Planktonic production and respiration in oligotrophic Shield lakes

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ABSTRACT: A precise oxygen method was used to measure primary production, community respiration and to determine the importance of exogenous organic carbon as an energy source to planktonic communities in the epilimnion of 12 oligotrophic to mesotrophic Shield lakes. Median photosynthetic parameters observed with the oxygen method were up to twice as high as those measured with ^{14}C in other oligotrophic Shield lakes. Gross photosynthesis was almost always larger than community respiration, with a median P: R ratio of 1.7. We observed strong relationships between respiration and gross photosynthesis, but could not detect any significant trend between respiration or the P: R ratio and the concentration of dissolved organic carbon (DOC). DOC appeared to depress both photosynthesis and respiration. These results argue against the importance of exogenous organic carbon supply as a significant energy source to freshwater planktonic communities. Previously low P: R ratios reported for oligotrophic fresh waters may be due to the uncertain meaning of ^{14}C production data.