

# Diversity of the Vascular Epiphyte Flora at Two Different Elevations

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## Introduction

The montane forests are very diverse; here the epiphytes represent a large proportion of the diversity of plants<sup>1</sup>. Under favorable conditions epiphytes may reach 25% of the species found in a hectare<sup>2</sup>. The placement of epiphytes is typically divided in five different zones<sup>3</sup> on a tree. The composition and life-form change among the zones. The most important epiphyte vascular plant families are Orchidaceae<sup>4</sup>, ferns<sup>5</sup>, Bromeliaceae, and Araceae<sup>6</sup>.

Inventories of epiphytes are few and at very different scale and are therefore difficult to compare. In the Bolivian Yungas 637 epiphytes have been recorded<sup>1</sup>. A total of 175 epiphyte species were found in 0.32 ha in the forest of Cotapata<sup>7</sup>, and 147 species were found in foothills of the Madidi National Park<sup>8</sup>.

## Methods

In this study we made two inventories 1) at Pauje Yuyo between 900–1050 m and 2) at Wayrapata between 1290–1470 m. Both localities are found near the border between the provinces Franz Tamayo and Bautista Saavedra in the Integrated Management Area Apolobamba in the Department of La Paz (Fig. 1).

We inventoried all epiphytes and hemiepiphytes in the understory in 10 plots each 400 m<sup>2</sup>, five at each site and located at different elevations. In each plots we also inventoried the largest and most epiphyte covered tree completely<sup>8</sup>. The position of the epiphyte was classified following Johansson<sup>3</sup> (Fig. 2).

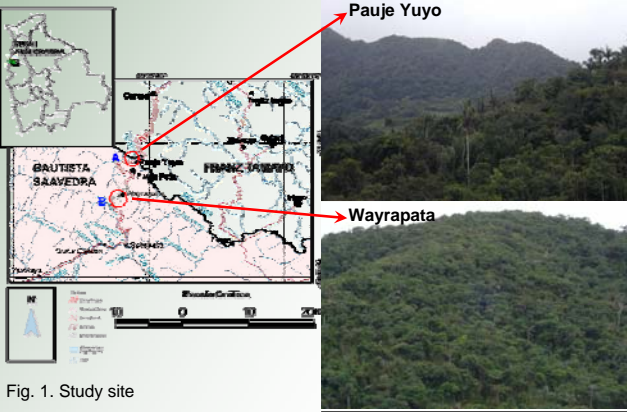


Fig. 1. Study site

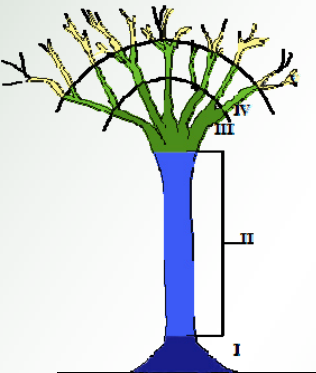
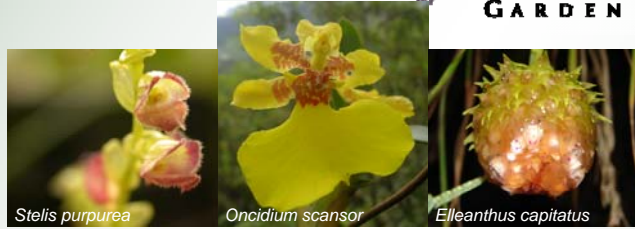


Fig. 2. Johansson zones<sup>3</sup>

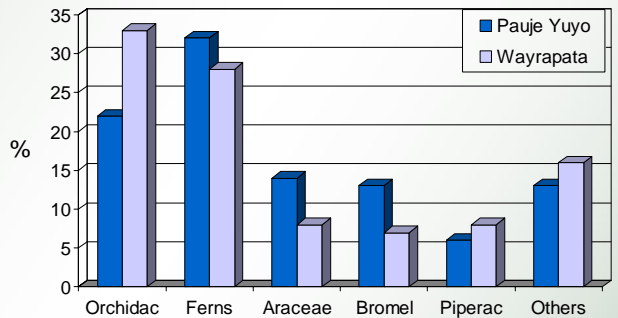
V	The upper crown or terminal branches
IV	The middle of the crown or secondary branches
III	The lower crown or primary branches
II	Upper part of trunk
I	Basal 1 m of the trunk

## Results

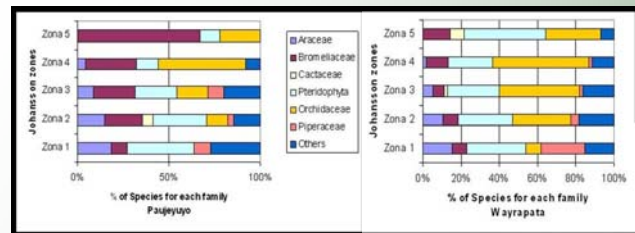
We recorded 127 species at Pauje Yuyo contained in 54 genera and 24 families, at Wayrapata we found 201 species in 61 genera and 25 families. The beta-diversity compared across sites was large with only 48 species in common, and at the same time the alpha-diversity increases with increasing elevation, in the elevational range studied, which coincides with Gentry & Dodson<sup>9</sup>.



Percentage of species at the study sites



The elevational range (930–1470 m) here studied is very poorly known. There are few floristic studies and even fewer studies that focuses on epiphytes<sup>10</sup>. Despite differences in methodology we fell comfortable concluding that the diversity we find is relatively high compared to other studies<sup>11</sup>. However, we find fewer epiphyte species than Ibsch<sup>2</sup> did in a smaller area, but we find approximately half the number of species found by Webster & Rhode<sup>12</sup> in an area 110,000 times larger.



The relative patterns of diversity of families is similar in the lower four Johansson zones. Araceae diminishes in diversity with an increasing zone class, ferns are relative constant independent of the zone, while orchids becomes more diverse as the zone class increases. For class five there is a change in pattern, here the Bromeliaceae are more diverse at Pauje Yuyo while the ferns are more diverse in Wayrapata. This difference in relative composition may be caused by an increased in dryness (Bromeliaceae better adapted to a dry season than ferns) at the Pauje Yuyo versus the Wayrapata locality, this correspond also to the total diversity as epiphytes richness is predicted to follow high humidity areas.

The distribution of epiphytes in the Johansson zones found in this study compares well with other works<sup>2, 3, 7, 12</sup>. The zones that contain the highest diversity are 2, 3, and 4. Araceae is well represented in zone 1 and 2<sup>7</sup>. Bromeliaceae represent 70% of the species in zone 5 at Pauje Yuyo. Orchids are present in all zones but there is a clear differentiation in size, only smaller orchids are present in zone 5.

## Literature cited

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