Once, the Monsoon

Field notes from a botanical sanctuary: changing weather patterns are causing havoc to plants.

SUPRABHA SESHAN

I love being at home, in Wayanad, when the south-west monsoon arrives. This hilly district of northern Kerala is still full of tall trees and myriad creatures, and drenched in rain for several months in a year. From my window, I see Banasuramala, a beautiful mountain 2,000 metres high, gracing the southern horizon, and canopied hills to the west. Small farms make scruffy patchworks on the other sides. To the north-east are the shola grasslands of the Brahmagiris. All around, streams born of millions of seeps gifted by trees gather to flow to the Kabini and then to the Kaveri.

I work at the Gurukula Botanical Sanctuary, where a small team of dedicated ecosystem gardeners, skilled in various aspects of horticulture, plant conservation and Western Ghat ecology, grow native plants of this mountain ecosystem, or biome, through techniques honed over four decades of experimentation and practice. We cultivate plants that are highly endangered in the wild, some 2,000 species in all, accounting for 40% of the Western Ghat flora. We deploy a range of methods, from intensive-care nurseries to outdoor habitats rich with herbs, tubers, succulents, shrubs, trees, creepers, climbers, epiphytes (plants that grow on other plants) and lithophytes (plants that grow on rocks). These species have been initially brought from different parts of the Western Ghats, mostly from areas that have already been deforested. Much of our work is a search-and-rescue mission, and we refer to these plants as refugees, similar to human refugees suffering the depredations of war, displacement, climate change and general toxification of the environment. We also speak of species being rehabilitated when they form mixed-species communities that eventually become quite independent of our care.

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Surrounding these "refugee camps" we also have once-denuded patches, adding up to an area of more than 60 acres, which are recovering to forest through natural processes of succession under our vigilance. Since we are on the edge of a reserve forest, still rich and diverse despite its small size of about 100 square km, reforestation happens easily if the land is simply protected—because insects, birds and mammals transfer spores and seeds. Beyond all this, we educate students and visitors about the centrality of the natural world, first of all to itself and then to human lives, including the economy, something most urban people seem to deny, to our collective peril.

Over time, this botanical sanctuary has become a zoological sanctuary. We have noted 220 species of birds, including Malabar trogons, flycatchers, frogmouths and laughing thrushes. Many unusual mammals, reptiles, amphibians and insects abound, and several are endemic to the Western Ghats, such as the iridescent shield-tail snake, the Nilgiri marten, a nimble and ferocious small mammal, and many species of bush frogs.

The sanctuary has become a river-maker too. I've seen how moss-laden trees condense mist, how droplets of water gather on downy grasses, how cool it is inside the infant forest we have grown, and how water trickles out of the toes of trees to form tiny rivulets, which flow into neighbours' fields. By leaving large areas of the land to natural succession, and not deliberately planting trees, as practised by other agencies, and giving time, a slowly restoring area acquires many important properties of a healthy ecosystem. These include species diversity, a thick layer of leaf litter decomposing to humus, a robust water cycle, layered and dense vegetation, and different climates from the canopy all the way down to the shady interior.

As gardeners and habitat-restorers we, of course, are dependent wholly on the timing and duration of the monsoon, on its intensity and quantity—because our wards, namely the land and the plant species we conserve, are. On an average we require 500 cm of rainfall a year, and most of it in the south-west monsoon. The weather features regularly in our speech. Much of our work hinges on the fine sensibilities of land-based peoples: common-sense knowledge to do with life-cycles in the forest and our own intuitive understanding of weather patterns, instead of measurements and forecasts alone.

Changing Monsoon

Most Indians believe that the monsoon is unassailable: a wind system 18 million years old, which has breathed life into the subcontinent since the rise of the Himalayas, whose formidable heights block it from travelling to Central Asia, condensing it instead into long hard rain. Its intensity varies from year to year, but we believe it will blow. But ever since I have been here, about 24 years now, I have heard people talking about how the monsoon has gone awry, that it is no longer what it used to be. We also know this from scientific data, but crucially for us, we know this from the behaviour of the plants and animals in our sanctuary.

We depend on both monsoons, together called the double monsoon, but the south-west matters more, as it brings more than 90% of what we need annually. The north-east monsoon,

however, makes this a rainforest, along with locally generated thundershowers between the two monsoons, by extending the wet period to cover more than eight months of the year. Typical rainforests have rain or mist throughout the year, as we do here. Luc Lambs, an eco-hydrologist at the University of Toulouse in France, studies the double monsoon system in South India—its variation over time, the role of the forests in water–vapour recycling and what meteorologists call the "gatekeeper" effect of the Western Ghats range. He says the south-west monsoon has weakened considerably over the past three decades, while the north-east monsoon is getting stronger. He also affirms that forests are necessary to condense rain as are the icy heights of mountains.

Anecdotal evidence also suggests that the monsoon is changing in fundamental ways. The monsoon was much colder when she was a little girl in this valley, says Laly Joseph, my colleague, recalling how it poured from June to October, with a brief break during Onam, which usually falls in September. For the past decade, however, it has rarely arrived on time, often disappearing after setting in, sometimes drying up in August only to rain very heavily in winter.

Plants Confused

All this fluctuation spells trouble for monsoon-dependent plants. Laly propagates 100 species of endangered native balsams, which belong to the genus *Impatiens*, all endemic to the Western Ghats, with succulent stems and brightly-coloured flowers, considered by many naturalists to be a flagship group of the range. She says that many species are struggling because they are confused by changing environmental cues: plant hormones are, after all, finely attuned to tiny changes in seasonal patterns of moisture and temperature. For example, species rescued from higher elevations are not doing well at the sanctuary's 750-metre elevation any more because it is becoming too warm and the rain is often interspersed with long dry spells, which, if too long, can signal the end of the monsoon to these species. Laly is growing these delicate plants in the nursery because their natural habitats have been eroded. The sanctuary's plant conservation programme envisages that at least a few can be given a toehold chance for survival by our tribe of ecosystem gardeners, if lost in the wild, because of rapid alterations to global climate conditions. Also, rising temperatures bring new diseases and many species are succumbing to these.

For the past three years, *Impatiens stocksii,* a small plant with white flowers that is endemic to Coorg and Wayanad, has been sprouting two weeks later each consecutive year, says Abhishek Jain, our plant scout at large, who travels through the mountains documenting species in the wild. They are thus a month late this year, and haven't sprouted yet in early June. Both Laly and he say that pre-monsoon convectional showers that lead up to the main monsoon are critical to the dormant tubers setting out their annual leaves and shoots. The pre-monsoon allows for the dormant tubers to start growing underground, and once the main monsoon starts, the plants quickly put out leaf shoots as if assured that a long period of growth lies ahead. The tubers gain in size from the starch made by the photosynthesising leaves. Flowering and seed formation can happen once enough energy is accumulated, usually towards the middle or latter half of the monsoon. Shockingly, this year we had no pre-monsoon rain, and *Impatiens stocksii* is even more delayed.

I have been keeping a diary to note when trees flower, fruit, produce seeds, drop leaves and flush. There's a marked difference in these timings between last year and now. Jackfruit, for instance, has fully ripened and fallen in end-May instead of in late June or early July. Mala-elengi (*Chionanthus mala-elengii*) has flowered and fruited a full six weeks ahead of last year. The southern rudraksh (*Elaeocarpus tuberculatus*) flowered copiously in early February this year instead of the usual March. I am concerned that some of the trees are masting this year, a term used for synchronised and exceptional production of flowers, fruits and seeds. I've heard that this can happen sometimes in anticipation of death by drought. It takes consecutive years of drought to kill mature trees, but when they reach survival's edge they put their final energy into the next generation by producing copious quantities of seeds.

The Monsoon's Needs

So we know that the forest needs the monsoon. But we don't give as much thought to how much the monsoon also needs forests, although most of us have an inkling that

plants cool the land and that forests are intimately connected to rain and rivers. Scientists used to refer to rainforests, particularly the Amazon, as the planet's lungs. Now, some like Luc Lambs and Antonio Nobre, an earth-systems scientist in Brazil, talk about forests acting as biotic pumps, whereby trees release organic molecules into the atmosphere, thereby changing air pressure, which creates a drag effect to draw in the winds from the sea. The proponents of this theory are a pair of Russian nuclear physicists named Anastassia Makarieva and Victor Gorshkov, who studied the contribution of forests all over the world to the global hydrological cycle.

Yet deforestation proceeds untrammelled. A report released in the first week of June by the Indian Institute of Science shows that Kerala has lost half of its forest cover in the past four decades. It is no wonder that the quantity of rainfall has also decreased. If we could reforest more of the land and protect whatever remains of old forest, we could keep droughts and floods at bay, because vegetation has an ameliorating effect on both. Indeed, we keep saying that the monsoon is necessary for agriculture, but we hardly ever talk about what the monsoon needs. In an era when an Indian court redefines the Ganga and Yamuna as "living persons," let me propose that we look at the monsoon as a being, with its own needs: cooler oceans and lands, glacier-bearing Himalayas, forested Western Ghats, a vegetated India. Further afield, it needs the Siberian permafrost to not melt. It needs the Antarctic to remain icy.

Sights and Sounds

Lately, I have been falling asleep to the songs of different bush-frogs and crickets. Tonight, they outdo every other sound—thunder, passing vehicles and barking dogs. Last week, birds such as nightjars, frogmouths and owls were clearly audible and now they're drowned out by the insect–amphibian choir. My ears hurt. This raucous medley is a sure sign that the monsoon is here or about to arrive very soon. The trails are full of jackfruit (*Artocarpus heterophyllus*) and smashed, partly-eaten remains of its relative, the ainili (*Artocarpus hirsutus),* which sports smaller orange fruits with a spiny skin enclosing lobes of sweet flesh and large seeds. Wild jamuns and mangoes, rose apples, guavas and sweet limes, and dozens of forest tree species are also fruiting. Bonnet macaques, Nilgiri langurs, Malabar grey hornbills and giant squirrels are gorging in the canopy. Someone reported seeing a troop of lion-tailed macaques with babies. It is feasting time for everybody in this valley: wild boar, humans and cattle included. Elephants come by at night, attracted from afar by the smell of overripe jackfruit—to them, a delicacy.

Herbaceous plants and creepers are suddenly exuberant with the prospect of regular rain. They grow fast during the onset of the monsoon, infused by nitrogen from lightning and the perfect combination of sunshine and water. Soon, if the monsoon arrives and sustains, the trails and rock-walls will be covered in *Impatiens* flowers, ground orchids and ferns—a spectacular visual treat.

I fantasise sometimes about a perfect monsoon. Rain that is not too much or too little, neither lasting the whole year nor only a few days, arriving perfectly on the first of June and lasting till October. Rivers full and flowing, everyone happy and well-fed, reservoirs lasting through the summer, and fields and forests growing lush and fecund.

I worry, though, that the monsoon, with its moods and savage powers, might altogether cease. Daily, I awaken to an inescapable prospect in the middle of paradise, this botanical sanctuary in Wayanad. Plant conservation is precious work, and it must be done. But what if the monsoon fails? What will happen if forests and drought get into a positive feedback loop? In other words, what if drought leads to forest fires, leading to less rain, and then to more forest fires and so on? What, then, of rivers and the millions of people downstream?

So I busy myself with thinking about how to conserve the monsoon. I believe it is mostly a matter of stopping toxic or destructive activities. Author Derrick Jensen writes that a single Trident nuclear submarine is capable of destroying 408 cities at once. What sort of a mind could conceive of creating such a machine? It seems to me, it is the same mind that is killing the monsoon. The US army alone can stop the murder of the monsoon. It is the single largest contributor to global warming. Why do I say murder? We know that the military–industrial complex is destroying the planet, and we know that it is happening wilfully.

Whom shall we serve? The machines or the monsoon?

Suprabha Seshan (suprabha.seshan@gmail.com) lives and works at the Gurukula Botanical Sanctuary in Wayanad, Kerala. She is the sanctuary's managing trustee and is an Ashoka Fellow. On behalf of the sanctuary's ecosystem gardeners, she received United Kingdom's Whitley Award in 2006.