

CONSIDERING ALLOMETRIC RELATIONSHIPS IN THE ANALYSIS OF SPATIAL TREE PATTERNS

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Abstract. Inferring ecological processes based on the observed spatial tree patterns is an important incentive for research in spatial forest ecology. Difficulties associated with these studies are that it is typically impossible to observe the long-term spatial dynamics of a forest stand and most of the available data relate to spatial patterns representing a single instance in time. To understand the past development of a forest stand, it is useful to examine the correlation structure of tree characteristics with memory properties. The allometric relations between these characteristics are able to preserve a legacy effect even better than the single characteristics. Our study addresses the allometric statistical dependence as a multivariate mark in the analysis of marked point patterns. The data included four research plots and two main species in the natural uneven-aged woodland at Lligwy Woods in North Wales (the UK). These plots were compared through the analysis of mark correlation and mark variogram to find evidence of interactions between neighbouring trees. Our findings showed that these interactions were less pronounced for plots with native ash-dominant overstorey than for plots with a non-native sycamore-dominant overstorey. These results contribute to understanding the mechanisms of species alternation at Lligwy Woods and suggest that the two species have adapted to each other and form an equilibrium, where the allometric properties play a key role.

Key words: marked point processes, point-pattern analysis, legacy effect, mark correlation function, mark variogram.