

Transcriptomic and zootechnical exploration of parental contribution to progeny quality in Eurasian perch, *Perca fluviatilis*

The aim of this project is to objectively verify “if” and “to what extent” the male and/or female gametes of freshwater fish species – Eurasian perch (*Perca fluviatilis*) – affect the quality of their progeny, hereinafter considered as ability of the larvae to hatch and adapt to the culture environment. In other words, the project aims at identification of biological processes controlled by male and/or female as well as exploration of their role in determination of larvae quality. The knowledge on this aspect is crucial in planning selective breeding operations (involving generation of specific cross-breeds through controlled crossing of particular male and female), being the key toward sustainable development of modern fish farming. Until now, the knowledge on parental contribution (in fishes linked with the effect of molecules derived from gametes to progeny) is very limited in fishes, and for Eurasian perch – being important candidate for diversification of European aquaculture – is actually missing.

The main research theme of this project – i.e. parental effect – will be addressed by two-phase project: **initial** (defining “larvae quality” and removing important knowledge gaps) and **implementation** (utilizing the results coming from initial phase in further research operation). Within the **first step of initial phase** the larvae quality will be defined via interdisciplinary approach involving detailed investigation of zootechnical performance (i.e. growth performance, survival, etc.) as well as transcriptomic analysis. Transcriptomics is a method allowing simultaneous analysis of expression of tens of thousands of genes at the same time, what will allow to identify processes being modified in different quality of the larvae and determine zootechnical-transcriptomic profile of high quality larvae. The **second step of initial phase** of the project will include the evaluation of the effect of sperm cryopreservation to the larvae quality. Sperm cryopreservation is a technology allowing long-term storage (tens of years) of frozen sperm allowing long-term perspectives of management of genetic diversity of cultured populations. Application of this technology is indispensable element of advanced selective breeding programs and will be used routinely during the implementation phase of the project. However, on the first place it is important to know to what extent the usage of cryopreserved sperm for fertilization can alter transcriptomic profile and quality of the larvae, what will be explored in this project. During the **implementation phase**, during which findings of initial phase will be utilized, it is expected to acquire knowledge on the effect of several measurable traits of either maternal or paternal origin on larvae quality. For this purpose several specific experiments will be performed where the effect of (1) egg and sperm quality [where novel concept of sperm quality definition will be employed], (2) origin of female and male [wild vs domesticated] and (3) size of female and male [of the same age] on larvae quality indices will be addressed.

The project will allow to bring us new knowledge on early life history of freshwater, commercially relevant fish species and its relation to the parental-origin traits. This, in turn, will allow to understand how the future breeding programs should be planned and which factors can be responsible for the successful obtainment of high quality larvae. Besides, the findings of this project will allow to gain knowledge in the field of cryobiology (part of science aiming at efficient storage of cells and tissues in a frozen state), by addressing the effect of sperm cryopreservation on the progeny obtained, as well as developmental biology, by investigating the relation between the gametes quality and larvae quality. In addition to that, the initial phase of the project will allow, for the first time, to define the larvae quality and characterize zootechnical-transcriptomic profile of high quality larvae. Consequently, the final outcome of the project, in long-term perspective, will have significant importance for planning and undertaking future breeding programs of not only Eurasian perch, but also other fish species.