Dendroecological analysis of *Fagus orientalis* temperate rainforest in northern Turkey

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Summary

Disturbances influence the structure and development of forests. Old-growth forests are particularly suitable to study the influences of disturbances as they record these influences for a long time span. This Master thesis is based on a dendroecological analysis of an old-growth forest. The aim of this study was to verify that the investigated plot is old-growth, and that this forest is driven by gap dynamics. Climate influence on tree growth, and on the structure of the forest is analysed. Disturbance history should help to confirm the gap dynamics further. As several methods aiming to detect disturbances exist, this thesis aims to compare three of them to evaluate the pros and cons of each method compared to the other methods.

The study was conducted in an old-growth temperate rainforest in the UNESCO (United Nations Education, and Scientific Cultural Organisation) Biosphere reserve Camili lying in the Colchic region at the east coast of the Black Sea. Trees were cored on a plot in old-growth forest and additional variables like diameter at breast height (DBH), tree height, canopy class and spatial information were collected. Cores were prepared according to standard procedures and then crossdated, before ring widths were measured. Growth response on climate was analysed. The disturbance analysis was done with three different methods. This included radial growth averaging (RGA), the boundary line method (BLm), and the time series approach (TSa). Disturbance histories were calculated for each method, showing percentage of trees releasing per decade.

Tree growth is strongly influenced by the climate in spring, whereas growth is positively correlated with temperature and negatively correlated with precipitation. DBH and minimum age distributions compared well to findings of other studies and confirmed that the investigated forest is old-growth. The spatial distribution of the trees displayed that trees of small DBH tended to form more clusters than trees with larger DBH. The three methods for disturbance detection detected different mean releasing rates per decade: Starting with the highest rate by RGA with 16.12%, followed by the BLm with 6.36% and the Ts with 3.06%. RGA showed quite high release rates. It detected in some decades release rates that exceeded 33%. This result appears not very reliable compared to the other two methods. The comparison of the three methods identified strong methodological differences. However, all methods displayed peaks of releasing trees in the same or neighbouring decades. The highest values were found in the 1820s, 1890s, 1920s, and 1970s. These decades were evident in the standardised ring width chronology as increased growth. Furthermore, the spatial analysis of releases in these four decades identified two decades where gaps must have formed. These led to patches of trees releasing around the fallen tree. This together with the analysis of today’s forest structure shows that gap dynamics are an important driver of succession in this forest.
Summary

In conclusion, this old-growth forest resembles other old-growth forests in DBH and age-structure and is most likely driven by gap dynamics. However, additional research in these old-growth forests would allow verifying the findings of this study further. Only one plot was investigated, which might not represent the forest accurately. By changing the plot design, more information on disturbances could be collected and therefore disturbance history made more reliable. Studies on, for example, seedling recruitment, and/or the extension of formed canopy gaps would broaden the knowledge of the ecology in this forest.