

Nadkarni Still 'Up in the Air'

As a Tree Canopy Life Specialist

It was way back in 1981, when *Park Science* was still *Pacific Park Science*, that an article on rainforest canopy research at Olympic NP appeared under the by-line of Nalini M. Nadkarni. Two photos of this athletic young lady accompanied the story – showing the author's techniques, with ropes, harness, and Jumar ascenders, in the Hoh rainforest at Olympic.

Twelve years later, Nadkarni appears as the likely heroine of a *New York Times News Service* article by Carol Kaesuk Yoon entitled "Layers of Life." It describes a miniature world of animals and insects that exploit the large bromeliads (members of the pineapple family) that flourish in the canopy high above the jungle floor. Visitors by air include species of bats, wasps, butterflies, and birds, that sip from the rainwater pools or tanks stored deep inside the bromeliad's centerpiece – a tight rosette of leaves. Poison-dart frogs – with flattened bodies and spindly legs perfect for maneuvering through the bromeliad's leaves – bathe, hunt, and raise their young in the pools.

Bromeliads also are home to other small animals, including many yet-unnamed species of beetles and ants, some of them so tree-loving their feet never touch earth.

Less appealing but important are the tank's many worms, microbes and protozoans with Bromeliad addresses. Examination of these plants has yielded up to 300 different species. "If you take a bromeliad and plunge it out into a petri dish and then look under a dissecting scope, it's just a zoo," Nadkarni said.

Nadkarni now is a biology professor at The Evergreen State College in Olympia. She has worked in the Monteverde Cloud Forest Reserve in Costa Rica, and says it's "exciting to get to the plants in this upper part of the forest that nobody knows anything about."

David Benzing, a biology professor at Oberlin College, quoted in the same article, says that "these bromeliad tanks are providing a major resource for life in the canopy ... Wet forest canopy probably is the

most species-rich of all the terrestrial communities in the world, and bromeliads are really a pivotal part of the whole system."

Bromeliads get all their water from clouds and fogs and from rainwater they manage to store in their tanks. As for nutrients, they foster the generation of their own fertilizer by means of a happy mutualism – the animals swimming in their tanks excrete wastes, while bacteria and insects help decompose and digest leaves and dead bodies that have fallen into the water. All in all, a rich organic soup.

Scientists have found that the bromeliad then feeds out of its own leafy tureen, using specialized hairs to strain out what it needs. These hairs, called trichomes, can grow on the outer leaves as well, enabling the plant to gather moisture from the forest's humid air.

Tree-dwelling ants leave trails leading out from the edges of the bromeliads where they make their nests in the dry shade of the older, outer leaves. Some ant species are so fond of bromeliads that when they build their huge mound nests in the trees, they plant their own bromeliad seeds.

Certain species of the aforementioned poison-dart frog have been seen *only* in bromeliads. Researchers have tracked mother frogs hopping from bromeliad to bromeliad, visiting each nursery pool where they have left a tadpole or two, lowering themselves into the pools to feed their offspring nutritious meals of unfertilized eggs.

Other plants also reside within the bromeliads ... from algae to tiny predacious plants. The insectivorous plants deep in the pools are hard to spot, Benzing said, except when their blooms jut through the surface of the water as they flower. When small unsuspecting insects swim by the plant, they trigger a bladder which pops open, sucking in the nearby water and usually the prey.

These arboreal gardens, of which there are 2,000 to 3,000 species, are so rich that in a single Costa Rica tree the air plants weighed in at more than 300 pounds.