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a.n. Dr. Dewi Elfidasari, S.Si., M.Si

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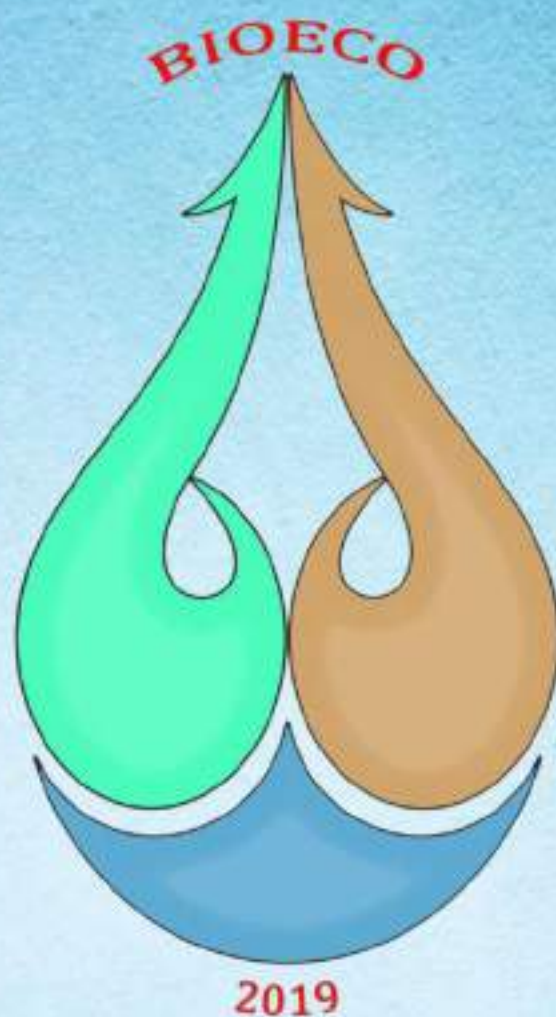
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SEPTEMBER 26-28, 2019
İSTANBUL / TURKEY

Edited By
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09:30-10:00	Coffee Break
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10:15-10:45	Memorial Ceremony for Kaptiris Kostas
10:45-11:15	Age determination techniques in the marine gastropods
11:15-11:45	Diversity and ecology of tardigrades
11:45-12:15	Climate induced changes in population Dynamics in the Mediterranean Sea
12:15-14:00	Lunch Break

Theme Section A: Conservation of Biodiversity: Biological and Ecological Aspects in Aquatic Ecosystems		Theme Section A: Conservation of Biodiversity: Biological and Ecological Aspects in Aquatic Ecosystems		Theme Section B: Biological and Ecological Aspects in Terrestrial Ecosystems	
Freshwater Ecosystems		Conservation of Biological Diversity		Population Status, Life Histories, Ecology, Assessment, Conservation and Management of Terrestrial Species	
Conference Hall- Ankara		Conference Hall- Bodrum		Conference Hall- Bursa	
Chairman	Dr. Muhammed Yasar DÖRTBUDAK	Chairman	Dr. Yusuf Bozkurt	Chairman	Dr. Emire Elmas
14:00-14:15	Freshwater ichthyodiversity in Iran: Past, present and future trends <u>Hamid Reza Esmaili</u>	14:00-14:15	Cryobanks and their role in conservation of aquatic biodiversity <u>Yusuf Bozkurt</u>	14:00-14:15	How plant strategy types change in coastal wetland from dune to reeds? <u>Emire Elmas, Sevdâ Türkis, Barış Bani</u>
14:15-14:30	Diversity and density of Pleco (<i>Pterygoplycthis</i> sp.) in Cilivung River, Jakarta Indonesia <u>Dewi Elfidasari, Hurunin Fathonah Muthmainah, Fahma Wijayanti</u>	14:15-14:30	Determination of genetic variations of <i>Carasobarbus luteus</i> populations living in Euphrates River based on mitochondrial DNA cyt b sequences <u>Ani Parmaksız</u>	14:15-14:30	Study of soil-vegetation relationships of the forest Ouled Bechih (Souk Ahras) Algérie <u>Ibtissem Samai, Nouha Menadja</u>
14:30-14:45	First occurrence of <i>Ligula</i> sp in endemic cyprinid <i>Ladigesocypris irideus</i> (Ladiges, 1960) From Ula Reservoir (Mugla, Turkey) <u>Somayeh Doosti, Fevzi Yılmaz</u>	14:30-14:45	Isolation and 16S rRNA sequence analysis of six environmental haloversatile bacteria from Çamaltı Saltern <u>Pınar Çağlayan</u>	14:30-14:45	Analysis of vegetal biodiversity under saline conditions <u>Adda Ababou, Abdelkader Bouthiba</u>
14:45-15:00	Relationship of otolith size to standard length of The Prussian Carp <i>Carassius gibelio</i> (Bloch, 1782) in Tigris River, Şırnak, Turkey <u>Muhammed Yasar DÖRTBUDAK, Gülnaz ÖZCAN</u>	14:45-15:00	Selective enrichment for clinical strains of <i>Vibrio vulnificus</i> based on virulence correlating gene <u>Sedat Cam, Robin Brinkmeyer</u>	14:45-15:00	Biological strategy for the rehabilitation of saline soils in the perspective of sustainable agricultural development. <u>Moulay Belkhouja, Nadia Souahm</u>
15:00-15:15	Relationship of otolith size to standard length of the <i>Capoeta trutta</i> (Heckel, 1843) in Tigris River, Şırnak, Turkey <u>Muhammed Yasar DÖRTBUDAK, Gülnaz ÖZCAN</u>	15:00-15:15	Effect of environmental factors on biofilm formation by clinical and environmental <i>Vibrio vulnificus</i> strains <u>Sedat Cam, Robin Brinkmeyer</u>	15:00-15:15	The economic value analysis approach to conservation and sustainable use of Biological Diversity: <i>Fritillaria</i> sp as a case study <u>Aynur Demir</u>
15:15-15:30	The ancient Lake's Ohrid and Prespa ecological status- a comparative study <u>Sasho Trajanovski, Biljana B. Gjoreska, Sonja Trajanovska, Konstantin Zdraveski</u>	15:15-15:30		15:15-15:30	Securing the production of durum wheat (<i>Triticum durum</i> Desf.) by supplementary irrigation in the semi-arid zone (south of setif province, <i>Aberkane case of the harrachien variety</i>) <u>Chentti Khalioua, Guessoum Salma, Djouada Lyamine, Belhaouchet Zine Abidine, Mansour Lynda-Maya</u>
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16:00-16:15	Concentrations of toxic elements in mussels <i>Mytilus galloprovincialis</i> as bio-indicator of coastal pollution <u>Levent Bat</u>	16:00-16:15	Predicting the impact of climate change on yield and water requirement of rainfed crops in setif region (Algeria) <u>Tarek Bouragaa</u>	16:00-16:15	Stakeholder Analysis of The Artificial Reefs in Edremit Bay (Northern Aegean), Turkey: Contributions to management <u>Sezgin Tunca, Vahdet Ünal, José Luis Sánchez Lizaso</u>
16:15-16:30	The Contents of Heavy Metals in Plecostomus (Loricariidae) from the Cilivung River Jakarta, Indonesia <u>Laksmi Nurul Ismi, Dewi Elfidasari, Riris L. Puspitasari, Irawan Sugoro, Afina P. Sabira</u>	16:15-16:30	A Dileptid Ciliate Isolated From Tekirdağ Soils, <i>Rurikoplites armatus</i> (Foissner & Schade 2000) Ciliophora: Litostomatea, Rhynchostomatia): Infracladus and Monoblastic Characterization <u>Hilal Ural, İsmail Yıldız, Naciye Gülkız Şenler</u>	16:15-16:30	Analysis of Biodiversity and Ecological Data by R Software Packages <u>Yusuf Kurt</u>
16:30-16:45	Variable glochidium prevalence on gills suggests different resistance potential in fish: a preliminary evidence in the fish community of a temperate small stream (Tersakan, Muğla) <u>Ertan Ercan, Neslihan Ağrah, Ali Serhan Tarkan</u>	16:30-16:45	Diversity and distribution pattern of waterbirds in wetlands of Algerian steppe region <u>Ettayeb Bensaci, Asma Zoubri, Yassine Noudjem, Fateh Mimeche, Bilal Gasmi and Menouar Saheb</u>	16:30-16:45	Impact of production systems on salt lakes: Case of the complex Chott Merouane and Melghir (Algeria) <u>Fatma Demnati, Farid Allache, Mounira Zouatine, Naima Mebrek</u>
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09:30-09:45	Extraction of collagen and gelatine from invasive toxic pufferfish specie <i>Lagocephalus scalaratus</i> in Mediterranean sea (İskenderun Bay) and their possible uses in different sectors <u>Yasemin YILDIZ</u> , Mevlüt AKTAS		09:30-09:45	Characterization of new strains belonging to the defoliant pathotype of <i>Verticillium dahliae</i> from the cultivated olive tree in Algeria. Benzina- Tihar F., Reghmât AB., Sahir-Halouane F., Oulebsir-Mohand Kaci		09:30-09:45	Salleemah Hasan Hamad, Sayed Mohamed Ali, Ramadan A. S. Ali, Ervan S. Alfegani Larval Helminths in <i>Helix lucorum</i> Linnaeus, 1758 in Some Regions of Georgia	
09:45-10:00	Is the Gediz River Basin Suitable for Breeding and Populating of the Red Eared Slider, <i>Trachemys scripta elegans</i> ? Special emphasis to some Observations on the Overwintering Hatchlings of Terrapins at Western Turkey Ertan Taşkavak, Ragıp Balaltı, <u>Halit Filiz</u>		09:45-10:00	The species of the genus Calligonum L. in the Ustyurt <u>Tajetdinova Dilarom Mnajetdinovna</u>		09:45-10:00	Lela Arabuli , Lali Murvanidze, Tsitsino Lomidze, Ketino Nikolaishvili Temporal variation of Gastropoda and Scaphopoda (Mollusca) species along the Sugözü coast (İskenderun Bay, Levantine Sea)	
10:00-10:15	Attention please! <i>Pinna nobilis</i> in great danger <u>Sefa Acarlı</u>		10:00-10:15	A Phytosociological research on the surroundings of Sürgü Dam (Sürgü / Doğanyehir / Malatya) <u>Hatice Tosyagılı Celik</u> , Omer Faruk Kaya		10:00-10:15	Banu Birla, Bilal Öztürk Beneficial Roles of Freshwater Mussels in the Ecosystem	
10:15-10:30	Citizen Science Approach in North Macedonia - Protect Rare Snails from Lake Ohrid - an Innovative Approach to Biodiversity Conservation Konstantin Zdravetski, Sasho Trajanovski, Biljana B. Gjoreska, Sonja Trajanovska		10:15-10:30			10:15-10:30	<u>Hulya Serelhan</u> , <u>Ece Kılıç</u>	
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Chairmen	Dr. Naim Arslan		Chairmen	Dr. Ali Serkan Tarkan		Chairmen	Dr. Lukas Kaczmarek	
11:00-11:15	Levels of some trace elements (cadmium, lead, mercury and chromium) in water and planktonic organisms in Abant Lake (Bolu, Turkey) <u>Tahir Altar</u> , Naim Arslan, Deniz Mercan		11:00-11:15	Annual variation in the abundance of prokaryotic picoplankton (<i>Synechococcus</i> and <i>Prochlorococcus</i>) in the Northeastern <u>Ece Kılıç</u> , Nebil Yücel, Zahir Uysal		11:00-11:15	Biodiversity and honey bee diseases in Algeria <u>Wahida Loucif-Ayad</u>	
11:15-11:30	A preliminary Observation on Relationships of the Liver, Ovary and Body Weights for Short snouted seahorse, <i>Hippocampus hippocampus</i> at the Tirebolu Coasts (Black Sea) <u>Sule GURKAN</u> , Ertan TASKAVAK, Burcu TAYLAN, Arzu AYDIN UNCUMUSAOGLU		11:15-11:30	A new application of the Micronucleus Test on Zooplankton: from lab to field <u>Sabriya Barka</u> , Zouhour Ouane-Ben Othmen, Abir Gharbi ¹ , Imen Gdara,		11:15-11:30	Susceptibility of two whitefly (<i>Bemisia tabaci</i>) (Hemiptera: Aleyrodidae) strains to insecticides from Oman Naser Nasser Hamoud Al-Rawahi, Ismail Abdullah Al-Siyabi ¹ , Riaz Shah, Diversity and host associations of aphid parasitoids (Hymenoptera: Braconidae: Aphelinidae) in non-cultivated areas of Khentchela Province –East Algeria	
11:30-11:45	An investigation on the gravid females and embryos of <i>Gymnura alavela</i> from Yumurtalık Bight, İskenderun Bay (Turkey) <u>Nuri Başusta</u> , Asiye Başusta		11:30-11:45	Gill Histopathology in the Marine Fish <i>Psetta maxima</i> After Acute Exposure to Cpemethrin <u>Serhat Engin</u>		11:30-11:45	Havet Argoum, Laamari Malik,Tahar chaouche Souad Tiger beetles in the Mediterranean Region – flagship bioindicators in perfect hot-spot area	
11:45-12:00	Age and Growth of a Mullidae: <i>Mullus barbatus</i> (Linnaeus, 1758) caught in the Algerian West Coasts <u>Hebbar Chafika</u> , Gherras Hamida		11:45-12:00	Ladigesocypris sp. (Ladiges, 1960)-complex current status of knowledge and implications for conservation of these Cyprinids species Daniella Giannetto, <u>Somayeh Doosti</u> , Ali Serhan Tarkan, Fevzi Yılmaz		11:45-12:00	Population Dynamics Of Black Scorpion (<i>Androctonus Crassicauda</i> (Olivier, 1807; Scorpiones: Buthidae) In Şanlıurfa Province <u>Nevin ASLAN</u> , Sahin TOPRAK	
12:00-12:15	Spatio-temporal variation in distribution and abundance of marine Cladocerans in relation to environmental factors in Gullük Bay (Aegean Sea, SW Turkey) <u>Nurcin Kılıç</u> , Ali Serhan Tarkan		12:00-12:15			12:00-12:15	Study of the Insecticidal Activity of <i>Taxus baccata</i> of the Ifrane valley on <i>Sitophilus oryzae</i> (L.) (Coleoptera: Curculionidae) Amechrouq Ali, Rifi Ouassima, Ehouiri Mohammed El idrisi Mostafa, Flou Jamila	
12:15-12:30	The Nutritional Value of Smooth Scallop <u>Pervin Vural</u> , Sefa Acarlı		12:15-12:30			12:15-12:30	Lunch Break	
12:30-14:00	Lunch Break		12:30-14:00	Lunch Break		12:30-14:00	Lunch Break	
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14:00-14:15	Investigation of Statistical Experimental Design Results of UV Absorbance Values of Aluminium Nanoparticles of Different Sizes Mehmet Ateş, <u>Banu Kutlu</u> , Önder Akso, Durali Danabaz, İşıl Canan Çiçek-Çimen, İlkey Ünal, Burcu Erti Taştan		14:00-14:15	Preliminary Researches on Tardigrada Fauna of Meşelik Campus (Eskişehir, Turkey) <u>Naim Arslan</u> , Akın Karahasan, Deniz Mercan		14:00-14:15	Dangers of Invasive Fish Species, Prevention and Control <u>Zehra Arzu BEÇER</u> , Edafe ODIOKO	
14:15-14:30	Applied of a new bacterial species isolated from an activated sludge in the denitrification treatment of the wastewater <u>Yasmina Angar</u> , Salima Gana-Kebbouche, Nacer-Eddine Djelali, Souad Talbi-Khenili		14:15-14:30	Furan induces cytotoxicity, oxidative stress and apoptosis in Leydig cells <u>Yasemin Ölkü Dikbasan</u> , Yasemin Aydın		14:15-14:30	Adapted Seagrass Watch Protocol to evaluate <i>Posidonia oceanica</i> health, in the Eastern Aegean Sea <u>Çlun Çotte</u> , Sarah Meek, Ute Hansen, Anastasia Miliou	
14:30-14:45	The Effect of Remote Monitoring Methods in The Fight Against Marine Pollution <u>Sebnem Erkebay</u> , <u>Cem Erkebay</u>		14:30-14:45	Nocturnal Activity of <i>Anatololacerta pelasgiana</i> (Mertens, 1959) from Çiğlıkara Nature Reserve, Antalya, Turkey Batuhan Yaman YAKIN, <u>Kerim Çiçek</u> , Murat Afsar, Cemal Varol TOK		14:30-14:45	The importance of <i>Sipuncula</i> species in marine ecosystems Sermin Açık	
14:45-15:00	Analysis and Comparison of Risk Factors In The Installation And Design of Potable Water Treatment Plants <u>Sebnem Erkebay</u> , <u>Cem Erkebay</u> , Arzu Morkoyunlu Yüce		14:45-15:00	Another Case of Piebaldism in <i>Blanus strauchi</i> (Bedriaga, 1884) from Kaş, Turkey Batuhan Yaman Yakın, Ulvi Kerem Günay, <u>Kerim Çiçek</u> , Dinçer Ayaz, Cemal Varol Tok		14:45-15:00	Sipunculans associated with <i>Posidonia oceanica</i> (L.) Delile 1813 in İzmir Bay (Aegean Sea, Eastern Mediterranean) Sermin Açık	
15:00-15:15	Investigation of the effects of <i>Gardia lamblia</i> and <i>Cryptosporidium parvum</i> on environmental pollution by real-time PCR in horse farms in Southeastern Anatolia <u>Akın Yiğit</u> , Mehmet Demirci, Hikmet Dinç		15:00-15:15	An Investigation of How Aquatic Beetles (Arthropoda:Insecta) Effect on Water Quality of Riva Stream (İstanbul) Nilay Dökümcü, Serap Koşal Şahin		15:00-15:15	Marine Parasites <i>Gnathia</i> sp. (Gnathiidae) of the Libyan fishes along the western coast of Libya Sarah ben Zeglani, <u>Esmail A. Şakman</u>	
15:15-15:30			15:15-15:30			15:15-15:30	The role of constructed wetlands in conservation of biodiversity:A case study on birds diversity in Al-Hadba treatment plant, Libya <u>Aya ALGADRY</u> , Extra DORMAN, Essam BOURASS and Khaled	
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16:15-16:30	Comparison of Turkish and EU legislation for fishing gear used in small-scale fishery <u>Zafer Tosunoğlu</u> , Harun Güçlüsoy		16:15-16:30	Effects of Astaxanthine, Canthaxanthin and Lycopene Containing Diets on the Chemical Quality and Textural Properties of the Black Sea Trout (<i>Salmo labrax</i>) Fillets <u>Ekrem Cem Çankırılı</u> , Nermiş Berik		16:15-16:30		
16:30-16:45	Slipping practises in Turkish purse seine fishery <u>Zafer Tosunoğlu</u> , Nazlı Kasapoğlu		16:30-16:45	Pattern of <i>Lingulodinium polyedra</i> cyst distribution in the Black Sea <u>Nina Dzhembekova</u> , Fernando Rubino, Snejana Moncheva, Nataliya Slabakova, Petya Ivanova, Elitsa Stefanova		16:30-16:45		
16:45-17:00	Analysis of the small-scale fisheries landings in the Foça MPA (Turkey) for the second half of <u>Harun Güçlüsoy</u> , Zafer Tosunoğlu		16:45-17:00	Penetration of the Pacific Korean rockfish <i>Sebastes schlegelii</i> into the <u>Evgenia Karpova</u> , Igor Tamoykin, Vyacheslav Kuleshov		16:45-17:00		
17:00-17:15	Analysis of the trawl landings in Foça (Turkey) for the second half of 1990s <u>Harun Güçlüsoy</u> , Zafer Tosunoğlu		17:00-17:15			17:00-17:15		
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17:30-18:00	Coffee Break		17:30-18:00	Coffee Break		17:30-18:00	Coffee Break	
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9:30-14:00	İstanbul Bosphorus Cruise Leaving İstanbul					2019 İstanbul / Turkey		



ORAL PRESENTATIONS



The Contents of Heavy Metals in *Plecostomus* (Loricariidae) from the Ciliwung River Jakarta, Indonesia

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Abstract

Indonesia has a life-oriented river. As much as 68 percent of the quality of river water in Indonesia is heavily polluted, including the Ciliwung River in DKI Jakarta Indonesia. The pollution can affect river ecosystems, especially river biota such as plecostomus species found in the Ciliwung River. Plecostomus that have dominated Ciliwung River are widely used by traders to be used as processed raw material products. The purpose is to identify the content of heavy metals, especially lead (Pb), mercury (Hg) and cadmium (Cd) in the flesh of plecostomus from the Ciliwung River in Jakarta. The methods employed were collecting plecostomus samples, plecostomus flesh preparation, and metals content analysis with X-Ray Fluorescence (XRF) Spectrometer. The metal results identified with the XRF method on the flesh of plecostomus as much as 57 metals and there are three types of heavy metals of Pb, Hg and Cd. The concentration of heavy metals of Pb, Hg and Cd exceeds the maximum value of SNI threshold. Therefore, plecostomus flesh from Ciliwung River Jakarta is not feasible for consumption.

Keywords: Ciliwung River, *Plecostomus*, fish flesh, heavy metals, Jakarta Indonesia.

Introduction

Rivers in Indonesia are used as a source of life, such as a place to live and to work. Around 68 percent or the majority of the river water quality in 33 provinces in Indonesia is in heavily polluted status including Ciliwung River in DKI Jakarta and its neighborhood (KLHK 2015). The quality of Ciliwung river is heavily polluted in all segments, starting from the upstream (Bogor) to the downstream (DKI Jakarta) and that makes Ciliwung river not feasible to use for any kinds of activities as it can pollute Ciliwung's River Stream Area. The pollution may affect the river ecosystems especially the river biota such as fish species in Ciliwung River.

Plecostomus is one of the species found in Ciliwung River (Hadiaty 2011). This is an introduced fish from Central America and South America which comes from Amazon River (Pound et al. 2010) brought by hobbyists, then entered into public waters in intentionally or unintentionally (Ploeg 2008). Biological and ecological fish brooms include being able to take oxygen from the air (facultative air breather) and detritus feed type (Yossa & Araujo-Lima 1998).

Nowadays, plecostomus from Ciliwung River is mostly used as the raw materials for food, such as dim sum, *empek-empek*, and fish chips (Mahdiah 2002) because plecostomus has economic value. The problem is if plecostomus lives in Ciliwung River that is polluted by metals, and consumed by people as food, it can be poisonous (DINKES 2015). Therefore, there comes the need to conduct a research about metals content in plecostomus flesh. This research is aimed at identifying the contents of heavy metals, especially lead (Pb), mercury (Hg), and cadmium (Cd) within plecostomus flesh from Ciliwung River. This is expected to give additional information about metals content in plecostomus flesh as people's food material.

Material and Methods

The research was conducted from September 2017 until October 2017. The location was at PAIR Laboratory to prepare for the samples and to analyze the results, meanwhile the employment of XRF tool to identify metals in plecostomus flesh was located at PTBGN Laboratory, National Agency of Nuclear Energy (BATAN).

1.1. Materials and Tools

Tools that were used during the sampling were containers and nets. The tools used in laboratory were knife, scissors, rulers with 1 mm precision, containers, mortar & alu, 60 °C oven, analytical balance with 0.0001 g precision, Ziploc plastic bag sized 6x8 cm, desiccator, spatula, crucible, crucible brace, and *X-Ray Fluorescence* (XRF) tool. The materials that were used were 18 plecostomus fish which were categorized into three groups in accordance with its body size, which were small-size plecostomus fish weighed < 115 g, medium-sized plecostomus fish weighed 140-180 g, and bigger-size plecostomus fish weighed > 215-310 g.

1.2. Samples Collection

Samples collection was started with conducting a survey and raw materials sampling at the research location to gain information about the origin of plecostomus and its habitat at Ciliwung River Stream Area (Figure 1). The fish were caught using fish nets and put into containers. After that, morphometric measurement was administered covering the total length, width, and height of the fish. Some samples which had not been researched were preserved inside freezer.

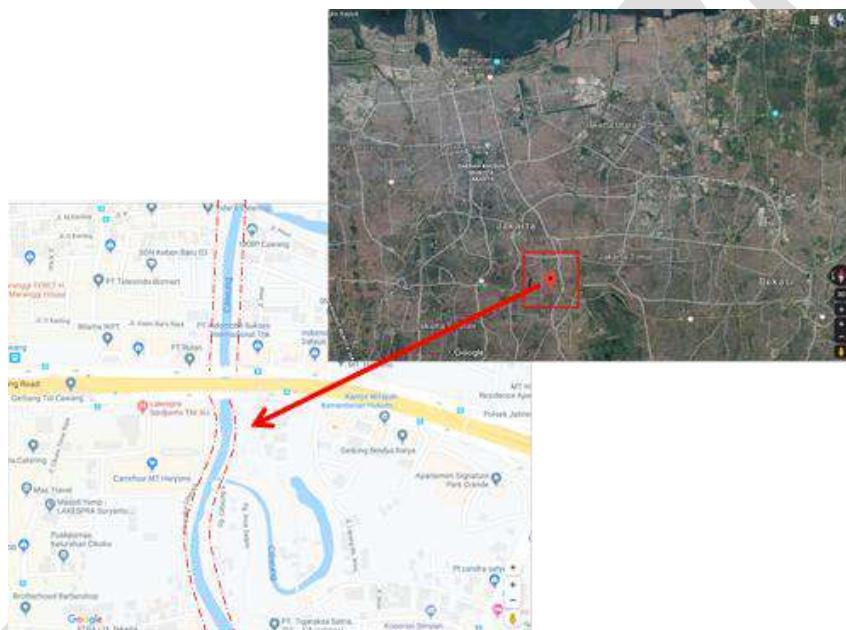


Figure 1 Sampling site Ciliwung River Stream Area Jakarta, Indonesia

1.3. Samples Preparation

The fish were dissected and were separated from its bones and skins using fillet technique. Then, the fish were weighed using analytical balance. The fish were put onto crucible and dried inside the oven for 60°C for five days. The dried flesh were weighed again using digital balance and were crushed and were put into Ziploc plastic bag. Each plastic was given labels according to the fish size category.

1.4. The Analysis of Metals Content in Plecostomus Flesh

The dried flesh samples were filtered $\pm$ 100 mesh and were weighed for 5 grams. The analyzed samples were in the form of *press powder*. After that, the analysis of metals content in plecostomus flesh samples employing *X-Ray Fluorescence* (XRF) *Spectrometer* tool with GeoChemPellet 2 method was administered. The data gained from the analysis results using XRF were in qualitative and quantitative analyses. The results of metals measurement can be seen from the program in graphs, spectrum, and



tables. Then, the results were converted to Microsoft Excel for data processing and would be analyzed using SPSS to determine the correlation. The heavy metals were further analyzed as Pb, Hg and Cd.

Results

The identification result using XRF, it was found three heavy metals; they were Pb (Pb), mercury (Hg) and cadmium (Cd). The unidentified heavy metals were because the XRF method only analyzes metals with high concentration within the samples. Therefore, metals content in relatively low concentration cannot be detected by XRF (Suhariyono & Menry 2005). The presence of metals inside an organism's body occur because there is an accumulation of metals inside the organisms (Puspasari 2006).

Tabel 1. The result of heavy metals in pleco flesh

Heavy Metals	Pb (mg/kg)	Cd (mg/kg)	Hg (mg/kg)
Small	3.6 ± 0.3	0.6 ± 0.1	1.4 ± 0.3
Medium	2.7 ± 0.3	$<0.5 \pm -0.2$	0.8 ± 0.3
Large	2.2 ± 0.3	$<0.5 \pm -0.2$	0.3 ± 0.3

Discussion

The Pb concentration in three different size categories of plecostomus flesh – smaller-sized fish were for 3.6 ± 0.3 mg/kg, medium-sized fish were for 2.7 ± 0.3 mg/kg, and larger-sized fish were 2.2 ± 0.3 mg/kg (Table 1). The concentration value of Pb that was identified in three different categories of the fish flesh was > from 1 mg/kg as a safe threshold for fishery product to be able to consume and > from 0.3 of the safe threshold of consumption in fishery products (BSN 2009). Thus, it can be found that the concentration value of Pb is higher than the safe threshold value to consume.

Table 2 The comparison of Pb concentration with SNI research results

Heavy Metals Category	Pb (mg/kg)			SNI 2009	
	2009	2013	2017	Flesh	Fishery Products
Small			3.6 ± 0.3		
Medium	0.02	2.88 ± 1.93	2.7 ± 0.3	1	0.3
Large			2.2 ± 0.3		

Based on research conducted by Ratmini (2009), plecostomus that were caught in Ciliwung River have 0,02 mg/kg of Pb, but the value is not higher than the set standard. However, results found in a research conducted by Alfisyahrin (2013), showed that the metal concentration of Pb in plecostomus from Ciliwung River near Bogor, Depok, and Jakarta Railway Stations were for 2.88 ± 1.93 which were higher than the set standard.

The Hg concentration in plecostomus flesh is higher than the safe threshold which is > from 0,03 mg/kg as fishery products and > from 0,5 mg/kg as fishery products, therefore it is not feasible to consume (BSN 2009). The concentration of heavy metal Hg in plecostomus flesh in three different sizes are $1,4 \pm 0,3$ mg/kg in smaller-sized fish, medium-sized fish for $0,8 \pm 0,3$ mg/kg and larger-sized fish for $0,3 \pm 0,3$ mg/kg (Table 2).



Table 3 The comparison of Hg metal concentration with SNI research results

Category	Heavy Metals		Hg(mg/kg)		
	2009	2013	2017	SNI 2009	
				Flesh	Fishery Products
Small			1.4 ± 0.3		
Medium	0.0005	0.001	0.8 ± 0.3	0.03	0.5
Large			0.3 ± 0.3		

The comparison result gained from Ratmini's (2009) and Hardi's (2013) research, showed that Hg concentration in plecostomus flesh in Ciliwung River was < from 0.001 thus it was still lower than the set standard from the government, but if it was consumed constantly for longer period of time, the possibility of being poisoned would occur. Consequently, alter has to be given since Hg metal is bio-accumulative (Puspasari 2006).

The concentration of Cd metal in plecostomus flesh found in three different size categories, showed that in smaller-sized fish has a concentration for 0.6 ± 0.1 mg/kg, medium-sized fish for 0.5 ± 0.2 mg/kg, and bigger-sized fish for 0.5 ± 0.2 mg/kg (Table 3). The metal concentration of Cd found in the three categories of plecostomus flesh was > from 0.3 mg/kg from the safe threshold of consumption in fishery products and > from 0.1 as a safe standard of consumption in fishery products (BSN 2009). The result showed that the concentration of Cd in plecostomus flesh is higher than the safe threshold to consume.

Table 4 The comparison of Cd metal concentration with SNI research results

Category	Heavy Metals		Cd (mg/kg)		
	2009	2013	2017	SNI 2009	
				Flesh	Fishery Products
Small			0.6 ± 0.1		
Medium	0.003	< 0.005	<0.5 ± 0.2	0.3	0.1
Large			<0.5 ± 0.2		

According to the comparison of Cd concentration value in 2017 research finding to Ratmini's (2009) and Dhika's (2013) showed that there was an increment of concentration. From 2009 until 2013, plecostomus flesh from Ciliwung River contained Cd metal concentration for < from 0.005 mg/kg thus it was still lower than the set standard by the government (Table 4). However, in 2017, the Cd concentration was higher than the set standard by the government for > from 0.3 mg/kg as fishery products and > from 0.1 as fishery products. Therefore, plecostomus flesh is not feasible to consume by people (BSN 2009).

The concentration contents of heavy metals of Pb, Hg and Cd from 2009 until 2017 has been increasing inside plecostomus flesh. Increased metal content can be caused by seasonal differences each year (Olojo et al. 2012). Based on the investigation at the sampling area exactly around Ciliwung Riverbank in Jln. Inpeksi Ciliwung Letjen MT. Haryonoo, the stream condition of the water at the sampling location is not too big since the water is black and much of garbage is found alongside the riverbank.

So, the identified metals using XRF method in plecostomus flesh are 57 metals with certain concentration value and there are three types of heavy metals such as Pb, Hg and Cd. The highest heavy metal concentration of Pb, Hg and Cd is in smaller-sized fish for 3.6 ± 0.3 mg/kg of Pb, Hg 1.4 ± 0.3 mg/kg and Cd 0.6 ± 0.1 mg/kg. The heavy metals concentration of Pb, Hg and Cd has always been increasing from 2009, 2013, and 2017 and it has beyond the maximum value of SNI of being feasible to consume status for meat and fishery products, thus plecostomus flesh from River Stream Area of Ciliwung Jakarta is not feasible to consume.

Construction projects, industries, and number of vehicles every year have become the main trigger in the increasing value of heavy metal concentration in Ciliwung River. In addition, the changes in the use of land and more population along the riverbank have implied towards pollutants' addition to Ciliwung River. This finding is supported by research conducted by Taufik (2003) that the sources of pollution in Ciliwung River Jakarta are coming from kinds of activities of the people living close to it and industries. Therefore, the dangerous heavy metal sources such as Pb, Hg and Cd are suspected to come from the



waste of construction projects, industries, residential areas, and transportations along the riverbank which can pollute the river ecosystems especially river biota such as plecostomus in Ciliwung River.

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HEAVY METAL CONTAMINATION OF CILIWUNG RIVER, INDONESIA Dewi Elfidasari^{1*}, Laksmi Nurul Ismi¹, Irawan Sugoro² ¹The Study Program of Biology (Biotechnology), Faculty of Science and Technology (FST), University of Al Azhar Indonesia, Jl. Sisingamangaraja Kebayoran Baru, Jakarta Selatan 12110, Indonesia ²The Center of Isotope and Radiation Application (PAIR), The National Agency of Nuclear Agency (BATAN). Jl. Lebak Bulus Raya No 49, Jakarta 12440, Indonesia Abstract River Stream Area (DAS) of Ciliwung gives many advantages to its surrounding people, however, nowadays this river stream area of Ciliwung has been heavily polluted. One of the most harmful pollutant components for people is the existence of heavy metals. The high number of people doing activities surrounding the river area may contribute to the increase of metal contents in the river. The aim of this research is to prove that there is an increase level of heavy metal pollutant in Ciliwung River. The methodology that was used to analyze the content of heavy metal in Ciliwung River was X- Ray Fluorescence (XRF) in part per million (ppm) unit. The result of this research shows that there is an increase in heavy metal pollutants of Cd, Hg, and Pb in the water of Ciliwung River that is located from Bogor to Jakarta that exceeds the standard of PP RI No.82 year 2001. The highest heavy metals pollution occurs in the river stream area of Ciliwung Jakarta. Respectively, the order of heavy metal concentration ranging from the highest to the lowest in Ciliwung River is Mn, Zn, Cu, Cd, and Hg. Keywords: Ciliwung River, heavy metals, pollution, XRF 1.

INTRODUCTION Ciliwung River is one of the rivers that flows from Bogor Regency to the Jakarta gulf. The river stream area of Ciliwung (DAS) has always been used by people living surround it as an irrigation source, drinking water source, sanitation, farming, and small and medium enterprises of the people. The presence of people's activities around the river area has a great impact towards the river as it has become the pollutant source for the river. One of harmful pollution types in the river is heavy metal. Heavy metal is an environment polluting substance that is very common and always found in the water. This heavy metal has a negative impact on people who use the water and its biota inside the water. An intense increase of urbanization and industrialization has made the river be polluted, as it has become the industry and domestic waste disposal place (Khatun & Jamal, 2018). An intense industrial and people's activity has created a heavy metal to the environment (Karbassi, et al., 2008). Heavy metal can move from an environment to an organisms and from one organism to another through the food chain (Yalcin, et al., 2008); (Puspasari, 2006). The heavy metal found on water will sink and settle at the bottom of the water, creating a sedimentation and contaminate people who always make use of the water for their activities. Water with heavy metal will be a toxic material inside people's body and may cause death towards them (Palar, 2008). The existence of heavy metal on Ciliwung River's water informs that there is a need to monitor and evaluate its water condition surrounding the people as a mean of supervising towards its water quality (Yudo & Said, 2018). In addition, people need to get the information about the level of pollution on the water that they use for their own virtues. Therefore, an analysis towards heavy metal contents on Ciliwung River's water needs conducting to figure out that there is a metal content on

the water as well as its regular monitor towards the environmental pollution especially on the Ciliwung River's water. This study is aimed at proving the existence of the increase of heavy metal pollution on Ciliwung River. This research is expected to be able to inform an updated condition about Ciliwung River and can be an information source for decision makers to resolve its issues. [2. MATERIALS AND METHODS 2.1. Water Sampling](#) [The research was conducted](#) at three sampling areas located alongside the river stream of Ciliwung River. The sampling location is located at one water area line of Ciliwung River that is divided into three locations representing the river's upstream and downstream. The first location is located at Inpeksi Ciliwung Letjen MT. Haryono Gg. Ciliwung, Cawang, Central Jakarta with the coordinate point of longitude 6°14'36.50"S and of latitude 106°51'45.03"E. the second location is at Poncol, Depok with the coordinate point of longitude 6°21'41.9"S and of latitude 106°50'18.3"E. The third location is at Otto Iskandardinata, Bogor with the coordinate point of longitude 6°36'08.8"S and of latitude 106°48'08.7"E ([Figure 1](#)). [Figure 1. Map of Sampling Location of Plecostomus at the Ciliwung River Stream Area.](#) Source: <http://www.mdpi.com> 2.2. Heavy metal analysis of water sampling The analysis of water sample was conducted using [X-Ray Fluorescence \(XRF\)](#) spectrometer. [XRF \(X-ray fluorescence\) is a non-destructive analytical technique used to determine the elemental composition of materials. XRF analyzers determine the chemistry of a sample by measuring the fluorescent \(or secondary\) X-ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays \("a fingerprint"\) that is unique for that specific element, which is why XRF spectroscopy is an excellent technology for qualitative and quantitative analysis of material composition.](#) This research using the XRF Method based on Ene et al., (2010). In this method, fish samples were made into cup samples. The making of cup samples began by scaling sample powder as many as 5 grams, later the samples were placed into cups. Then, samples inside the cups were coated with three layers of tissue and sealed with plastic. Fish samples inside the cup will be analyzed using XRF. Sediment samples were later changed into pellet samples. The making of pellet samples began by scaling sample powder as many as 5 grams, later added with 1 gram of fluxana before getting homogenized. Then, the samples were put into hydraulic press machine. Water sample were analyzed by making the samples into cup samples. The process began by scaling the water before placed into cups. The samples were later coated with three layers of tissue and sealed with plastic. Then, the samples are ready to be analyzed using XRF. Devices used to analyze metal contamination were calibrated and measured for its sensitivity to every elements with metal sheet fluxana HD Electronic MCACAL RA 1012. Measured data, such as intensity and elements energy later converted to numbers, so the result will come into absorbent percentage and part per million (ppm) metal element on samples. (AMPTEK, 2009) explain that XRF utilize X-ray emitted from materials that later forwarded to detector and transmitted into signal which intensity is appropriate with the amount of elements inside the samples (figure 4). The result of the metal measurement process can be seen in the program so that the output received in the form of chart, spectrum, and table. Figure 2. Analysis XRF Methods Scheme 3. RESULTS The research result shows that on the Ciliwung River's water, it contains the heavy metals of Pb, Hg, Cd, Cu, Mn, and Zn with a very high concentration, far beyond [the standard of PP RI No.82 year 2001](#) (Table 1). [The](#) polluting source of [heavy](#) metal is suspected to have come from industrial activities of waste disposal on to the river so that it pollutes the water and its biota within the river (Widowati, et al., 2008). The industrial waste coming into the river stream area of Ciliwung Bogor and Depok is brought by the streams to the river stream area of

Ciliwung Jakarta, resulting in high pollution at [the river stream area of Ciliwung Jakarta. Respectively, the types of metal](#) that have [the highest concentration at the](#) three sampling points are Mn, Zn, Cu, Pb, Cd and Hg (Table 1). The river stream area of Ciliwung Jakarta shows a very high metal concentration at other sampling points. The metal content in a water area can make the downstream have a higher metal concentration compared to the upstream area (Mishra, et al., 2008). The finding is in line with the research result that the heavy metal contents at the three sampling points show the highest value at the river's downstream. Table 1. Heavy Metal Concentration at the Ciliwung River Stream Area Concentration (ppm) Heavy Metals Year 2013* Mn - (Manganese) Bogor Depok Jakarta (Upstream) (Middle stream) (Downstream) 1468 ± 3 472.1 ± 2.3 3101 ± 5 Zn (Zinc) $85.30-1270$ 689.7 ± 3.9 39.9 ± 0.8 912.7 ± 4.7 Cu (Copper) $16.60-157$ 120.2 ± 2.4 6.4 ± 6.4 152.5 ± 2.7 Pb (Lead) $7.800-89.4$ 59.9 ± 1.4 4.2 ± 0.4 73.8 ± 1.3 Cd (Cadmium) $0.29-1.74$ $<0.3 \pm 0.0$ 1.3 ± 0.1 6.3 ± 0.3 Hg (Mercury) - 2 ± 0.9 $<0.7 \pm 0.0$ $<0.7 \pm 0.0$ * Budianto and Lestari 2017; **Indonesia's Government Regulation No.82 year 2001; (-): metals research was not conducted Standard (ppm)** 0.1 $0.05-2$ $0.02-0.2$ $0.03-1$ $0.01-0.01$ $0.001-0.005$

4. DISCUSSION There are three factors that cause the increase of heavy metal contents at Ciliwung's downstream (Jakarta area), first is the erosion of mineral stones at Ciliwung's upstream area. This condition happens because the upstream area is eroded which deepens the valley alongside the river stream, the erosion rate is faster than the sedimentation, and the density of the drainage is higher with steep slopes. Therefore, mineral erosion at the upstream area will settle at the middle stream and upstream of the river area (Harjadi, 2009). The second factor is the typology of the middle stream and downstream with their characteristics of sedimentation process and less erosion. Consequently, there is an accumulation value of heavy metal on the water and river sedimentation (Cahyani, et al., 2016). The third factor is an additional number of polluting substance that comes from people's activities. As what has been informed, people's activities by disposing wastes and activities related to river are more at the downstream area. It results in the higher potential increase of pollutant substance at the river stream area (Susanti, et al., 2014); (Supenah, et al., 2015) The research results from 2013 to 2018 show the increase value [of heavy metals](#) of Zn, [Cu, Pb and Cd](#). The [Zn](#) metal content is higher that is caused by industrial wastes that keeps getting higher each year in the water (Silambarasan, et al., 2012). This will lead to zinc ore smelting that has become the main source of zinc pollutant. Besides, the increase number of garbage, transportation, pesticide, and farming fungicide which contains $ZnSO_4$ is an additional polluting source of the environment as the zinc has become one of the polluting sources (Silambarasan, et al., 2012). The metal content of Cu keeps increasing along with the increase number of transportation (Silambarasan, et al., 2012). Cu metal [has a tendency to](#) be complex [with organic species in the water](#). Through the process of water stagnation, the Cu ion can interact with organic species (which is from industrial waste) that has the capability of being settled as a solution in a complex and stored at the bottom surface of the river and is absorbed on to the water surface (Silambarasan, et al., 2012). The source of pollution of Lead metal content in a water comes from the use of Lead as a medium to connect pipes used in industrial and domestic wastes disposal drainage. The presence of waste or solution cases the contact with the pipes containing Lead, that leads to the absorption of Lead to the river surface (Widowati, et al., 2008). The natural source of cadmium (Cd) is found in the form of mineral in the water that is rare in the environment. Cadmium is the biggest and most toxic that is used in industries to metal coating, steel coating protection, and certain pigments of nickel-cadmium batteries and on plastic

stabilizer during its manufacture and disposal thrown at the water. The concentration value of cadmium ranges from $<0.3 \pm 0.0 - 6.3 \pm 0.3$ ppm. The cadmium polluting source is suspected to have existed due to the waste disposal by paper, food, and pulp industries located alongside the river area. The previous studies also supported the fact that the water in Ciliwung River has been contaminated by Cd metal (Budiyanto & Lestari, 2017).

5.

CONCLUSION There has been an increase in terms of heavy metals on the river area of Ciliwung River. The highest heavy metals pollution occurs in the river stream area of Ciliwung Jakarta. The level of heavy metal pollution on Ciliwung River's water is beyond the basic water standard PP no. 82 Year 2001.

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The Contents of Heavy Metals in Plecostomus (Loricariidae) from the Ciliwung River Jakarta, Indonesia

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HEAVY METAL CONTAMINATION OF CILIWUNG RIVER, INDONESIA

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Abstract

River Stream Area (DAS) of Ciliwung gives many advantages to its surrounding people, however, nowadays this river stream area of Ciliwung has been heavily polluted. One of the most harmful pollutant components for people is the existence of heavy metals. The high number of people doing activities surrounding the river area may contribute to the increase of metal contents in the river. The aim of this research is to prove that there is an increase level of heavy metal pollutant in Ciliwung River. The methodology that was used to analyze the content of heavy metal in Ciliwung River was X-Ray Fluorescence (XRF) in part per million (ppm) unit. The result of this research shows that there is an increase in heavy metal pollutants of Cd, Hg, and Pb in the water of Ciliwung River that is located from Bogor to Jakarta that exceeds the standard of PP RI No.82 year 2001. The highest heavy metals pollution occurs in the river stream area of Ciliwung Jakarta. Respectively, the order of heavy metal concentration ranging from the highest to the lowest in Ciliwung River is Mn, Zn, Cu, Cd, and Hg.

Keywords: Ciliwung River, heavy metals, pollution, XRF

1. INTRODUCTION

Ciliwung River is one of the rivers that flows from Bogor Regency to the Jakarta gulf. The river stream area of Ciliwung (DAS) has always been used by people living surround it as an irrigation source, drinking water source, sanitation, farming, and small and medium enterprises of the people. The presence of people's activities around the river area has a great impact towards the river as it has become the pollutant source for the river.

One of harmful pollution types in the river is heavy metal. Heavy metal is an environment polluting substance that is very common and always found in the water. This heavy metal has a negative impact on people who use the water and its biota inside the water. An intense increase of urbanization and industrialization has made the river be polluted, as it has become the industry and domestic waste disposal place (Khatun & Jamal, 2014). An intense industrial and people's activity has created a heavy metal to the environment (Karbassi, et al., 2008).

Heavy metal can move from an environment to an organisms and from one organism to another through the food chain (Yalcin, et al., 2008); (Puspasari, 2006). The heavy metal found on water will sink and settle at the bottom of the water, creating a sedimentation and contaminate people who always make use of the water for their activities. Water with heavy metal will be a toxic material inside people's body and may cause death towards them (Palar, 2008).

The existence of heavy metal on Ciliwung River's water informs that there is a need to monitor and evaluate its water condition surrounding the people as a mean of supervising towards its water quality (Yudo & Said, 2018). In addition, people need to get the information about the level of pollution on the water that they use for their own virtues. Therefore, an analysis towards heavy metal contents on Ciliwung River's water needs conducting to figure out that there is a metal content on the water as well as its regular monitor towards the environmental pollution especially on the Ciliwung River's water.

This study is aimed at proving the existence of the increase of heavy metal pollution on Ciliwung River. This research is expected to be able to inform an updated condition about Ciliwung River and can be an information source for decision makers to resolve its issues.

8 2. MATERIALS AND METHODS

2.1. Water Sampling

The research was conducted at three sampling areas located alongside the river stream of Ciliwung River. The sampling location is located at one water area line of Ciliwung River that is divided into three locations representing the river's upstream and downstream. The first location is located at Inpeksi Ciliwung Letjen MT. Haryono Gg. Ciliwung, Cawang, Central Jakarta with the coordinate point of longitude $6^{\circ}14'36.50''\text{S}$ and of latitude $106^{\circ}51'45.03''\text{E}$, the second location is at Poncol, Depok with the coordinate point of longitude $6^{\circ}21'41.9''\text{S}$ and of latitude $106^{\circ}50'18.3''\text{E}$. The third location is at Otto Iskara Dinata, Bogor with the coordinate point of longitude $6^{\circ}36'08.8''\text{S}$ and of latitude $106^{\circ}48'08.7''\text{E}$ (Figure 1).

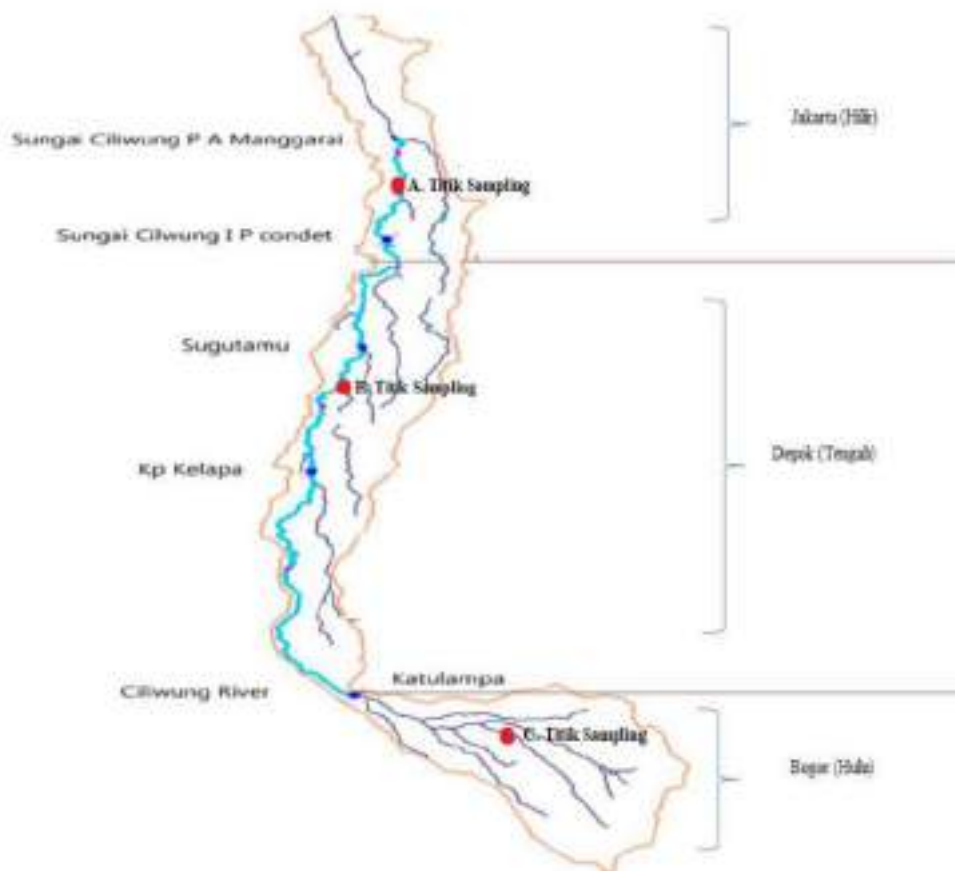


Figure 1. Map of Sampling Location of Plecostomus at the Ciliwung River Stream Area.

Source: <http://www.mdpi.com>

2.2. Heavy metal analysis of water sampling

The analysis of water sample was conducted using X-Ray Fluorescence (XRF) spectrometer. XRF (X-ray fluorescence) is a non-destructive analytical technique used to determine the elemental composition of materials. XRF analyzers determine the chemistry of a sample by measuring the fluorescent (or secondary) X-ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays ("a fingerprint") that is unique for that specific element, which is why XRF spectroscopy is an excellent technology for qualitative and quantitative analysis of material composition.

This research using the XRF Method based on Ene et al., (2010). In this method, fish samples were made into cup samples. The making of cup samples began by scaling sample powder as many as 5 grams, later the samples were placed into cups. Then, samples inside the cups were coated with three layers of tissue and sealed with plastic. Fish samples inside the cup will be analyzed using XRF. Sediment samples were later changed into pellet samples. The making of pellet samples began by scaling sample powder as many as 5 grams, later added with 1 gram of fluxana before getting homogenized. Then, the samples were put into hydraulic press machine.

Water sample were analyzed by making the samples into cup samples. The process began by scaling the water before placed into cups. The samples were later coated with three layers of tissue and sealed with plastic. Then, the samples are ready to be analyzed using XRF.

Devices used to analyze metal contamination were calibrated and measured for its sensitivity to every elements with metal sheet fluxana HD Electronic MCACAL RA 1012. Measured data, such as intensity and elements energy later converted to numbers, so the result will come into absorbent percentage and part per million (ppm) metal element on samples. (AMPTEK, 2009) explain that XRF utilize X-ray emitted from materials that later forwarded to detector and transmitted into signal which intensity is appropriate with the amount of elements inside the samples (figure 4). The result of the metal measurement process can be seen in the program so that the output received in the form of chart, spectrum, and table.

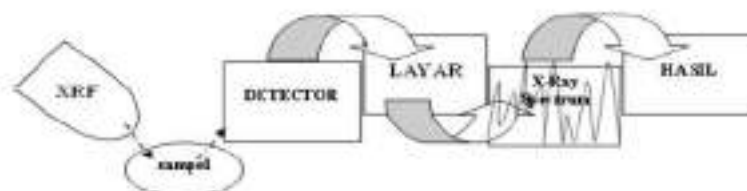


Figure 2. Analysis XRF Methods Scheme

3. RESULTS

The research result shows that on the Ciliwung River's water, contains the heavy metals of Pb, Hg, Cd, Cu, Mn, and Zn with a very high concentration, far beyond the standard of PP RI No.82 year 2001 (Table 1). The polluting source of heavy metal is suspected to have come from industrial activities of waste disposal on to the river so that it pollutes the water and its biota within the river (Widowati, et al., 2008). The industrial waste coming into the river stream area of Ciliwung Bogor and Depok is brought by the streams to the river stream area of Ciliwung Jakarta, resulting in high pollution at the river stream area of Ciliwung Jakarta.

Respectively, the types of metal that have the highest concentration at the three sampling points are Mn, Zn, Cu, Pb, Cd and Hg (Table 1). The river stream area of Ciliwung Jakarta shows a very high metal concentration at other sampling points. The metal content in a water area can make the downstream have a higher metal concentration compared to the upstream area (Mishra, et al., 2008).

The finding is in line with the research result that the heavy metal contents at the three sampling points show the highest value at the river's downstream.

Table 1. Heavy Metal Concentration at the Ciliwung River Stream Area

Heavy Metals	Year 2013*	Concentration (ppm)			Standard (ppm)**
		Bogor (Upstream)	Depok (Middle stream)	Jakarta (Downstream)	
Mn (Manganese)	-	1463 ± 3	472.1 ± 2.3	3101 ± 5	0.1
Zn (Zinc)	83.30-1270	689.7 ± 3.9	39.9 ± 0.8	912.7 ± 4.7	0.05-2
Cu (Copper)	16.60-157	120.2 ± 2.4	6.4 ± 6.4	152.5 ± 2.7	0.02-0.2
Pb (Lead)	7.800-89.4	59.9 ± 1.4	4.2 ± 0.4	73.8 ± 1.3	0.03-1
Cd (Cadmium)	0.29-1.74	<0.3 ± 0.0	1.3 ± 0.1	6.3 ± 0.3	0.01-0.01
Hg (Mercury)	-	2 ± 0.9	<0.7 ± 0.0	<0.7 ± 0.0	0.001-0.005

* Budianto and Lestari 2017; **Indonesia's Government Regulation No.82 year 2001;

(-): metals research was not conducted

4. DISCUSSION

There are three factors that cause the increase of heavy metal contents at Ciliwung's downstream (Jakarta area), first is the erosion of mineral stones at Ciliwung's upstream area. This condition happens because the upstream area is eroded which deepens the valley alongside the river stream, the erosion rate is faster than the sedimentation, and the density of the drainage is higher with steep slopes. Therefore, mineral erosion at the upstream area will settle at the middle stream and upstream of the river area (Harjadi, 2009). The second factor is the typology of the middle stream and downstream with their characteristics of sedimentation process and less erosion. Consequently, there is an accumulation value of heavy metal on the water and river sedimentation (Cahyani, et al., 2016). The third factor is an additional number of polluting substance that comes from people's activities. As what has been informed, people's activities by disposing wastes and activities related to river are more at the downstream area. It results in the higher potential increase of pollutant substance at the river stream area (Susanti, et al., 2014); (Supenah, et al., 2015)

The research results from 2013 to 2018 show the increase value of heavy metals of Zn, Cu, Pb and Cd. The Zn metal content is higher that is caused by industrial wastes that keeps getting higher each year in the water (Silambarasan, et al., 2012). This will lead to zinc ore smelting that has become the main source of zinc pollutant. Besides, the increase number of garbage, transportation, pesticide, and farming fungicide which contains ZnSo4 is an additional polluting source of the environment as the zinc has become one of the polluting sources (Silambarasan, et al., 2012).

The metal content of Cu keeps increasing along with the increase number of transportation (Silambarasan, et al., 2012). Cu metal has a tendency to be complex with organic species in the water. Through the process of water stagnation, the Cu ion can interact with organic species (which is from industrial waste) that has the capability of being settled as a solution in a complex and stored at the bottom surface of the river and is absorbed on to the water surface (Silambarasan, et al., 2012).

The source of pollution of Lead metal content in a water comes from the use of Lead as a medium to connect pipes used in industrial and domestic wastes disposal drainage. The presence of waste or solution cases the contact with the pipes containing Lead, that leads to the absorption of Lead to the river surface (Widowati, et al., 2008).

The natural source of cadmium (Cd) is found in the form of mineral in the water that is rare in the environment. Cadmium is the biggest and most toxic that is used in industries to metal coating, steel coating protection, and certain pigments of nickel-cadmium batteries and on plastic stabilizer during its manufacture and disposal thrown at the water. The concentration value of cadmium ranges from $<0.3 \pm 0.0 - 6.3 \pm 0.3$ ppm. The cadmium polluting source is suspected to have existed due to the waste disposal by paper, food, and pulp industries located alongside the river area. The previous studies also supported the fact that the water in Ciliwung River has been contaminated by Cd metal (Budyanto & Lestari, 2017).

5. CONCLUSION

There has been an increase in terms of heavy metals on the river area of Ciliwung River. The highest heavy metals pollution occurs in the river stream area of Ciliwung Jakarta. The level of heavy metal pollution on Ciliwung River's water is beyond the basic water standard PP no. 82 Year 2001.

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