

UNIVERSITI TEKNOLOGI MARA

**BIOACCUMULATION OF HEAVY
METALS IN DOWNSTREAM
ECOSYSTEM OF SEMBILANG
RIVER, KUALA SELANGOR,
MALAYSIA**

**NIK NUR IZZATTUN BINTI NIK ADNAN
NUR RIFQAH SAFIRA BINTI CHE NOR DIN
NUR ANISA BINTI MUHAMAD RASID**

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ABSTRACT

Accumulation of heavy metals (Copper, Zinc, Lead and Cadmium) were investigated in downstream ecosystem of Sembilang River, Kuala Selangor, Malaysia. The development of various industries and landfill along the Sembilang River have high tendency for being effected towards the quality level of water resources. The distribution of heavy metals in water resource lead to huge impacts towards aquatic organisms such as fish and able to be human health threat. Heavy metal is easily deposited in the sediment and immobilized through adsorption and coagulation. This study aims to access the accumulation of Copper, Zinc, Lead and Cadmium in water, sediment and Sembilang fish (*Plotosus canius*) from Sembilang River, Kuala Selangor, Malaysia. Further, the potential health risk of heavy metals in Sembilang fish (*Plotosus canius*) were determined. In the study, samples of water and sediment were collected from five sampling points with the distance of 250m from each sampling points. Meanwhile, the Sembilang fish (*Plotosus canius*) samples were collected from the river estuary area of Sembilang River. Prior for analysis, the acid digestion procedure were conducted on water and sediment samples and dry ashing procedure for fish samples. All the samples were analyzed for Copper, Zinc, Lead and Cadmium using Atomic Absorption Spectrometer. In general, the heavy metals content in sediment indicate that Zinc as the highest mean values in the study area for all sampling sites followed by Copper and Lead. In term of water quality, the presence of heavy metals concentration along this river could be shows as Lead > Cadmium > Zinc > Copper. The result on fish samples stated that Lead and Zinc concentration were highest in the gills of the fish. Meanwhile, Cadmium and Copper contents were mainly enriched in the muscle of the fish. The results and further health risk assessments revealed that the consumption of Sembilang fish (*Plotosus canius*) from Sembilang River, Kuala Selangor is free from the probable carcinogenic and non-carcinogenic risks. Overall, this investigation indicate that the concentrations of heavy metals in the sediment and muscle tissue of the studied fish were lower than the limits as set in Sediment Quality guidelines, Food and Agriculture Organization, 1983 and Malaysian Food Regulations, 1985. Lead and Cadmium at certain sampling points for Sembilang River water samples have exceeded the acceptable level of National Water Quality Standards.

Keywords: *Heavy metals concentration, Sediments, Water quality, Sembilang River, Sembilang fish (Plotosus canius)*

CHAPTER ONE

INTRODUCTION

1.1 Background Information

In recent years, world consumption of fish has increased simultaneously with the rising knowledge of their nutritional and healing benefits. In addition to its important as a source of protein, fish are typically rich in essential minerals, vitamins and unsaturated fatty acids (Rajeshkumar & Li, 2018). However, the universal problem is the environmental pollution and most important pollutants are the heavy metals in the aquatic network because of their toxicity, accumulation and bio-magnification by marine creatures. Domestic, industrial and anthropogenic activities may broadly become the source of natural aquatic systems contamination of heavy metals (Velez & Mоторo, 1998; Conacher & Mess, 1993).

The toxic effects of heavy metals can affect individual growth rates, physiological functions, mortality and reproduction in fish (Amundsen *et al.*, 1997). In addition, the consumption certain kinds of fish may become a major health concern due to the amount of heavy metals and other contaminants in water. Thus, the determination of the chemical content that has been accumulated in aquatic organisms is vital, particularly pollutants of concern, such as heavy metal concentrations in widely consumed fish species. Fish bioaccumulate metals from surrounding water, sediment and from their diet (Yi *et al.*, 2011; Jayaprakash *et al.*, 2015). From this, fish are presumably the best-understood organisms in the aquatic environment and considered to be effective indicators of heavy metal contamination in aquatic environments.