

Nutrient Enrichment of Coral Reef Waters in the Gulf of Aqaba, Red Sea

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Abstract

Coral reefs are known to be sensitive to increased nutrient concentrations. On the other hand, evidence is progressively growing that nutrient concentrations within coral reefs are naturally elevated. In the present investigation we report on the quantitative modification of nutrient concentrations in reef waters from the northernmost part of Gulf of Aqaba. Coral reef waters from fixed depths between the surface and 30m and offshore reference waters were collected biweekly and analyzed for ammonia, nitrate, nitrite, phosphate, silicate and chlorophyll *a*. Nutrient concentrations both in the coral reef and offshore waters showed clear seasonality. Relatively high concentrations occurred in winter and extremely low concentrations in summer. Comparison between the concentrations in the coral reef waters and the reference offshore waters, using a specially devised mathematical technique to normalize the data, followed by two way analysis of variance with respect to season and depth showed that in summer all measured parameters in coral reef waters were significantly positively modified relative to the upper 25m offshore water. On annual basis, ammonia concentration was higher in reef waters in 91% of the samples, nitrate in 79%, nitrite in 70%, phosphate in 92%, silicate in 90% and chlorophyll *a* in 73%. Cases of lower nutrient and chlorophyll *a* concentrations in coral reef water than in offshore waters occurred only in winter (November-May). Nitrite and chlorophyll *a* concentrations showed significant elevations only in summer. The observed modifications are attributed to efficient filtration, rapid recycling, and to differential rates of phototrophic uptake and heterotrophic fixation and release of nutrients in the coral reef. These processes are strongly light and temperature dependent and therefore seasonally variable.