Low pH affects survival, growth, size distribution, and carapace quality of the postlarvae and early juveniles of the freshwater prawn Macrobrachium rosenbergii de Man

Abstract

Acidification of rain water caused by air pollutants is now recognized as a serious threat to aquatic ecosystems. We examined the effects of low pH (control pH 7.5, pH 6, pH 5, pH 4) on the survival, growth, and shell quality of *Macrobrachium rosenbergii* postlarvae and early juveniles in the laboratory. Hatcheryproduced postlarvae (PL 5) were stocked at 250 PL per aquarium, acclimated over 7 d to experimental pH adjusted with hydrochloric acid, and reared for 30 d. Dead specimens were removed and counted twice a day. After 27 d rearing, all specimens were measured for total length and body weight. Carapace quality was assessed by spectrophotometry. Survival of juveniles was highest at pH 6 (binomial 95% confidence interval 79 - 89%) followed by control pH 7.5 (56 - 68%) and pH 5 (50 - 60%) and was lowest for unmetamorphosed postlarvae and juveniles at pH 4 (43 - 49%). The final median total length and body weight of juveniles were similar at control pH 7.5 (18.2 TL, 50.2 mg BW) and pH 6 (17.7 mm TL, 45.0 mg BW) but significantly less at pH 5 (16.7 mm TL, 38.2 mg BW); at pH 4, the postlarvae did not metamorphose and measured only 9.8 mm TL, 29.3 mg BW. Length frequency distribution showed homogeneous growth at pH 6, positive skew at control pH 7.5 and pH 5, and extreme heterogeneity at pH 4. The carapace showed different transmittance spectra and lower total transmittance (i.e. thicker carapace) in juveniles at pH 7.5, pH 6, and pH 5 than in unmetamorphosed postlarvae and juveniles with thinner carapace at pH 4. Thus, survival, growth, size distribution, and carapace quality of *M. rosenbergii* postlarvae and early juveniles were negatively affected by pH 5 and especially pH 4. The thinner carapace of the survivors at pH 4 was mostly due to their small size and failure to metamorphose. Natural waters affected by acid rain could decimate *M. rosenbergii* populations in the wild.