

High-resolution mapping of mangrove topography and vegetation community structure

D.A. Friess^{1,2}, R. Leong³, W.K. Lee² & E.L. Webb³

¹Department of Geography, National University of Singapore, 1 Arts Link, Singapore 117570. E-mail:

dan.friess@nus.edu.sg

²Singapore-Delft Water Alliance, National University of Singapore, Engineering Drive 2, Singapore 117576.

³Department of Biological Sciences, National University of Singapore, Science Drive 2, Singapore 117543.

Abstract

Mangrove vegetation establishment and spatial distribution is constrained by multiple physical processes such as tidal inundation frequency and duration (linked to surface elevation), as well as wave and current action. However, such constraints are site-specific, and few studies are able to rigorously quantify such relationships. We present a novel mapping methodology to investigate elevation/hydrology-vegetation linkages at Mandai, a 17 ha mangrove patch in NW Singapore. In summer 2011 a Nikon Total Station was used to construct a high-resolution topographic map of Mandai mangrove and the surrounding mudflat. This instrument has also recorded the position and elevation (at mm precision) of every tree in the mangrove forest above 5 cm dbh. Information recorded includes species, dbh and mortality. Overlaying both datasets in a GIS framework allows us to deduce relationships between vegetation patterns and physical parameters such as elevation and distance from shore. These novel datasets also have multiple future uses: 1) the high-precision elevation map and intensive vegetation distribution data are providing the base layers for a sea level rise vulnerability model of Mandai, 2) all mapped trees have been tagged, providing researchers with a rigorously studied permanent mangrove forest plot for long-term vegetation studies, and 3) mangrove restoration practitioners have been trained in this mapping protocol – it is planned to apply this methodology to restoration sites to predict where species-specific “Ecological Mangrove Restoration” will be most successful.

Keywords

elevation, restoration, Singapore, surveying, zonation