

## How does tree competition and stand dynamics lead to spatial patterns in monospecific mangroves?

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### Abstract

Information on mangrove succession and stand development is rare because long-term monitoring data is often lacking. Such information is important in order to plan management measures effectively. Novel approaches are required to bridge this gap of knowledge based on existing data sets. This study uses a unique combination of field data analyses with simulation experiments in order to demonstrate how information on mangrove dynamics can be extracted if data is sparse. The paper provides a baseline characterization of stand development in a monospecific pioneer mangrove stand of *Kandelia obovata*. Point pattern analyses revealed that self-thinning has started but has not yet lead to a regularity of spatial tree distribution in the entire stand; trees located in smaller clumps hinder each other in growth but do not lead to a significant size class differentiation in 10 years. However, after ca. 2 decades this size class differentiation starts to become visible. In order to understand and predict the future stand development, simulation experiments were carried out by means of the individual-based model KiWi which was parameterized to Far East Asian mangroves for the first time. It was found that the total biomass production per unit land area is not influenced by the initial density, but is determined by the relative mortality rate and increasing regularity in the spatial distribution pattern of individual trees.

### Keywords

IBM, ABM, intraspecific competition, KiWi, point pattern analysis, self-thinning, *Kandelia obovata*