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LIBRO DEGLI ABSTRACT

TROPHIC GRADIENTS, CLIMATE CHANGE AND CYANOBACTERIA: WHAT WE EXPECTED AND WHAT WE GOT – A LESSON FROM LAKE GARDA

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In this contribution we analyzed the impact of temporal trophic gradients on the phytoplankton community of Lake Garda. The station "Lago di Garda" was included in the Long Term Ecological Research network since 2007. We related the long-term development of phytoplankton and cyanobacteria to the fluctuations in the availability of nutrients at different temporal scales, from decadal temporal development to inter-annual changes. Estimation of parameters in linear models was carried out by applying Generalised Least Squares models (GLS). GLS allows estimation of unknown parameters in linear regression models even when assumptions are violated, i.e. when the variances of the observations are unequal, or when the data have a certain degree of serial correlation, as is usually the case in long-term ecological investigations. The development of cyanobacteria showed a strong dependence from the decadal development of phosphorus, with maximum correlation at a time lag of 1 year. Similarly, at the annual temporal scale, this algal group showed a strong dependence from the surface spring availability of TP, which, in turn, was related to deep mixing dynamics and winter climatic oscillations. Nevertheless, temporal trophic gradients showed a differential impact on the different groups of cyanobacteria. While the Oscillatoriales (in the whole range of temporal scales) and Chroococcales (decadal temporal scales) were closely linked to P fluctuations, the Nostocales (mainly *Anabaena lemmermannii*) appeared unaffected. Unexpectedly, this algal group increased its importance not only in Lake Garda, but also in other deep southern subalpine lakes just in the period coinciding with their oligotrophication (Maggiore, Como) or stabilization of nutrients (Garda, Iseo). These results suggest the need to change our present vision on the factors controlling the development of cyanobacteria, with important implications on water quality assessment criteria and lake management.