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Title: Photosynthesis and community respiration at three depths during a period of stable phytoplankton stock in a eutrophic brackish water culture pond.

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Abstract: A 14 d period of dense but stable phytoplankton stock in a brackish water earthen pond (0.2 ha area, 0.7 m depth) was characterized to provide a baseline for study of instability. Results illustrate the potential of ponds to serve as microcosms of natural systems. Primary production and community respiration were assessed by diel curve analysis of oxygen and inorganic carbon sampled every 30 min at 3 depths. Neither stocks nor diel oxygen regimes were destabilized by 2 isolated days of low light, the first accompanied by heavy rainfall. Among nutrient elements, only inorganic nitrogen exhibited marginally limiting values. Daytime net production (dNPP) of oxygen ranged from 0 to 0.26 mol m^{-2} d^{-1}, carbon uptake from 0.01 to 0.22 mol m^{-2} d^{-1}. Nighttime respiration (nR) approximately matched dNPP, resulting in low mean diel net production (NPP). Minimal estimates of daytime respiration (dR) were substantially greater than nR and dNPP; minimal gross production (GPP = dR + dNPP) averaged 2.5 times dNPP. Estimated dR varied with dNPP in a stabilizing negative feedback, possibly mediated by photosynthetic products. Both dNPP and NPP varied with diel irradiance, but nR did not. Both dNPP and nR decreased with depth; positive NPP was concentrated in the upper layer. Stocks and oxygen cycles were more resistant to disturbance by low light than predicted by models assuming 1.0 m pond depth. We suggest for further examination that stability was related to the shallow depth of this pond, which permitted sufficient light penetration to the bottom layer for positive dNPP on most dates.

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