Phytoplankton species composition along the salinity gradient in the Pangani estuary, Tanzania

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Abstract:
Estuaries form transition zones linking freshwater and marine biomes. Estuaries are characterized by pronounced gradients of physical and chemical components. These factors strongly influence the phytoplankton community structure along the resulting continuum. Phytoplankton are the base of primary productivity in aquatic ecosystems. Their species composition can vary depending on various factors like nutrients and physiochemical characteristics.

On March 2006 to September 2008 a study was done to assess the phytoplankton species composition was done along the salinity gradient in the Pangani estuary, Tanzania. The Panagni estuary is situated in the Northern Tanzania at latitude 5°30'0" and longitude 38°49'60" E. Six sites were selected according to salinity difference. Samples were taken at every two month. By using a boat and a GPS sites were reached. Phytoplankton samples were preserved immediately after collection with acidified Lugol’s solution. Identification was performed using a Zeiss microscope with phase contrast. Counting was done according to Utermohl (1958) and Lund et al. (1958) with a Zeiss microscope. Species richness and diversity was estimated considering all species identified during the study period. Primer 6 statistical programme was used to do the statistical analysis.

A total of 153 species were identified. The Bacillariophyceae were the dominant group, Stephanodiscus astaca being the dominant species followed the chlorophyceae and cyaenophyceae were the minor group. For percentage composition the analysis of similarity (ANOSIM) showed no significant difference among the sampling sites (Global R Global Test Sample statistic (Rho): 0.0-0.016) species composition was not variable among the sites as well (r = 0.24 but among sampling months it was significant different (Rho: 0.056 p = 0.01). Mostly July 2006 and September 2007 were significantly different from other months. BIOENVE shows that salinity (R=-0.059, p=0.66) and DO (R=0.037, p=0.458) has no effects but pH (p=0.07) has effect on phytoplankton assemblage in the Pangani estuary.

Shannon - Wiener's diversity index (H') values recorded for the sampling sites was higher at Mashine ya maji site (fresh water end) and was lower for Mlangoni and kikokwe site the (marine end). The species diversity showed no significant variation between the stations. Evenenness values ranged between 0.58 to 0.82 and showed a uniform distribution of species all the six sites. This is attributed to mixing.

Due to nutrient discharges from point sources in the Pangani estuary, no evidence of poor water quality phytoplankton was found. In fact the Cyanobacteria and Dinophyceae, which are dominant in high trophic state ecosystems, as well as Cryptophyceae whose predominance is known to be an indicator of eutrophication were all minor contributors to the algal community in the Pangani estuary suggesting that at present, cultural eutrophication is not a problem in this estuary.