes fly among the treetops in search of their favorite foods: nectar and fruit.

But that search is becoming more difficult. The bats' rain-forest habitat is shrinking at an alarming pace. Fewer than 1,500 of these great bats exist, all of them on two small Comoros islands: Anjouan and Mohéli. The deforestation rate here is one of the world's highest—nearly half the forest vanished in the last decade. The World Conservation Union lists these bats as critically endangered.

With the forests disappearing, the survival of Livingstone's flying fox depends on the rapid conservation of its most critical habitat. But which habitat is most critical? What forest areas and which tree species should we protect first? Until now, little has been known of the bats' foraging ecology—how the bats search for food, where they go to feed, and what they eat. This critical problem has vexed the Comorian government and conservation groups. And it was the motivation for my visit to the Comoros Islands. With support from a Bat Conservation International scholarship and help from my Comorian field assistant, Daoud Attoumane, I investigated the bats' foraging ecology on the island of Anjouan.

Daoud understands why the forest is retreating up the mountainsides. He lives with his wife and two children on Anjouan, farming small fields near the village of Sangani. “When I moved to Sangani 12 years ago, I wanted to plant cassava and Angola peas, but all the land close to town was taken. So I cleared land up here,” he said. “Then more people came to Sangani. They put in their fields above mine.”

The bat we were watching soared high above the valley, slipped out of its column of warm rising air, and began gliding toward the far hillside. As it flew just above the forest canopy, its wings beating slowly, Daoud and I watched carefully for the bat to reveal its destination. Suddenly, the bat banked to the right, circled twice about a treetop, and just after skimming over a branch, grabbed on tightly with its feet. It swung in a half-circle around the branch to a hanging position as the branch sagged from its weight. The bat had just completed its first flight of the day, unaware that it had given us a valuable clue to understanding its foraging ecology.

The author's field assistants, Daoud Attoumane (left) and Ishaka Said, measure the girth of a giant-leaved fig tree on the Comoros Islands. The fruit of this tree is favored by Livingstone's flying foxes, which are threatened by the rapid disappearance of the island's rain forests.
The next morning, we hiked across the valley floor and up the opposite hillside, searching for the tree where the bat landed. Daoud and I climbed side by side to avoid the rocks that loosened under our steps and tumbled downhill. The tree we sought was an enormous giant-leafed fig (Ficus lutea) rooted in another steep slope. The fig’s waxy green leaves, each the shape and size of a flattened football, filled the canopy nearly 50 feet (15 meters) overhead and spread more than 30 feet (9 meters) from the trunk in all directions. Its branches were festooned with bunches of marble-sized, purple-speckled yellow figs.

Did the bat land here to eat these figs? Do Livingstone’s flying foxes prefer figs to other kinds of fruit? To find out, we hung tarps of porous cloth to capture fruit and any other items dropped by flying foxes. We repeated the process at other sites, until dozens of white tarps dotted the landscape. We left the tarps open through the next foraging bout, which for Livingstone’s flying fox – one of the few partially diurnal bats in the world – begins in late afternoon and continues for half the night.

When we inspected the tarps the next day, Daoud plucked a fruit from the first tarp. “Teeth marks,” he said, pointing at a hole in one side. In another tarp, we found a different clue: a walnut-sized object we call an ejecta pellet. When a bat eats fruit, it chews and then presses the fruit against its palate with its tongue, squeezing out the juices. Eventually, it spits out as much of the dry, fibrous pulp as possible.

This pellet, yellow-brown with a grainy texture, was formed of the fruit of a giant-leafed fig tree. Daoud measured teeth imprints in the pellets and found them so large that only a Livingstone’s flying fox could have made them. One mystery was solved: Livingstone’s flying foxes do eat giant-leafed figs.

Because pellets of this type were commonly found, despite the relative rarity of giant-leafed figs in the habitat, it became clear that these are a preferred food. The small, black seeds embedded in the pellets showed that bats return the favor by carrying seeds away from the tree. As Daoud put it, “I knew people planted coconut and mango trees, but I never knew who planted forest trees until I started watching the bats.”

Through investigations like this, we identified several tree species that apparently are most important for Livingstone’s flying foxes, as well as the islands’ two other fruit-eating bats: the Seychelles yellow-headed flying fox (Pteropus seychellenesis comorensis) and the Comoros mouse (Rossellus oblivius). While these last two bats sometimes eat fruit from trees planted by people, Livingstone’s flying fox relies almost completely on a few native forest trees. That means its fate will remain tightly linked to that of the rapidly disappearing forest. But it also suggests ways to help this bat survive.

Brent Sewall and his field assistants placed tarps like this one (below) around the rain forest to collect fruit and anything else dropped by Livingstone’s flying foxes. Among the collections were these “ejecta pellets” (right), which are what’s left of the fruit after the big bats chew it and squeeze out the juice. The flying foxes spit out the dry, pulpy remains. These often-found pellets originally were fruit of giant-leafed fig trees, confirming that the fig is an important part of the bats’ diet – a finding that could help conservationists identify the most critical habitats for protection.

A common agricultural practice on the islands is to retain some trees as forage for cattle, erosion control, and shade. So, at least for the short term, farmers can reduce the impact of deforestation on bats by simply retaining the “bat trees” that we’ve identified. For the long haul, our findings should help identify for conservation those areas of remaining forests that provide the most critical habitat for Livingstone’s flying fox.

These and other ideas from my research are being directly applied to conservation. The Comorian government, local and international conservation groups, and rural Comorians are united by a common interest in Livingstone’s flying fox, and together we are developing a plan to...
protect the species. This conservation plan emphasizes habitat protection, environmental education, research and monitoring, captive breeding, and sustainable development.

The plan is to be implemented mostly by rural community groups and Comorian non-governmental organizations, with the support of the government and international groups. We have presented this five-year plan to the Comorian government, with the hope that it will be set in motion in the near future.

Success will depend upon the engagement of rural Comorians, who unfortunately face a host of other problems—from poverty and poor health to declining soil fertility—which demand their attention. Yet these very issues have convinced many Comorians of the need to protect Livingstone’s flying fox. “We need the forest for wood to build, roots for medicines, and streams for drinking water. And the trees need bats,” one villager said during a meeting on the conservation plan. “How can we exist without the forest? Without bats? Conservation may be difficult, but it is our only choice.”

Back on our ridge-top perch the next day, as Daoud and I tracked the flight of a pair of Livingstone’s flying foxes, I puzzled over still-unanswered questions. Why do the bats prefer the fruits they do? How much forest must be protected to sustain the bats? What is the best way to meet the needs of both bats and people?

We had already learned a great deal, but there was much more to learn about the bats’ foraging ecology and how best to protect them. As the Livingstone’s flying foxes embarked again on their daily search for food, we were ready to follow wherever they led us.

BRENT J. SEWALL conducted this research and coordinated the development of the Comorian National Livingstone’s Flying Fox Conservation Action Plan as a graduate student in Conservation Biology at the University of Minnesota. He is currently studying the ecology and conservation of tropical forests at the University of California at Davis. His research was partially funded by BCI.

(The author also gratefully acknowledges matching support from the Darrell Wildlife Conservation Trust, Bristol Zoo Gardens, Dayton-Wilke Fund of the Bell Museum of Natural History, University of Minnesota’s MacArthur program, University of Minnesota’s Office of International Programs, and University of Minnesota’s Conservation Biology program. Collaboration included Proje Biodiversité and Action Comores-Aménuan. Other field assistants included Ishaka Said, Joseph Hawai, Salihi Radjali, Soyuze ben Said Mardjam, Ahmed Abdallah, Ahbou Said, Elise Grame, and all of the Mohéli Marine Park wardens.)
K

Keith Christenson's wife, Jen, represents the United States in various countries as a State Department official. Keith represents bats.

A caving enthusiast whose encounters with bats and BCI convinced him to become a bat biologist, Christenson discovered and documented bat caves, advised wildlife agencies, and educated people from Cuba to Africa on the importance of bats to economic and environmental health. Much of that was done on his own during his travels as a "diplomatic spouse."

For his accomplishments as a dedicated, if unofficial, bat ambassador, Bat Conservation International recognizes Keith Christenson as the Bat Conservationist of the Year for 2003.

Christenson, a BCI member since 1994, describes his educational history as "checkered." He went to Pennsylvania State University in 1983 for an aerospace engineering degree, a plan that didn't work out. About eight years later, the amateur caver encountered Jim Kennedy, now BCI's Cave Resources Specialist, and found his interests focusing on bats and other small, cavedwelling mammals. Landing a job with the Pennsylvania Game Commission, Christenson worked with longtime BCI partner Cal Butchkoski and "quickly realized that working with bats was my calling."

He returned to Penn State, earning a bachelor's and later a master's degree in wildlife and fisheries science. "My interest in bats had always been high, but after Merlin Tuttle and Janet Tyburee began holding bat workshops in Pennsylvania, I was hooked forever." He participated as a facilitator at several of the workshops during his highly productive six years with the Game Commission.

Then he married Jen and promptly found himself living in the Dominican Republic. Over the next two years, on a purely volunteer basis, he visited 200 caves, documented bats in almost 100 of them, and wrote conservation reports for the national parks agency. He kept it up after moving to Panama and later Zambia, and also made working visits to Peru and Cuba.

Everywhere he went, Christenson identified caves used by bats, educated communities and officials about the values and needs of bats, and provided government agencies with information that is essential for protecting cave-dwelling bats.

The family recently returned to the United States, living now in the Washington, D.C., area, where this ambassador for bats is still on the job.

Still time to sign up for a BCI Field Workshop

Get hands-on experience in bat-conservation and field-research techniques at BCI's 2004 Bat Conservation and Management Workshops.

In addition to our popular sessions in Portal, Arizona, and Barree, Pennsylvania, we're adding a workshop this year in the heart of U.S. karst country near Kentucky's Mammoth Cave, plus a special acoustic-monitoring session in Arizona. (Please note the revised schedule for the Acoustic-Monitoring workshop.)

The 2004 Workshop Schedule:
Services

W hen the Coeur d’Alene Mines’ Rochester operation in Ne-

vada targeted the Nevada Packard silver-mining district for development, it discovered about 110 Townsend’s big-eared bats (Corynorhinus townsendii) roosting in the complex of abandoned mine workings. Though it was not required to do so, Coeur Rochester, under the leadership of Environmental Manager Jerry Hepworth, invested more than $110,000 over three years to rescue these bats and find new, improved homes for them. Along the way, the company developed what it hopes will be a carefully documented model for future relocations of the species.

For its extraordinary efforts to protect these bats and improve scientific knowledge about their habitat needs, Bat Conservation International honors Coeur Rochester as its 2003 Corporate Conservationist of the Year.

Nevada Packard was mined intermittently from the 1890s to 1970s, work that left about 150 openings in the area where Coeur Rochester identified a commercially viable Óebody. Upon discovering that Townsend’s big-eared bats were using the old workings as seasonal habitat, Rochester decided to “redefine the state of the art” in reclamation of abandoned mines. The company teamed with University of New Mexico Professors William L. Gannon and Richard E. Sherwin (a former BCI Scholar) to study the reclamation of bat-inhabited mine works, put the new knowledge to practical use, and monitor the results. Rochester added its own financial support to a National Fish and Wildlife Foundation grant for the Gannon-Sherwin study.

Simply moving big-eared bats from one shaft to another was not enough to ensure survival. Because their habitat needs vary according to seasonal, reproductive, hibernation, and feeding requirements, careful planning was required for successful relocation. The broad extent of workings at Nevada Packard made it an ideal setting to conduct the research and develop a model.

The project included winter and summer surveys and an analysis of 79 candidates for alternative roosting sites, of which six were selected as optimal. Two exclusions were undertaken, each planned to minimize risks to the bats. Subsequent surveys found no bats in the old workings, and additional surveys are planned to confirm that. Meanwhile, bat-friendly gates are planned at the six alternative sites, where monitoring continues.

The systematically collected data, both fundamental research and its application in the field, already have been the subject of four peer-reviewed publications, with at least seven more in various stages of completion. Much of the exclusion and habitat information has already been reported to the Nevada Division of Wildlife and the U.S. Bureau of Land Management to help similar efforts in the future.

“We are proud of what happened here,” the company said. “The old miners created the habitat. The new miners cleaned up after the old, found the bats new homes, and improved public

A Coeur Rochester staffer backs carefully into an old mine as part of the company’s efforts to safely relocate bats that have been using abandoned mine workings in Nevada.
A New Kind of Bat House

At Conservation International has for several years been developing and testing a new generation of artificial bat roosts. These new roosts are designed specifically for forest-dwelling bats that historically required extra-large hollows found only in ancient trees.

Solving the roosting needs of these bats is urgent. As North America’s old-growth forests were harvested, many of them more than a century ago, bats that relied on big tree hollows lost their homes. Those that survived often moved into the empty rooms of abandoned cabins. Now even these are disappearing as the aging and often abandoned structures collapse or are torn down. With few alternatives available, new solutions are critical.

Experimental roosts made of concrete culverts are already attracting bats, but their use is limited by the high cost of transporting and erecting these extremely heavy sections. A solution is now being tested in Kentucky’s Mammoth Cave National Park, where one of the state’s few remaining nursery colonies of Rafinesque’s big-eared bats (Corynorhinus rafinesquii) will soon be evicted from an old building. When that happens, the bats will find the first-ever cinder-block roosts.

Designed by BCI and paid for with contributions from BCI member Paxson Offield, these experimental roosts are much less expensive to build. Another pair of cinder-block roosts is planned at Saint Catherine Creek National Wildlife Refuge in Mississippi, again thanks to Offield’s generosity and a grant from the U.S. Bureau of Land Management through the National Fish and Wildlife Foundation.

If successful, this new approach could provide desperately needed roosts for some of America’s most threatened forest bats.

To help support this important, continuing research, please contact Mark Kiser at mkiser@batcon.org or (512) 327-9721.

Bats & Forests

Many of North America’s top foresters and bat biologists will be in Hot Springs, Arkansas, March 9-12 for the 2nd Bats and Forests Symposium and Workshop. Organized by Bat Conservation International, the session will feature the latest research on how bats use forests and how efficient forest management can enhance bat conservation. The symposium features scientific presentations, posters, field trips, and a special half-day workshop on techniques for managing bat habitat. Co-sponsors include the Southeastern Bat Diversity Network, the American Forest and Paper Association, the National Council for Air and Stream Improvement, the U.S. Bureau of Land Management, and the U.S. Forest Service. Information: www.batcon.org/nasbf.html
Amazon Eco-Adventure
Join BCI for an unforgettable cruise

Cruise the Amazon with Bat Conservation International Founder Merlin Tuttle into one of the world’s richest wildlife habitats, home to scores of bat species, colorful birds, huge caimans, and the remarkable white uacari, a monkey with long white fur and a bright red face.

Fabled Amazon riverboat Captain Moa Fortes and Brazilian biologists will take us into some of the most remote regions of Brazil’s Mamiraua Reserve, the largest single block of protected rain forest in the world.

Within this seasonally flooded forest reserve, we may see more than 250 species of birds, including primitive hoatzins, macaws, and toucans, and such mammals as manatees, dolphins, capybaras, sloths, giant otters, and jaguars. Ten species of monkeys and marmosets scamper noisily in the trees. The largest known population of black caiman, some reaching lengths of up to 18 feet (5.4 meters) long, shares the waterways with anacondas.

Evenings will be spent netting and photographing bats along upland jungle trails. A dazzling array of bats can be expected, including vampires, frog-, fruit- and nectar-eaters, fishing bats, and possibly even canivores with wingspans up to three feet (1 meter). Last year, on the less-diverse Rio Negro, we saw 35 species.

We arrive after the rainy season, but during the height of Amazon flooding, the best time for spotting land-loving animals, such as boa constrictors and jaguars. Relying on his deep knowledge of Amazon river waters and wildlife concentrations, Moa will take us by canoe deep into his favorite flooded-forest waterways, both day and night.

Captain Moa’s Victoria Amazonica provides private (double-occupancy) rooms with air-conditioning and baths, a beautiful dining room and bar, gourmet food, an upper viewing deck, and an assortment of motorized canoes.

Due to the exceptional popularity of these trips, we are offering two during 2004 — the first June 3-15 and the second June 12-24. The cost, including round-trip airfare from Miami, is $3,950 per person, which includes all accommodations and meals aboard the boat and a tax-deductible $1,000 contribution to BCI. Your contribution will be used to support urgently needed conservation projects in Latin America.

We hope you will join us for this unique adventure. To reserve your place, please call Pat Ludden today at (512) 327-9721, ext. 26.

See Bats & Ruins in Southern Peru
April 7-19, 2004

Travel with BCI deep into the Amazon Basin and high into the Andes. On this spectacular adventure, we will explore remote tropical rain forests and the highland cloud forests surrounding Machu Picchu. These two ecosystems are teeming with amazing bats (fish-, frog-, nectar- and fruit-eaters, as well as vampire bats) and other wildlife. Fiona Reid, author of A Field Guide to the Mammals of Central America and Southeast Mexico, leads this amazing ecotour.

$4,500 from Lima (includes a tax-deductible $500 contribution to BCI’s Global Grassroots program)

For more information and to register online, visit our Web site at www.batcon.org/trips/toptrips.html or contact Andy Moore at amoore@batcon.org or (512) 327-9721.
‘The Call of the Wild’

That outdated old cell phone you haven’t used in years can help save some bats instead of gathering dust in a desk drawer or closet. The Houston Zoo has launched a cell-phone recycling program that sends 100 percent of the money it raises directly to Bat Conservation International.

The Wireless Foundation pays for every cell phone, battery, or charger that’s donated for recycling. The collected phones will be refurbished and sold or safely recycled. The Houston Zoo chose BCI as the sole recipient of its phone-recycling program, issuing the appeal: “Answer the Call of the Wild – Be a Bat Crusader.”

Winning Pollinators

Pollination Partnerships in Texas, a traveling exhibit featuring bats and other pollinators, won third place in a national Media Awards Competition.

Developed by the Botanical Research Institute of Texas and supported by the National Fish and Wildlife Foundation and Pier 1, the exhibit teaches about “one of the most vital ecological processes on earth: the plant and pollinator relationship.” The bat portion of the exhibit is based on photos and information provided by BCI.

About 160 entries from across the United States competed for the 2003 awards given by the National Association for Interpretation. The Texas exhibit, displayed at a number of Texas sites, will be at the University of North Texas in Denton through March 2004.

A Welcoming Gate

Blowing Hole Cave on Florida’s Withlacoochee State Forest once sheltered a colony of southeastern myotis (Myotis austroriparius), a species that has declined alarmingly because of human disturbance of its roosts in caves.

The declining colony disappeared entirely after installation of a gate that inadvertently excluded bats. Now, thanks to funding from the Florida Division of Forestry, advice from BCI’s Cave Resources Specialist Jim Kennedy, and construction expertise from BCI member and veteran cave-gater Roy Powers, there is a chance for the bats to rebuild their colony.

This past summer, Powers and his team installed a cupola-style gate over Blowing Hole Cave’s entrance. For the first time in many years, bats will have a chance to enter and exit freely without threat of disturbance.

The Wish List

Your help with any of these special needs will directly improve BCI’s ability to protect bats and bat habitats. To contribute or for more information, please contact Acting Development Director Nicole Daspit at (512) 327-9721 or ndaspit@batcon.org.

Vietnam’s Threatened Bats

Bat research and conservation is only just beginning in Vietnam, where these invaluable mammals are widely considered not only a symbol of bad luck, but also a favored menu item. Bat populations of Vietnam’s Cat Ba National Park, meanwhile, are under increasing pressure from unregulated hunters who harvest bats for human consumption. This tropical island park includes wonderfully diverse habitats ranging from limestone mountains to swamp forests, yet only four bat species have thus far been documented there.

The Vietnam Center for Natural Resources and Environmental Studies requests a Global Grassroots Conservation Fund grant of $4,940 to conduct baseline population surveys in the park. The results will be used for local bat-awareness programs.

Piercing the Darkness

A constant challenge in studying bats is that most of them are active only at night. Studying their behavior and habitat use requires night-vision equipment. BCI biologists find themselves hampered by worn-out infrared light sources for our two night-vision scopes. To improve our research and educational effectiveness, we need two IR6 lamps ($450 total) and two battery packs and chargers ($160 total).

Sharing Knowledge

Nothing changes attitudes about bats like pictures, and BCI educators use them liberally in frequent presentations to schools, community groups, and workshops. To give these presentations more impact, we need a lightweight, high-resolution LCD projector to display PowerPoint presentations from a laptop computer to a projection screen. The cost is $2,000.
The Discoverer of Echolocation Transformed Bat Research

Donald R. Griffin (1915-2003)

Donald Griffin discovered bats’ use of echolocation in 1940, opening what he once called a “magic well” from which scientists have been extracting knowledge ever since. More than six decades later, that well is still pumping. Echolocation, a term he coined, has been confirmed in a wide variety of animals and become a cornerstone of bat research.

Griffin, who did so much to reveal the wondrous complexity of bats, died November 7, 2003, at his home in Lexington, Massachusetts. He was 88. Griffin’s wife, Jocelyn Crane, died in 1998; he is survived by two daughters and a son. And, notes bat biologist M. Brock Fenton, Biology Department Chair at the University of Western Ontario, “he is survived by his work. He left the world of biology a much richer place.”

Few scientists have done more to fascinate the public about bats. BCI Founder Merlin Tuttle remembers him for his early encouragement, while BCI Science Officer Barbara French found him a wonderful mentor, providing priceless kindness and enthusiasm in support of her studies of freetailed bat communication. And bat researchers around the world will long remember Griffin’s lead-off presentation at BCI’s Echolocation Symposium in Austin, Texas, last year.

Donald Redfield Griffin, born August 3, 1915, in Southampton, New York, published his classic book, Listening in the Dark, in 1958, describing the biological sonar system of bats and how they use it both for high-speed collision-avoidance and to locate, track, and capture flying insects. It was an epic discovery in biology and was not without controversy at the time.

He saw echolocation confirmed not only in most bat species, but also in toothed whales, porpoises, shrews, oilbirds, and swiftlets. Griffin was a Harvard University undergrad when he conducted the pioneering research with fellow student Robert Galambos from 1938 to 1942.

But the seeds of the echolocation story were planted 150 years earlier [BATs, Summer 1991]. Eighteenth-century Italian scientist Lazzaro Spallanzani put an owl and a bat in a completely dark room and found that while the bat flew effortlessly the owl kept bumping into objects in its flight path. When he covered the bat’s head, it also had trouble navigating in darkness. Spallanzani concluded that bats navigated with an unidentified “sixth sense.”

Swiss zoologist Charles Jurine, meanwhile, found that blocking one of a bat’s ears spoiled its navigating abilities, a finding Spallanzani pursued, eventually concluding that bats somehow see with their ears, perhaps using sound. That notion was considered preposterous by his peers. It languished until Griffin puzzled over the ability of bats to fly at high speeds through pitch-dark caves without running into each other or walls.

Griffin recalled years later that Harvard Physics Professor George Washington Pierce had developed a “sonic receiver” to study insect sounds. The device took high-frequency sounds beyond the range of human hearing and reduced the pitch to an audible level. Griffin convinced the professor to use the receiver while bats flew about his laboratory. Those first runs in about 1938 were disappointing. Griffin and Galambos explored and tested until they eventually demonstrated that bats were in fact emitting a stream of high-frequency sonic beeps in flight and that blocking either hearing or sound emission caused the bats to bump into obstacles. “These were,” Griffin understated, “surprising results in 1940.”

Griffin continued his innovative experiments over the years, soon confirming that bats adjust their sonic beeps for the task at hand (whether collision avoidance, searching for prey, or closing in to attack) and analyze the echoes of the beeps with surprising precision. “Animals do not perform miracles,” Griffin wrote of echolocation in 1988, “but some of their capabilities would have seemed magical had anyone ventured to suggest them 50 years ago.”

Griffin, elected to the National Academy of Sciences in 1960, was a professor of zoology at Cornell University, Harvard, and Rockefeller University, from which he retired in 1986. His retirement hardly ended his research: Griffin continued to present papers at national and international meetings, providing key ideas and encouragement to a variety of students and scholars.

The research Griffin spawned continues unabated, as each new bit of knowledge seems to spark still more questions. “Don took us to the magic well of echolocation,” Fenton said. “It is his well, but he always shared it, and he will ever be with those who go there.”
Bat Conservation International’s Student Scholarship Fund has helped 172 young scientists conduct research on vital bat-conservation issues in 44 countries over the past 13 years. These scholarships support projects that are critical for today’s conservation planning, while they also prepare a new generation of biologists and conservationists to expand the worldwide efforts begun by BCI.

Our 14 student scholars for 2003 are exploring a wide range of topics in 12 countries. A sampling:

- Researching diet, habitat, and conservation needs of cave-dependent bats in Madagascar’s Berenty Reserve to better balance tourism with bat conservation.
- Evaluating the roosting and habitat needs of the long-fingered myotis (Myotis capaccinii) to improve the management of vulnerable populations in the Dalion Forest Reserve of Greece.
- Broadcasting the sounds of bat echolocation over Texas crops to test their effectiveness in repelling moth pests.
- Evaluating selective forest practices to better protect bat diversity and ensure forest health in Brazil.
- Studying detailed distribution of New Zealand’s two native bat species to help predict key roosting sites.

A lack of scientific knowledge remains one of the biggest threats to progress in bat conservation, and the primary hurdle to helping more young conservationists pursue that knowledge is insufficient financial support. Every year we must reject many worthy applicants. In our most recent review period, we received a total of 56 applications, but we could fund only 14.

An international panel of nine leading bat scientists is currently reviewing our 2004 scholarship applications. Your donation today can help ensure that these dedicated students and their conservation projects will not be left out. Help BCI make 2004 our most successful scholarship year!

To learn how you or your company can support deserving young conservationists, please contact:
Nicole Despit, Acting Director of Development
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