Microevolution of urban life - genetic mechanisms of animal urbanization

Rapid processes of natural habitat transformation by humans means that more and more animal species are exposed to and challenged with this kind of changes. Many species are unable to adapt to the presence of humans and alterations they cause in the environment - these species shall avoid highly transformed landscapes, often experiencing significant declines in numbers and reduction in the size of geographical ranges. On the other hand, an increasing number of animal species successfully adapt to life in human-dominated environments, and some species may even adapt to urban life so strictly that they can hardly function without resources provided by humans. These adaptations may be most easily observed in animal behaviour - individuals living in cities are often bolder and more explorative, show less fear of humans or other threats, and are more aggressive towards conspecifics or individual from other species. At the same time, studies of urban faunas indicate that adaptations to urban life require a broad spectrum of other, less prominent changes at the hormonal, physiological, and immune levels. Fast adaptation rate of some vertebrate animals, in particular birds, to urban life has long raised questions about the mechanisms that not only allow the emergence, but also spread and fixation of such adaptations in urban populations. It is acknowledged that certain adaptations to urbanization may result from individual plasticity, i.e. a different reaction of an organism to changing environmental conditions. However, we also know that at least some of the adaptations should be genetically fixed through microevolutionary changes - usually small changes in DNA that can significantly improve performance of individuals in an urbanized landscape and, thus, spread in urban populations through natural selection. The aim of this project is to determine the genetic basis of adaptations to urban life in a common waterbird species, the Eurasian coot. The adaptations will be primarily tested at the level of genes responsible for changes in behaviour and immune response of urban individuals. Additionally, there will be an extensive search for new genes that may be responsible for yet unrecognized adaptations of birds to urban life. The results of this projects will extend our knowledge on the mechanisms and processes that determine the effective adaptation and performance of animals in human-dominated environments.