Nutrient cycling and use by the species *Rhizophora mucronata* in two contrasted mangrove settings from the French Scattered Islands, Western Indian Ocean

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Abstract

The islands of Europa and Juan de Nova (JDN) located in the Mozambique Channel host very distinct mangrove ecosystems. On Europa, a 700 ha mangrove forest grows on the edge of an open lagoon while JDN has only a small *Rhizophora mucronata* stand enclosed in a 2.5km² sinkhole located 80m inland and connected to the sea through galleries in the karstic ground. Europa receives little nutrient and freshwater inputs while Juan de Nova has a small brackish groundwater reservoir and ancient guano deposits exploited in the 1900's. This study aims at comparing nutrient cycling in these two systems and at investigating the physiological responses of the species *R. mucronata* to these different conditions of nutrient and freshwater availability. Nutrient concentrations, resorption efficiency (RE), nutrient use efficiency (NUE), as well as carbon and nitrogen stable isotope signatures ($\delta^{13}C$ and $\delta^{15}N$) were measured in mangrove leaves, sediment and/or waters from both systems. Data show higher loads of ammonium and phosphate in the creek waters of JDN (86.2µM and 13.8µM, respectively) compared to Europa (~5.5 µM and 0.4µM, respectively). However, N:P ratios of mature green leaves were similar in both systems (~14) and $\delta^{15}N$ ratios suggest that mineralization of mangrove litter rather guano is the major nitrogen source in both systems. Also, despite the higher ammonium and phosphate concentrations in JDN, the RE and NUE of both nitrogen and phosphorus were unexpectedly 1.5 to 3 times higher in the trees of JDN than in those of Europa. These data suggest that the JDN mangrove is actually more nutrient limited than in Europa. It is likely that the peculiar hydrological functioning of the sinkhole only allows rare inundation of the entire *R. mucronata* stand and that trees thus mainly rely on the nutrient-poor groundwater source.

Keywords
nitrogen, phosphorus, nutrient limitation, nutrient-use, resorption efficiency