



PHOTO BY TREVOR SAMSON

WILDLIFE AND SEED DISPERSAL

What Elephants and Bats Have in Common in a Forest Ecosystem

Wildlife feeding on fruits, berries, seeds or gathering nuts are said to be responsible for seed dispersal for up to 90 per cent of tree species in the tropics and half of those in temperate zones.

BY FELIX PATTON

Both are vital to the continuing life of ecosystems by way of their ability to spread seeds over long distances. Some plants, such as dandelions and maples, have seeds that are adapted to being dispersed by wind while some fruits explode, ejecting their seeds by force.

However, it has been estimated that 60 per cent of seeds are dispersed by animals and that is where elephants and bats have an important role to play.

But first, why do we need animals to disperse seeds? Many plant species, especially trees, drop their seeds at the foot of, or close to, themselves. This means the seed is kept in the shade of their canopy, so being denied the sunlight necessary for germination. It is therefore essential for seed to be transported

into the open and that requires an animal. By moving seeds to a new territory, the odds of them germinating are greatly increased having avoided being deprived of light or big, competitive clumps, or being infected by pathogens or eaten by seed predators.

Improved germination of seeds may result from being digested by the animal with stomach acid stripping away the pulp and neutralising compounds that attract fungus and pathogens. The seed may also be deposited in the fertile dung.

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Overall, estimates suggest that some 73,000 known tree species and perhaps 435,000 plant species rely on wildlife for dispersing their seeds. Seed can be carried inside mouths,

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The African elephant (*Loxodonta africana*) is a keystone species that occupies an integral niche within African ecosystems. Elephants serve as ecosystem engineers due to their wide-ranging ecosystem functions, such as seed dispersal, production of manure compost and as agents of habitat modification. Elephants can eat whole fruits of the sausage tree, too large for other animals to ingest.



PHOTO BY MORREFF

beaks and stomachs, or on legs and fur with a myriad of birds, bats, rodents, primates, insects and mammals, both large and small, all capable of undertaking this duty.

Researchers have studied how far animals can spread seeds. Ants tend to move seeds about one metre, vervet monkeys less than 850 metres, and trumpeter hornbills as far as 2,000 metres. The likely maximum distance for seed transport by forest elephants has been calculated at five to six kilometres while that for the savannah elephant is much greater at as much as 65 kilometres when long treks are taken such as when a male goes in search of a mate.

It has been estimated that, for any given fruit, a savannah elephant would move half the seeds 2.5 kilometres from where they were eaten, and one per cent of seeds would move further than 20 kilometres.

Bats disperse seeds through defecation and by physically carrying an entire fruit, too big to swallow, in their mouth. Small bats were recorded as having dispersed defecated seeds some 30 kilometres; larger, non-migratory bats distances up to 24 kilometres;

while migratory bats managed as far as 88 kilometres. Since bats defecate in flight, they can disperse seeds anywhere along their foraging route which can be useful for restoring disturbed areas.

Birds are vital for seed dispersal with some light, sticky seeds attaching to feathers or legs to hitchhike long distances. A recent study found seeds in the digestive tracts of migratory birds that had flown at least 300 kilometres.

Animal-based seed dispersal is becoming an ever-growing problem with the decline of important species due to poaching and the bushmeat trade. In addition, habitat fragmentation particularly due to logging, the introduction of invasive alien plant and animal species and human habitation have all aided in reducing the populations of seed dispersal species.

Plants provide a myriad of benefits to human survival. They store carbon, control floods, and provide food, timber, fibre, fuel and medicine. Plants need seed dispersers for their survival so without them, humanity will face serious challenges;

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Although their name indicates that they are fruit-eaters, bat species also eat nectar, pollen, leaves, and sap. They tend to consume only the “juice” of fruits and leaves.



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The dodo was a large bird which, as it had no predators to escape from, had lost the ability to fly. It lived and nested on the ground and ate fruits that had fallen from trees, dispersing seeds throughout its range.

Rising temperatures and more frequent extreme weather events mean that some plants will need to be transported to areas more favourable for their germination and survival. A movement towards the poles and/or closer to water can be expected. To maintain constant environmental conditions, this may require a migration of tens of kilometres every year. This will be a massive problem without animals that can undertake seed dispersal over such long distances.

Strangler fig tree

The fruits from the strangler fig tree provide many forest species with their main source of nutrients. The tree starts life from seed dropped onto the top leaves of the forest canopy by bats, birds and monkeys. Its roots grow down the host tree to the ground where it anchors and grows, often killing the host. Without its animal seed dispersers, there will be no new strangler figs to feed the forest dwellers.

Learning the Lessons

If East Africa’s forests and savannahs are to survive, the lessons from Mauritius, Guam, the Galapagos Islands and elsewhere around the world, must be learned. The survival of elephants, gorillas, chimpanzees, bats and other seed-dispersing species is not just for tourists but for the future of ecosystems essential to humankind.

Dodo the symbol of extinction

The island of Mauritius, in the Indian Ocean, was once a thriving natural, dense rainforest ecosystem full of tortoises, parrots, pigeons, fruit bats and giant lizards, including the infamous Dodo. Mauritius was believed to be the only place in the world where the bird existed in any number.

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The dodo (*Raphus cucullatus*) is an extinct flightless bird that was endemic to the island of Mauritius, which is east of Madagascar in the Indian Ocean. It is presumed that the dodo became flightless because of the availability of abundant food sources and a relative absence of predators on Mauritius.

DID YOU KNOW

Sausage tree fruits can grow to be very large, averaging 30 to 99 centimetres in length and 15 to 20 centimetres in diameter and are filled with seeds.

CONSERVATION



PHOTO BY JASON HOLLINGER

Humans, actually Portuguese sailors, first came to the island at the beginning of the 16th century. Eager for a meal of fresh meat, they preyed upon the dodo. At the end of the century, the Dutch used the island as a penal colony bringing in convicts alongside monkeys and pigs. Worse still, the ships that brought them also brought rats.

The rats, pigs and monkeys ate dodo eggs in the ground nests and, along with other animals introduced, were able to outcompete the dodo for food.

The dodo's struggles were further worsened when the Dutch found they were able to profit from the ebony wood and the French imported slaves to start sugar cane plantations leading to mass deforestation. With their habitat eroded, there was little protection for the remaining dodo along with many other animal and plant species. With few animals left to disperse tree seeds, the forest too had no chance of revival.

It took less than two hundred years for humans to wipe out the dodo although today it lives on as a symbol of human-driven species extinction.

The Guam Experience

Guam, a small island west of Hawaii, had twelve species of native forest birds. Today, ten of those are extinct and the other two have fewer than 200 individuals.

Some 70 years ago, a few brown tree snakes found themselves in Guam, far away from their South Pacific homelands. With only feral pigs and mangrove monitors as predators and an abundance of prey species, the snakes increased rapidly. The snakes fed on the defenceless birds and their eggs causing the extinctions.

Unfortunately, the ecological gap created has not been filled by non-native species. This has left few birds to disperse tree seed which could have a devastating effect on the long-term survival of the Guam forests.

The Galapagos story

Islands are exceptionally vulnerable to ecological change. On the Galapagos Islands,



PHOTO BY FRANK WIRTH



PHOTO BY RODDA

the Santa Cruz lava lizard spreads more than half the community's plant species. The other key fruit eaters – the giant tortoise, mockingbirds and a flycatcher – would be unable to fill the gap should the lizard become extinct.

The giant tortoise is also special as it is the only animal big enough to eat large fruits, dispersing the seeds while following their migratory routes over large distances and across the peaks and troughs of the terrain. In doing so, some of the seeds land in climatically unsuitable areas for establishment.

With climate change, former unsuitable areas may become suitable. When the seeds germinate and the plants establish it creates the shade the tortoises need to regulate their temperature. In turn, by browsing, the giant Galapagos tortoises benefit the density and distribution of the endemic *Opuntia* cacti, which are considered a keystone plant species on the islands. ●

TOP LEFT

Santa Cruz lava lizard inhabits volcanic rock areas, dry shrublands, dry grasslands, deciduous forests, and urban areas.

TOP RIGHT

Galapagos giant tortoise. These reptiles are among the longest-lived of all land vertebrates, averaging more than a hundred years.

BELOW RIGHT

Brown tree snakes are nocturnal and spend most of their time balancing on branches in the treetops.



FELIX PATTON is a wildlife ecologist with an MSc and PhD in conservation biology. He has been working in and writing about conservation in East Africa for over 20 years.