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HARMFUL ALGAE BLOOMS LINKED TO NITROGEN RUNOFF FROM GOLF COURSE ON GUANA CAY

Hundreds of golf courses around the world overlooking coral reefs have environmental impact assessments claiming no harm will happen to coral reefs from fertilizer nutrient runoff into the sea. Guana Cay, Abaco is the only place where impacts of golf courses on coral reef health have been studied both before and after golf course construction. After the golf course was established harmful algae blooms and coral disease outbreaks began on nearby coral reefs. There had been no sign of them before the golf course was established. They continue to be persistent since, with worst impacts in the warm season. We analyzed in duplicate nitrogen, phosphorus, and carbon contents of 80 samples of the most abundant algae species growing at 10 sampling locations near the golf course, unpopulated coastal areas around Guana Cay remote from the golf course, areas near populated centers, and coral reefs near and far from Guana Cay. Nitrogen and carbon and their isotopes were analyzed by mass spectroscopy, and phosphorus by absorption spectrophotometry. Samples were collected in 2011, 2012, and 2013. Comparison of the mean and standard deviations of the algae data from different sites showed that algae blooms near the golf course have the highest nitrogen content at all times, indicating that excess nitrogen from land is entering near-shore waters via groundwater discharge from fertilized golf course greens. Isotopic analysis of nitrogen in algae near the golf course shows a strong sewage nitrogen origin. This seems to result from use of slow-release organic nitrogen fertilizer, made from recycled sewage. In contrast, algae nitrogen near populated areas is overwhelmingly natural in origin, with little sewage contamination. Algae phosphorus levels are highest in the main town harbour. Their main source may be detergent runoff via drains. It appears that little golf course phosphorus is running off to the sea. High groundwater nitrogen inputs to the sea are especially common in limestone areas like the Bahamas. Since algae have excess nitrogen available, their growth is limited by lack of phosphorus, so very small additional phosphorus inputs could trigger massive harmful algae blooms that overgrow and kill corals. Nutrient inputs from land need to be reduced to protect coral reefs.