One of the main challenges in biology is to understand the evolution of complex adaptations that allow realization of the astonishing variety of "lifestyles." Predator-prey interactions are important components in ecological communities, where under the pressure of natural selection, predators have evolved a variety of behavioral, morphological and/or physiological adaptations for detecting, catching, killing, and digesting prey. The examples include the wolf with its cooperate hunting skills, the cheetah — the world's fastest land animal, the golden eagle with excellent eyesight that allows to spot even a small prey from the great height, or the grasshopper mouse *Onychomys*, hunting on cotton rats that are three times their weight. The predatory behavior is important not only from the ecological and evolutionary, but also from biomedical perspective, because of its relevance to pathological forms of aggression observed in humans. It is then surprising that our knowledge concerning biological mechanism determining the predatory aggression is very limited, especially in comparison with that concerning conspecific-directed aggressive behavior. One of the reasons of this deficiency is a limited range of suitable animals models.

In this project, we will use our unique model system, in which we simulate the evolution of a small non-laboratory rodent, the bank vole (*Myodes glareolus*) toward increased propensity to hunt crickets. As in any proper experiment, we have a control and replications. However, as the evolution is a population-level process, the replications are independent lines (populations). Hence, four lines selected for the predatory behavior and four unselected control lines are maintained in the experimental evolution model system. This allows to answer the question whether the changes observed in subsequent generations result from random factors (e.g., the so-called genetic drift) or are indeed a response to the specific selection factor. Within the course of already more than 30 generations, the predatory behavior indeed has evolved. Almost all voles from the predatory lines successfully hunt crickets, while most of the voles from the control lines do not show such a hunting behavior.

In this project, we will use this animal model to accomplish the following five main objectives. First, we will characterize details of the predatory behavior to learn whether the selection increased only the propensity to attack, or also the hunting skills. Second, we will ask whether selection for predatory behavior caused changes in conspecific-directed aggression. In other words – we will check whether predatory voles are more aggressive towards members of their own species and whether the aggression of predatory voles is atypical. Third, we will assess the contribution of "nature – nurture" effects on the behavioral differences between the predatory and control lines. We will apply a cross-fostering experiment in which newborn voles will be exchanged between mothers from the selected and control lines. This will allow to test whether rearing by a predatory mother increases predatory propensity of an individual independently of its genetic background. Fourth, to uncover the mechanisms underlying the differences due to selection for predatory behavior, we will investigate hormones, neurotransmitters (chemical messengers, which transmits signals from neurons to other neurons, muscle cells, or gland cells) and brain activity activated by recent experience with crickets. Finally, the project will provide tissue samples ready for investigation of the molecular background (gene expression level) of the predatory behavior, which will be undertaken in a prospective next project.

Although the project belongs to base science, the results may have practical implications. The most cruel crimes committed by people are often referred to as "predatory aggression", because they resemble aggression showed by animals during hunting behavior. This resemblance is reflected both on behavioral and physiological levels. Thus, in addition to contribution to explanation of the evolution and determining mechanisms of predatory behavior in animals, the project can also bring results that will help developing further research, aimed directly at a better understanding of human aggression, especially its abnormal forms, seen in most cruel criminals.