Floristic patterns and drivers of kwongan vegetation patterns in Eneabba region of the Northern Sandplains, Western Australia

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Background & Aim: Plant community studies based on floristic composition are important for improvement of conservation and restoration strategies, especially in areas with high endemism and species richness. Vegetation classification and ordination are the main tools used in community studies that seek to describe vegetation patterns and searching for the origins of the patterns. The central goals of this paper are to (1) classify the kwongan (mediterranean-type scrub of SW Australia; see Mucina et al. 2014), and (2) establish how habitat (soil) heterogeneity and regional climate may drive the vegetation patterns in this enigmatic, species- and endemic-rich vegetation.

Materials & Methods: The study area is located in the Northern (Geraldton) Sandplains around the township of Eneabba (29°82′ S, 115°27′ E), approximately 250 km north of Perth, Western Australia. The vegetation plot data set, collected using standard field methodology of the Braun-Blanquet approach, comprises 542 relevés, sharing 801 taxa. Environmental data matrix consists of 105 variables, mainly extracted from 200 soil samples collected as a representative subset of the entire vegetation-plot data set as well as from topographic and BioClim data. Series of multivariate analyses were employed to classify and ordinate both vegetation and environmental data, using the programs JUICE, PC-ORD, and Syntax 2000. OptimClass was used as a tool to assist in the selection of the most robust combination of transformation, resemblance and clustering algorithm. Clustering embedded within JUICE was used to define plant community types. Canonical correspondence analysis (CCA), and a series of partial CCAs were performed to infer major ecological drivers of vegetation patterns.

Main Results & Interpretations: Presence-absence transformation, Bray-Curtis resemblance and flexible beta clustering were revealed as the most robust data-analytical combination that was used to produce a dendrogram yielding 24 well-defined plant communities. Three groups of communities (alliances?) were detected each was floristically unique and having only 8.3% of species shared across all alliances. Two of the groups represented typical kwongan vegetation (on deep sandy soils vs. on laterite pavements, respectively), while the third unit was composed of largely non-kwongan (woodlands and thickets) vegetation or very specialised kwongan scrub on limestone and very rare ferricrete kwongan on 'bog-iron' formation (Griffin et al. 1983). Although the role of soil factors has been suggested in the past as a major vegetation pattern driver (Hnatiuk & Hopkins 1981), our study brings unequivocal quantitative support to this assertion.

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Banksia hookeriana (*Proteaceae*) – a typical low scrub species on deep Bassendean sand dunes in the Eneabba sandplains. Photo: L. Mucina.

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