Submitted Abstract

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Abstract

High-altitude lakes are sensitive ecosystems and appear to be good indicators for studying the effects of global change on biodiversity. However, their ecological functioning is still poorly understood, especially in terms of the aquatic vegetation in the lakes and the various roles of plants that are important to the functioning of aquatic ecosystems. Understanding the impact of global change in mountain lakes requires understanding how environmental factors govern the organization of aquatic plant communities.

We present a study that focused on monitoring aquatic plant communities in 30 high-altitude lakes and conducting transplantation experiments with measurements of morphological and physiological traits for a common alpine species.

Plant diversity was low with high dissimilarity between lakes, but plant cover was relatively high and correlated with fine sediment area. Two plant strategies were observed with high dispersal species characterized by thin leaves, low abundance levels but present in many lakes and with relatively tall species with high abundance levels but present in very few and neighbouring lakes. Plant colonization appears more limited by the probability of dispersing to the lake than by local environmental factors, as suggested by the decrease in species richness according to elevation between the lake and car park. Transplantation experiments were performed with Ranunculus trichophyllus eradicatus, the most frequent species in northern French lakes. The growth of the plants and their organs over 2 weeks was similar at 7 or 17 °C, regardless of the population of origin. The variability in photosynthetic capacity was mainly explained by the experimental temperature conditions during the measurements, weakly explained by the temperature of the two-week cultures, and not explained by the temperature of the lakes of origin. These results confirm the high plasticity of aquatic plants and that numerous species are able to develop under highly contrasting environmental conditions.

Spatial factors favouring connectivity and dispersion were more dominant than local abiotic factors in explaining community diversity. Thus, the amount of aquatic plants contributing to the primary production of lakes could therefore be greatly underestimated, especially since climate change, eutrophication and human activities should encourage their colonization in these high-altitude ecosystems.