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Title: Observations and model predictions of daily areal primary production in a eutrophic brackish water culture pond

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Abstract: Observations of daily gross primary production of oxygen per unit area in a eutrophic, brackish water shrimp culture pond over a 14-day period are compared with predictions from two models in order to assess the utility of the model approaches for ponds and to refine observational protocols and techniques for pond assessment.

The models predicted rates (3.2 to $37.7 \text{ g O}_2 \text{ m}^{-2} \text{ d}^{-1}$) which exceeded observations (4.7 to $15.7 \text{ g O}_2 \text{ m}^{-2} \text{ d}^{-1}$) at all but the lowest light levels. Observed rates were also lower than other observations at similar light levels. These shortfalls are attributed to (1) the inadequacy of the method for estimation of community respiration as a component of gross production, in the absence of direct observation; and (2) the possibility of nutrient limitation of rates in the pond ecosystem.

The models are sufficiently sensitive to chosen parameter values, and the day-to-day variation of the parameters in the ecosystem likely sufficiently variable, that daily determinations of parameters should be made when possible, with particular attention to timing and use of surface water. Field observations of daytime community respiration, and improved knowledge of its controlling factors and relationships, are important needs for the advancement of model treatment of photosynthesis in ponds.

Eutrophic pond ecosystems have characteristics (vertical temperature structure resembling natural water bodies, complete light extinction within the shallow water column) which make them amenable to study as microcosms of some general aspects of aquatic primary production, particularly problems involving the prediction of daily areal rates from small-scale volume-based rate data.

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