



Experimental study of mercury accumulation in juvenile cyprinid fish *Barbonymus schwanenfeldii* and *Tor tambroides*, exposed through water and feed

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Abstract. This paper reports the experimental study of mercury accumulation in juvenile cyprinid fish of *Barbonymus schwanenfeldii* and *Tor tambroides*. The juvenile cyprinids were exposed to mercury (Hg) through water (0.5 mg/L and 1.0 mg/L) and feed (0.5 mg/kg and 1.0 mg/kg) for 30 days. The behavioral response during feeding was monitored over the experimental period. The Hg concentration in the juveniles was analyzed after 30 days. The juveniles exposed to water contaminated with 1.0 mg/L Hg was found to disperse upon feeding suggesting an increase in vulnerability towards threats. This however was not observed in other treatments through feed and at 0.5 mg/L Hg. In terms of survival percentage, no statistical difference was deduced between treatments for both species. Among the two species, *T. tambroides* demonstrated greater affinity of accumulation; this is likely due to its biological behavior as a fast swimming species. The uptake of Hg (II) through gills was more pronounced than that through ingestion as the diffusion of Hg(II) was inhibited by the mucosal lining in the latter pathway. No significant correlation was established between size and Hg concentration in juveniles of both species.

Key Words: mercury (II) chloride, behavioral response, survival percentage, bioconcentration factor.

Introduction. Mercury (Hg) is a naturally occurring element. It is found in elemental, inorganic and organic states, of which organic methylmercury (CH₃Hg) is the most toxic and bioavailable species. In the environment, Hg is usually found in the form of elemental and inorganic species. They can be transformed into CH₃Hg that is lipid soluble in the presence of microorganisms and is readily taken up by aquatic organisms. The accumulated Hg would biomagnify as the trophic level increases and eventually transfer to humans *via* food chains.

The accumulation of mercury in fish has been extensively studied allowing inference of the uptake behavior and pattern in relation to numerous factors including species, size, age, sexes, feeding habits, trophic levels and anthropogenic influences (Storelli et al 2007; Kasper et al 2009; Li et al 2009; Drenner et al 2010). Essentially, Hg is taken up through gills and diet with the latter contributing more profoundly. It is learnt that Hg concentration increases with the trophic level, with carnivorous species demonstrating greater accumulation than omnivorous and herbivorous. The data available are largely based on temperate and subtropical species with fewer reported on tropical species.

The cyprinids constitute the most diverse freshwater fish in Borneo. They are found in many river systems of Sarawak (Northwest of Borneo) serving as an important protein source for the indigenous communities (Kottelat et al 1993; Abdullah 2004; Nyanti & Grinang 2007). *Barbonymus schwanenfeldii* and *Tor tambroides* are two major cyprinid species. The State Government has initiated the effort to culture these species reducing the dependence on wild sources (Kottelat et al 1993; Silang & Chai 2004; De Silva et al 2004; Ingram et al 2005; Nguyen et al 2006). *B. schwanenfeldii* is locally