An R&D Study on Using a Nutrient Treatment Bio-Filter to Combat Oceanic and Freshwater Deadzones which Harnesses the Intrinsic Potential of Halophyte Species

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The world's waters are fighting with numerous issues but spreading below the surface is a serious issue - our waters are running out of oxygen. Areas of water that contain low or zero levels of oxygen are called deadzones. Deadzones occur when excess nutrients, e.g. phosphorus and nitrogen, enter a body of water causing algal blooms. As the algae die, bacteria feed on them and use up the available oxygen. The goal of my research was to develop a natural, plant-based solution to deadzones. I set out to build a semi-submerged system which would contain a halophyte community that would reduce nutrient pollution. Halophytes are salt-tolerant plants found growing abundantly in marine environments. From my initial research in a local coastal area, and from secondary data, I identified two suitable halophytes: Salicornia europaea agg. and Spartina anglica. I measured the salinity, pH, nitrogen and phosphorus levels of a sample of the seawater as well as the climatic factors of the area so that I could replicate the specific conditions of a deadzone in my school laboratory. I used design software to create working drawings of my system. The design features included not requiring electricity, enclosing halophytes to prevent seed dispersal, allowing human access to a removable core and allowing natural light and air to the plants. Finally, it should allow water to flow through it, i.e. it should float semi-submerged. I built a prototype and used it to compare the uptake of various nutrients, including phosphorus and nitrogen, by Salicornia europaea agg. and Spartina anglica. I found that Spartina angelica was the more effective at extracting nutrients from the test solution. In conclusion, a new solution to the issue of deadzones, ready for commercial development, was studied.

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