

## Biology and culture of the clown loach



In comparison to older life stages, the embryonic stages of fishes generally have narrow tolerance ranges for environmental conditions, as regards water quality, temperature and mechanical shocks. The knowledge of these factors is indispensable to appraise the threats brought about by climate or anthropogenic changes upon their resilience, and to define adequate ways of incubating their eggs for an efficient propagation of the species under controlled conditions. Clown loach eggs have a narrow thermal tolerance range in comparison to other tropical and temperate fishes. Hatching occurs at 22–30 °C, and non-deformed larvae can only be obtained at 23.8–30.2 °C. Furthermore, the thermal tolerance of any particular progeny was found dependent on the maintenance temperature of the female parent, thereby making the actual tolerance no broader than 4.5 °C. The (log-log) relationship between the duration of the incubation period and temperature was characterized by a shallow slope, which is more typical of coldwater fishes, as is a narrow thermal tolerance range. On the other hand, clown loach hatched more rapidly (20 h at 26 °C) than predicted by existing models on the basis of water temperature and egg diameter, a feature that is shared by other warmwater fishes producing eggs that undergo a strong swelling process (about three times the ova diameter in clown loach). Clown loach embryos are strongly sensitive to mechanical shocks, but their development is not viable either in protracted steady state conditions, in absence of water movement, as they develop various deformities (e.g. pericardial oedema). This is thought to originate from a hypoxic microenvironment around the embryo, as a consequence of an oxygen gradient developing inside and outside the egg, since the boundary diffusion layer is not refreshed by water movement. This issue is worsened by strong egg swelling and incubation at warm temperature.

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