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# Temperature fluctuations affect biofilter performance in preliminary study

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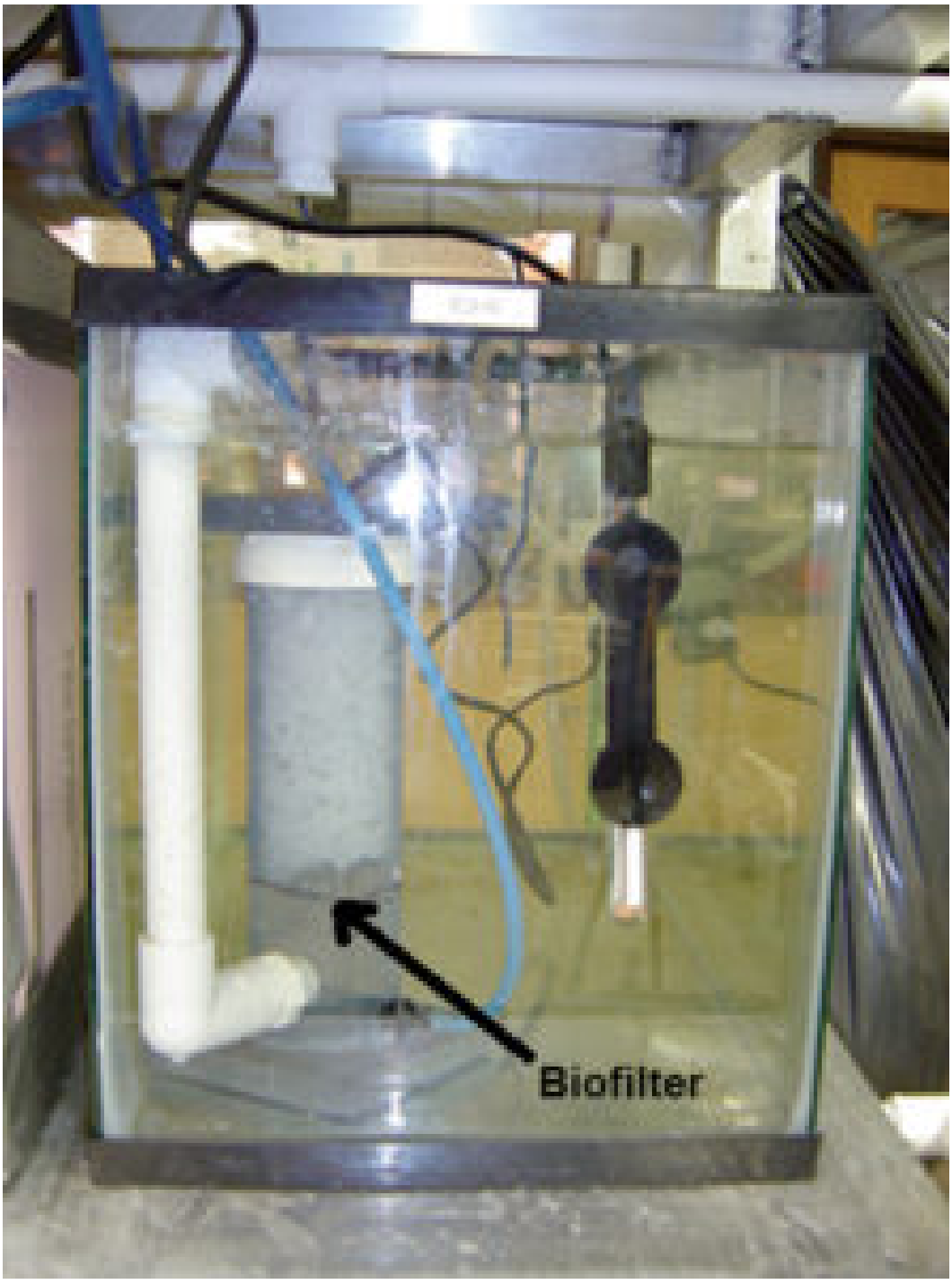
## Spectrophotometer determined rate of ammonia decay over time

Recirculating aquaculture systems face the need to be more efficient than ever for production to increase with profit. This need and the demand for complementing fishing from natural habitats emphasize design improvements in existing systems.

A key element in recirculation systems is the biofilter, which is strategic to controlling ammonia concentrations below toxic levels and maintaining a cost-effective and profitable system. Biofilters therefore need to be optimized to increase production capacity and reduce the risk of mortality in varying environmental temperature conditions.




The biofilters were designed to fit into the 40-l tanks as self-contained systems.

## Temperature study

In a recent study, the authors set up a series of temperature-controlled tank systems to determine the effects of temperature variation on biofilter performance. The biofilters, which were custom designed to fit into the tanks as self-contained systems, were positioned independently and loaded with synthetic

ammonia substrate feedstock. They were then exposed to temperature regimes of 20 ± 3 and 30 ± 30 degrees-C over a 72-hour period.

A computer-automated temperature-control system with independent 40-liter tanks was used for the experiment. Two triplicate batches of six tanks total were used to subject the biofilters to the two temperature regimes (Fig. 1). The biofilters were acclimated before sampling. The samples were analyzed using a spectrophotometer to determine the rate of ammonia decay over time at each temperature regime.

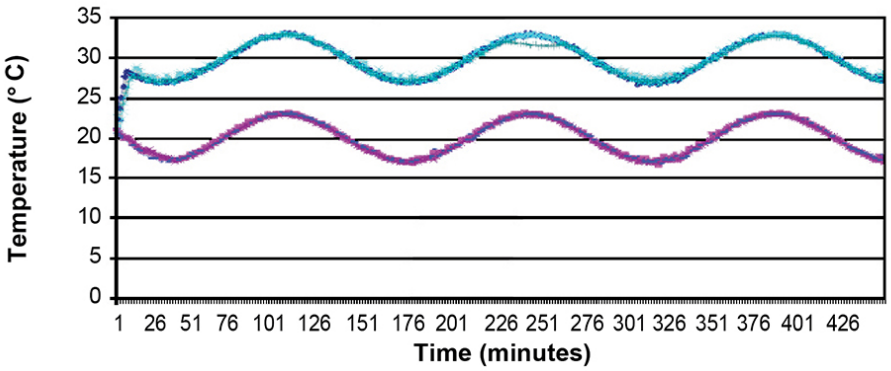



Fig. 1: Temperature regimes for 20 ± 3 and 30 ± 30 degrees-C.

# Results

A reaction kinetics decay curve was plotted for the ammonia decay over time for both regimes (Fig. 2). At $P < 0.05$, the decay coefficients indicated the decay rate was higher at 30 ± 30 degrees-C. This may support further, in-depth study of temperature fluctuations in relation to biofiltration for future system designs.

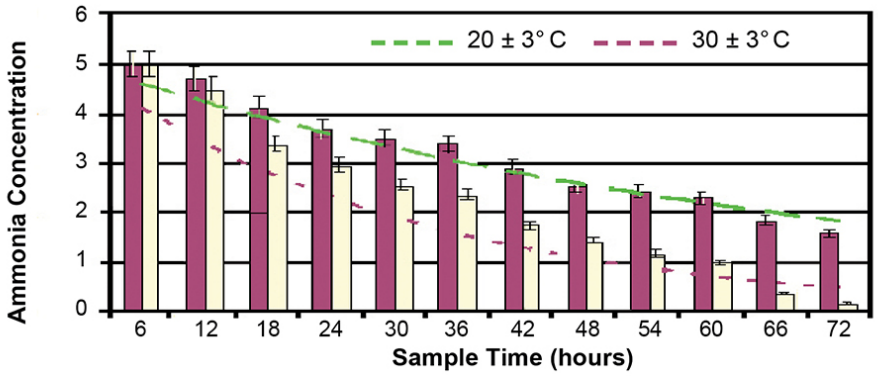



Fig. 2: Ammonia decay curve.

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