

# Gametes Collision in Freshwater Fish: Evidences of Guidance and Selection



S. Boryshpolets, V. Kholodnyy, H. Gadelha, and J. Cosson

Externally fertilizing species, especially freshwater fish, reproduce in an environment that is very harsh for gametes. They undergo the pressure of various external factors (temperature, water flow, pH, ion composition, viscosity, presence of ovarian fluid, etc.). Variability in cell responses to these parameters creates a wide spectrum of reproduction strategies. Existence of specific mechanisms for guiding and triggering the encounter of gametes would be highly expedient in these conditions, nevertheless, only scarce information exists on this issue. The existing data and observational studies performed by us support the idea that the factors, which are the part of ovarian fluid or released by the eggs, could significantly affect the behavior of male gametes and influence the outcome of fertilization. This could be made by the support of sperm motility traits on a certain level, attraction or repulsion of gametes with some predefined qualitative characteristics, and targeted promotion of sperm with proper genetic material to encounter the egg. The specific mechanisms supporting the potential selection by externally fertilizing females are unclear. In addition to chemical agents, there is evidence that some physical factors, e.g., presence of surfaces and their features, contribute to fertilization performance. All these phenomena, i.e., motility activation and progress, kinetic and tactic effects, possible selection, and promotion of gametes could be the elements in the guidance pattern. This is even more challenging for freshwater fish reproduction, considering the limited period of motility compared to marine species, and thus, it makes the need for specific support of gametes encounter even more apparent. This work suggests that guidance during fertilization is a rule, not a fortune, at least, because guidance is highly expedient during external fertilization in terms of environmental variability and stability of living matter.

---

S. Boryshpolets (✉) · V. Kholodnyy · H. Gadelha · J. Cosson  
Faculty of Fisheries and Protection of Waters, Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses, University of South Bohemia in České Budějovice,  
České Budějovice, Czech Republic  
e-mail: [sboryshpolets@frov.jcu.cz](mailto:sboryshpolets@frov.jcu.cz)

**Acknowledgments** The study was financially supported by the Ministry of Education, Youth and Sports of the Czech Republic—projects “CENAKVA” (No. CZ.1.05/2.1.00/01.0024), “CENAKVA II” (No. LO1205 under the NPU I program), CZ.02.1.01./0.0/0.0/16\_025/0007370 Reproductive and genetic procedures for preserving fish biodiversity and aquaculture, and by the Czech Science Foundation (18-12465Y).