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English summary

Perch, *Perca fluviatilis* L., is pointed out as a one of the most important species dedicated for intensive freshwater aquaculture. One of the most important bottleneck in the production cycle of this species is controlled reproduction and larviculture. Effectiveness of this phases of production is much lower than the ongrowing phase up to the commercial size fish with the commercially available compound feeds.

Controlled reproduction is one of the most important steps of intensive aquaculture cycle. In perch this applies, among others, to the synchronization and prediction of moment of ovulation, which determines the possibilities of selective breeding, genome manipulations as well as fertilization with the cryopreserved sperm. Moreover, a huge effect on the further production steps have gametes quality, which directly affecting the quality of larvae. Therefore, in aquaculture the possibility of evaluation of gametes quality before *in vitro* fertilization has obvious importance. In the case of perch, there was no indicators of eggs quality applicable before *in vitro* fertilization. What the more, in this species there was also no information regarding the *in vitro* fertilization protocols, which, when optimized, may have important effect on the reproduction outcome.

The aim of the study was to optimize chosen steps (to which no or very limited data were available) of the controlled reproduction of perch. The studies included:

- development of the preovulatory oocyte maturation stages suitable for synchronization of ovulation in perch females and its application in induced spawning,
- evaluation of eggs quality on the base of the morphology (fragmentation) of the oil droplets,
- optimization of *in vitro* fertilization protocol with the application of different activating solutions.

On the base of the dynamic of morphological changes in oocytes during observations conducted 6 preovulatory oocyte maturational stages were distinguished. Those stages covered final phase of vitellogenesis and final oocyte maturation until ovulation. The

application of the developed stages of oocyte maturation has proven its suitability in controlled reproduction of perch.

The research on the evaluation of eggs quality on the base of fragmentation of oil droplets in ovulated eggs has shown significant dependency between eggs rate characterized by oil droplet fragmentation and quality of particular eggs batch. The higher number of eggs in particular egg-batch with fragmented oil droplet the lower eggs quality were noted.

Within the optimization of *in vitro* fertilization protocol the most commonly applied in aquaculture activating solutions were tested. Additionally, the period of time, during which eggs remain capable of fertilization in the solutions tested, was investigated. The obtained results indicates that perch eggs remain capable of fertilization for 2.5 min in a hatchery water. However, after application of this activating solution in the control group (when sperm was added to the eggs before the activating solution was added) significant decrease in fertilization rate was noted, as compared to the groups where sperm was added between 15 and 150 s following eggs activation. The obtained results indicates that Woynarovich solution (4 g of NaCl and 3 g of urea per 1 L of water) was the most suitable solution among the tested ones. In this solution eggs remained active for the entire period of time considered (180 s) without negative effect on the fertilization rate.

The obtained in the present thesis results indicates, that the developed system of determination of oocyte maturation stages allows for more precise prediction of moment of ovulation in perch. Also, the commercial applicability of those system was proven. It was also found, that morphology (fragmentation) of oil droplets in ovulated oocytes was an effective and simple indicator of eggs quality in perch. This method may be easily applied to the hatchery practice affecting positively breeding procedures as well as scientific activities. The present study also indicates, that for *in vitro* fertilization Woynarovich solution may be recommended. Application of hatchery water as an activating solution may be recommended only when eggs will be activated 15-30 s prior sperm addition. Moreover, it has to be pointed out, that eggs of perch remain active for about 2.5 min in a hatchery water, what may have huge practical importance since it allow effectively fertilize the eggs when they are released by the female during the handling procedures (if only sperm will be previously collected and freely available).