DESCRIPTION FOR THE GENERAL PUBLIC

Sodium chloride (NaCl) is widely used as a deicer for roads, despite it being known to have toxic effects on the environment. Apart from its widely-known harmful effects on roadside green areas and pets, it also accelerates corrosion in cars and hastens the destruction of roads and sidewalk surfaces. However, it is often forgotten that the salt used on roads and sidewalks is usually washed into the rainwater drainage system with rainwater and snowmelt runoff, from where it passes directly to the nearest river. Road salt pollution is characteristic of the winter period, during which time many aquatic organisms are found in their survival forms - such as dormant eggs of zooplankton. This form of pollution is typically encountered during winter, and hence little information exists regarding the impact of road salt on the functioning of ecosystems during the growing season.

As the toxicity of chlorine ions is usually assessed using adult organisms under summer conditions, little, if any, information exists on the influence of chlorine on the survival of dormant eggs, and on the success rate of egg hatching for subsequent generations of zooplankton. This knowledge is essential for understanding the role of zooplankton in reducing water blooms, particularly cyanobacterial toxic blooms. Zooplankton can be used as a biomanipulation tool to limit the occurrence of blooms by feeding on phytoplankton: the so-called top-down effect.

Zooplankton populations are able to produce survival forms, i.e. dormant eggs (cysts), thanks to which the species does not die out in a given location if unfavorable environmental conditions occur. The construction of dormant eggs ensures their survival at low temperatures and in the absence of water; however, there is not enough information on how the construction of eggs protects them against different types of pollution, including road salt. The aim of the project is therefore to assess the impact of chlorine ion pollution from the use of road salt on the hatching success and survival of various species of zooplankton. The tests will be carried out on microbiotest organisms (populations not exposed to chlorine), and on organisms and dormant eggs collected from three urban stormwater ponds with different levels of chloride ion pollution. Various types of commercially-available salt products will be used for laboratory tests: one based on NaCl, another based on $MgCl_2$ and another based on $CaCl_2$, either with or without corrosion inhibitors or pH regulators.

To achieve the main goal of the project, field monitoring is also planned to determine the maximum chlorine concentrations in three selected urban stormwater ponds, and the duration of the high Cl^- concentrations in them. Three sets of water samples will be examined: surface water, sedimentary water (0.5 m above the bottom) and pore water (centrifuged from sediments).

The US Environmental Protection Agency (EPA) provides norms for acute (860 mg/L) and chronic (230 mg/L) chlorine ion exposure in surface water; however, in urban stormwater ponds concentrations exceeding these values can be expected. However, our previous studies have shown that the maximum concentrations of chlorine in urban rivers may exceed these doses by many times: The maximum Cl^- concentrations can be as high as 12,000 mg/L in winter, and elevated levels of chlorides (> 230 mg/L) have also been observed as late as in July. However, little is known of the concentrations occurring in the sediments of reservoirs, i.e. where dormant zooplankton eggs are stored to await favorable hatching conditions, and hence the duration of these periods of high concentration is also unknown.

The project findings will fill the above knowledge gaps, and they should positively contribute to reducing the occurrence of cyanobacterial blooms in water reservoirs by refining management procedures. It will also shed more light on how road salts advertised as alternative and more environmentally friendly than pure NaCl affect the aquatic environment.