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A comparison of species composition and stand structure between planted and natural mangrove forests in Shenzhen Bay, South China

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Abstract

Aims
For assisting faster restoration of damaged or severely disturbed coastal ecosystems, selected mangrove species have been planted on previously mangrove-inhabited sites of the tropical and subtropical coasts of southern China. The objective of this study was to understand the stand dynamics of the planted mangroves and their functional traits in comparison with natural mangrove forests under similar site conditions.

Methods
Species composition, stand density, tree size distribution, and aboveground production were investigated along three transects in a 50-year-old planted mangrove stand and three transects in an adjacent natural mangrove stand in Shenzhen Bay, South China. Measurements were made on tree distribution by species, stand structure, and aboveground biomass (AGB) distribution. Analyses were performed on the spatial patterns of tree size distribution and species association.

Important Findings
We found that the planted and natural mangrove stands did not differ in stand density, average diameter at breast height (DBH), species composition, and AGB. Spatial distribution of AGB and frequency at species level were also similar between the planted and natural stands. However, the traits in stand structure were more variable in the planted stand than in the natural stand, indicating higher spatiotemporal heterogeneity in the development and succession of planted mangroves. Geostatistical analyses show that both DBH and AGB were spatially auto-correlated within a specific range in the direction perpendicular to coastline. More than 60% of the variance in these attributes was due to spatial autocorrelation. The Ripley's *K*-function analysis shows that the two dominant species, *Kandelia obovata* and *Avicennia marina*, clumped in broader scales in the natural stand than in the planted stand and displayed significant interspecific competition across the whole transect. It is suggested that interspecific competition interacts with spatial autocorrelation as the underlying mechanism shaping the mangrove structure. This study demonstrates that at age 50, mangrove plantations can perform similarly in stand structure, spatial arrangement of selected stand characteristics and species associations to the natural mangrove forests.

Keywords: coastal ecosystem • forest restoration • mangroves • spatial autocorrelation • species association

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