

## INVESTIGATING THE PLEATED-LEAFLET ZAMIAS OF COSTA RICA

by Michael Calonje

Costa Rica is a relatively small and narrow country. The distance between the Atlantic and Pacific oceans is 115 km at the narrowest point. One can travel from coast to coast in less than seven hours. Despite Costa Rica's small size, it is remarkably diverse. It is split longitudinally by a central mountain range that reaches a height of 3,820 meters in Cerro Chirripó. This rugged mountain range has varied topography conducive to high species diversity. It also creates a formidable barrier affecting how species migrate and evolve. As a result, there is considerable difference in the species composition of the Pacific and Atlantic slopes of Costa Rica. Those differences are also notable in Costa Rica's native cycads.

On a Montgomery Botanical Center-sponsored expedition to the Pacific slope of Costa Rica in November of 2004, we were surprised to find three distinct taxa of *Zamia*. According to herbarium records, those were all considered *Zamia fairchildiana*. In contrast, the Atlantic slope of Costa Rica contains mostly pleated-leaflet zamias of the *Z. skinneri* and *Z. neurophyllidia* species complex.

In 1851, Warscewicz described *Zamia skinneri* based on plants he collected in Panama. All Central American pleated-leaflet zamias were considered to be this species until 1993 when Dennis Stevenson segregated them into three species: *Z. skinneri*, *Z. neurophyllidia*, and *Z. dressleri* (Stevenson 1993). Under Stevenson's species concept, *Z. dressleri* has a subterranean trunk and leaflets 30-50 cm long; *Z. neurophyllidia* has an aerial trunk to 60 cm tall and leaflets less than 20 cm long; and *Z. skinneri* has an aerial stem up to 250 cm tall and leaflets 30-50 cm long. Stevenson originally described *Z. neurophyllidia* as endemic to Panama. But all pleated-leaflet *Zamia* populations ranging from northwestern Panama through Costa Rica's Atlantic slope and into southern Nicaragua have since been considered *Z. neurophyllidia*.

The morphological differences and genetic relationships among these widely scattered populations of pleated-

leaflet *Zamia* are poorly understood. The opportunity to help clarify these relationships presented itself in January 2006, when I returned to Costa Rica on a two-week, MBC-sponsored expedition to take a closer look at the pleated-leaflet *Zamia* of Costa Rica's Atlantic slope. Accompanied by my brother, Christopher, and biologist Claudia



Author and female *Zamia neurophyllidia* with 46 cm-tall trunk, from inland population.

Gutierrez, we collected data, photographs, living material, and herbarium specimens from widely scattered populations of pleated-leaflet *Zamia* along Costa Rica's Atlantic slope. On this trip we also took detailed measurements of vegetative and reproductive structures of 25 plants within each pleated-leaflet *Zamia* population to contribute to the dataset of similar measurements taken by Dr. Alberto Taylor, cycad researcher at the University of Panama, and former Montgomery Botanical Center biologist, Jody Haynes.

In two weeks we visited eight distinct locations along Costa Rica's Atlantic slope. We began exploring mountainous areas 125 km from the Atlantic Ocean and made our way east all the way to the coastal area bordering Panama. We found pleated-leaflet zamias at every site and were surprised to find some con-

siderable differences between the inland pleated-leaflet *Zamia* populations and those populations near the Atlantic coast bordering Panama. The inland *Zamia* populations achieved a maximum trunk length of 55.5 cm, matching Dennis Stevenson's description of *Z. neurophyllidia* having trunks up to 60 cm tall. However, the leaflets on these plants were not less than 20 cm long as in Stevenson's description, but up to 36 cm long and with an average length of nearly 27 cm.

On the other hand, the pleated-leaflet zamias near the coast were much larger plants than the inland populations. The largest plant we saw near the coast had a trunk length of 270 cm! This was closer to Stevenson's description of *Zamia skinneri*, which he reported could have a trunk up to 250 cm tall. However, the leaflets on these plants were not 30-50 cm long as in Stevenson's description, but a maximum of 30 cm and on average closer to 25 cm long. With none of the pleated-leaflet *Zamia* populations visited during the Costa Rica expedition matching existing species descriptions, our trip ended with more questions than answers: Were the inland plants smaller because they had migrated there recently from the coast, or were they a truly distinct species from their coastal relatives? Do the descriptions for *Zamia neurophyllidia* and *Z. skinneri* need to be expanded to fit populations documented in the Costa Rica expedition, or were the Costa Rica plants different from either of those?

Although our expedition ended with many questions, we were encouraged by the fact that the detailed measurements, photographs, herbarium vouchers, and living material collected during this two-week expedition would eventually help untangle the complex relationships among populations of the Central American *Zamia skinneri* and *Z. neurophyllidia* species complex.

### References

Stevenson, D.W. 1993. The Zamiaceae in Panama with comments on phytogeography and species relationships. *Brittonia* 45: 1-16.

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