

Effects of disturbance events on primary production in the northern basin of Lake Biwa

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The effects of environmental factors on primary production by phytoplankton were elucidated at a site in the center of the northern basin of Lake Biwa, Japan. Chlorophyll *a* concentration, which is used as an index of phytoplankton biomass, and photosynthetic photon flux density (PPFD) were measured continuously at depths of 5, 10 and 15 m from August 2017 to February 2018. Monthly measurements of photosynthetic activity were performed using a pulse amplitude-modulated chlorophyll fluorometer, and photosynthesis-PPFD curves were produced throughout the observation period; these results were then used to calculate daily gross primary production per unit area. Primary production ranged from 0 to 3.92 g C m⁻² d⁻¹ (1.11±0.83, mean±SD) during the observation period, tending to be higher in spring (April-June) and summer (July-September), and lower in fall (October-December) and winter (January-March). In addition, primary production peaked in the late spring of 2018, with high production levels in this period attributed mainly to two large species in the Chlorophyceae (*Staurastrum dorsidentiferum* and *Micrasterias hardyi*). The meteorological events, such as typhoons and/or heavy rain, greatly affected the light and nutrient conditions in the water column and had a marked influence on primary production. In general, meteorological events increased the supply of nutrients and other essential material inputs from the terrestrial environment into the lake. However, such extreme weather events were also associated with increases in the supply of large amounts of sediment in runoff, greatly increasing the turbidity of the water column and decreasing primary production for a period of several weeks. These marked changes in environmental conditions were associated with the dominance of large-celled phytoplankton in blooms. Temporal variation in primary production was highly dependent on PPFD ($R^2 = 0.46$), although the contribution of biomass (chlorophyll *a*) to primary production also increased during the algal blooms ($R^2 = 0.36$).

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