The Dinaric Mountains versus the Western Carpathians: is structural heterogeneity similar in close-to-primeval Abies-Picea-Fagus forests?

– SUPPLEMENTARY MATERIAL –

(EUROPEAN JOURNAL OF FOREST RESEARCH)

J. Paluch (corresponding author) [a], S. Keren [a], Z. Govedar [b]

[a] Faculty of Forestry, University of Agriculture, Al. 29 Listopada 46, 31–425 Krakow, Poland, Tel. +126625048; Fax +124119715;
E-mail jaroslaw.paluch@urk.edu .pl

[b] Faculty of Forestry, University of Banja Luka, 78000 Banja Luka, Bosnia and Herzegovina, Republic of Srpska

To evaluate the statistical power of the paired-plot approach in the detection of positive spatial correlation (patchiness), we carried out a simulation experiment. In a single simulation, in a sampling grid similar to that used in the field (15×15 sample plots), we built up a distribution pattern of known spatial properties and then applied the paired-plot approach for its identification. Then, for 100 simulations we registered the proportion of correct identifications, i.e. cases for which the U-values were greater than 1 and thus indicating positive correlation across all the spatial scales predefined in the simulated pattern. In a statistical sense this proportion estimates the power of a binary hypothesis test that is the probability that the test rejects the null hypothesis when a specific alternative hypothesis is true.

We obtained patterns of different spatial properties by overlaying a predefined number of square patchy structures, $\mathrm{B}_{ij} = [y_{i+p,j+r}]$, $p, r \leq M$, on a randomized matrix $\mathrm{A} = [x_{ij}], i = 1,2, \ldots, 15, j = 1,2, \ldots, 15$. This allowed us to form a gradient of distribution patterns from purely random and containing only matrix (0% patchy structures) to purely patchy (no matrix, 100% patchy structures). In the simulations the patch size within a given pattern was held constant, M=3, and the patches were randomly distributed within the matrix A but not allowed to overlap. The patterns were generated in two steps. First, all the elements x_{ij} were drawn from the normal distribution with a mean $\bar{x}$ and a predefined standard deviation s_A, $X \sim Norm(\bar{x}, s_A)$. Then, a predefined number of patchy structures B_{ij} with the elements $y_{i+p,j+r}$ being a representation of a random variable $Y \sim Norm(x_{ij}, s_B)$ was superimposed on the matrix A. In different patches building up the same pattern, the mean values were different and conditioned on x_{ij}, whereas the standard deviation to mean value ratios, s_B/x_{ij}, were kept constant. The increasing k-values, $k = (s_A/\bar{x})/(s_B/x_{ij})$, allowed us to obtain patterns with a deepening contrast between within-matrix $(s_A/\bar{x})$ and within-patch (s_B/x_{ij}) variation. We tested the statistical power of the paired-plot approach (i.e. probability of detection of patchy structures) for the patterns with

k-values ranging from 0.8 to 5.0 and the total proportion of the patchy structures between 0 and 100% (Figs S1 and S2).

The simulations carried out indicated that when the proportions of patchy structures were 50 and 70% in the entire matrix, the paired-plot method correctly classified 98 and 100% of the cases, respectively (Fig. S1). The proportion of patchy structures somewhat more strongly affected the estimation of patch size. For the proportion of patchy structures of

50 and 70%, the paired-plot approach correctly identified the patch size predefined in the mechanism generating the pattern in about 90 and 98% of the cases, respectively. The ratio between the within-matrix and within-patch variation (i.e. the *k* value) also had a significant effect on the statistical power of the tested procedure (Fig. S2). Nonetheless, even for a *k* value close to 1, that is, for comparable within-matrix and within-patch variation, the paired-plot method was still capable of revealing patchiness because of differences in the mean values within the matrix (conditioned on the overall mean $\bar{x}$) and within the patches (conditioned on the local value x_{ij}).

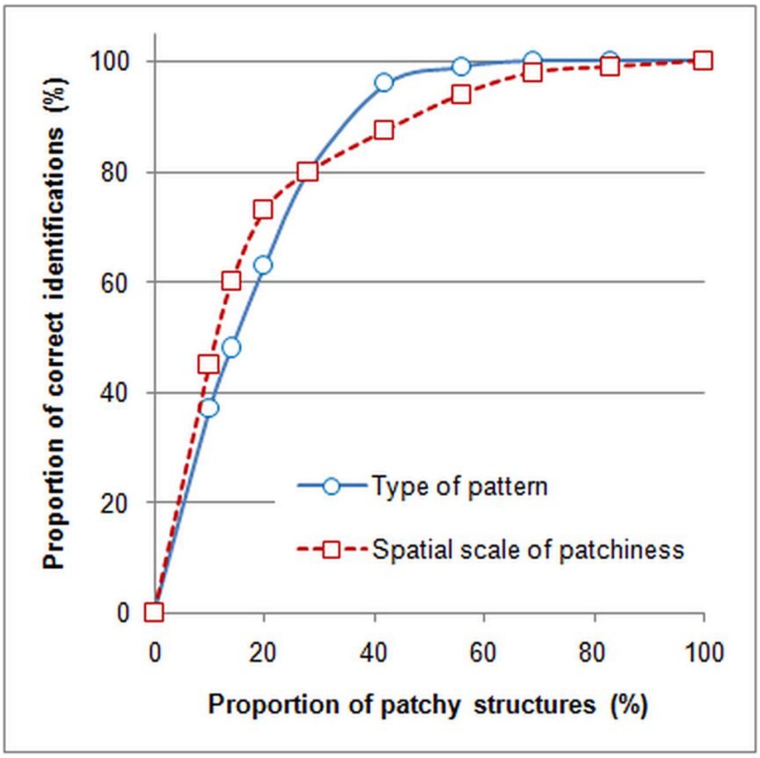

Fig. S1. The statistical power of the paired-plot method: proportion of correct identifications of patchy patterns and their spatial scale depending on the proportion of the patchy structures within the matrix (simulations for *k* = 1.5, for definition of the *k* value see text).

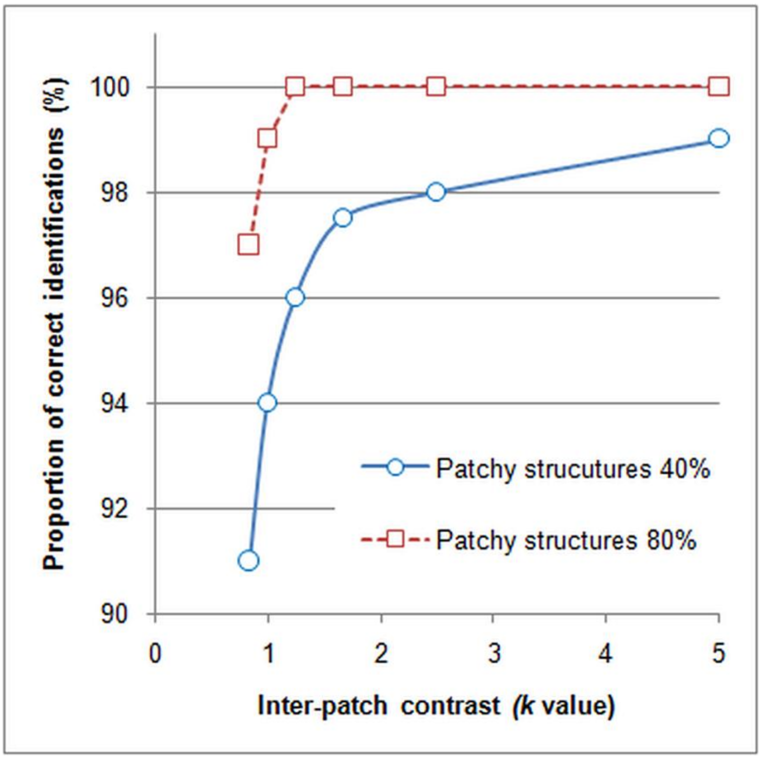

Fig. S2. The statistical power of the paired-plot method in the identification of patchy patterns depending on the proportion of the patchy structures within the matrix (40 vs 80%) and the ratio between the within-matrix and within-patch variation (the *k* value).