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Bats and Disappearing Wild Bananas
Can bats keep commercial bananas on supermarket shelves?
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Bats pollinate wild bananas and disperse their seeds. But the commercial bananas we eat have been seedless and without the need of pollination for thousands of years. They're grown only from suckers cut off a mother plant and transplanted around the tropics. So who needs bats these days? Well, we do â€“ at least we do if we want to keep eating bananas. The plants that produce all that tasty fruit are so genetically similar that a single disease could devastate the global crop. In fact, some scientists warn that commercial bananas may already be at great risk from a recently reported fungus.

The banana, the source of a multibillion-dollar industry that sells around 100 billion bananas of the Cavendish variety each year, is a remarkable plant with a long, long history that's deeply intertwined with bats and humans. But populations of pollinating fruit bats are under threat in many parts of the world â€“ and that threatens the banana's long-term future.

Musa, the banana genus, includes about 50 species; all of them originated in an area from eastern India, through SouthÂ-east Asia to New Guinea. Wild bananas must be pollinated and their seeds dispersed away from the mother plant. "OrnaÂ-menÂ-tal" bananas, with upright flowers, are pollinated by birds. The rest, including the ancestors of our edible bananas, have horizontal or drooping flowers that are pollinated primarily by bats.

Bananas are an ancient group that has evolved â€“ along with bats â€“ over 50 million years. The plant's adaptations for bat pollination include nocturnal flowering, a strong and characteristic odor that attracts bats worldwide, plus abundant and accessible nectar and pollen. The co-evolution of bananas and bats also resulted in adaptations for seed dispersal. The wild fruit is packed with hard-shelled seeds and little pulp. Bats, along with monkeys and some other animals, eat the fruit and scatter the seeds. Bats, however, are by far the most effective seed dispersers.

All those seeds mixed into too little pulp make wild bananas almost impossible for humans to eat. They were, however, the progenitors, in India and Southeast Asia, of all the bananas we eat today. Bats' role in scattering banana seeds and pollinating flowers for millennia produced the genetic variability that led to both an invaluable fruit and highly productive plants that were selected and propagated by ancient villagers. In some 80 recent years of scientific banana breeding, no one has been able to beat those bat-bred and villager-selected bananas. And the fruit bats are still at work, maintaining the wild plants that could someday keep bananas from disappearing from supermarket shelves. Yet the bats, like the wild banana plants they support, are in startling decline.

Bananas were domesticated thousands of years ago. In the tropics, domestication begins by simply finding a wild plant you like and bringing it home to grow. Hard-to-eat wild bananas might seem an unlikely choice for cultivation, but people of the time needed fiber for fish line, ropes and nets, as well as large leaves that could be used as wrappers for food. For this, banana plants are ideal, especially the species Musa balbisiana in upper India and Burma.

It was easy to dig up a few suckers to grow in gardens and to carry them along as early people migrated southward into the islands of Indonesia and the Philippines. M. balbisiana now grows around villages all the way to New Guinea. In the Philippines, another great fiber banana, M. textilis, was growing wild in the jungle; it was cultivated extensively to produce the famous Manila hemp ropes so useful in the days of sail. Both species are still seeded.

Meanwhile, the mother of our edible bananas, the widespread Musa acuminata, was thriving, with bats' help, throughout this vast jungle region. Somewhere along the way, foraging humans found occasional plants with fruit that contained few or no seeds and were ready to eat when picked or after cooking. Suckers from these plants were transplanted into gardens and carried along when the people migrated.

But these domesticated bananas were moved and introduced, along with their diseases, into new countries and continents from suckers rather than seeds. Each new plant is a clone of its mother, and it is genetically fixed. Over thousands of years as clones, seeds disappeared completely from these varieties. Cultivated bananas are sterile and would soon die out if humans did not perpetuate the plants via suckers (and now by tissue culture).

Moreover, sterility makes it difficult to breed new edible varieties. And new ones are needed because commercial bananas, such as the popular Cavendish, are so susceptible to disease that they now require more fungicide spraying than any other crop. Yet diseases are rare among wild bananas, in which the constant mixing of genes has evolved resistance to local pathogens.

Virtually all bananas found in stores today are the Cavendish variety. But until the mid-20th century, Gros Michel bananas were the chosen fruit. Discovered in Asia two centuries ago and transplanted to Central America and elsewhere, these were larger and, by most accounts, tastier than the Cavendish. But the Gros Michel had little resistance to Panama disease, which was spread with its suckers across the banana-growing world in the early 1900s. Disease-resistant versions of the Gros Michel could no longer be produced, since it was grown only as a clone. Repeated delaying tactics only slowed the inevitable and growers were financially devastated. The last Gros Michel banana split was eaten in the early 1960s. Now the Cavendish, resistant to the old Panama disease, reigns. But now it, too, has proved susceptible to a heretofore undetected strain of Panama disease, native to Malaysia and Indonesia. And this disease has already appeared in China, the Philippines and Australia.

Wild bananas, with their diverse gene pools, are the feedstock for new commercial varieties. The genetic change that gives bananas a fruity pulp without pollination and fertilization is called parthenocarpy (virgin fruit). It must have been stumbled upon many times, but it is hard to detect in wild bananas where bats are abundant and pollination produces seeds. I recently collected seed from a normal-looking, seeded banana that, when grown in isolation, produced some plants that were parthenocarpic and some not. In effect, I domesticated a new banana variety.

Bat pollination and seed production must continue or the wild species will disappear. This has already happened over vast areas of bananas' former range as forest habitat was cleared for agriculture. The loss of tropical forests also destroys the bats' habitats. And on top of that, villagers in many areas capture, sell and eat the flying foxes on which wild bananas depend.

I once met an elderly Dutchman who had lived in Jakarta before World War II. He recalled the magic of watching the skies darken each night as enormous flights of flying foxes blocked out the setting sun. Such flights are long gone. At the great botanical garden at Bogor, some 50 miles (80 kilometers) away, I was delighted for several years to watch a small colony of flying foxes fly out from their tree roosts at dusk. Last year, they, too, were gone even from that sanctuary.

Wild bananas are now largely extinct over vast areas. Those that remain are especially precious as potential breeding parents for disease-resistant plants. But they have never been properly collected, so we don't even know what is there. We do know, however, that serious diseases rarely affect wild bananas. Clearly, they have evolved much resistance.

Breeders are often reluctant to return to these wild ancestors as parents for new commercial bananas. But the wild species can carry invaluable genes. And domestic bananas, since they are clones and have been clones for thousands of years, are very close genetically to their wild ancestors.

The remaining wild bananas must be conserved. And that means we must protect the flying foxes that are essential to these plants' survival. The loss of these bats could have devastating effects, not only to wild bananas, but also on the health of the few remaining tropical forests.

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