Tiny life forms thriving again in Lake Zurich

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While elsewhere species extinction is proceeding at an ever-increasing rate, plankton biodiversity in Lake Zurich is apparently benefiting from rising temperatures and the successful measures against over-fertilization. Begun in the 1970s, this course of action may have a long-term positive effect on fish diversity, although it is too soon to tell. The new species are being watched closely by the water supply company, for some of them can produce harmful substances.

Not only the variety but also the number of plant and animal plankton in Lake Zurich has increased in the last 30 years, as has been ascertained by an Eawag research group working with experts from the Zurich Water Supply Company (WVZ). Their results have just been published in the journal Oikos. While in the 70s about 40 phytoplankton species and only 7 zooplankton species were found in the lake, in 2008 there were more than 100 ”plant” and 15 animal species. Parallel to the increase in biodiversity of these tiny organisms suspended in the waters of the lake is the growth of their total biomass, probably because there are now more species which are tolerant to reduced nutrients and profits from warmer temperatures even in deeper layers of the lake. Earlier, algae growth was limited to the uppermost layers.

The investigation of unusually detailed chemical, physical and biological data, measured in the deepest part of the lake and recorded by the Zurich Water Supply Company since 1977, made this work possible. Regularly monitored at 14 different depths from the surface to a depth of 135 m were temperature, pH, phosphorous, nitrogen and light et al. In addition, samples of phytoplankton and zooplankton were counted, analysed and classified. Using complex statistical methods, the scientists have now evaluated the data and determined the driving factors behind the result.

Characteristic for the period since 1977 are, above all, a slight but steady increase in water temperature (circa 0.2°C) and a decisive decrease in phosphorous concentration (from ca. 90 to 20 µg phosphate-P/Litre). Phosphorous concentrations today also show less seasonal variation, but greater variation over the range of lake depth levels. All of these changes had a positive effect on the increase in species diversity and have led to more stable populations than existed 30 years ago. According to project leader Francesco Pomati more ecological niches, to put it simply, have arisen in the lake, in which even less competitive organisms can find space, light and nourishment to survive. The increase in phytoplankton species variety has also fostered the growing number of zooplankton species, as these feed on the phytoplankton. This has occurred in spite of an increase in water temperatures, which leads according to other projects to a decrease in the biodiversity of zooplankton.

“The warming of the climate and the successful reduction of over-fertilization is leading to more variation over the whole range of lake depths. This means the presence of more species in a given space”, says Pomati. The aquatic biologist is convinced that the results from Lake Zurich apply also for other lakes of similar depth. “And our work should certainly enrich the discussion about detrimental effects of environmental change brought about by humans”, he says.

Among the species profiting from the changed circumstances are also those not appreciated by everyone, for example the Planktothrix rubescens, which can produce toxic microcystins. For this cyanobacterium, the stable thermal layering of the lake and the supply of phosphate in the deeper layers of water is advantageous. Its increased growth is watched over especially carefully by the Zurich Water Supply Company. “We’re keeping a very close eye on this development, especially in those

depths where lake water is taken in for the water utilities”, says the microbiologist Oliver Köster from the WVZ. There is certainly no cause for alarm among the consumers, for today's filters and oxidizing substances like ozone are dependable insurance that the organisms and their harmful substances do not get into Zurich's water pipes.

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