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The Blue Plague

The Proliferation of Cyanobacteria in Guatemala's Historic Lago Atitlan



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Guatemala is known as the “land of eternal Spring.” Guatemalan winters are consistently seventy degrees Fahrenheit, which surely beats the incoming frigid temperatures characteristic of Oberlin winters. One of the many hidden gems in Guatemala is the famous Lago Atitlan. Lago Atitlan is situated in the Guatemalan Highlands of the Sierra Madre and three-and-a-half hours from the hustle and bustle of the capital. As you begin the descent towards the lake, driving down an incredibly windy and pot-hole induced road, the sudden glimpses you get of the lake are indescribable.

The entire scene is raw: the deep blue of the lake water, the vivid green hues of the trees, and the crunchy tan dirt that flattens under the weight of the ‘chicken buses’ that pass by. The lake and its fauna remain largely untouched by the massive onslaught of tourism that it attracts year round. It has stood the test of time — not only is the lake a site for outdoor adventure, but it is a Mayan treasure. Many of the towns surrounding the lake continue centuries old customs, such as weaving textiles with natural dyes, continuing traditional fishing methods, and wearing ‘el traje típico’ (traditional dress). The lake is much more than a travel destination — it is a spiritual, historical, and life source for many Guatemalans.

For the past six years, I have travelled to Lago Atitlan and consider it as my home away from home. Three years ago, after a tremendous and destructive hurricane, a problem presented itself on my regular afternoon kayaking trip. As I was paddling out onto Atitlan’s blue-green water, drifting along on the calming water, I was surprisingly greeted by brown and green globs that stuck to my kayak like magnets. All of a sudden, these moss-like compounds evolved into unquantifiable colonies that invaded all parts of the lake. I paddled back to shore, disgusted by what I had just seen, but curious to learn more about this pest.

After talking to people in the nearby town of San Juan, it was clear that these clumps of algae are all too familiar to the Guatemalans living in the many towns surrounding Lago Atitlan. This invasive pest, known as cyanobacteria, has become one of the more pronounced environmental disasters plaguing this region of Guatemala. Cyanobacteria is an unwelcome and unappealing sight to both tourists and residents of the Atitlan region. On top of that, this pest can be quite toxic and is silently sucking life out of the lake.

Cyanobacteria are heterotrophs that make their own food through photosynthesis. They are extremely capable aquatic bacteria that are considered to be one of the most important, and largest, groups of bacteria on the planet. Cyanobacteria poses incredible ecological and environmental threats. First and foremost, it contributes to the production of algal blooms. Algal blooms arise from three general conditions: sunlight, slow moving water, and excess nutrients such as nitrogen and phosphorous. Lago Atitlan checks off all three criteria, which contributes to the massive, uncontrollable growth of algae. This not only harms living organisms within the body of water, but anyone or anything that comes in contact with it. Algal blooms deplete oxygen in bodies of water, creating dead zones, through a process called eutrophication. Essentially, when nitrogen and phosphorous levels far exceed what is absorbed and useful to plants, it causes a mass growth of algae. The algae suck up almost all the oxygen in that body of water like a vacuum. Bacteria, like cyanobacteria, then feed off of the algae, leaving a trail of destruction that is often visibly unappealing, sometimes quite smelly, and environmentally hazardous.

The rapid presence of cyanobacteria has truly taken its toll on fish populations in the lake. It is almost a guarantee that you will come across at least two dead fish as you cool off in the lake from a hard day’s work. Fisherman and families who depend on the lake’s fish for income and food are truly suffering. One early summer morning, I rode out on a beaten-down, hand-made canoe to take my stab at fishing with a local fisherman. The sun was slowly peeking out over the mountain-laid horizon. We waited hours upon hours — the fish simply would not tug on the line.

The fisherman, Pablo, told me that it has been like this for the past few years. He comes out every morning and is lucky to catch three or even four fish a day. When your life depends on fishing for an income and as a means to put food on the table, cyanobacteria becomes an even greater tragedy.

Cyanobacteria has overstayed its welcome. Oftentimes it remains hidden, festering below the surface and waiting to warrant its attack. It sprouts back up to the surface after major rainfall, ready to bask in the overflowing sunshine that transcends as the thick, grey rain clouds dissipate. Rain proves a crucial component in the abundance of algal blooms as erosion carries a plethora of nutrients, chemicals, and waste into the lake. Since Lago Atitlan is surrounded by mountains and steep volcanoes, when the rain comes, everything flows down into the beautiful lake at a rapid pace. It has nowhere else to go but straight into the lake. Erosion can often be so problematic that it destroys many roadways that skirt the sides of the mountains.

Given that the lake has no drainage system, such as a river that both brings water in and flushes it out, the contaminated water has nowhere to go. It just sits there, accumulating more and more waste off of which cyanobacteria may flourish. High levels of nitrogen and phosphorous runoff create ideal conditions for algal blooms. These nutrients persist in the agricultural runoff (i.e. fertilizers, manure, compost) and human waste that trickle into the lake. Nitrogen and phosphorous are abundant in agricultural runoff and human waste, hastening the creation of dead zones via eutrophication. It is precisely these dead zones that contribute to the decimation of fish populations.

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This is a cyclical environmental crisis that is continuously fed by a lack of water circulation, drainage, and filtration systems. Excess sources of nitrogen entering the lake contribute a great deal to the rise of cyanobacteria. Many of the towns surrounding the lake lack a system that is sometimes taken for granted in developing countries: wastewater treatment facilities. Residents bathe in, drink from, and rely on lake water for everyday tasks. They are both using the contaminated water and contributing to further contamination.

National Geographic estimates that, “although the 350 meter deep lake remains healthy, the eutrophication process has accelerated in the last few years; measures must be taken to reduce the nutrient loading, otherwise the lake may become irreversibly altered.” This statement was made three years ago, and while some organizations and towns have mobilized to clean up the lake, these efforts only go so far. Without adequate wastewater and sewage treatment, contaminants will continue to sneak into the lake. It is estimated to “cost at least 32 million dollars to clean up the lake, install water treatment plants, and implement other measures to limit the flow of pollution into the lake to prevent future outbreaks.” And this money is hard to come by, especially in a developing country like Guatemala. Thankfully, with strides in environmental research, scientific studies, and community partnerships, residents of the Lago Atitlan area are mobilizing to educate others about looking after the lake in hopes of one day bidding farewell to cyanobacteria. This is an exceptional issue that gives great opportunity for more environmental research and immediate action. Students, such as those interested in environmental studies, can catapult on the many lessons from Lago Atitlan’s battle with cyanobacteria, particularly given the far-reaching impact of cyanobacteria and water contamination. ●