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Possible effects of tidal currents on the water chemistry at RekawaLagoon, Tangalle, Sri Lanka

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The possible effects of tidal waves on the physico-chemical properties of the Rekawa Lagoon were assessed based on the preliminary experimental data collected on April and July 2014. The April data showed a strong positive linear relationship ($r^2 > 0.9$) between pH and dissolved oxygen (DO) and a negative linear relationship between turbidity and DO ($r^2 > 0.8$). These two linear relationships were explained by hypothesizing that the pH and the DO of the lagoon are highly influenced by the photosynthesis of aquatic plants. Moreover, negative linear relationships between conductivity and DO ($r^2 \approx 0.7$), and TDS and DO ($r^2 \approx 0.7$) were also observed. The concentrations of sodium, calcium, iron, chloride and sulfate were also positively increased with the conductivity and turbidity. These observations were explained by hypothesizing that the seawater delivers to the lagoon during tidal currents is responsible for the changes in the lagoon water chemistry during tidal events. The changes in the concentrations of certain chemical constituents such as sodium and chloride are a direct result of mixing seawater with the lagoon brackish water. However, the changes in the DO and pH were explained based on the possible effects of sediments brought to the lagoon by the tidal waves on the photosynthetic processes of aquatic plants. The fine and coarse sediments increase the water turbidity and as a result, the penetration of sunlight through the water column is greatly reduced. This phenomenon negatively affects the photosynthesis and hence, the production of O_2 and the consumption of CO_2 (aq) is greatly reduced. The pH and DO of aquatic systems has a significant impact of its water chemistry. The rate of certain chemical reactions in aquatic systems including redox reactions, solubility of metal oxides, complexation and de-complexation reactions, photochemical reactions are highly dependent on the pH and DO. For an example, the rate oxidation of Fe^{2+} (aq) is first order with respect to DO and second order with respect to pH. Therefore, it is proposed that tidal currents have a relatively high impact on the overall water chemistry at the Rekawa Lagoon based on April experimental data.

Key Words: Rekawa Lagoon, water chemistry, tidal currents, photosynthesis

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