

Ghana's Treetop Bats

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by Dan Taylor

I lay motionless on my back on a small wooden platform, perched high in the crown of a great tree. The night was dark and moonless and the heavy tropical air seemed to absorb the light of all but the brightest stars. I strained to hear something that would tell me the bats had arrived, but heard only the sound of my breathing, the faint rustle of leaves, and the quiet whine of a mosquito. A smile slowly spread across my face as it occurred to me—yes, you are indeed 6,000 miles from home, lying in the dark on a tiny platform, suspended more than 100 feet above ground in a West African forest.

A year earlier, while working at BCI, I had become aware of the plight of flying foxes. Some 200 species of these unique bats are key pollinators and seed dispersers of Old World tropical forests. Unfortunately, they are also one of the most critically threatened groups of bats, often overharvested for food or slaughtered in large numbers when they occasionally harm orchards. In Africa, many are killed simply because of misperceptions.

I returned to school at Northern Arizona University, determined to conduct research that could help these fascinating and imperiled animals. While reviewing the literature in BCI's library, I came across Don Thomas's excellent thesis on a West African flying fox community [BATS, Winter 1991, 8-13]. I read that the fruit of the Iroko tree (*Milicia excelsa*) makes up 88.9 percent of the diet of the straw-colored flying fox (*Eidolon helvum*) during its annual migrations. Aware that Iroko ranks as one of Africa's most valuable and threatened hardwood trees, I realized that seed dispersal of such an important tree would provide strong economic incentives for the conservation of Ghana's traditionally persecuted straw-colored flying foxes. As a result, I planned a collaborative project with the Forestry Research Institute of Ghana.

Ghana lies along the Gulf of Guinea and is bordered by Cote d'Ivoire to the west and Togo to the east. Known as the Gold Coast under British rule, Ghana's rich history centers on the once-great Ashanti Empire. The European presence in Ghana is still marked by a string of colonial forts and castles that dot its coastline—strongholds that anchored the European trade in gold, ivory and slaves. Today, gold is still the country's most important export, followed closely by cacao and timber. Almost 17 percent of the timber revenue is from one tree, the Iroko.

Known locally as the odum tree, the Iroko is a fast-growing canopy emergent, meaning its crown extends well above the primary forest canopy. A female Iroko tree typically fruits every other year, producing a huge crop of finger-sized fruits resembling mulberries. Each fruit contains an average of 80 small, tomato-like seeds that must be transported away from the parent tree in order to germinate and begin the long journey to adulthood.

The second largest of Africa's 13 fruit bats, the straw-colored flying fox has dark wings that contrast with the tawny fur on its back, shoulders and belly, and adult males also have a bright orange ruff. They are found across Africa's west and central tropical forest blocks, forming some of the largest colonies of any of the world's fruit bats. The bats from Kumasi, Ghana's second largest city, live in a colony of at least 400,000 and were the most

likely to visit my study area.

Straw-colored flying foxes are the long-distance flight champions of the fruit bat world. Don Thomas documented that West African colonies undertake an annual seasonal migration of some 931 miles (1,500 km). Colonies also cover an approximate 43-mile radius (69 km) in their nightly search for food. Like many flying foxes that form large colonies, these bats roost conspicuously in the open, literally covering acres of treetop branches. This makes them easy targets for subsistence and market hunters, so they often choose somewhat protected roost sites, either on steep hillsides or in city parks. One colony in the town of Accra roosts on the grounds of the Military Hospital, where public access is restricted. The Kumasi colony roosts within the fenced grounds of the zoological gardens. But even these populations are subjected to both regulated and unregulated harvest. Reports from several African countries indicate that many of the largest colonies are in decline.

After arriving in Kumasi I was soon introduced to my Forestry Research Institute counterpart, Bright Kankam, a recent graduate of the wildlife science program at the university in Kumasi. I could tell immediately that Kankam would be an enthusiastic and dedicated partner. Though he had never been higher off the ground than a three-story building, Kankam did not flinch when I told him we would be building small platforms and sleeping in the treetops.

Our study area, the Afram Headwaters Forest Reserve, was located approximately 43 miles (69 km) north of Kumasi in a dry, semi-deciduous tropical forest. To determine which fruit-eating animals were most important as dispersers of Iroko seeds, we decided to conduct staggered, around-the-clock observations at five fruiting trees. We used blinds, both on the ground and in the canopy. With binoculars, spotting scopes and night vision equipment, we would record which fruit-eating animals visited the trees, how much they ate, and whether they were seed dispersers or seed predators.

The blinds on the ground were easy. Our assistants fashioned them from palm fronds with a few quick strokes of a cutlass. The canopy platforms were another story. With two expert assistants flown in from the U.S., some 220 pounds (100 kilos) of climbing and carpentry gear, and what seemed to be the biggest slingshot on the planet, we set about trying to build blinds in the largest Iroko trees. We figured one day's labor for each of the three platforms.

Many canopy biologists use powerful bows that can easily fire a line over the tallest of branches. This line is used to pull up the rope, which is then climbed with mechanical ascenders. The only problem was we did not have a bow, and even our slingshot kept coming up about two inches short. Finally, by climbing an adjacent tree, we were able to fire our line into the target tree. After more than two days, some ingenious rigging and strong joists made from (what else) Iroko wood, I finally climbed onto our first small platform. Moments later, a large black-and-white hornbill landed just a few feet away as if to welcome me to his treetop world.

When we boasted of our accomplishment to the local forestry manager, he smiled and asked us why we had not contacted Mr. Dua, a local tree climber often hired to collect seeds for the Forestry Department. Dua could climb any tree in under an hour, and would charge only 15,000 cedis (about U.S.\$7). The next day, we watched in awe (and just a little chagrin) as Dua built a stick ladder straight up the trunk of a tall Iroko using only a small hammer, an old canvas shoulder bag full of sticks, a handful of nails and a waist belt made from an old tire tube. He alternately hammered a stick to the trunk, pulled himself up on to that stick, and reached up to hammer another rung in the ladder. For safety, he attached the waist belt to the stick above the one on which he was standing. With Dua's help, we quickly finished two more platforms.

Before the fruit ripened, we built a grid of seed traps in canopy gaps at three different distances from our biggest Iroko to measure seed rain—seeds defecated in flight by bats or birds. We also laid out plots in small gaps near two Iroko trees where we would conduct seed predation trials. This meant we would follow the fate of seeds placed on the forest floor to determine if seeds dispersed by bats survived insect predators longer than seeds falling beneath the parent tree. We also conducted germination trials, placing small groups of seeds on moistened paper in a shallow dish. We watered these daily, recording germination rates.

There was only one more thing to do. Kankam had told me that if we wanted the cooperation of the local village, we should pay a visit to the chief. It was customary to bring him a bottle of schnapps, spirits made from fermented juniper berries, so he could pour libation for the ancestors and ask them to sanctify our presence. We arrived at dawn, with Kankam serving as our interpreter in the local Twi dialect. We were introduced to the chief and his court, his linguist, who relays all requests and speaks (interprets) for the chief, and the fetish priest (medicine man), who communicates with the spirits. There were several others present whose positions were unclear (but who I believe may have been there for the schnapps). As the glass was passed to each person, the linguist recited what I assumed was a prayer, and a small amount of alcohol was spilled on the ground for the ancestors. The rest was consumed. Perhaps emboldened by my early morning shot (considerably more schnapps than I spilled for the ancestors) I asked through Kankam if the ancestors could make the bats come. The chief smiled, and the answer was translated: they would.

Returning that weekend from a supply trip to Kumasi, we found the ground below one of our trees littered with fibrous pellets, the remains of Iroko fruit, spat out after the juice had been drained by fruit bats. We had missed the flying foxes at this tree, but I was excited to know they had come. Surely they would come to tree #1, the largest tree with the most fruit, and the one with our surrounding seed traps. Each night, bats did come, quietly, in small groups of two or three. They quickly plucked fruits and carried them off to a feeding roost to eat in a safer place.

During the daytime, small green parrots would come, sitting quietly, sometimes for hours, alternately eating the fruit and resting, but our seed traps recorded only occasional seed rain, always defecated by bats. On the fifth night on the platform, exhausted from 12-hour days in the field, I dozed off to sleep. I was startled awake by the sound of a loud squawking growl just above my head. The bats had come en masse. For the next three hours, a noisy flock of 50 to 100 straw-colored flying foxes plucked fruit from around the platform and carried it away in flight. Others used their long dexterous thumbs to crawl squirrel-like, chewing and spitting out one ripe fruit after another, all the while arguing and fussing and making an awful racket. I clicked my hand-held counter 205, 206, 207—more than 250 fruits taken in just 10 minutes. Then suddenly, with the quiet sound of branches rustling and leathery wings swishing through the night air, they were gone. When I awoke again, the first rays of light were bathing the rain forest and the birds were beginning their dawn chorus.

The next morning, more than 75 percent of our seed traps had been hit. The effect of the bat visits was enormous. Over the course of the next 30 days, Kankam and I continued to watch our five trees from the ground and canopy, until no fruit remained. Although we observed many fruit-eating animals, including monkeys, hornbills and giant flying squirrels, in the tree crowns or vicinity, bats were the only effective seed dispersers, and visitation by straw-colored flying foxes increased seed trap hits by more than 100 percent. The parrots, at best, defecated the seeds directly below into the seed-hostile environment of the parent tree's crown; at worst, they were seed predators, destroying the seeds. Meanwhile, the bats scattered large numbers of seeds all across the forest.

A conservative estimate shows that during peak fruiting, the bats from the Kumasi Zoo grounds alone disperse more than 300 million Iroko seeds each night over an area of hundreds if not thousands of square miles. Preliminary results from our seed predation and germination trials also suggest that flying fox-dispersed seeds may germinate more quickly and survive longer than seeds that fall beneath the parent tree. Clearly, in this region of Ghana, straw-colored flying foxes depend heavily on Iroko trees during their annual migrations, and the long-term viability of the Iroko timber industry is heavily reliant on them.

Kankam and I are publishing the results of our research, and we anticipate the support of the Forestry Department and the Timber Marketing Board in lobbying Ghana's Minister of Natural Resources to grant permanent protected status for the country's remaining flying fox colonies. We are also planning to work with the Ghana Wildlife Department and Ghana's fledgling conservation organizations to construct the continent's first bat-viewing tower at the Kumasi Zoo colony. The bat-based ecotourism and educational opportunities generated by the viewing tower will hopefully inspire future generations to help protect these bats as one of Africa's most valuable natural resources.

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The straw-colored flying fox relies heavily on the fruit of the Iroko tree.



Iroko trees are one of Africa's leading agricultural products.



Field assistant Bright Kankam photographed bats from the treetop platform.



To set up their forest laboratory, some 220 pounds of climbing and carpentry equipment were hauled into the forest. Biologist Dan Taylor searches the canopy for suitable platform sites.



Constructing platform.



Dan Taylor checks a seed trap.



Kankam and Taylor examine droppings on a tarpaulin.

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