HEALTH OF COCHIN BACKWATER SYSTEM (WEST COAST OF INDIA) - DISTRIBUTION AND MECHANISMS OF TRACE METAL AND NUTRIENT CONTROLS

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The Cochin Backwaters (256 km^2) receives nearly 0.105M m^3 d^{-1} of wastes containing organic wastes of the order of 260 t d^{-1}. The rivers carry a fertilizer load of 20000 t y^{-1} to the backwater (estuary) system. The hydrodynamic features of the estuary controll the water quality and pollution of the estuarine system. Trace metals in estuarine sediment had a post - monsoon enrichment of iron with 740 mg/g in the northern and southern limbs of the estuary. The dissolved iron had an opposite trend to that of it in the sediments. The strong influence of fresh water modifies the sediment to leach out chromium as inferred from low values (<30ug/g) at the bar mouth. The entire region is enriched with manganese (141- 337 ug/g) with the lowest values around the bar mouth. High values of Zinc (>1000 ug/g) were noted in the east channel and low levels (~90 ug/g) at the bar mouth. The dissolved zinc had enrichment in the backwater with 116 ug/l in the year 1986 and with 879 ug/l in 1991. Nearly 80 tons of Zinc seems to have accumulated in the water body. The copper content in sediment ranged between 5 - 53 ug/g with high values in the northern limb and the dissolved copper had a range of 1 -3 ug/l. Copper content upto 6 ug/l were also reported earlier. Significant enrichment of copper within the sediment and the biological control of copper are quite remarkable as hinted by the correlation (0.62) of it with organic carbon. The distribution of Nickel and cobalt were similar and a concentration of Ni (0.60 ug/g) indicates the absence of pollution. The maximum concentration of cobalt was 25 ug/g. Significant correlation of iron with other metals (except Mn) indicates that elemental accumulation in sediments may be controlled by precipitation of iron on to organic matrix. The significant correlation between metals (except Mn) shows a common source of metals. Natural processes control the distribution of most metals, while Zn is influenced more by anthrpopogenic input. The northern part, an enrichment of metals, especially Zn is evident. Post monsoon mid estuarine build up of metals in sediment was also evident. Absence of build up in harbor and bar mouth may be due to periodic dredging and removal of recent sediment deposit. Annual dredge spoils from harbor area $10^7 m^3$, which are dumped into coastal area. Strong negative correlation between salinity and nutrients within the estuary indicate that nutrient levels are controlled by upstream discharge. The estuary acts as sink for silicate during neap tide. The nutrients NO_3 and PO4 were present at very low levels up to mid 60s and the levels had increased during 80's. The levels for nitrate and phosphate were 0.75 uM, 2.0 uM during 1965 and were 3.9 uM, 6.0uM during the year 2000. A build up of N & P after 1975 was observed in the backwater and from 1980 onwards, the concentration remained high. The enhancement of nutrient levels has not led to any oxygen depletion. It is estimated that the backwater is receiving 42.4 10^3 mol d^{-1} inorganic PO_4 and 37.6 * 10^3 mol d^{-1} of organic nitrogen through Periyar. The export to coastal waters is only 28.2 * 10^3 mol d^{-1} inorganic PO_4 and 24* 10^3 mol d^{-1} of inorganic NO_3. Thus estuary seems to act as a sink for nutrients.