

SUMMARY

Identity crisis of Madagascan *Selaginellas* – The search for (species) boundaries

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Madagascar, the fourth-largest island in the world, east of the African continent in the Indian Ocean, is a biodiversity hotspot. Due to its long history of isolation, a unique flora and fauna could develop with species that are found nowhere else in the world. This is also the case for several species of the genus *Selaginella*. *Selaginellas* are a group of plants that are neither mosses, ferns nor seed plants. They form one of three living plant families of the so-called lycophytes. A group of plants that, like ferns, have a vascular system and disperse by shedding spores. Spikemosses, as *Selaginellas* are also called, shed two kinds of spores even – large megaspores and small microspores which are produced in strobili. Structures inside those spores produce gametes (analogous to human egg and sperm cells) that fuse and form a new organism. Most spikemosses display four rows of leaves along their shoots. Leaves in the two upper (median) rows are usually smaller and leaves in two lower (lateral) rows are larger leading to the shoots appearing flat, which has previously contributed to confusions with mosses and ferns. Most of the 750 to 800 spikemoss species inhabit subtropical and tropical regions, including Madagascar.

In my Degree Project, I focused on three perennial and erect *Selaginella* species that are only found on Madagascar: *Selaginella moratii*, *S. lyallii*, and *S. pectinata*. A method that has been used to distinguish among species, has been by morphology, that is, visually inspecting individuals for defining characters. Studies on morphology of these spikemosses revealed that *S. lyallii* and *S. pectinata* were difficult to distinguish; individuals were found to have morphological characters typical for both. Using morphology alone, it was therefore difficult to establish a clear species boundary between them. In contrast, *S. moratii* looks different from these two. Alongside morphology, molecular techniques can help us identify different species. The DNA of each of these species become important, defining characters. The more closely related species are, the more of their DNA sequences are shared via a common ancestor. This property helped us to infer relationships among these species, and was represented in phylogenetic trees. But: Former phylogenetic analyses of these three Madagascan species were equally inconclusive; clear species boundaries could not be found. The aim of my thesis was to understand, analyze, and resolve the species relationships among *S. moratii*, *S. lyallii*, and *S. pectinata* using both molecular and morphological approaches.

From herbarium material, DNA sequences, morphology, and image information, I was able to further resolve the relationships between the three species. *Selaginella moratii* is considered different from the others. In contrast, *S. lyallii* and *S. pectinata* formed a species complex, and allowed for two interpretations: *S. lyallii* was either a subspecies of a broader *S. pectinata*, or *S. pectinata* was incorrectly grouped together and is not just one species, and can therefore be subdivided further. The identity crisis of *S. pectinata* specifically is not yet resolved. However, my study indicated that with further investigation, more pieces of the puzzle can be found to resolve the identity of these spikemosses.

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