Comparative Heavy Metal Distribution in Fish Organs: Insights from the High Contamination Zones of Northern Thailand, Salween River

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INTRODUCTION

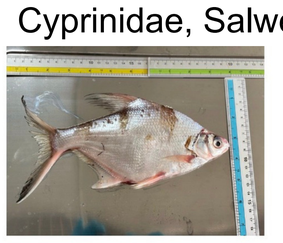
Heavy metal distribution is one of issue in aquatic environment and aquatic life including fish. It is often caused by agricultural, household waste or mining. Most toxic caused by gold mining in the upstream area and contaminants flow into the Salween River. Fish is key indicators to estimate heavy metals in freshwater. Therefore, analyzing heavy metals from fish that are commonly consumed can be positive impact for consumers. This research was analyzed with 7 heavy metals: Arsenic (As); Cadmium (Cd); Chromium (Cr); Copper (Cu); Mercury (Hg); Manganese (Mn); and Lead (Pb). Fish accumulates heavy metals through food ingestion and exchange ions in gills. This associated risk of metals contaminated food.

OBJECTIVES

1. To analyze the concentration of heavy metals in different fish species from the high contamination zone, Salween River.
2. To compare the level of heavy metals in different fish organs.
3. To determine whether the metal levels exceed food safety limits for consumption.

METHODOLOGY

1. **Fish Sample Collection ;** 3 fish species were selected from Cyprinidae, Salween



Barbonymus gonionotus (Barb)



Neolissochilus stracheyi (Blue Mahseer fish)



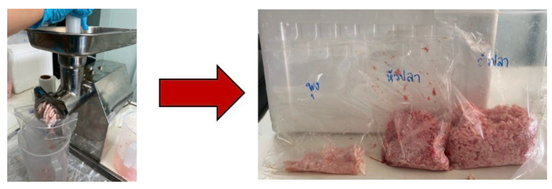
Puntioplites proctozysron (Smith's barb)

2. **Sample Preparation:**

2.1) Cut each fish into 4 parts; body (B), head (H), belly (O), and offals (D).

2.2) Place each part of sample into the grinder.

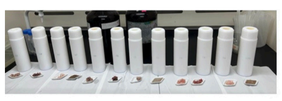




3. **Weigh Fish Sample; 2 grams per part**

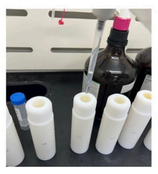
Samples	MSL-F1-B	MSL-F1-H	MSL-F1-O	MSL-F1-D	MSL-F2-B	MSL-F2-H	MSL-F2-O	MSL-F2-D	MSL-F3-B	MSL-F3-H	MSL-F3-O	MSL-F3-D
Weigh/grams	2.0114	2.0052	2.0223	2.0020	2.0831	2.0919	2.0437	2.0700	2.0984	2.0026	2.0538	2.0317

4. **Bring the weighed fish sample into TFM microwave digestion vessel in fume hood.** And leave it for 10 minutes before close the vessel.



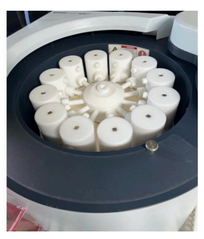


Use pipette to add 8 ml of HNO_3 and 2 ml of H_2O_2

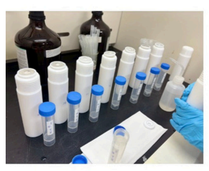




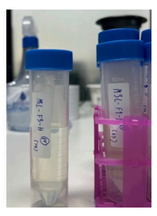
Bring all vessel into Microwave Digestion (speedwave XPERT) for digest heavy metals



5. **When process is done, leave it for 15 minutes before open the vessel.**

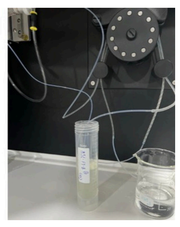


Adjust all samples to 25 ml volume with Deionized Water.



6. **Bring sample to analyze 7 heavy metals; As, Cd, Cr, Cu, Hg, Mn, and Pb by PlasmaQuant 9100 Elite (ICP-OES)**





7. **Use the analyzed values from the machine to determine real concentration of heavy metals: C x Dilution Factor;** ex. As 0.0153 ppm; Dilution factor = Volume (25 ml)/weigh of fish (2.0114) =12.43, **So As = 0.0153 x 12.43 = 0.190 ppm = 0.190 mg/kg**

RESULTS

Type of sample	Sampling location	Fish Species	ID	Name of sample	As	Cd	Cr	Cu	Hg	Mn	Pb
Fish Sample (mg/kg)	Mae Sam Laep (MSL), Sop Moei District, Mae Hong Son	Barb (F1)	MSL-F1_B	Body (fish meat)	0.1904	ND	0.4829	0.2534	0.0112	0.9901	0.0540
			MSL-F1_H	Head	0.3432	ND	0.4564	0.3305	0.0066	1.6131	0.0875
			MSL-F1_O	Belly	0.4571	ND	0.8143	0.2162	<LOD	4.0783	0.1714
			MSL-F1_D	Offals	1.5840	0.0708	0.7066	2.9054	<LOD	16.2326	0.8122
		Blue Mahseer (F2)	MSL-F2_B	Body (fish meat)	0.1113	ND	2.5548	0.4008	<LOD	0.5764	0.0148
			MSL-F2_H	Head	0.1696	ND	0.7041	0.4656	<LOD	1.2081	0.0333
			MSL-F2_O	Belly	0.1244	ND	1.7238	0.3441	<LOD	0.3756	<LOD
			MSL-F2_D	Offals	0.2856	0.0775	0.0938	3.8118	<LOD	2.2486	0.1096
		Smith's barb (F3)	MSL-F3_B	Body (fish meat)	0.3261	ND	0.6081	0.2759	0.0377	1.2784	0.0306
			MSL-F3_H	Head	0.3674	ND	0.6729	0.2959	0.0114	2.7310	0.0928
			MSL-F3_O	Belly	0.5696	<LOD	1.2616	0.4401	0.0151	2.7790	0.0637
			MSL-F3_D	Offals	0.8543	0.4324	0.1760	3.2607	0.0064	12.6591	0.1719

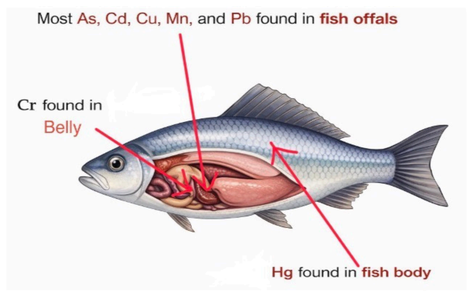
Fish is the main edible for human, heavy metal contamination in fish poses a risk to consumers. Assess human health base on food safety for consumption;

Standard values in Fish (Food Safety) for human health consumption (mg/kg)

Heavy Metals	No. 414 (Thailand)	Codex (International)
Mercury (Hg)	0.5	0.5
Chromium (Cr)	-	1
Lead (Pb)	0.3	0.3
Cadmium (Cd)	0.05 - 0.25	0.05 - 0.25
Arsenic (As)	2.0 (ทูนา)*	-
Manganese (Mn)	-	0.5 - 1.0

This research study for analyze the concentration level of heavy metals in different fish organs from Salween River. Associated with food safety consumption for human.

CONCLUSION



- Most heavy metal accumulation is Mn: 16.23 mg/kg that found in fish offals.
- Most As found in fish offals: 0.29, 0.85 and 1.58 mg/kg
- Most Cd found in fish offals: 0.07, 0.43 mg/kg
- Most Cr found in belly: 0.81,1.26 mg/kg and in fish body: 2.55 mg/kg
- Most Cu found in fish offals: 2.90, 3.81 and 3.26 mg/kg
- Most Hg found in fish body: 0.01 and 0.03 mg/kg
- Most Pb found in fish offals: 0.10, 0.17 and 0.81 mg/kg

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- Lab Connection Company, Mueang Chiang Mai District, Chiang Mai 50200

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