

Ecophysiology of learning: The effects of short- and long-term changes in ambient temperature on learning performance in a model songbird

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Our world is currently facing an increase in climate unpredictability and short-term variability. Thus, it becomes increasingly relevant to study whether animals are able to cope with those changes. On the one hand, highly variable environmental conditions could induce physiological costs which drain resources available for cognitive functions. On the other hand, environmental fluctuations could promote cognitive mechanisms responsible for more versatile behaviors. The main aim of this project is to study the effect of temperature unpredictability in different time scales on learning efficiency in a model songbird.

Zebra finch (*Taeniopygia guttata*) originates from Australia, where it lives in highly unpredictable environment. In the project, zebra finch is used primarily because of being a well-established model bird species. It is also widely used as a model for human speech learning. Experiments performed in the captive population of zebra finches will allow answering the questions such as:

- Does living in a highly variable ambient temperature entails physiological costs that negatively affect efficiency of learning?
- Are different types of learning affected by the variable ambient temperature in the same way?
- Can parents alleviate the effect of the ambient temperature on their offspring via pre-natal maternal effects or post-natal parental care?
- Whether offspring which develop in variable conditions are better in adapting to the variable environmental conditions experienced in the adulthood?

In the two experiments parents will start breeding either in the conditions of stable temperature (20 °C) or in unpredictable temperature fluctuations (changing randomly between 10-30 with mean 20°C). Half of birds will experience change in environmental conditions: in one study it will happen at the time of incubation and in the second study, at the onset of offspring independence. In both studies, the other half of the birds will remain in their initial conditions. All of the offspring produced in the two studies will undergo tests assessing several aspects of their learning performance at juvenile and/or at adulthood. Song learning is essential to the reproductive success of the males. In zebra finches, song learning, is restricted to the juvenile period and the quality of that process can be assessed at adulthood. Learning to get food is crucial for survival of both sexes. I will study the ability and speed of problem-solving in relation to food acquisition in the juvenile and adult birds. Finally, in adult birds, I will also study learning associations, spatial learning and social learning – also in the context of food acquisition.

The project will contribute to the field of evolutionary physiology of endothermic organisms and to the field of animal behavior, especially to avian cognition. It allows to study environmental dependency of learning different traits and also potential trade-offs between different cognitive abilities.