

STUDY ON THE EARLY DEVELOPMENT AND
EFFECTS OF VIBRATION ON CLIMBING PERCH
ABILITY OF *Blattella germanica* (L.) LARVAE

NG BENG SANG

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OF AMMONIA ON CLIMBING PERCH
(*Anabas testudineus*, Bloch) LARVAE**

NG BENG SIANG

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Chairperson : Associate Professor Abol-Munafi Ambok Belong, Ph.D.
Member : Professor Noor Azhar Mohd Shazili, Ph.D.
Associate Professor Mohd Effendy bin Abd. Wahid, Ph.D.
Faculty : Institute of Tropical Aquaculture

The early life development and effects of ammonia on the climbing perch *Anabas testudineus* embryos and larvae were studied. The water bath system was used to maintain water temperature, dissolved oxygen (DO) and pH ranging from 29.0 - 29.8 °C, 7.4 - 7.8 mg/l, 7.64 - 7.73 during embryonic development and 28.8 - 30.9 °C, 6.8 - 7.5 mg/l and 7.06 - 7.98 for larval development, respectively. Newly fertilized eggs were spherical with mean diameter of 0.93 ± 0.02 mm. First cleavage occurred 30 min after fertilization. The morula, blastula and gastrula stages occurred at 1:10 hour, 1:32 hour and 3:34 hours, respectively. The embryo stage began seven hours later with development of optic vesicle and pigment action followed by heartbeat and blood circulation. The embryos started to hatch 17 hours after fertilization and were completed within 2 hours. The newly hatched larvae were actively swimming one day after hatching and started exogenous feeding on day 2. All the yolk were absorbed 6 days after hatching and during this stage flexion occurred at the caudal fin. On day 8, the dorsal, anal and caudal fins had developed primordial finfold. Nine day old larvae have a compressed oblong body. Within two weeks, the scale and lateral line were

clearly differentiated and completion of the development to a young juvenile were observed on day 15 after hatching.

The positive allometry of the head region (inflexion point at 12.85 mm TL) and pre-orbital (inflexion point at 13.84 mm TL) were needed for sensory functions, exogenous feeding and respiration function. The development of the tail for improved swimming ability, feeding success, reduced transport cost and predator avoidance were concomitant with the inflexion point at three different stages at 4.32 mm TL and 10.83 mm TL.

In the study of ammonia effects, acute tests on the embryos and larvae of *A. testudineus* were conducted. Embryo survival was significantly different than control ($p < 0.05$) at concentrations above 0.68 mg/l $\text{NH}_3\text{-N}$, where abnormal development such as abnormal cell division in various stages were detected in treated embryos. Larval survival was significantly affected by exposures up to 0.47 mg/l $\text{NH}_3\text{-N}$. The 96 hours LC_{50} was calculated to be 0.61 mg/l $\text{NH}_3\text{-N}$. At the concentrations above 0.25 mg/l $\text{NH}_3\text{-N}$, outer morphological swelling was obvious. Additionally, alterations in gill histopathology such as hypertrophy, diffusion and hyperplasia were observed at concentrations above 0.18 mg/l $\text{NH}_3\text{-N}$. Thus, the growth of *A. testudineus* larval was significantly affected at the concentrations higher than 0.25 mg/l $\text{NH}_3\text{-N}$ ($p < 0.05$).