

**Sexual and clonal reproduction in alpine plant life: persistence and dispersal as key processes to explain the maintenance of genetic diversity** Tina Weppeler, Andrea R. Pluess and Jürg Stöcklin

**Address of the authors:**

Botanical Institute, University of Basel  
Schönbeinstrasse 6  
4056 Basel/Switzerland  
tina.weppeler@unibas.ch

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Persistence by clonal growth is an obvious characteristic of most alpine plant life. Species from alpine communities are usually long-lived and rely strongly on the reproduction by vegetative growth. However, it remains unclear how the surprisingly high level of genetic variation in extremely long-lived clonal species with usually poor dispersal capacity is maintained. Current theories on the maintenance of genetic diversity have been developed for animal organisms and focus on the effects of spatial dispersal of mobile organisms with separate sexes, usually referred to as metapopulation theory. In an ongoing project we ask whether and how this dominant theoretical concept also applies to sessile plants which occur in the extreme patchy and fragmented alpine landscape and which possess complex reproductive systems. We use demographic field work, an experimental approach and molecular tools to answer the following questions: (1) How important is dispersal by seeds and the colonisation of new sites in the alpine landscape? (2) How effectively does it affect the balance between sexual and asexual reproduction? (3) How is the spatial genetic structure in alpine clonal species related to the dispersal of pollen and seeds? We will present preliminary results from a demographic study with the clonal *Geum reptans* in which we ask if the importance of establishment from seeds is sufficient to maintain a high genetic diversity within populations and if in newly created habitats traits favouring a high seed production and dispersal are favoured compared to later successional stages. Our results will be helpful to predict the resilience of alpine plants to global warming.

**Phylogeographic analysis of *Pulsatilla alpina* (Ranunculaceae), including a relic population from the Harz Mountains (Northern Germany)** Holger Zetsche<sup>1,2</sup> and Frank R. Blattner<sup>1</sup>

**Addresses of the authors:**

<sup>1</sup>Institut für Pflanzengenetik und  
Kulturpflanzenforschung (IPK)  
06466 Gatersleben/Germany  
holzet@gmx.de

<sup>2</sup>Institut für Geobotanik  
Martin-Luther-Universität  
Am Kirchtor 1  
06108 Halle (Saale)/Germany

*Pulsatilla alpina* (L.) Delarbre subsumes up to nine subspecies with a complex distribution pattern in European alpine regions, ranging from Northern Spain through the Alps to the Carpathian Mountains. Populations also occur on mountain ranges in Corsica, Italy and the Balkan peninsula, as well as in some low mountain ranges north of the alpine arc. Though the species complex was morphologically extensively studied (Aichele & Schwegler 1957, Feddes Repertorium 60:1–230; Moser 1996, Dissertation, University Bern), the conspecific status of the subspecies and phylogenetic relationships between them remain unclear.

On the very top of the «Brocken» (1142 m, Harz Mountains, Germany) occurs the northern-most population of *P. alpina* (ssp. *alpicola*) in about 700 km distance to the nearest *P. alpina* habitat. This remote population is part of a small group of alpine plants growing just above the timberline (at 1110 m). It is hypothesised that these plants are relics of the last ice age. Equally likely seems recent long distance dispersal from one of the populations in the core area of distribution of *P. alpina*.

In the framework of a study on the origin of the alpine species of the Upper Harz Mountains we conduct a phylogeographic analysis of *P. alpina*. We use a nested analysis approach to clarify (sub)species boundaries within the *P. alpina* complex, and to analyse population genetic parameters for populations from the entire distribution range of the taxon. In a first step we sequenced the nrDNA ITS region in all subspecies recognised by Moser (1996), together with *P. occidentalis* and *P. vernalis* as outgroups. First results show that ITS sequences produce sufficient polymorphisms to analyse phylogenetic relationships within *P. alpina*. The deepest split within the *P. alpina*-clade separates an accession from northern Italy from all other individuals in the analysis. Accessions of the yellow-flowered ssp. *apiifolia* are dispersed in the cladogram and group together with white-flowered individuals from neighbouring regions. Accessions of ssp. *alpicola* are genetically similar, though geographically widely apart (Tatry