

Spatial variation in the morphological structure of monospecific stands of the mangrove *Avicennia marina* in an arid-zone world heritage area: challenges for management and conservation

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Abstract

For management purposes, mangroves are generally treated as uniform units with little consideration of variation at the forest scale. Spatial variation in the morphological structure (e.g. density, areal extent, height etc.) of mangrove patches is likely to lead to differences in the ecological role of, and ecosystem services (e.g. primary productivity, nutrient cycling, sediment trapping etc.) provided by, mangroves. Variation in patch structure arises in response to differences in the physical environment over a range of scales; however, changes in stand morphology in response to regional-scale gradients in the environment have rarely been reported. Here we quantify spatial patterns of stand morphology within the Shark Bay World Heritage Area (SBWHA), Western Australia, which is an arid area with strong regional-scale gradients in the physical environment. A range of morphological variables (e.g. height, density, number of stems, leaf size etc.) were measured at 12 sites across Shark Bay which represents a putative gradient in physical and oceanographic conditions from oceanic on the western side of the bay to metahaline on the eastern side of the bay. Data were tested using both univariate and multivariate analyses. Most morphological variables displayed considerable variation between sites and differences were generally significant for all comparisons. The multivariate analysis of the combined suite of morphological variables also found a significant difference between sites and pairwise tests revealed significant differences for almost all comparisons. Additionally Canonical Analysis of Principal Coordinates (CAP) revealed a significant difference in the multivariate structure of mangrove patches between salinity zones. The results suggest that mangrove stand structure varies over regional scales and is influenced by background physical conditions. It is likely that the functional roles of these patches differ across the region, and thus, treating monospecific stands as uniform 'units' may not be an appropriate management strategy.

Keywords

Shark Bay Marine Park, spatial pattern, management unit