

In urbanized environments, fishponds are the main habitat of waterfowl in Europe. Although these areas seem to be very similar to natural, they are under considerable economic pressure as places of intensive fish farming, hunting and fishing activities. For many years, certain solutions in the fishing and hunting activities have been a source of great controversy among environmental toxicologists due to significant amount of lead they add into the environment. Lead is a very toxic element, so its availability in the environment, the analysis of its fate and monitoring of concentrations requires a lot of research. The main source of lead linking fishpond with hunting and fishing activities are lead pellets. They are used in hunting ammunitions and as weights in fishing. Both materials act in the environment roughly in the same way, although it seems that the number of pellets from hunting activity deposited in the environment is much higher. Waterfowl hunting (e.g. ducks and geese) is mostly carried out in wetlands with relatively small areas. In many sites the number of birds hunted per year is high and often exceeds several thousands. Statistics show that an average hunter has to shoot several times (usually between 3 and 6, including missed shots) to hunt a selected bird. The hunting ammunition cartridge contains about 200 lead pellets (popular caliber 12, shot no. 4). This means that hunting one individual can result in shooting more than 1,000 pellets (nearly 0.2 kg of lead) into the environment, while hunting one thousand birds more than 1,000,000 shots (200 kg of lead). Due to a scale effect, there are places on earth where the number of pellets (shots) found per 1 m² reaches several hundreds. It is worth noting that hunters and anglers do not do anything illegal and comply with the established regulations in force in most countries of the world.

The vast majority of environmental toxicology research concerns the fate of pellets in terms of animal exposure. It turns out that pellets lying on pond areas may be swallowed by mistake by birds feeding there, which leads to their poisoning, often with lethal consequences. These observations come from all over the world and concern mainly representatives of the Anseriformes order (swans, ducks and geese), but it has been already confirmed that predators may get poisoned by foraging on poisoned waterfowl. Implications and elevated concentrations are also observed among people - game consumers. In view of the above, a large amount of data on bird poisoning from different parts of the world has been collected. On the other hand, the fate of pellets in the hunting grounds, from the environmental point of view, has not been fully investigated. Many papers assume that the environmental components of hunting grounds (water and soil) are contaminated, although scientific data on this subject is very scarce. Moreover, these few mentioned studies show that water pollution is not so obvious, and it may occur only in very specific and rare in nature conditions (this was revealed by the pilot studies carried out by the team proposing the current project).

Before lead from pellets pollutes the water, the effective weathering (erosion) of pellets and lead leaching to water has to take place. The occurrence of these phenomena and their efficiency depend on many abiotic and biotic factors. These issues will be investigated by the project presented. It is planned to thoroughly verify the influence of water pH, water hardness and sediment type on the rate of lead release from pellets to water. Next to that, the relationship between microbiological activity and lead leaching efficiency will also be investigated. This is a problem that is quite difficult to interpret and predict, because on the one hand, one should assume high microbiological activity in pond water on the surface of pellets, which promotes and stimulates the erosion. On the other hand, it is known that lead is a very toxic element, so probably the microbiological activity will be inhibited on the surface of pellets (it is unknown if it is completely or to some extent - such studies have not been conducted so far). The whole project is planned for four experiments with the use of microcosms (laboratory systems simulating the conditions of fishponds). The microcosms will be small glass containers (about 500 ml) containing water, sediments and lead shots. Experiments will last 60 days and before, during and after the experiments, many parameters will be measured in water and pellets, such as metal concentrations (the shot consists mainly of lead, but there are many other metals in the alloy), weight change of shots, surface change of shots, as well as bacteria composition and its changes (qualitative and quantitative). Advanced laboratory techniques will be used in the research and a comprehensive statistical analysis of the results will be carried out.

The project combines different scientific disciplines and fits in the fields of ecotoxicology, environmental chemistry, earth sciences and instrumental analysis. Experienced specialists from these disciplines will be involved in its implementation. The results will be valuable for the diagnosis of lead wetland contamination, the identification of potential sites at risk of contamination, the preparation of policies for the management of contaminated sites, as well as strategies for their reconstruction. It is very likely that the studies will identify important factors influencing the weathering of pellets that have not yet been taken into account in the overall conclusion on lead contamination of the environment. This knowledge will be presented in scientific and popular-scientific publications and used in the preparation of future research projects.