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“Bridging the gap between increasing knowledge and decreasing resources”

Population Structure and Genetic Diversity of *Populus laurifolia* Stands in the Altay Mountains of Mongolia

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Abstract

Riparian forest ecosystems belong to the most vulnerable ecosystems on our planet, and at the same time deliver important ecosystem services such as habitat provision, carbon sequestration, watershed stabilisation, erosion prevention and in-stream processing of pollutants. Over the last decades, however, human impacts such as logging of trees and over-grazing by livestock have profoundly altered these ecosystems, whose effects are still poorly understood. Since population structures, species' dynamics and viability mainly depend on the spatial heterogeneity of habitats, a reduction in stand density is usually equivalent to a reduction in the effective population size. The latter may be low because fragmentation may result in inefficient gene flows.

The Laurel Poplar (*Populus laurifolia*) appears to be ideal to study such effects of human intervention under harsh climatic environments. Therefore, a study was conducted under semi-arid conditions along the Bulgan River catchment area, western Mongolia, where tree growth is strongly restricted to watercourses, harmed by logging and subjected to browsing and grazing of livestock.

A total of 600 individuals, grouped into 40 sub-populations (comprising one Bulgan River population and five populations of 2nd order tributaries) were geographically recorded, dendrometric variables measured, and leaves sampled. Extracted DNA was analysed by nuclear encoded microsatellite markers, and genetic diversity and differentiation were subsequently calculated.

Statistically significant differences and large variations were found for tree and stand characteristics within the six surveyed populations. Size classes indicated that Bulgan River populations were younger compared to the tributaries, while stand density was highest along the Bulgan River. However, a strong variation in stand densities as well as the total absence of trees in upstream areas was even more striking. Genetic measures revealed a downstream accumulation of diversity and a moderate genetic differentiation among populations.

In conclusion, strong spatial fragmentation and clear genetic variations indicated substantial impacts of human intervention even in this remote region, which is of concern regarding the viability of populations and the ecosystem's services in future.

Keywords: Ecosystem differentiation, habitat fragmentation, poplar, riparian forest, stand density