

Ferns took to the trees and thrived

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Hymenophyllum jamesonii, an epiphytic fern of neotropical rain forests, has berry-like clusters of sporangia where reproductive spores are produced. | Courtesy of Eric Schuettpeiz

(PhysOrg.com) -- As flowering plants like giant trees quickly rose to dominate plant communities during the Cretaceous period, the ferns that had preceded them hardly saw it as a disappointment.

In fact, they flourished. While modern tropical rain forests were becoming established, ferns climbed aboard, and experienced a flowering of their own species diversity.

"The canopy is there and -- boom -- diversification," said Duke

University researcher Eric Schuettpelz, who is completing a post-doctoral fellowship in biology with associate professor Kathleen Pryer.

By integrating genomic data from 400 living fern species with information from the fossil record, Schuettpelz and Pryer constructed a new time-calibrated family tree for ferns. Their study appears on the cover of the July 7 [Proceedings of the National Academy of Sciences](#).

Though ancient, it appears that ferns really came into their own during a very hot, very wet period that peaked about 10 million years after the Cretaceous/Tertiary boundary 65 million years ago.

Two key innovations may have led to the ferns' success in the face of the new competition from [flowering plants](#), Schuettpelz said. Some ferns developed the ability to make a living on light that was more toward the red end of spectrum -- shade, in other words. And, around this time, some ferns also developed the ability to live on trees, sometimes without soil, as epiphytes.

By storing water, developing thicker skin, or being more tolerant to drying out, the epiphytic ferns could now perch on a trunk, limb, or twig and live quite happily more than 100 feet off the forest floor, where moisture, temperature, and sunlight are very different indeed.

Whereas the fossil record seemed to suggest that ferns experienced three distinct pulses of species diversification, the Duke team's analysis shows that there was a fourth, roughly corresponding with the development of epiphytism.

So, as rain forests developed and tropical trees and vines clawed past each other to reach heavenward, they took the ferns up along with them. Thousands of new fern species evolved to take advantage of all the new niches being created in the canopy.

"In some ways I guess, the epiphytes escaped the battle on the ground," Schuettpelz said.

Today, epiphytes comprise about 30 percent of the more than 9,000 living fern species. But this isn't the only plant group that includes epiphytes. This fall, as a post-doctoral fellow at the National Evolutionary Synthesis Center (NESCent), Schuettpelz will begin to look for parallel patterns of diversification in epiphytic flowering plants like bromeliads and orchids.

Source: Duke University ([news](#) : [web](#))

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