

Foliar nutrient concentrations of South Patagonian bog species along a climatic and floristic gradient

Introduction

The southern Andes create extreme natural environmental gradients and have consequently a strong effect on the floristic composition and the trophical status of bog ecosystems.

Along a longitudinal gradient bog vegetation changes from hyperoceanic blanket bogs in the west, which were built by cushion-forming vascular plants to more continental *Sphagnum*-dominated bogs. In a transition zone both bog types intermingle (Fig. 1).

The nutrient balance plays an important role in various key-processes of bog ecosystems. In this study, we want to assess the nutritional status of the major South Patagonian bog types by the analysis of plant nutrient concentrations, which were supposed to be good indicators for plant growth and biogeographical patterns.

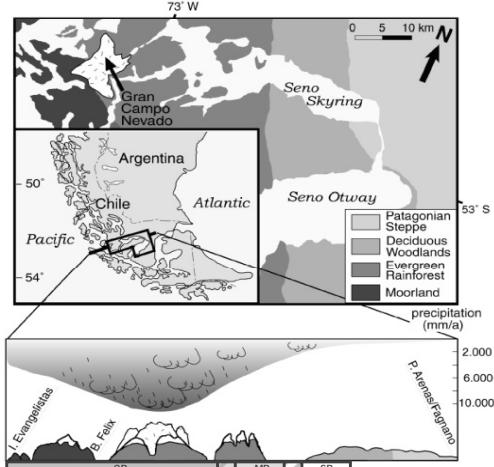


Fig. 1 Study area and precipitation gradient.

CB Pacific cushion-plant bog, MB *Sphagnum*/cushion-plant mixed bog,
SB continental *Sphagnum*-dominated bog (after Schnirch 2001, modified)

Methods

Plant foliar material of eight plant species was sampled and analyzed for their chemical composition (N, P, Ca, Mg, K, Na). Besides the main peat creating species such as the cushion-building vascular plants *Astelia pumila*, *Donatia fascicularis*, *Oreobolus obtusangulus* and the peat-moss *Sphagnum magellanicum*, species with abundant occurrence along the entire floristic gradient were of main interest. According to this criterion, *Empetrum rubrum*, *Tetroncium magellanicum* and *Marsippospermum grandiflorum* were sampled. *Schoenus antarcticus* was included as a typical constituent of inclined oceanic cushion bogs.

Results

Nutrient contents were generally lowest in *Sphagnum magellanicum* and highest in *Tetroncium magellanicum*. Nutrient concentrations in cushion plants differed widely. *Donatia fascicularis* showed *Sphagnum*-like low nutrient concentrations, whereas nutrient contents in *Astelia pumila* were relatively high. Concentrations differed significantly among all species, but the variation among the species was arbitrary for each nutrient. A Principal Component Analysis (Fig. 2) was carried out to examine characteristic patterns among species. Although variation in foliar nutrient concentrations was mainly reflected by the interspecific variability, a moderate shift along the considered gradient was obvious. N and Ca concentrations increased and P concentrations decreased westwards in most species. Consequently, a noticeable shift was an increasing N:P ratio that suggests an increasing P limitation from east to west (Fig. 3).

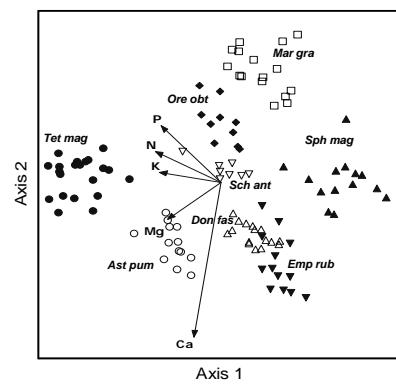


Fig. 2 Distance-based biplot of PCA per sample, explaining 82 % of the variation of nutrient concentrations.

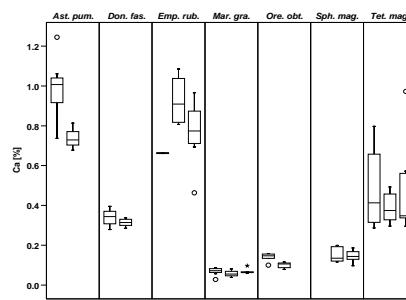
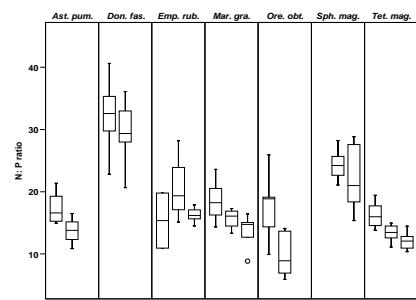


Fig. 3 Foliar concentrations [% dw] of calcium and N:P ratios of seven species among bog types.
SB *Sphagnum* bog, MB *Sphagnum*-cushion mixed bog, CB Cushion bog



Conclusions

- South Patagonian bog ecosystems are characterized by nutrient-poor conditions even if the considered species differ in their nutrient demands.
- Foliar nutrient contents indicate an important impact of the trophic conditions on floristic composition.
- The growth form of cushion plants might be an adaptation to nutrient-poor conditions in the hyperoceanic west.
- Data indicate a high interspecific and a moderate intraspecific variation in foliar nutrient contents along a west-east gradient in South Patagonian bogs.
- Phosphorus limitation is supposed to have an important impact on plant growth in cushion bogs, indicated by increasing N:P ratios westwards.
- Calcium concentrations in plant material suggest a higher soligenous influence in western cushion bogs.