



Characteristics of landward expansion of mangrove forests with sea level rise

Ruth Reef (1) and Catherine Lovelock (2)

(1) School of Earth, Atmosphere and Environment, Monash University, Clayton, VIC, Australia (ruth.reef@monash.edu), (2) School of Biological Sciences, The University of Queensland, St Lucia, QLD, Australia (c.lovelock@uq.edu.au)

Exmouth Gulf is an inlet of the Indian Ocean in arid Western Australia. The low energy coastlines of the gulf consist of muddy sediment on which mangroves and saltmarshes have established. Landward of the mangroves, extensive carpet-like cyanobacterial mats cover approximately 100 km² of the gulf. Exmouth Gulf is physically connected to the Leeuwin Current, a poleward flowing warm ocean current along the WA coast. ENSO derived Interannual variations in the sea level of the tropical Pacific are transmitted to the Leeuwin Current via the Indonesian Throughflow. Thus, the strength and volume of the Leeuwin Current is linked to the ENSO cycle. This results in interannual changes in coastal sea level in this region, with higher coastal sea levels during La Niña years. The rate of sea level rise in this region (1993-2009) is ca. 2.7 mm yr⁻¹ but ENSO derived variability exceeds 10 cm. In this setting, we tested characteristics of the landward colonisation of cyanobacterial mats by mangroves during periods of elevated sea levels. We collected demographic data for all mangrove seedlings within a 0.2 km² region in 2013, 2014 and 2018. Mangrove seedlings rapidly established at significantly higher elevations during years with higher sea levels, colonising the cyanobacterial mats. Survivorship at higher elevation was greatly reduced once sea levels dropped, but the survival rate of seedlings that were above 21 cm tall at that stage was fifteen times higher than in smaller seedlings. We thus conclude that colonisation of upland regions is occurring and that this process is episodic in nature with survivorship greatly affected by the time available for seedling growth.