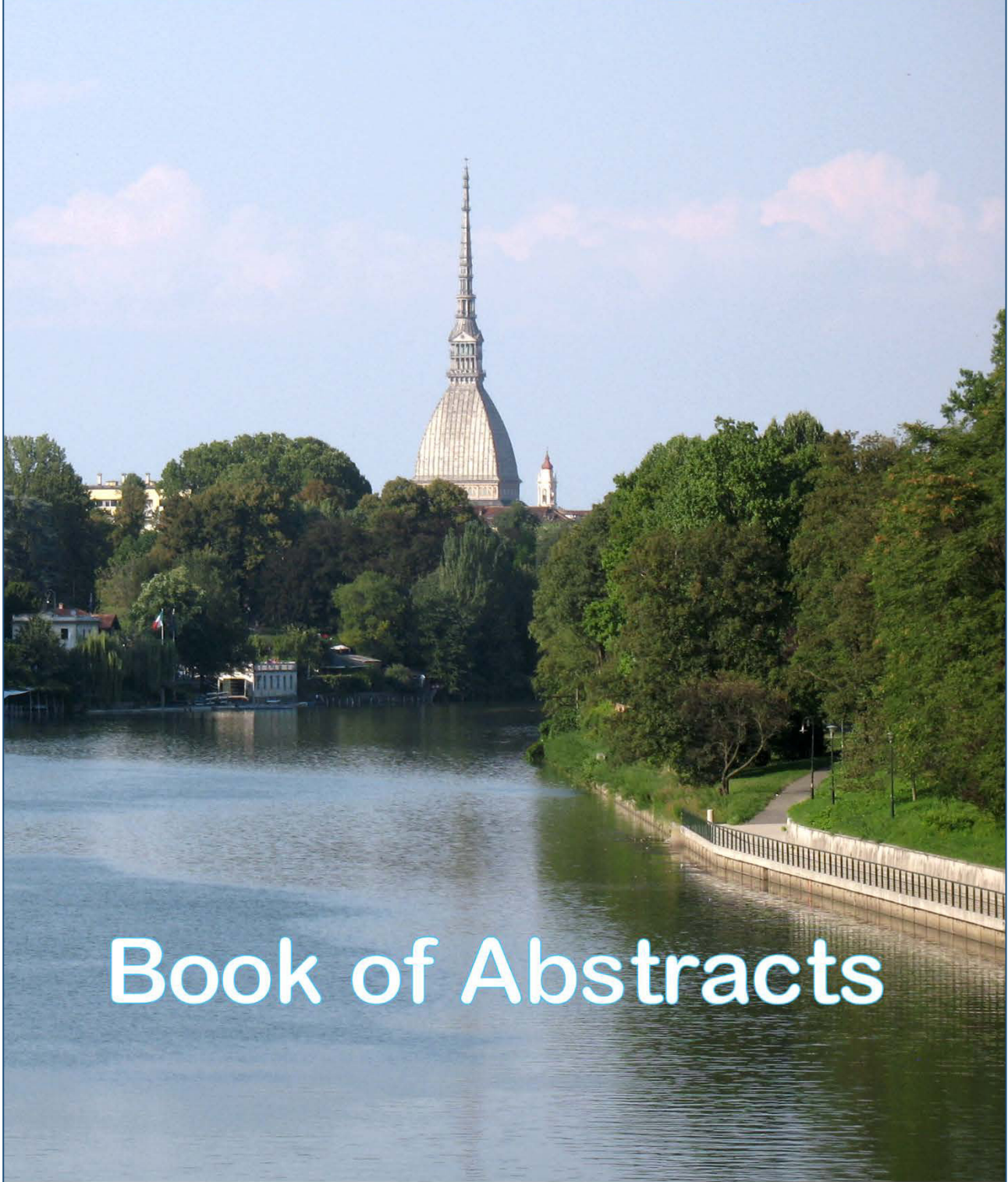




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upper water layer. A decrease in the atmospheric load of N was also detected in the last few years through the data collected at a number of monitoring sites in the watershed of Lake Maggiore.

The change point in NO₃ trend in the lake was around 2010; in the same period, both reactive and total phosphorus started to increase slightly, with TP moving from 9 µg L⁻¹ as yearly average on the whole water column to 11-12 µg L⁻¹. Some re-arrangement inside the phytoplankton assemblage was also detected, such as the non-occasional record of “eutrophic” species among the dominant taxa.

The present work will present and discuss some hypotheses to explain these trends in nutrient concentrations, taking into account the role played by atmospheric deposition and meteorological drivers, such as precipitation regime. The catchment loads, calculated through the chemical monitoring of the main tributaries, will be considered. The thermal regime of the lake, and particularly the mixing depth and its effect on nutrient replenishment at winter overturn, will also be discussed.

39-O Biogeography of *Dolichospermum lemmermannii* (Nostocales, cyanobacteria) in European waterbodies: a multidisciplinary approach. Camilla Capelli¹ - Andreas Ballot² - Leonardo Cerasino³ - Nico Salmaso¹

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The presence of *Dolichospermum lemmermannii* was documented in northern temperate and boreal regions, between the 40th parallel and the Arctic Circle. In the last decade, this species spread towards southern Europe, making its appearance also in the largest lakes south of the Alps (Garda, Iseo, Como and Maggiore). Extended surface water blooms of this species were observed in Lake Garda at the beginning of the 1990s, and afterwards in lakes Iseo (second half of the 1990s), Maggiore (2005), and Como (2006). Blooms were always observed in summer and early autumn, during calm weather.

The study of sub-fossil akinetes preserved in core sediments allowed antedating the introduction of this species in Lake Garda in the middle of the 1960s. The significant increase in water temperatures and nutrient enrichment of the lake seemingly supported the development of this species in the successive decades. Global warming is indeed considered one of the major factors favouring the invasion of Nostocales, particularly due to the ability of the large gas-vacuolated species belonging to this group to control vertical movements in stratified water columns.

The large perialpine lakes are a renewed tourist destination and an important source of water for drinking, irrigation and industry. The appearance of *Dolichospermum* in this group of lakes represents a new potential risk because of the previous identification of several toxigenic populations associated with animal poisoning events in northern European countries. Despite serious concerns raised by the ecological, health and economic impacts, a comprehensive taxonomical, ecological, and toxicological study was begun only very recently.

The variability of morphological features in natural populations of *D. lemmermannii* are quite wide and some strains showed high temperature optima. The recent expansion towards the south highlights the ecological heterogeneity of this species and the conceivable existence of different ecotypes. In this work, we report the results of a wide research aimed to deepen the biogeography of *D. lemmermannii* at a continental level, along climatic and trophic gradients. The research was based on a wide multidisciplinary approach, including taxonomical, genetic and metabolomic determinations of several strains. A phylogenetic analysis of the 16S rRNA and *rpoB* genes was followed by the identification of toxic strains, evaluating the presence of cyanotoxins (i.e. microcystins, nodularins, anatoxins, cylindrospermopsins, saxitoxins) by LC-MS and cyanotoxins encoding genes (*mcyE*, *anaF*) by PCR.

This study will allow understanding the ecological factors involved in the development of this recently expanding species, contributing to identify the better management options finalized to relieve the economic impact on the large subalpine lakes, which are increasingly more exposed to high anthropogenic activities and climate change.

39-O Effects of eutrophication management on the interactions between zoo- and phytoplankton in a deep perialpine lake (Lake Lugano, Switzerland and Italy). Fabio Lepori, Andreas Bruder, Gabriele Consoli

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