

Arsenic accumulation and speciation in freshwater fish living in arsenic-contaminated waters

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Striped snakehead (*Channa striata*), carnivorous freshwater fish that serve as popular food in Thailand, were collected from a reference site ($1.4 \mu\text{g As L}^{-1}$) and from two arsenic-contaminated ponds (Pond A $550 \mu\text{g As L}^{-1}$ and Pond B $990 \mu\text{g As L}^{-1}$) in southern Thailand and analysed for arsenic by inductively coupled plasma mass spectrometry (ICPMS) and for arsenic species by HPLC/ICPMS performed on aqueous methanol extracts of muscle, liver and gill ($n=3$ fish from each site). Mean total arsenic concentration in muscle tissue of *Channa striata* collected from the reference site was $1.9 \mu\text{g As g}^{-1}$ (dry mass) while fish from the contaminated sites contained $13.1 \mu\text{g As g}^{-1}$ (Pond A) and $22.2 \mu\text{g As g}^{-1}$ (Pond B). Liver and gill tissues showed similar increasing arsenic concentrations on going from the reference site to Ponds A and B, with Pond B showing the highest levels. Speciation analysis on the three tissues showed that, although arsenate was the major extractable arsenical in reference fish (e.g. $0.73 \mu\text{g As g}^{-1}$ in muscle tissue), dimethylarsinate was by far the dominant arsenic species in fish from the two contaminated sites. The study shows for the first time a clear effect of water arsenic concentrations on natural fish tissue arsenic concentrations, and is the first report of a freshwater fish species attaining arsenic concentrations comparable with those found in marine fish species. Furthermore, the high concentrations of toxic inorganic arsenic (predominantly arsenate) in the muscle tissue of the edible fish *Channa striata* have human health implications and warrant wider investigations.