

MODELLING THE INFLUENCE OF DISTURBANCE ON SPATIAL-TEMPORAL VARIATIONS OF KENYAN MANGROVES IN GAZI BAY AND THE IMPLICATIONS

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A disturbance is a relatively discrete event that disrupts the structure of an ecosystem and changes resource availability. Disturbances create patterns in vegetation by producing a mosaic of seral stages that ecologists have long recognised as important to landscape-level patch mosaics. Some important factors that regulate disturbances include temporal and spatial scales, intensity and frequency.

Several good reasons justify the need for pursuing a predictive understanding of the ecology of mangrove species competition including the role of disturbance events and the aftermath. A predictive understanding can challenge our assumptions concerning the factors that control plant distribution and abundance, and provide techniques for predicting rates of species change ranges in response to disturbances. The aim of this study was to evaluate and predict the impact of disturbance on Gazi Bay mangrove forests and the behavioural patterns both spatially and temporally using cellular automaton models based on the Lotka Volterra competition model.

The simulations are carried out for disturbance events which cause impacts of different percentages spatially of the total area of interest and the disturbed location on the spatial extent is also considered. The results of *Bruguiera gymnorrhiza* simulations are presented which indicate that, comparatively for all the interacting species with *Bruguiera gymnorrhiza*, the highest population density trajectory occurs when it interacts pair-wise with *Rhizophora mucronata* for a 20% disturbance event, while for the 60% disturbance, the highest population density trajectory occurs in its interaction with *Ceriops tagal*. The different population density trajectories for the same pair-wise species interactions is consistent with the hypothesis that the varying scales of disturbances may lead to different outputs for the simulations and consequently affect succession trends. Application of the cellular automation model is a good metaphor for predicting mangrove species dynamics.

Keywords: Spatio-temporal; Modelling; Mangrove; Disturbances; Gazi Bay.