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Preliminary results on carbon and nutrients fluxes at the sediment-water interface in natural and planted mangroves, central Arabian Gulf

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ABSTRACT

Despite the many ecological services and benefits provided by the mangrove ecosystem, deforestation of mangrove ecosystem for industrial and other development has caused irreversible damage in coastal regions throughout the world and in the Arabian Gulf. In 1980s, transplantation of mangrove in Qatar's coastal areas was approached as an effort to restore some of the lost mangrove. However the growth of the transplanted mangrove over three decades seems constrained where the plants are shorter (about 2–3 m less than natural mangroves) and less dense. Despite the fact that sources of inorganic nutrients (N, P) in Qatari coastal water are minimal, natural mangroves seem to grow efficiently in this arid environment. However, the growth of transplanted mangrove over three decades was not fully efficient. Factors limiting the growth of the transplanted mangrove, are not evaluated. The current study was funded by Qatar University (2015–2017) and it aims to quantify and compare sediment metabolism in natural and planted mangrove and to compare the function "role" of the benthic community (autotrophs and heterotrophs) using in situ measurements of fluxes of nutrients and carbon. Sediment-water exchange of dissolved oxygen and inorganic nutrients were measured in situ in natural and planted mangrove during the extreme summer (2015) and winter of 2016 in the central Arabian Gulf. Paired benthic chamber was used in sediments incubations for up to three hours in each location.

Two locations were selected to represent the natural and planted mangroves, (Al Dakhira and Al Mafjar). Average salinity was 44 psu. Results showed that the concentrations of Chla and Chlb were significantly variable between mangrove locations ($P < 0.01$) with highest concentration in the natural mangrove exceeding 2. μg.cm-2 at some locations. On the other hand, there was significant difference in the fluxes of carbon and nutrients between the natural and planted mangrove. Oxygen production in the sediments of the natural mangrove was also significantly higher than those in the planted mangrove ($P < 0.01$). Percentage of the net O2 production measured at the planted mangroves ranged between 10% – 50% of the net production measured at the natural mangrove. The results indicated that remineralization of organic matter and cycling of carbon and nutrients are significantly more efficient in the natural mangrove which consequently affect the trophic conditions in these ecosystems.

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