

Embryonic and Larval Development of Freshwater Angelfish (*Pterophyllum scalare*)

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Freshwater angelfish are a popular ornamental fish in the world. Even though sufficient information on their reproductive behavior and larval rearing is available, their embryonic development is poorly understood. An understanding of embryogenesis is essential, not only for culturing of a species, but also to determine morphological, cellular and molecular processes of growth and development. Hence, the present study focused on documenting and analyzing the embryonic development of *Pterophyllum scalare*. Different stages of embryogenesis starting with the fertilized egg were observed using a Zeiss inverted microscope. A minimum of ten embryos per each embryonic stage was carefully observed and different embryo length measurements of each embryo were recorded using Zen 2012 Software. Bone and cartilage measurements of acid free double stained specimens and allometric growths were recorded to further understand its larval development. The eggs are 1.5 ± 0.05 mm in diameter, oval shaped, slightly pale in color and full of yolk-granules. The first stage in embryonic development, the zygote was observed for 1.30 hours. Each of the next embryonic stages, cleavage, blastula and gastrula which are collectively referred to as early embryos were observed for 4.5, 11.25 and 8.35 hours, respectively. The ensuing stages commonly referred to as segmentation was observed for 30 hours. At 60 hours post fertilization (hpf) there were 25 somites, and the tail is completely separated from the yolk, while structures like the digestive tract and the eyes are well developed. Embryos hatched 60 to 72 hpf and soon after attached to a substrate using their cement glands located dorsally and ventrally on the larval head. After about 96 hpf, the larvae started to swim. Larvae had an average length of 3.51 ± 0.05 mm. *Pterophyllum scalare* larval development show positive allometric growth for head length ($a=0.09$, $b=1.24$, $R^2=0.91$, $n=30$) and eye diameter ($a=0.86$, $b=0.96$, $R^2=0.93$, $n=30$) while negative allometric growth for trunk length ($a=0.42$, $b=0.57$, $R^2=0.57$, $n=30$). The overall assessment of embryogenesis of *P. scalare* indicate that this species has a slower rate of development during both early embryogenesis and segmentation period (24 and 36 hours, respectively) compared to that of Zebrafish (8 and 10 hours, respectively), one of the main model fish species.

Key words: *Pterophyllum scalare*, Embryonic development, Larval development, Freshwater angelfish