

Into The World of Orchids, In the Mystic Canopies of the Western Ghats

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Tropical forests are a treasure trove of incredible wonders. Orchids are one among them. Did you know that Orchidaceae is the most successful family of flowering plants in establishing itself all over the tropics? These orchids are grouped into epiphytes, terrestrial and saprophytic based on their habit. Interestingly, epiphytic orchids form 70% of all orchids. In evolutionary science, recent concepts suggest that terrestrial orchids climbed trees with time in search of light and nutrients and became epiphytes! It could also mean that orchids are sensitive to climate and other requirements. Although widely distributed, scientists believe that forest types, climate in the regional scale and close vicinity could influence habitat of orchids. This even makes them eligible to become a group that can give warnings (indicator group) as we move towards changes in climate (sometimes micro) or forest structure. Further, the flowers are specialized in architecture, sometimes deceptive to pollinators and above all, have magical roots called velamen to absorb moisture from the air! Here is the importance of research that can perhaps unravel these mysterious mechanisms of the orchids. I was determined to know more when I learnt that, though most charming, they are the least studied in terms of their relationship with environment (ecology)!

Ecologically, epiphytes, in general regulate canopy climate and, thus, local climate. Additionally, they keep up pollinator diversity of a region and keep the system in balance. They are also proved to favour huge diversity of arthropods and thereby birds. Epiphytes store nutrients from rain and storms and release them during unfavourable times. Thus, epiphytes are a 'keystone

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resource' that plays a significant role in maintaining the forest canopies. Today, these unique features of epiphytes fetch great attention from the few canopy researchers across the world. Being the most successful epiphytes, it is time orchids are studied as a major component of tropical forests. Apart from its ecosystem services, how are orchids beneficial to the common man? Orchids have always played a role in different cultures for thousands of years. Preparation of medicines with the help of orchids in China dates back to 28th century BC! The prospects include cultural, medicinal, food values apart from the recent high demand in ornamental plant sector.

It surprised me when I realized that, of all the research carried out on epiphytes in the world, only one addressed ecology of epiphytic orchids in the Western Ghats! This work suggested that forests that are managed (for other uses by man) are very different from natural forests in epiphytic orchid composition. This raised many questions in my mind. The Western Ghats presently suffers from huge man-made pressures throughout its range. As per global research findings, changes related to human growth and global warming pose serious threats to plant and animal diversity. As a corollary, conservation strategies have to be developed at the earliest. If the ecology of a species is not even known from the forests, no conservation methods can be developed! It means these species would be history before we even know about them. And probably a group of other taxa that are dependent, along with them. What would be the current status of epiphytic orchids in the canopies of the Western Ghats in the context of current threats? Are they in danger of extinction with changing climates, destruction of forest or natural calamities? There are only taxonomical records available about orchids. According to them, the Western Ghats own diversity as high as 307 species. Of which, the orchids restricted to the region (endemic), the Western Ghats are high (113). The specific habitat or climate or other features that sustain this huge diversity have to be identified. Without which, conservation of orchids becomes unreal. Therefore, it should interest researchers to take up unaddressed aspects of orchid ecology. These concerns pushed me towards my research proposal that asked questions never asked before.

I started my Ph.D. research in 2014, the first doctoral research on epiphytic orchid ecology in the Western Ghats, asking major questions in orchid ecology. My research proposal focused on basic ecological questions about epiphytic orchids. The pattern of distribution of epiphytic orchids in different spatial scales, such as a forest type, a host tree, and micro-habitats (such as branch types/outer canopy, etc.) was studied. It differed from other global orchid researches (that have been mostly single tree specific) in considering different spatial scales in a single study. Due to the vast expanse of the Western Ghats, forests in Kerala across an elevational gradient were considered. It was so challenging that no earlier work was available in this regard nor an accepted method. It made me to test used methods in epiphyte ecology in global research. A year-long trial and errors finally yielded the development of an effective integrated method called Linear Line Transect with Selective Tree Scanning (LLTSTS). This was based on plotless sampling. The sampling was time-consuming but measured the characteristics of a vegetation type, host tree and orchid substrate. At times, the tree had to be climbed to survey the canopy. Can you imagine the beauty of being up in the canopy feeling the clouds? The feasibility for the same was different in northern, central and southern Kerala. I, therefore, had to resort to mostly binoculars with high magnification for

observation. Regional climate of Shenduruny Wildlife Sanctuary was recorded using rain gauges and outdoor climate loggers to understand the influence of climate on epiphytic orchids. Data collection involves a lot of effort and sometimes risks money and health of a person or a team. However, I learnt that research in the forests makes you humble, inquisitive, patient, complacent, and emotionally, mentally, spiritually and physically healthy and prepares you for life!

After another three years of research and extensive travel, I was able to come up with significant patterns of distribution of orchids from the Western Ghats of Kerala. The new method is identified as effective to sample endemic/ epiphytic orchids of the Western Ghats as supported by a paper presented in the International Symposium 'Ecology 2017' in Turkey. Endemic orchids preferred mid-altitudes and evergreen forests. In general, the diversity and abundance pattern of epiphytic orchids showed significant patterns along mid altitudes and vegetation/habitat types. For example, evergreen forests hold higher diversity of orchids with the old trees in the lower reaches and highly branched short trees in the hilltop forests. This agrees with theories that suggest a mid-elevation richness of biodiversity in the tropics. It means these factors could actually be a predictor for epiphytic orchid diversity. On a host tree level, the epiphytic orchids are not specific to host species but characteristics such as tree size, tree height, bark types and crown cover. These factors play a role in the selection of host trees during colonization. Spatial occurrence of epiphytic orchids on host trees can be identified into zones such as trunk, lower canopy, middle canopy and outer canopy. Epiphytic orchids have a preference towards a zone depending upon their physiological needs. You could observe epiphytes on trees lining the roads and record their positions for your own research. Further, on the substrate level, branch types, canopy soil, diameter, etc, influences the exact space of establishment for orchids. Regional differences in diversity and abundance of epiphytic orchids in Shenduruny WLS was explained by regional climate (light, temperature and humidity and rainfall). I will have more results in my thesis and research papers that are in the pipeline. Although patterns are described, mechanism under each pattern has to be studied individually for long term in order to fill in each ecological question. These findings are first from the Western Ghats (and India) and therefore, unlock a new field of plant ecology called 'Orchid Ecology' for science enthusiasts.

My research improved knowledge about the ecology of orchids and suggests a long-term large-scale study to fill the gaps. Also, a detailed mapping of species and draft of conservation strategy for orchids may be needed in the future. Terrestrial orchids should also be studied in an integrated method to enhance Orchid ecology. I look forward to take up more specific questions in the future for my post-doctoral research because there are many questions yet to be addressed, Orchid ecology presents a unique world with immense opportunities for learning. I believe more researchers would explore this area and give further insight. Could it be you?