

# Assessing the biodiversity in the air: First approaches in an alpine environment

Franziska Zemmer<sup>1,2</sup>, Antonella Cristofori<sup>1,2</sup>, Fabiana Cristofolini<sup>1</sup>, Elena Gottardini<sup>1,2</sup>

<sup>1</sup>Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige, Italy

<sup>2</sup>NBFC, National Biodiversity Future Center, Palermo 90133, Italy

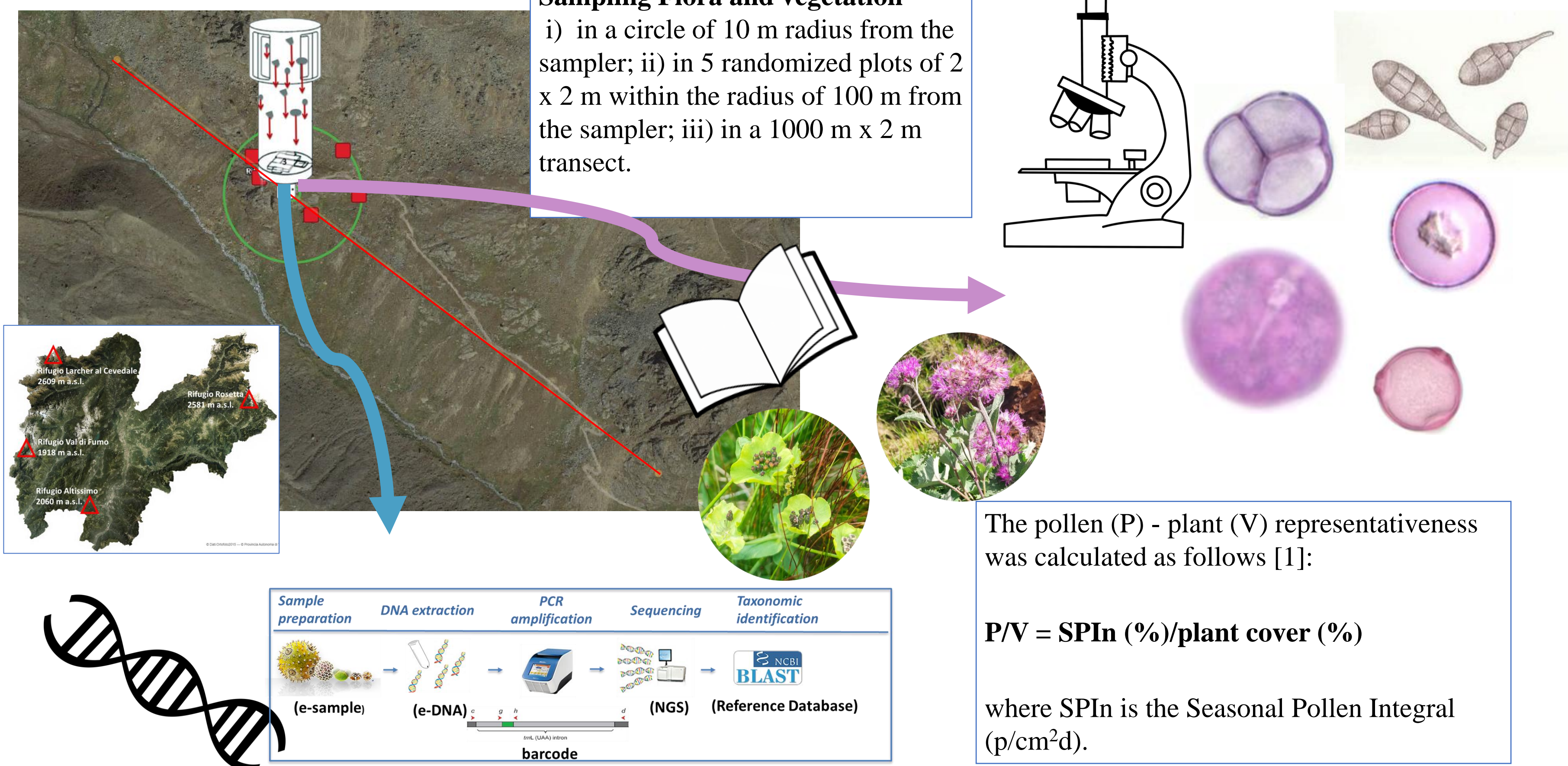
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**I. BACKGROUND** We explore the potential of air as a means for biodiversity assessment in an alpine environment, known to be especially sensitive to impacts of global change. As a first approach, we look at **the representativity of the pollen sample for the vegetation on site** taking the Rifugio Larcher as example.

## II MATERIALS AND METHODS

### Sampling Flora and vegetation

i) in a circle of 10 m radius from the sampler; ii) in 5 randomized plots of 2 x 2 m within the radius of 100 m from the sampler; iii) in a 1000 m x 2 m transect.



The pollen (P) - plant (V) representativeness was calculated as follows [1]:

$$P/V = \text{SPIn} (\%) / \text{plant cover} (\%)$$

where SPIn is the Seasonal Pollen Integral (p/cm<sup>2</sup>d).

## III. RESULTS

**A. Pollen taxa** 21 pollen taxa, 84% of herbal, 16% of woody plants, were detected. 9 constituted > 1% of the SPIn in the bioaerosol (Fig. 1). The protocol of environmental DNA (eDNA) extraction and amplification, a tailored reference database on ITS1 and ITS2 regions for pollen and fungal taxa identification, and an efficient bioinformatics pipeline have been concurrently developed.

**B. Pollen-vegetation relationship** Open acidophilous alpine grassland is the main vegetation cover on site. A total of 46 vascular plant taxa were recorded in five plots (total area 20 m<sup>2</sup>). For nine taxa we calculated the P/V-ratio.

If P/V = 1, the plant family was equi-represented; if P/V > 1, the family was over-represented by pollen analysis;

If P/V < 1 it was under-represented:

Apiaceae = 1; Asteraceae = 0,02; Cyperaceae = 0,11; Fabaceae = 0,13; Juncaceae = 3,28; Poaceae = 1,76; Polygonaceae = 0,18; Salix = 0,08

We found 13 taxa from non-local sources. Ten taxa recorded in the vegetation analysis were not represented as pollen in the air samples.

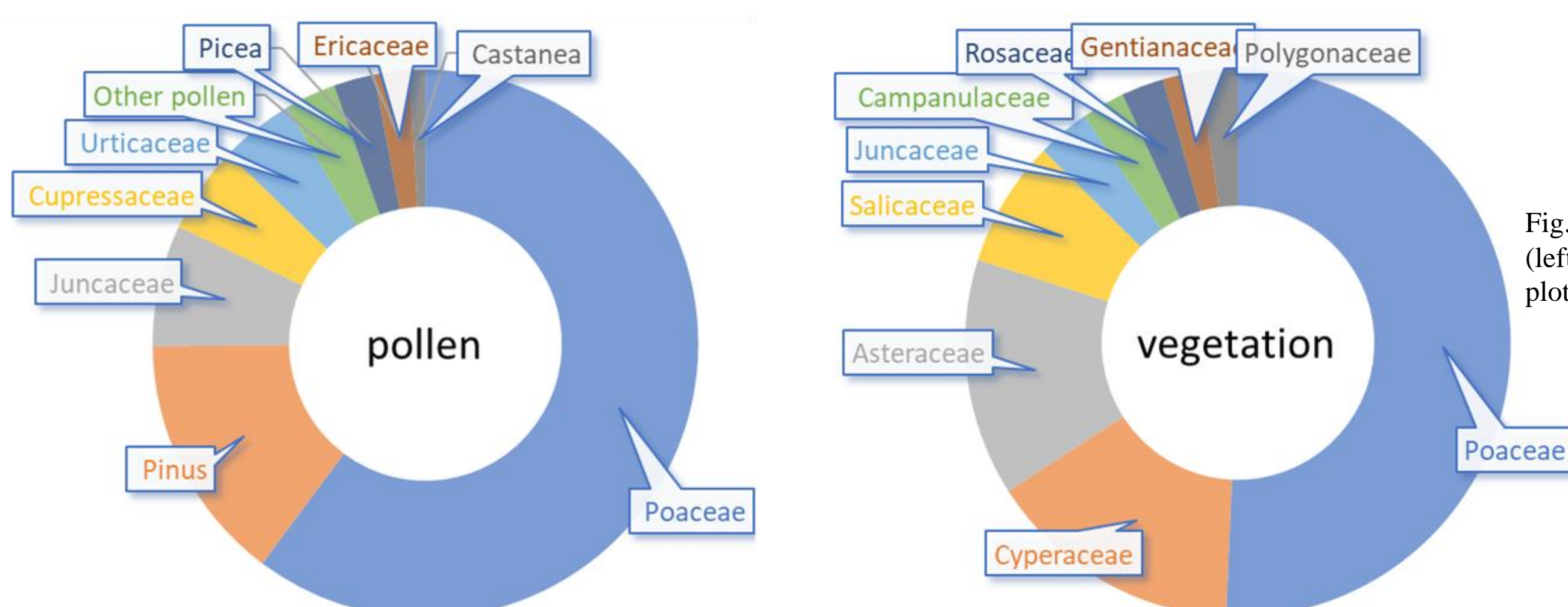


Fig. 1. The main pollen taxa (p/cm<sup>2</sup>d) in % (left) versus plant cover in % in vegetation plots at Rifugio Larcher al Cevedale (right).

**III. DISCUSSION AND MAIN CONCLUSIONS** Pollen in the air can be a means to assess plant biodiversity. The local flora dominated by grasses is well represented in the airborne pollen spectrum. However, there is a fraction of remote biodiversity transported by winds from lower elevations and/or longer distances to the receptor site. Results of the ongoing molecular analysis of eDNA are expected to provide a higher taxonomic detail of airborne pollen. Long-term aerobiological monitoring at high altitudes would provide insight on changes in terms of plant composition, reflecting for example, the upward movement of invasive species, and on flowering phenology. To our knowledge, this is the first study that investigates the potential of the air as a matrix for plant biodiversity monitoring at high altitudes using both eDNA and microscopy.