Cognitive processes, so perception, learning, long term memory, working memory, attention, decision making, determine many behaviours, that affect ecology and evolution of animals, such as nesting site selection, food choice, predator defence or mate choice. The main goal of this project is to find out if cognition depends on brain size and if their variation at the intraspecific level is related to important processes that influence individuals' fitness, such as habitat selection, prey selection, or being innovative in changing environment. Although it was showed before, that cognition is closely related to brain size in many different species of birds and other taxa including humans, studies on individual differences in brain size, cognition and fitness consequences of these differences are extremely rare. This is the first time that studies focuses on such crucial behaviours as avoiding predation by choosing safer habitat, foraging on newly introduced but abundant and easy to get prey species, and using material newly introduced in the environment to strengthen nest construction. We would like to answer several questions concerning relation of these cognition aspects and brain size: do birds with bigger brains choose safer habitats than small-brained birds? Do birds with bigger brains switch faster to more abundant, easy to catch prey than birds with smaller brains? Do birds with bigger brains are more innovative than small-brained birds?

Thanks to studies on barn swallows, it is now known that there are interindividual differences in brain size and that brain mass is correlated with external head volume independently to overall body size. Similarly, head measurements as a proxy for brain size are commonly used in paediatrics, because head circumference is correlated with brain mass and intracranial volume. Studies will be conducted on Red-backed Shrike *Lanius collurio* and they are based on assumption that brain size is correlated with head dimensions, which have been proved by Møller's in 2010. All three hypotheses require conducting routine procedures in each part of breeding season. After establishing territories by pairs of birds, we will start to search for nests in all potential locations. Individuals will be caught in mist nets, individually banded and measured (mainly height, width and length of head). To test the first hypothesis we will focus on predation rate and few characteristics of nesting sit chosen by birds (structure of shrubs, nest exposition, nesting shrub species). Nests will be regularly controlled to determine breeding success, and the cause of failure. Birds choosing safer habitats are the birds with better cognitive abilities, thus they should have bigger brains. Second hypothesis will be tested using a simple method of introducing new species of prey. After introducing mealworm larvae in birds' territories, we will test if individuals of known head measurements differ in time they need to start foraging on easy to catch, abundant, but unknown prey. Two-hours experiments will be recorded to obtain the best quality data. Third hypothesis will be tested by introducing new material – cotton strings, that can be easily incorporated in nest construction. Next we will analyse if birds that used new material are the birds with bigger brains. Results, to a large degree, will complete understanding of topics on which our knowledge is still poor: the relation between individual differences in brain size, cognition, and their effect on individuals' fitness. This project is the first one considering not only relation between brain size and the probability of breeding failure caused by predation, but also process of habitat selection including rarely studied nest sites availability. It will be the first time that foraging strategies and its relation to brain size will be studied. Research on innovative behaviour and brain size on interindividual level have been never conducted before. Moreover, thus far, none experimental studies have been carried on. Most of the studies on brain size and cognition were so far comparative studies. Comparative studies were under strong critique in the past. Project bases on hypotheses concerning the most important aspects that affect evolution, and have been never tested before. Publication of results is planned in the pages of leading magazines from the group of ecology, evolution and behavioural ecology. The results will form the master's and bachelor's thesis of graduate and undergraduate students from the University of Life Sciences engaged in field works of the project. We will also try to disseminate our results in popular science literature.