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Assessment of heavy metals contamination in edible fish species and its entry in the human food chain

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Abstract
The aim of study was analysis of serious metal within the selected fish sample from the marketed fish samples. The quantitative and analysis of metal exploitation by Flame Atomic Absorbance spectrographic analysis, cadmium, lead and metal take a look at in gill muscle and liver samples. Samples were bought from wet market set at Madurai, Tamil Nadu. Most of the fish samples were exceeded normal limits. The quality limits set by US-EPA & federal agency. Lead, Cd and Cr, metal normal limits i.e., 0.05, 0.5, and 0.1 severally 2 method multivariate analysis have shown that there's statistically significance among the extent of lead, cadmium, and Cr, metal, with p worth of, 0.9431, 0.6511 and 0.1428 severally within the gill, muscle, liver this study would be use full and build awareness of individuals and defend the general public from the harmful effects of environmental toxicity.

Keywords: cadmium, chromium, lead, flame atomic absorbance spectrographic

1. Introduction
The contamination of aquatic scheme one among the intense drawback in previous few decades (Vutukuru, 2005; Dirilgen, 2001) [1, 2]. A good vary of contamination by inorganic and chemical compound includes serious metals think about as natural trace parts of the aquatic ecosystems (Langston, W. J. 1990; Bryan *et al*., 1992) [3, 4]. Serious metals are typically divided in two kind essential and non-essential serious metals. Necessities metals are Zn, Cu, Cr, Se, Ni, Al and non-essential serious metals are Hg, Cd, Pb. serious metals are non deadly at this time in low concentration once their multiplied the concentration their deadly and cause adverse health effects as a result of these metals aren't simply metabolized by body which metals will simply accumulate in soft tissue and that they are long persistence and bio accumulation and bio magnifications within the organic phenomenon (Even *et al*., 2011; Henry M. Robert *et al*., 2009) [5, 6]. The most important supply of serious metal pollution are trade, mining, advance house hold waste, motor traffic, and technological progress of human society this is often the most important supply of serious metal pollution and simply contaminated within the environmental(Velez *et al*., 1998) [7]. Metal pollution will soil in even aquatic scheme and aquatic organism and aquatic animal (Conacher *et al*., 19938) [8]. This reason for fish and aquatic setting and aquatic organism has to observance underneath our police investigation as a result of fish vital role in human organic phenomenon (Farkas *et al*., 2001) [9]. Significant metals accumulated in fish by 3 ways particularly gill, organic process track and body surface most of the metals has entered in to the fish body through the gill via respiration when the exposure they're transported by the blood for apprehensiveness to a super molecule at some purpose and metal will accumulate in fish soft tissue and these significant metals is altered the morphological changes in fish tissue (Tao *et al*., 2012; Kamunde *et al*., 2002) [9, 10]. Fish consumed by human for super molecule nourishment Fish will occupy the highest of the food table that's most cost-effective and food compare to alternative food like meat, equivalent to beef and pork, and it's simply edible and in big-ticket. Fish food contains essential amino acids, fatty acids, carbohydrates, vitamins and minerals and high level of animal super molecule around 17-20% with organic compound profile that kind of like meet (Has-Schon *et al*., 2007; Sallam *et al*., 1999; Schmidt *et al*., 2005) [11, 12, 13]. The eight commonest waste product significant metals listed by the setting Protection Agency that's are As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn. Cadmium metal square measure non-corrosive nature usually used dyes and paints, cement and phosphate fertilizers and conjointly the byproduct of the mining and smelting of lead and zing most of the metal exploitation in metallic element nickel batteries, and it’s found in atmosphere within the approach of insect powder, fungicides, and industrial fertilizers (Bryan *et al*., 1992; Chrastny *et al*., 2006) [14, 15]. Lead It is terribly soft metals and that we square measure employed in paint, cosmetic, medicine, food supplements, and crude primarily based fuels, remaining usage of lead is cable covering, plumbing, PVC plastic, x-ray Shielding, pencil, pesticide, once a year the business manufacture concerning a pair of.5 million ton of lead throughout the world(Stohs *et al*., 1995) [16]. Chromium compounds square measure chiefly employed in ferrochrome production, the alternative metal used electroplating, pigment production and tanning. The industries square measure burning of fossil fuels and waste sources of Cr in air and water and chromium is present in nature (WHO, 1988) [17].

2. Materials and Method
2.1 Fish sample collection
Six species of fishes were examined for the presence of significant metal within the Madurai fish market. These fishes

were *Cirrhinus mrigala* (mrigala), *Etelis coruscans* (ula, ula), *Oreochromis mossambicus* (tilapia), *European pilchard* (mathi), and *Channa punctatus* (koravai), *Scomberomorus guttatus* (vanjaram), a tissue sample consisting of 5grams every was collected from gill, liver, and muscle region of every species

2.2 Fish sample acid digestion and preparation

The fish samples were wrapped with aluminum foil and transported into the laboratory in same day with on cube box and wash totally. Five grams of every sample were separated into three totally different elements (gill, muscle and liver,) were digestible in ten cubic centimeter concentration acid in associate degree open glass instrumentality for twenty-four hours, at temperature. The subsequent day the predigested sample were heated at 80ºc for 5 hours Samples were then cooled at temperature, and also the volume was adjusted to fifty cubic centimeter with H2O diluted sample where keep in synthetic resin (PET) bottle and were analyzed victimization flame atomic absorption spectrum analysis (FAAS).

Statistical analysis the applied mathematics calculations were done mistreatment the software package graph pad prime five. Two-way ANOVA analysis of variance was accustomed confirm whether or not the metallic element, lead, and metallic element content varied considerably between the various elements of the fish sample, particularly the gill, muscle, and liver with values of zero. 0001(p)

3. Results

The confirmed the presence of the serious metal particularly lead, cadmium, and metallic element within the six selected fish sample that area unit being marketed in Madurai, Tamil Nadu. The whole fish samples were chemical analysis mistreatment Flame Atomic Absorption spectrographic analysis (FAAS). Serious metal concentration found within the study was over the quality limit set by US-EPA & office. The quality limits were Cd, Lead, and Cr, metallic element commonplace limits i.e., 0.05, 0.5, and 0.1. Severally the graph (I, II and III) have shown the concentration in elements per million (ppm) of serious metals, cadmium, lead, and metallic element, given within the gill, muscle, and liver of the fish sample, Gill of the *Etelis coruscans* has shown the very best concentration of atomic number 48 compare alternative gill of the fish sample with a degree of 0.9113 (ppm), as conferred in the graph I, from all gill samples and therefore the least atomic number 48 concentrations is found from *Channa Punctuates* that is 0.235(ppm). Gill of the *Oreochromis mossambicus* contained the highest concentration of lead as compared to the alternative fish gill with associate degree quantity of 1.6526 (ppm). All-times low concentration from *European pilchard* muscle 0.493 (ppm). The highest quantity of lead as given by graph II. For metallic element chromium results, the liver of *Scomberomorus guttatus* 0.7973 (ppm), gift in the higher quantity of metallic element as compared to alternative fish samples at the lowest quantity of concentration the *Cirrhinus mrigala* gill 0.205 (ppm) severally among the fish sample seen in graph III.

4. Discussion

The result confirmed the presence of the significant metals, particularly atomic number 48, lead, and Cr within the six elect fish samples marketed in Madurai, Tamil Nadu supported North American nation independent agency &FDA normal limits are atomic number 48, lead, chromium 0.05, 0.5, 0.1. Most of the fish sample exceed the of the specification Cadmium normal limits is 0.05 (ppm) all the sample exceeds the allowable limits it's should be noted these metals will accumulate that body in long amount it will cause adverse health effects to physical body that's excretory organ diseases, bone injury, excretory organ pathology, and better risk of respiratory organ impairment and carcinoma (Amiard *et al*., 1987; Claude Bernard *et al*., 2008) [18, 19]. For lead, normal limits are 0.50 (ppm) all the fish sample exceed that allowable limits except *European pilchard* muscle 0.493(ppm), and *European pilchard* liver 0.493 (ppm), on the far side the allowable limits despite the fact that the sample of *Oreochromis mossambicus* 1.652 (ppm), gill and *Etelis coruscans* muscle 1.617 (ppm), goes on top of the quality limit it's should be noted, lead capable of accumulating within the physical body of muscle, bones, blood, fat, and newborns and young kids particularly delicate to even low level of lead(Elder *et al*., 1991) [20]. It causes diseases to human that's excretory organ diseases, brain, nerves, even generative disorder, heart diseases, anemia, and high pressure (Kalay *et al*., 1999; Weis *et al*., 1989; McCoy *et al*., 1995) [21, 22, 23]. For Cr normal limits is 0.1(ppm) all the samples are exceeded the allowable limits should be noted and *Scomberomorus guttatus* liver sample 0.793(ppm), goes higher quantity of concentration gift during this sample. Increase the concentration of Cr it's substance of physical body and it will cause efflorescence like allergy, and metabolism track drawback (WHO, 1988; Karadede *et al*., 2005) [24, 25]. We were conjointly determined if there would be a major distinction between the concentrations of atomic number 48, lead, and Cr from the elements of the fish samples. Applied math results are shown from the two-way analysis of variance analysis of variance of obtained p price (0.9431, 0.6511 and 0.1428) from the various elements of fish samples all the samples were zero.0001p

Table 1: Lead, cadmium and chromium mean concentration (ppm) from gill of the fish samples

Fish sample	Lead Mean conc.	Cadmium Mean conc.	Chromium Mean conc.
Cirrhinus mrigala	0.5726 SD 0.003	0.3 SD 0.003	0.205 SD 0.006
Scomberomorus guttatus	1.3623 SD 0.0015	0.2563 SD 0.0023	0.276 SD 0.002
Etelis coruscans	1.0396 SD 0.0020	0.9113 SD 0.0025	0.231 SD 0.003
Oreochromis mossambicus	1.6526 SD 0.0066	0.7273 SD 0.0049	0.328 SD 0.012
European pilchard	1.171 SD 0.002	0.663 SD 0.004	0.5913 SD 0.007
Channa punctuates	1.239 SD 0.002	0.235 SD 0.003	0.661 SD 0.002

Table 2: Lead, Cadmium and Chromium Mean Concentration (Ppm) From Liver of the Fish Samples

Fish sample	Lead Mean conc.	Cadmium Mean conc.	Chromium Mean conc.
Cirrhinus mrigala	1.4913 SD 0.0020	0.5786 SD 0.0030	0.604 SD 0.001
Scomberomorus guttatus	1.332 SD 0.002	0.6046 SD 0.0060	0.7973 SD 0.004
Etelis coruscans	1.5296 SD 0.0037	0.6666 SD 0.0032	0.446 SD 0.003
Oreochromis mossambicus	0.9456 SD 0.0015	0.625 SD 0.004583	0.2336 SD 0.002
European pilchard	0.78 SD 0.001	0.3363 SD 0.0045	0.4303 SD 0.004
Channa punctuates	0.7423 SD 0.0065	0.4873 SD 0.0035	0.596 SD 0.006

Table 3: Lead, Cadmium and Chromium Mean Concentration (Ppm) from Muscle of the Fish Sample

Fish sample	Lead Mean conc.	Cadmium Mean conc.	Chromium Mean conc.
Cirrhinus mrigala	0.732 SD 0.002	0.6296 SD 0.0037	0.659 SD 0.004
Scomberomorus guttatus	1.617 SD 0.002	0.6276 SD 0.0011	0.734 SD 0.002
Etelis coruscans	0.816 SD 0.004	0.6773 SD 0.0020	0.716 SD 0.004
Oreochromis mossambicus	1.2543 SD 0.0028	0.5936 SD 0.001528	0.6963 SD 0.005
European pilchard	0.493 SD 0.005	0.5736 SD 0.0066	0.704 SD 0.002
Channa punctuates	0.783 SD 0.001	0.3186 SD 0.0035	0.529 SD 0.002

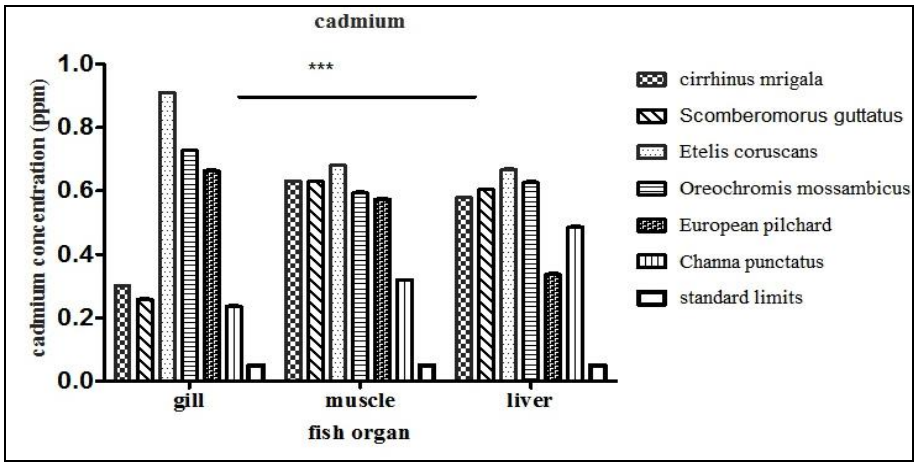

Fig 1: Graphical illustration of the Cd significant metals mean concentration (ppm) a part of the fish samples marketed in Madurai fish market

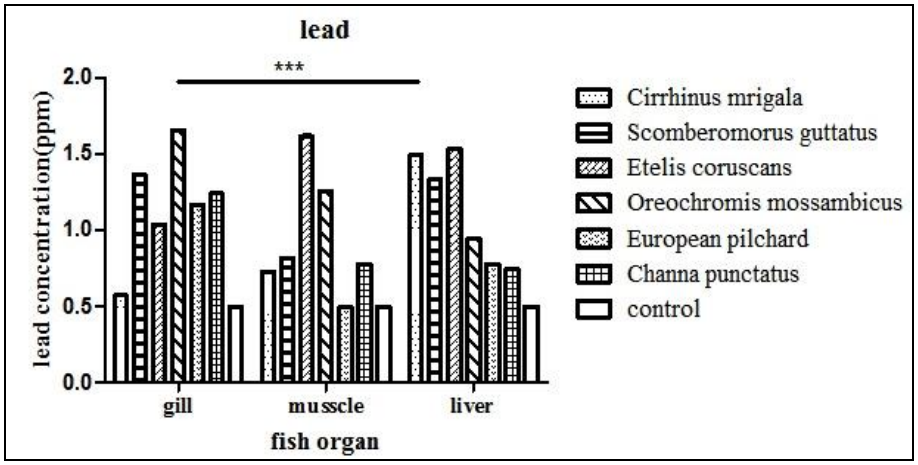

Fig 2: Graphical illustration of the lead significant metals mean concentration (ppm) a part of the fish samples marketed in Madurai fish market

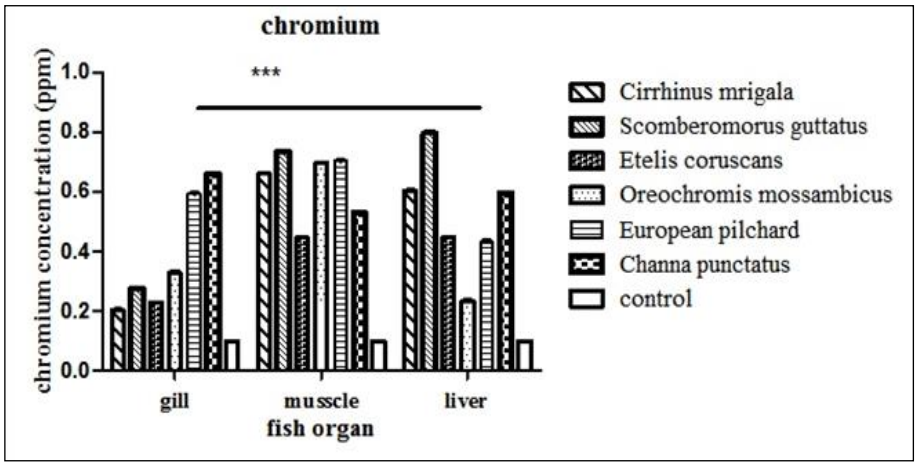

Fig 3: Graphical illustration of the chromium significant metals mean concentration (ppm) a part of the fish samples marketed in Madurai fish market

5. Conclusion and Recommendation

After conducting the study, it showed that variety of the fish samples exceeded the quality limits set for the serious metals specifically, lead, atomic number 48 and metal. Lastly, the researchers would love to stress that although some fish samples bestowed a secure concentration for one in all the 3 serious metals, alternative serious metals are still gift and should exceed the quality limit set. Serious metal stuff features a potential to bio accumulate within the chassis. Therefore, consumption of such fishes ought to be monitored to avoid the adverse effects led to by lead, atomic number 48 and metal. The researchers advocate to the authorities and world organizations concerned in marine and food nutrition to utilize this study as tips to guard the general public from the potential adverse effects that may be brought by the toxicants in fish samples.

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