



Anthropogenic Impact On Nitrogen Cycle In Tumon Bay Using ^{15}N , And ^{14}N Isotopic Ratio Methods



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Algal blooms along Tumon Bay in Guam are a major concern. Tumon Bay is the tourist hub for the island of Guam and the increasing pollution due to nutrient enrichment and subsequent algal bloom is an eyesore and could potentially have negative impact on the tourism industry on the island.

Early studies have clearly shown the excessive growth of green alga *Enteromorpha clathrata*. One of the possible nutrient sources for this algae comes from freshwater springs that discharges in the form of springs and seeps along the entire bay area. These spring waters flow from aquifers of the northern lens of the island. The levels of nitrates are significantly high enough in these springs to sustain algal population along the estuary. However, the increasing stands of algal bloom may be due to the rapid industrialization along the bay area.

The critical question is what are the major sources of enrichment along the estuary. Clearly the input from the catchment that discharges to the entire bay will need to be considered. Previous studies have focused on determining the levels of nitrogen containing nutrients and phosphate in the receiving waters and the intertidal water zone along the bay. While these data have been useful in confirming the enrichment status, they lack clarity as to the origin of the pollutants. Human impact through fertilizer applications, construction work, commercial operation such as restaurants, shopping malls, certainly have an impact but there is limited data on the extent and its role in the increase of algal growth.

The results of this study are:

- Determination of the different forms of nitrogen compounds in the ground water system discharging into Tumon Bay. This involved determining the levels of nitrates, nitrites and ammonia in all the possible inputs including those that have been studied previously.
- Determination of the isotopic ratio of stable nitrogen isotopes, ^{15}N and ^{14}N at the different components of the nitrogen cycle (water, plants, fish, invertebrates) in order to discriminate the contribution of human or animal waste nitrogen from fertilizer and industrial nitrogen.
- Determination of the mechanism of nitrogen uptake through the different levels of the nitrogen cycle based on the data collected.
- Comparisons of the findings with previous data on the levels of nitrogen containing nutrients.

The results from this study will help to pinpoint the sources of nitrogen enrichment along the bay and assist the management in designing suitable measures for minimizing pollution. This study has also trained students at the University of Guam to conduct environmental analysis and deepen their appreciation for chemical processes pertaining to pollutants in the environment. It has also enhanced the institute and the chemistry department in training on new techniques of isotopic methods, that were used in this study.