web as well as for the local commercial fishery, and the population structure of the species is important for its management.
We analyzed results from an annual monitoring program covering the whole pelagic part of the lake in late summer, a questionnaire to commercial fishermen, data from the fisheries and additional samples of vendace collected during spawning in late autumn. Our analyses covered a large number of parameters: genetic variation, demographical variation (spatial synchrony in population growth rates based on abundance, size and somatic growth), diet, stable isotope levels (d15N and d13C) and migration patterns.
Vendace were abundant in both basins and young-of-the-year and older vendace were found in both basins, although the relative abundance of life stages differed. Preliminary results from microsatellite analysis did not provide any clear support of genetic differentiation between basins. In contrast, demographic analyses indicated that the population growth rate patterns were not synchronous, implying independent dynamics in the two basins. We conclude that it may be important to combine genetic analyses with other sources of information, such as demography and migration rate, when providing advice for local management of important fish stocks.

39-P Plasticity in phytoplankton annual periodicity: an adaptation to long-term environmental changes.

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Many phytoplankton communities present a strong seasonal pattern in terms of abundance and composition. This pattern is usually described as an annually repeated process of community assembly driven by changes in physical factors, grazing pressure and nutrient limitations. However, climatic changes, in combination with local phosphorus management policies have caused important modifications of the environmental conditions in many lakes during the past several decades. Lake Geneva is one of the systems affected by both climatic induced changes and a strong decrease in phosphorus concentrations. In this study we used monitoring data of Lake Geneva to test whether annual patterns of phytoplankton seasonal succession present inter-annual variability in relation to those environmental changes. Our approach combined i) the identification of species assemblages using a developed Bayesian method and ii) wavelet analysis to detect transient dynamics in seasonal periodicity. A decrease in phosphorus concentrations appeared to play a major role in the inter-annual replacement of species assemblages, but the results also exhibited transient dynamics that were most likely induced by changes in *Daphnia sp.* abundance. The observed transient dynamics in the abundance of species assemblages induced a strong inter-annual variability in the pattern of their seasonal successions, but they did not necessarily affect the annual dynamics of total phytoplankton abundance. Accordingly, we demonstrated that plasticity in the pattern of seasonal succession played a stabilizing role at the community level. The exception being at the end of the studied period, in the mid-00's when almost all of the assemblages lost their seasonality. The results suggest that seasonality and inter-annual changes in seasonal dynamics of species assemblages are important components to consider for underlining and explaining long-term variability in phytoplankton community.

39-P Trophic role of crustacean zooplankton and transfer of POPs through the pelagic food web.

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Crustacean zooplankton is the major link between primary producers and zooplanktivorous fish in the pelagic community of lakes. They play a crucial role in the transfer of matter, energy and pollutants to higher trophic levels. The composition of the planktonic crustacean population largely varies with the season, Contribution of primary consumers to total net zooplankton biomass being prevalent in spring and early summer and that of secondary consumers prevalent in autumn and winter. Despite comprising two clearly different trophic levels, zooplanktons are often regarded as a one functional group, particularly in ecotoxicological studies and in models dealing with biomagnification and the role of zooplankton in transfer of pollutants to fish.
In the present contribution, we provide results of a pluriannual study on the deep subalpine Lake Maggiore (Italy), in which seasonal changes in carbon and nitrogen stable isotopes of zooplankton primary and secondary consumers were individually investigated. Results provide evidence that quantitative estimates of trophic roles within crustacean

zooplankton are essential for understanding fluctuations in POPs (persistent organic pollutants) concentration in different compartments of the pelagic food web.

39-P Limnology at work: when scientific research leads to the successful recovery of the polluted Lake Orta.

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Lake Orta (18.2 km^2, 1.3 km^3, 143 m max depth) has been severely polluted since 1926, when the lake began to receive industrial effluents containing high concentrations of copper and ammonia. Chromium-, nickel-, and zinc-rich effluents from plating factories have also contributed to pollution levels, and pH dropped below 4.0 as a result of the oxidation of ammonia to nitrates. More than 60 papers have documented the evolution of the chemical characteristics of both water and sediment, and the sudden decline of plankton, as well as benthos and fish. As a remedial action the lake was limed from May 1989 to June 1990 with 10,900 tons of $CaCO_3$. The treatment was immediately effective in raising the pH and decreasing the metal concentrations in the water column, and plankton and fish communities quickly rebounded, albeit as a poorly structured biological community. In the following years, the post-liming recovery of Lake Orta was tracked by monitoring its hydrochemistry and running a series of ecotoxicological studies. In 2015, a new research, based on toxicity testing of the main tributaries and the lake water column, coupled with the chemical assessment of the water quality, re-assessed the lake conditions and the real improvement of the environment.

39-P Water quality and long-term trends in the trophic conditions of the manmade Pertusillo lake (Basilicata, south of Italy): review of 50 years of monitoring activities.

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The aim of this study was to describe and discusses the long-term trophic conditions of the Pertusillo lake, a manmade lake completed in 1962. It is one of the strengths of Basilicata and Puglia regions water supply schemes, in fact, the water is employed into a hydroelectric power plant, for irrigation and production of drink water. The lake lies within a National Park and in the same area, are also located: the largest oil field of Continental Europe, 30.000 inhabitants, industrial, agricultural and zootechnical activities, authorized and illegal discharges of waste water. The study provides an overview of the complex dynamics of the lake Pertusillo, that is also subjected to a natural eutrophication process. The assessment of long-term ecological status was conducted through the collection and interpretation of historical dataset. The dataset was obtained from the review of 50 years of different monitoring activities (since 1963 to 2012), conducted by research centres, universities and regional environmental agency. The research has showed that the Pertusillo is a mesotrophic lake, and the water body has presented an accentuated trophic level just a few years after it was built. The lake has an extended summer stratification (thermal gradient of 12°C). The transparency, variable from 1 to 4 meters, is strongly influenced by the presence of suspended particles of silt. Oxygen concentrations vary from values of supersaturation (> 120% O_2) to anoxic values (<5% O_2). In this review, special attention is given to nutrients and phytoplankton dynamics, furthermore, a significant relationship between the level of nutrients and algal biomass has been established. The historical analysis of the algal species suggests that the present composition is not significantly different than in the past. It is therefore plausible to assume that the lake has not undergone radical environmental changes in 50 years. The seasonal increases in phytoplankton production (algal blooms) have favored anoxia condition in the hypolimnion during 1970, 1990 and 2010. Environmental data show that the lake had an experience of eutrophication in the 2010, while has recovered a mesotrophic status in 2012. Pertusillo lake has particular geomorphologic conditions which do not exclude a early silting of the lake basin and a subsequent self-cleaning capacity reduction of the lake. In conclusion, the knowledge of long-term trophic conditions can constitute a reference point for future actions to be taken to reduce the loads of nutrients incoming to the lake. Moreover, the monitoring of naturals and anthropogenics pressure represents a relevant environmental challenge.