

Spatial pattern analysis and applicability of landscape metrics for the monitoring of riverine landscape structural changes in East Mediterranean rivers

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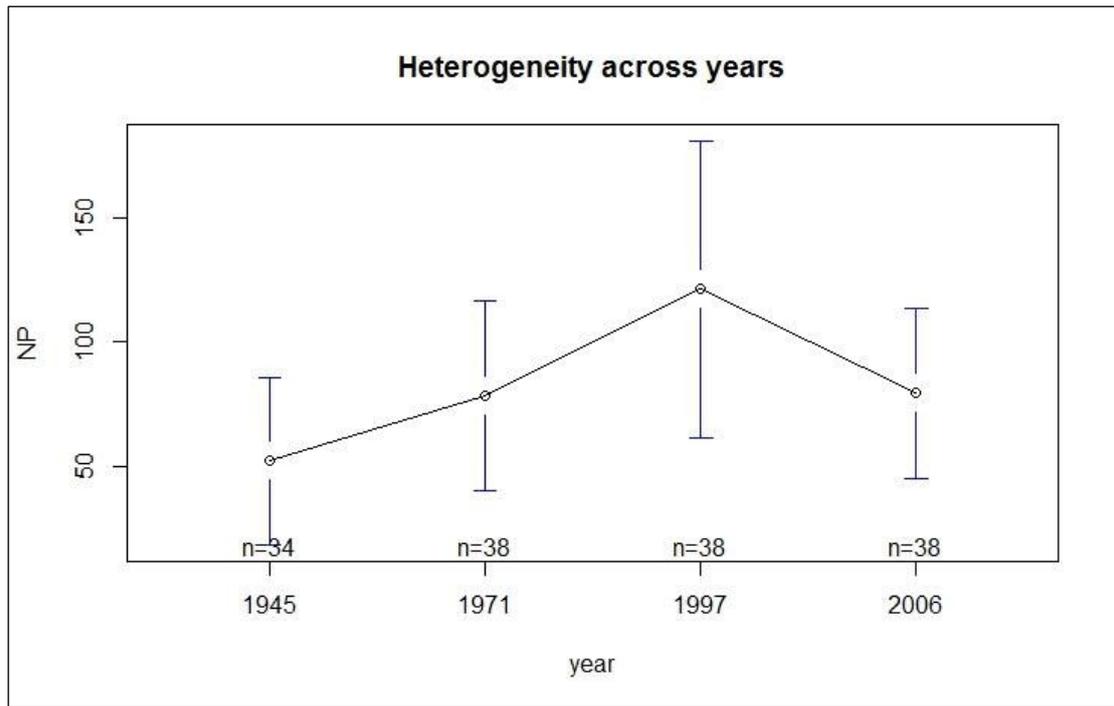
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Abstract

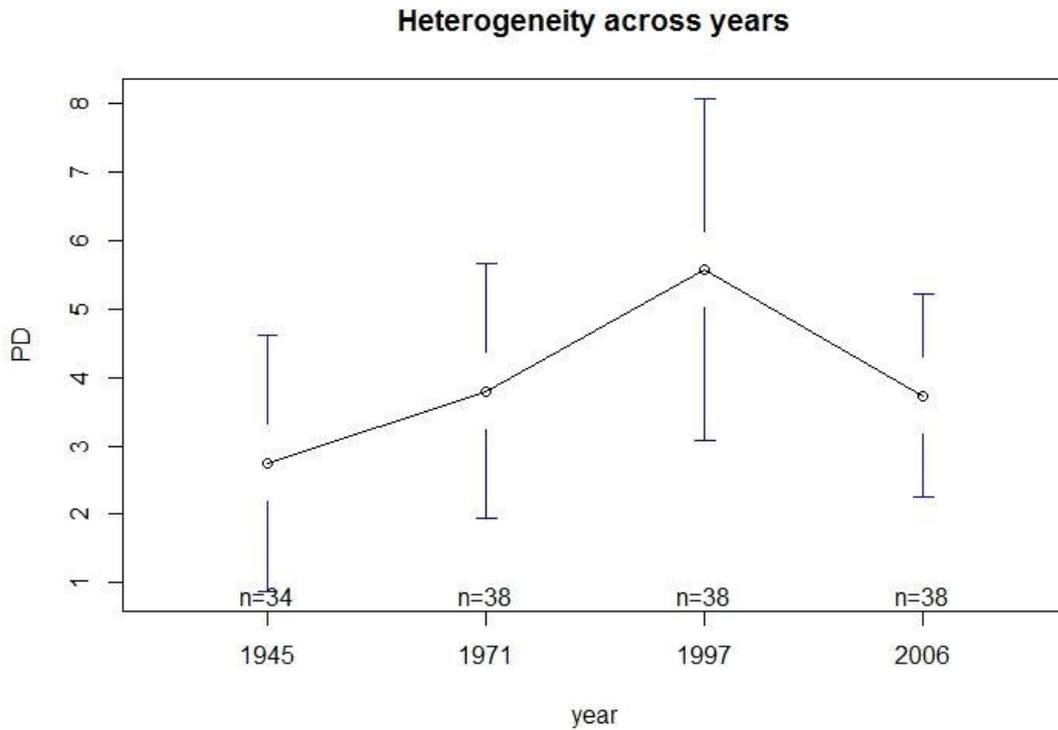
Mediterranean riparian areas are spatially heterogeneous, particularly complicated and variable in time and space. In order to improve the understanding of the relationships between landscape patterns and ecological processes, riparian ecosystems need to be mapped, quantified, and assessed. Remote Sensing and GIS techniques with air photos, topographic, environmental, and primary statistical data are used as sources of information's in order to estimate the basic components that determine the structure of riparian landscapes. The different land cover/ use patches, the structure of riparian vegetation, the longitudinal continuity of vegetation patches, the configuration and expansion of their limits, can reveal the level of human disturbance and can be used as indicators of the ecological status. Quantifying landscape elements is the key to understanding riparian structure, how it affects landscape processes, and will help in making informed decisions in management planning of riparian areas. In the current research, we quantify the relationships between selected landscape metrics for the upper, middle, and lower parts of two riparian landscapes in Western Greece, (from 1945 to 2006). The studied area was divided into 3km long river segments. Within each segment selected landscape metrics in Landscape and Class level were exported and land covers/uses were quantified. The different segments are grouped by cluster analysis on the basis of the land cover/use types which result in larger homogenised river parts. Firstly, the spatial distribution data of landscape metrics in each part are derived from the land use classification maps. Then, the fragmentation is quantified using a series of selected spatial metrics which further used as explanatory variables in the estimation. Finally, longitudinal data analysis was implemented to estimate the impacts of different land cover /use types on riparian landscapes. The examination of landscape metrics reflects the impact of human activities on the spatial heterogeneity of the riparian landscape. In both cases riverine landscape patterns are more heterogeneous in the 90's, while the heterogeneity across years fluctuates more widely in Louros river. In recent years the results indicate a trend for reduced spatial heterogeneity (NUMP, TE) in riparian zones, the landscape becomes more homogeneous, mainly as a result of the intensification of agriculture, which lead to the loss of valuable habitats (e.g. riparian forests, salt marshes, river islands). This trend is much more pronounced in low-lying river plains where intensive agriculture dominates in the landscape and presents simpler patterns as a result of modern farming methods. In the upper river parts, due to the complex topography, land abandonment has been recorded and therefore natural regeneration of vegetation. Current research could be a valuable tool for the local river authorities to develop area-specific policies that minimize human influences in the riparian landscape.

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Fig. 1a,b. Diagram representing the Heterogeneity across years a) in number of patches (NP) & b) in patch density (PD), in riverine landscape of Western Greece.