

Nature Watch

Trees with a Difference: The Strangler Figs

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The Banyan (*Ficus benghalensis*) and the Peepul (*Ficus religiosa*) trees associated with the Buddha come under a family of trees with murderous tendencies. These trees belonging to the genus *Ficus*, also found in the forests of the Western Ghats, end up killing the trees which nurture them in their infancy! Unlike its civilized urban counterpart, the wild banyan strangles its host tree as is seen in the central Indian forests.

The large strangler fig has a trunk like a mass of intertwined roots and with a wide spreading canopy of very characteristic leaves. My first encounter with these giants was in the evergreen forests of Karian Shola National Park in the Western Ghats. In a dark corner of the forest, a strangler fig had enmeshed a huge silk cotton tree. The silk cotton was one of the largest trees that I had ever seen; it took a dozen of us holding hands to encircle the base. The strangler fig and its huge host fascinated me though I had no inkling of the titanic struggle between them. Later, I saw half of the silk cotton tree had fallen down due to a storm, dragging along a host of lesser trees. The strangler fig which had contributed to the weakening of the silk cotton survived.

What are Strangler Figs?

Half of the 900 ficus species belonging to the subgenus *Urostigma* are strangler figs. An example of a ficus that is not a strangler is the edible fig *Ficus carica* which is a small tree that takes root directly in the earth.

Strangler figs are hemi-epiphytes, utilising their host trees only for support in the initial days. Though the stranglers do not



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Figure 1 The strangler fig seedling usually germinates in a crevice on the host tree. A fork in the host is an ideal site.

Figure 2 The roots of a strangler fig inside a branch of *Vitex altissima* tree.



parasitise their hosts, they eventually end up causing their death. The killing is not a swift process and may take several decades. The tiny strangler fig seed starts life by germinating in a humus-filled crevice atop the host tree (*Figure 1*). The sapling puts forth a few leaves and small roots. While a few delve into the humus for nourishment, others grope their way down the host tree's trunk. They grow with a great sense of urgency as soon as they establish themselves on the forest floor. Spurred on by the nourishment from the earth, the sapling thickens its trunk and widens its canopy. Meanwhile, more roots are let down which eventually merge to form a sheath around the host tree. This hinders the growth of the host tree and blocks its vessels which transport food and water. Further, the roots of the strangler fig compete successfully for water and nutrients from the forest floor while the large canopy hogs the sunlight. Deprived of its food, water and light, the host tree slowly dies. Sometimes you get to see the only evidence of the host tree: the hollow inside the fused roots of the strangler fig (*Figure 2*).

Why have the strangler figs adopted this singular habit of germinating in little niches high above the forest floor where water and food could become scarce before the sapling takes root in the earth? Tropical forests where strangler figs are most common have very dense canopies which allow only an occasional shaft of sunlight to illuminate the forest floor. The hordes of saplings on the floor compete for this scarce resource and only a few survive. By starting out high, as much as 20m on some trees, strangler figs gain a huge headstart over other saplings. Strangling figs also escape depredation by elephants and other large herbivores which relish their leaves and stem. Fires and floods which may ravage the forest floor below, have no effect on the strangler fig sapling. They store extra water, when available, in swollen bases of their stems and the relatively large leaves facilitate absorption of the light filtering down from the canopy.

These trees are common in crowded cities seen sprouting unexpectedly from the sides of buildings and underneath stone

benches etc. If allowed to survive, their expanding roots are capable of damaging the buildings (*Figure 3*). In Costa Rica and Honduras, ruins of past civilizations have been almost obliterated under the onslaught of the strangler figs.

Keystone Resources of the Tropical Forests

Although they end up killing the host trees, strangler figs are very important components of the tropical forest ecosystem (*Figure 4*). In ecological parlance they are known as *keystone resources*. Their absence affects the survival of a whole lot of other animal and plant species.

The importance of strangler figs to the ecosystem is due to their intimate relationship with their pollinators: the *agaonid wasps*. These tiny wasps, no bigger than a few millimetres, spend most of their life inside the figs and in turn pollinate the flowers. The fig trees and the wasps are crucial for the survival of each other. *Ficus* plants never seem to have any flowers, only fruits (commonly called figs, technical name being *Syconia*). The flowers are actually hidden inside the figs (*Figure 5*). The figs are small, hard and green when they first appear. The trees release particular chemicals which attract wasps that are specific to each species of fig. The gravid female wasps enter the unripe fig carrying the pollen from other fig trees. They pollinate the flowers while laying their eggs in the ovaries of some of the female flowers. The wasps lose their wings and antennae while squeezing in through the tiny orifice (ostiole) of the fig after which, they usually die inside the fruit. The development of the fig seeds and the wasp eggs proceed together and the young wasps emerge from the fruit just prior to complete ripening of the fig. The male wasps emerge first and mate with the female wasps which are not yet fully developed. The female wasps emerge later laden with pollen and fly out in search of another tree with figs to lay their eggs.

The short lives of the wasps requires that some strangler fig trees

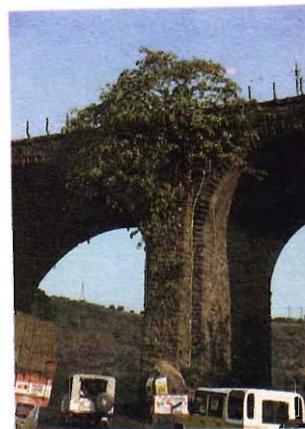


Figure 3 *Ficus arnottiana* is often seen growing among the rocks and sometimes even on stone buildings.



Figure 4 (left) Strangler figs are found throughout the tropics, with a larger representation in the wetter moist-deciduous and evergreen forests.

Figure 5 (right) An opened ripe fig reveals the large number of tightly packed seeds. Each fruit sometimes has hundreds of tiny seeds.

are in fruiting stage at any given time throughout the year. This ensures that the fig wasps emerging from one tree will find the fruits of another tree to lay their eggs, thus perpetuating the species. The intra-population asynchrony in fruiting of fig trees provides a continuous supply of *fig homes* for the wasps; this also results in a copious food supply for the frugivores during periods when other fruiting trees are scarce.

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Ripe figs generally make attractive fruit resource with their easy edibility, high nutrient value per fruit flesh (also contributed by the dead wasps inside the figs), non-toxic seeds, varied ranges in fig sizes and apparent lack of secondary compounds in the ripe figs. The soft and fleshy ripe figs without hard coverings or large seeds can be eaten by birds with large gape size who swallow them whole as well as by those with small gape size who peck at them.

The Flurry of Visitors

A fruiting strangler fig is heard much before it is seen! The canopy comes alive with the incessant activity of the frugivores attracted to the brightly coloured figs (*Figure 6*). I conducted a study on the pattern of bird activity at fruiting stranglers throughout the day at Karian Shola. I counted the birds present

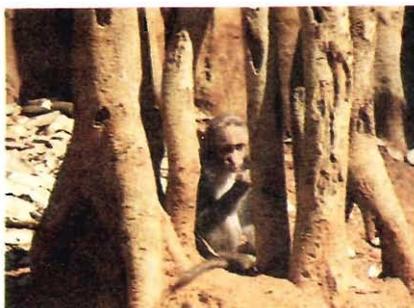


Figure 6 (left) A fruiting *Ficus benghalensis* tree. Copious, brightly coloured fruits are produced by most strangler figs which are very popular with the frugivorous birds.
Figure 7 (right) A young Bonnet macaque feeds beneath a fruiting banyan tree.

every 10 minutes and noted down their behaviour. There were many birds like the green pigeons and the barbets. Both avid fig eaters, they were green in colour, just the same shade of the new fig leaves. Each fruiting strangler fig had a different surprise in store. While observing *Ficus drupacea* with big bright red, luscious figs, I saw a couple of bears feeding on the fallen fruits, oblivious of my presence.

Solitary barking deer, monkeys (*Figure 7*) and the entire families of the wild pigs with striped piglets in tow would make their presence felt. The trees (e.g. *Ficus microcarpa*) were also visited by mongooses in the daytime like the striped necked mongoose. Though I heard from Ganesan, the tribal guide, that occasionally tigers lie in wait at these trees for their prey, I came across only leopards.

However, it was the birds which provided me with continuous entertainment. Each species had its own way of getting at the figs. The great pied hornbills and malabar grey hornbills would with a toss of their head throw entire figs into their mouth. On the other hand, the small quaker babblers had to slap each fig against a branch and peck it off piece by piece. Parakeets took only small delicate pecks off the figs, eating mainly the seeds while the large cuckoo-shrike almost always 'hawked' the figs in mid-air.



The green pigeons usually arrived in waves of twenty or more. Their plaintive tinkling notes would fill the air as they moved around the canopy feeding. They would then fly off to a nearby tree to rest before their next feeding bout. These birds are highly dependent on figs and are known to travel large distances, sometimes several tens of kilometers following ripening fig crops. However, they are not efficient dispersers since they digest most of the small seeds.

Some insectivorous birds also visited the trees to feed on the multitude of tiny insects hovering around the figs. Example, the brilliantly coloured Malabar Trogon. Occasionally raptors would dive into the canopy creating complete panic and confusion among the other birds. The entire bird assemblage would then fly away from the tree filling the air with their shrill alarm calls. Apart from the larger creatures, armies of tiny ants would work feverishly below the fruiting fig tree, carting away the seeds to their granaries.

Nocturnal creatures like the fruit bats, flying squirrels and civets also visit the trees. The bats are attracted to the trees with pale coloured figs since fruit bats rely mainly on their eyesight and the smell of the fruits to locate them at night.

Once the fruiting season is complete, the birds and the animals satiated with the fig feast disperse the fig seeds through their droppings. The ants also play their part in dispersing the small seeds. They feed on the outer nutritious covering of the small fig seeds (elaiosome) and carry away the seeds from under the fruiting tree or from the droppings of frugivores. However, only a few seeds manage to reach a humus filled moist crevice on another tree and survive. The humus has to be just right, with the proper kind of bacteria which will first decompose the seed coat so that the seed can germinate. And the moisture and nutrients have to last long enough for the roots of the sapling to reach the forest floor.



The Choice of a Host Tree

I also found during my study that strangler figs were partial to a few host species. More than half the stranglers were found on *Vitex altissima*, *Diospyros bourdilloni* and *Eugenia* (jamun) trees, though these trees constituted a small fraction of the total number of trees in the forest. Though the reasons for this preference are not yet known, it may have something to do with the higher abundance of cavities with sufficient humus and the ability of these tree species to attract frugivores which also disperse fig seeds.

Although banyan and peepul trees are strangler figs, in the cities and countryside they are seen to take root in the ground and not on other trees. This is because these are usually planted and tended by people. Also, they do not face competition from other trees for food, light and water as it would be inside the forest. Sometimes, you do come across wild strangler figs which sprout 'normally' from the forest floor. This is mainly along watercourses and edges of forests where sufficient light and moisture are readily available.

Some of the planted banyans have reached stupendous proportions. In 1888 a banyan tree in the Botanical Garden, Calcutta, had a girth of 14 metres and a canopy circumference of 285 metres. There is a report of an even larger tree near Mumbai, in Mhasve which had a canopy circumference of 530 metres in 1882! I wonder if these trees still exist!

Will the Stranglers Survive?

In the human habitations, the banyan and the peepul trees are the two most common species of figs that are planted and are rarely cut (*Figure 8*). But in Indian forests, strangler figs do not have immunity from the axe. Although the timber is not of much use, the leaves, bark and stem of most species are eaten by the larger herbivores, including elephants. People living around



Figure 8 *Marriage between a Ficus religiosa (peepul) and Azadirachta indica (neem) is occasionally met with along the Indian countryside. The peepul tree represents a god and the neem, a goddess.*

forests lop the leaves as fodder for goats and domesticated elephants. Heavily lopped trees are incapable of producing the famed crop of figs and can no longer be an important resource for the frugivores of that forest.

In the Indo-Malayan rain forests, the strangler figs face a more serious problem. Here, they grow mainly on the large Dipterocarp trees, which are also excellent timber trees, and their logging reduces the chance of strangler figs taking root. However, in northeast India, strangler figs escape the axe on account of the various myths and taboos surrounding these trees. One can find huge tracts of clear-felled forests with only the large strangler figs left alone. The tribals believe that these strange trees are the abode of spirits. However, the smaller strangler figs have perished, along with their hosts.

During my sojourns in various forests I had always been more partial to the vertebrates and invertebrates while ignoring the plants. But with the strangler figs, it turned out to be different. Every aspect seem to bring to light something more interesting. I started out with the frugivores, then went on to their relationship with host trees and then discovered their pollinators. I was hooked for life!

Suggested Reading

- ◆ Janzen D H. How to be a fig? *Annual Review of Ecology and Systematics* Vol. 10. pp. 13-51, 1979.
- ◆ Putz F E and Holbrook N M. *Notes on the natural history of hemi-epiphytes*. Selbyana Vol. 9, pp. 61-69, 1986.

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