



## XXIV Congresso dell'Associazione Italiana di Oceanologia e Limnologia

Centro Congressi, Area della Ricerca del CNR  
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## Long-term limnological research in the subalpine lake district: An Italian-Swiss collaboration extending the Italian LTER network

The Macrosite "IT08 Subalpine Lakes" includes a group of lakes located at the southern border of the Alps. The lake typologies consist of large and deep lakes (Orta, Garda, Maggiore, Como and Iseo) and smaller and shallow lakes (Candia). Already active well before the creation of the LTER network in 2006, collaborations between IT08 research sites can refer to a long tradition. Although not formally part of this network, Lake Lugano was and is largely involved in the scientific collaborations carried out within the Subalpine Lakes macrosite. Common research topics in these lakes include the effects of eutrophication and climate change, structure and dynamics of biological communities (e.g. plankton, nekton, benthos), paleolimnology, ecotoxicology, ecological status and remote sensing. Scientific investigations can rely on the availability of numerous technological facilities located in the reference institutions. New technological infrastructures and methodological approaches allowed to uphold and update the classical approaches adopted in scientific monitoring, opening the way to new research fields especially e.g. in molecular ecology and metabolomic profiling, antibiotic resistance genes, high-frequency monitoring by sensor technology, remote sensing detection of cyanobacteria. The most recent data collected in the large and deep lakes allowed identifying the principal cardinal changes affecting their ecological status. These include the impact of eutrophication and global warming, decrease in the frequency of full mixing episodes and establishment of persistent meromixis in lakes Iseo and Lugano, variations in phytoplankton dynamics and identification of new toxigenic cyanobacteria and cyanotoxins, introduction and establishment of allochthonous species, and detection of numerous new emerging chemical pollutants. In this context, the scientific monitoring is only a key element of LTER research, which should include not only data collection, but also data interpretation and definition of new conceptual frameworks in order to identify the more significant environmental stressors affecting ecosystems, communities and populations.

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