In Hot Water – Consequences for Global Fresh Water Quality: A Quantitative Study on the Effects of Rising Freshwater Temperatures on Water Chemistry and Microorganism Biomass and Productivity

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Global freshwater temperatures have increased and are projected to rise a further 3°-7°C in the next 100 years. Critical for drinking and agriculture, these highly temperature dependant ecosystems often limit sustainable development. Published studies on effects of water temperature on freshwater systems are inconclusive and contradictory. This experiment set out to develop a controlled mesocosm, modelling the predicted temperature rise, to examine the effects on water chemistry and biota. Experimental mesocosms populated with field zooplankton(Z), phytoplankton(P) and algae(A) were maintained at 25oC(control) or 29oC(test). Temperature was continuously monitored; surface evaporation and light were controlled. Dissolved O2, CO2(above water),and pH were determined daily. Water column samples were filtered,fixed and stained weekly. Biota species were identified and quantified using light microscopy and a counting chamber. Data were analysed by two-tailed T tests and linear regression. Increased water temperature, tended to increased percent change O2 (R2 (Temp) =0.04) lowered percent change CO2(R2 (Temp) 0.02) and did not alter pH(R2 (Temp)=0.004) .Z and P populations decreased (P= 0.49,0.24), A increased (P=0.16), however low replicates meant statistical significance (P≤0.005) was not reached. Increased A and dissolved O2 with stable pH, demonstrated the interrelationship between water chemistry and biota populations, suggesting the capacity for photosynthetic organisms (A) to mitigate some of the effects of climate change. The decrease in respiring and photosynthetic organisms (P/Z) has adverse implications for global fresh water systems. The development of a controlled experimental system will facilitate expanded studies to further interrogate these observations.

Awards Won:

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