

Diversity and activity of diazotrophs in the coastal waters of Southeastern Arabian Sea (SEAS)

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In marine environments availability of nitrogen (N₂) limits the primary productivity. Nitrogen fixing bacteria (diazotrophs) could convert atmospheric nitrogen to ammonium thereby providing significant input of new nitrogen into the ocean. The knowledge about their diversity, distribution and physiological activity are limited in tropical coastal marine environments. In this study, we determined diversity of nitrogen fixing bacteria and the nitrogen fixation rate through *nifH* based clone library analysis and ¹⁵N₂ bubble method respectively. We encountered *Trichodesmium* bloom and diatom diazotrophic associations along the coastal environments of SEAS. Nitrogen fixation rate in the coastal waters were varied from 0.15 to 1.02 nmolN/L/h. *Trichodesmium* bloom in the Arabian Sea during pre-monsoon season showed higher nitrogen fixation rate of 3.6 nmolN/L/h. Clone library analysis revealed that 19 Operational Taxonomic Units (OTUs) of nitrogen fixing bacteria were observed from the coastal waters SEAS. The OTUs were related to 7 OTUs of cyanobacteria and 12 OTUs of heterotrophic diazotrophs. Major cyanobacterial OTUs are closely similar to *Trichodesmium* sp., *Richelia* sp., *Synechocystis* sp.. Major heterotrophic diazotrophs belonged to alpha-, beta-, gamma-, epsilon-, proteobacteria and firmicutes. Gamma proteobacterial clones were dominating among heterotrophic diazotrophs in the coastal water column of south eastern Arabian Sea. Nitrogen fixation rate in the water column were significantly correlated with dissolved Fe ($R^2 = 0.66$, $p = 0.05$) and phosphorous ($R^2 = 0.49$, $p = 0.05$), which revealed these are the major factors controlling nitrogen fixation process in the coastal environments of SEAS.

Keywords: Nitrogen fixation , diazotrophs, Fe, SEAS