Determining the Effect of a Top-Level Predator in a Simulated Aquatic Ecosystem with Organisms Used for the Mitigation of HABs

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Harmful Algae Blooms (HAB) have caused over 1 billion dollars in ecological damages coupled with the dangerous environmental problem of perpetuating non-natural mitigation methods that destroy the world's waterways. This is why biological mitigation methods such as the introduction of predator species are used to reduce that cost. The purpose of the research is to determine the effect that a top-level predator (Ghost Shrimp) will have on an ecosystem with different organisms (Brachionus, Cladocera, Philodina, Tardigrades, and Cyclops Copepods) for the mitigation of Blue-Green Algae. It will also be determined which organism will work best with the top-level predator in a synergistic relationship in order to control Harmful Algae Blooms. A predator-prey relationship model is developed from the program PhysioDesigner, in order to determine the optimal amount of each organism that can be used in the real-life model of an ecosystem. From this optimal amount of organisms, a real-life ecosystem model was built with different combinations of the top-level predator with each organism against algae compared to just the organisms against algae in order to determine the effectiveness of each combination and the effectiveness of the introduction of a top-level predator. The results are significant because it shows that a top-level predator (Ghost Shrimp) can affect the ecosystem by regulating the population of the primary consumer (each organism) and that the most optimal combination of species for the mitigation of harmful Blue-Green Algae is Ghost Shrimp with Brachionus.

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