

## Description for the general public

Aquaculture, being one of the fastest growing branch of animal farming worldwide, now is facing with many constraints, where limited production capacity of traditional production systems is among the biggest bottlenecks. This applies especially to freshwater aquaculture, which is restricted by limited land areas (for ponds) and open water sources (mainly rivers), that could be used for fish production. In this regards, the biggest problem occurs in well developed countries, such as the European Union member states, in which additionally highly rigorous environmental regulations makes the increment of production of freshwater finfishes in traditional production systems highly difficult. Therefore, in recent years a high attention was paid to the recirculating aquaculture systems (RAS) which has the advantage of very high production capacities with very low land use and water consumption. Besides, the RAS-based production can be carried out in any place by using ground waters to supply the systems, which allows to establish production close to the target markets and thus ensure constant supply of high quality fresh products. Another advantage of RAS-based finfishes production is that the fish can be supplied to the market all year round, since the full environmental control over the life cycle allows to steer the reproductive cycle thus perform out-of season spawning at any time of the year. However, there is little known about the husbandry conditions (including photo-thermal regimes and food quality) which would be the most suitable for culturing many fish species. This creates many problems for aquaculture industry mainly because these factors are conditioning the course of oogenesis (process of formation and maturation of eggs), which usually takes 1 year in the species of temperate climate zone and thus affect the egg quality. Because of lack of the knowledge on how the husbandry conditions affect the oogenesis course (at which level and at which periods of oogenesis) in RAS-reared fish very often low egg quality can be observed. And the knowledge on the processes would allow to significantly improve the husbandry conditions and thus increased the production volume and reducing production costs at the same time. However, to achieve that, a very precise methods of evaluation of egg quality are needed.

So far, the only general reliable true assessment of egg quality may still be performed at different steps of embryonic development. In such a case the only answer which can be found is the final developmental competence of the egg giving general information whether the quality was high or low. In effect, it is still not possible to recognize which factor really played the most important modulatory role. This makes any kind of improvement a highly laborious, expensive and long-lasting scientific venture, which may still have plenty of limitations due to the synergistic involvement of many factors in the final reproductive outcome. That is why, in recent years a high attention was given to the application of modern scientific molecular tools in the investigation of factors affecting egg quality. That gave the opportunity to investigate not only developmental competence of the eggs, but also to identify mechanisms standing behind. In effect such analysis were pointed out to have great potential in adjustment of the husbandry practices in cultured finfishes.

This project aims at identification of the mechanisms affecting egg quality and ageing process (being the factor affecting egg quality in the regular hatchery practice and corresponding to the processes which takes place after ovulation). The project will use combination of modern molecular analysis (transcriptomics and proteomics) and state-of-the-art biological investigation of egg quality. Such an approach is a unique one as compared to the studies performed so far and will allow to address several not verified hypothesis, at different levels. Within this project, as a model species we will use one of the most emerging species for diversification of freshwater aquaculture nowadays, which is pikeperch (*Sander lucioperca*). Generally, the project is divided into two separate parts where the aspect of egg quality and egg ageing process will be studied independently. At first, the eggs will be collected after specific preselection procedure (being unique feature of this project) based on a previously developed methods by the researchers involved in this project. In the case of experiments on egg ageing, this process will be induced (according to typical hatchery practices) and the eggs will be collected at different time post ovulation, what will allow to have a precise information on the entire process from molecular and biological point of view.

The project will be carried out by international multidisciplinary research team (from Poland and France) which includes one of the most recognizable research groups in their fields. All of the partners are specializing in commercially important finfishes and their expertise covers controlled reproduction, husbandry practices, transcriptomics and proteomics.