

Genetic research reveals several new fern species in tropical America

February 29 2024



Danaea ubatubensis, one of the recently described fern species, is known only from a small area of coastal rainforest in Brazil. A large proportion of the species in the area are endemic. Credit: Hanna Tuomisto

Researchers have clarified the evolutionary history of a previously poorly known group of ferns from the tropical rainforests of America using DNA methods. The study discovered many new fern species, 18 of which have now been given official names and species descriptions.

The Amazon Research Team of the University of Turku in Finland has conducted [long-term studies](#) on the flora and vegetation of Amazonian rainforests to gain a better understanding of species distribution and evolutionary history. The researchers have collected data from both Amazonia and other parts of tropical America. Now, they have traced the [evolutionary history](#) of the fern genus *Danaea* using DNA analyses.

"Studying the evolutionary relationships between species reveals factors that can lead to the differentiation of species traits and ultimately to the evolution of new species," says Doctoral Researcher Venni Keskiniva.

"This type of information helps us understand the drivers behind the high biodiversity observed in tropical regions," Keskiniva continues.

The study revealed that there are many more species in the genus *Danaea* than previously thought, and as part of their revision, the researchers described 18 species that were new to science. The research is published in two parts in the journal *Willdenowia*.

Genetics helped to distinguish between tricky species

In the study, the researchers combined DNA methods with solid field experience. Many of the new species were found in [tropical rainforests](#) in areas that had previously been studied little or not at all.

"However, some new species were growing right under the researchers' noses, for example on Barro Colorado Island, which is one of the most intensively researched rainforests in the world. Two of our new species were found practically in the backyard of a research station," says Professor Hanna Tuomisto. "The plants had of course been seen, but they were thought to belong to a common species that grows throughout tropical America."



Danaea ampla, one of the new fern species recently described, was found in Panama on Barro Colorado Island, which is one of the most intensively researched rainforest sites in the world. Credit: Hanna Tuomisto

The recently published study shows that there are no such widespread species in the genus *Danaea*. Researchers have just been unable to distinguish between similar-looking species.

In the 1990s, it was estimated that the total number of *Danaea* species was 20–30, and that many of them were very widespread. Today, there are about 80 named species, with a further 20 or so still awaiting confirmation. This means that the number of species is much higher, but their ranges are smaller than previously thought.

"At first, we were surprised to see that different individuals of a known species were placed in completely different parts of the family tree. Then we noticed that they formed groups that differed not only in DNA but also in appearance and area of occurrence. This led us to conclude that they were different species," explains Keskiniva.

Danaea ferns are notorious for being difficult to identify. Therefore, the researchers from the University of Turku also published an online identification key. This will help other researchers gather information on the ecology and species richness of tropical forests.

Several species are already endangered at the time of discovery

The ferns of the genus *Danaea* represent a very old evolutionary line, already differentiated from other plants in the Carboniferous Period. At that time, their ancestors formed vast [fern](#) forests, the fossilized remains of which later became coal.

As a result of the burning of the coal and other [fossil fuels](#), the climate

of tropical rainforests is becoming hotter and drier. This is threatening the future of species adapted to [high humidity](#), such as Danaea ferns. The researchers estimate that six of the now described 18 species are already endangered.

"Suitable habitats for rainforest species have been reduced due to direct human activity, such as deforestation," says Tuomisto. "The situation is especially bad in the rainforests of the Atlantic coast, Andean montane forests, and parts of the Pacific coast and Central America. These areas are rich in endemic species, but the forests have been reduced to fragments. For understanding and protecting the biodiversity of tropical forests, it is important to realize that species distributions are narrower than used to be thought."

More information: Venni Keskiniva et al, Danaea (Marattiaceae) keeps diversifying, part 1: eighteen new species, *Willdenowia* (2024). [DOI: 10.3372/wi.53.53303](https://doi.org/10.3372/wi.53.53303)

Venni Keskiniva et al, Danaea (Marattiaceae) keeps diversifying, part 2: phylogeny and identification key for 81 taxa, *Willdenowia* (2024). [DOI: 10.3372/wi.53.53304](https://doi.org/10.3372/wi.53.53304)

Key to the Neotropical fern genus Danaea (Marattiaceae): [keys.lucidcentral.org/keys/v4/ ... o fern genus danaea/](https://www.lucidcentral.org/keys/v4/...o-fern-genus-danaea/)

Provided by University of Turku

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