MICROPLASTIC POLLUTION IN ESTUARINE ECOSYSTEM AT SUNGAI LALOH, PASIR PUTIH

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DEDICATION

This thesis is dedicated to my beloved family, close friends and my soft-hearted supervisor.

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LIST OF ABBREVIATIONS

ABS	-	Acrylonitrile butadiene styrene
ATR	-	Attenuated Total Reflection
FT-IR	-	Fourier Transform Infrared Spectroscopy
DO	-	Dissolved oxygen
EVA	-	Ethylene vinyl acetate
GPS	-	Global Positioning System
MMWQS	-	Malaysia Marine Water Quality Standard
MMWQI	-	Malaysia Marine Water Quality Index
P. viridis	-	*Perna viridis*
PAH	-	Polycyclic aromatic hydrocarbons
PC	-	Polycarbonate
PE	-	Polyethylene
PET	-	Polyethylene terephthalate
PP	-	Polypropylene
PPE	-	Personal Protective Equipment
PS	-	Polystyrene
PTFE	-	Polytetrafluoroethylene
PU	-	Polyurethane
PVC	-	Polyvinyl chloride
rpm	-	Revolutions per minute
SPSS	-	Statistical Package for Social Sciences
TBT	-	Tributylin
UK	-	United Kingdom
US	-	United States

LIST OF SYMBOLS

$	-	Dollar
%	-	Percentage
>	-	Greater than
□	-	Less than or equal to
µm	-	Micrometre
µg/g	-	Microgram per gram
µg/L	-	Microgram per Litre
µS/cm	-	Micro siemens per centimetre
□	-	Degree Celsius
Ca	-	Calcium
Cd	-	Cadmium
Cfu/ 100 mL	-	Colony Forming Units per hundred millilitres
cm	-	Centimetre
cm^{-1}	-	Per centimetre
Cu	-	Copper
Fe	-	Iron
g	-	Gram
g/cm^3	-	Gram per cubic centimetre
H_2O_2	-	Hydrogen peroxide
HCl	-	Hydrochloric acid
Hg	-	Mercury
HNO_3	-	Nitric acid
kg/L	-	Kilogram per Litre
KOH	-	Potassium hydroxide
m^2	-	Square metre
mg/L	-	Milligram per Litre
mL	-	Millilitre
mm	-	Millimetre
N	-	Newton

NaCl	-	Sodium chloride
NaI	-	Sodium iodide
NaOH	-	Sodium hydroxide
NTU	-	Nephelometric Turbidity Unit
particle/m^2	-	Particle per square metre
pcs	-	pieces
Pb	-	Lead
pH	-	Power of hydrogen
ppt	-	Part per thousand
v/v	-	Volume per volume
Zn	-	Zinc

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1.2 Problem Statement

Every year, hundreds of marine lives found dead due to environmental pollution. Results from previous study showed that microplastics were found in sediment at straits of Johor. However, the data was only covered on sediment along the river water. The result show that film microplastic was found in abundance (Shazani et al., 2018). Plastic pollution from land can also be transferred into the ocean by wind. In addition, plastics have different density which cause it to float or sink in the rivers. The trends of microplastic pollution might be different based on location especially nearest to the ocean. The actual types of microplastic that presented between freshwater and saltwater body is still in question. There is lack of information on microplastic pollution at the estuarine ecosystem in Malaysia (Athey, 2020).

Kampung Pasir Putih is located nearby industrial area and Pasir Gudang Ferry Terminal. Besides, the location is also famous with seafood. Mussels are good bioindicator to detect level of pollution. Previous study shows that aquaculture mussels at Kampung Pasir Putih is polluted with heavy metals. The heavy metal found exceeded standard limit were lead and cadmium (Mahat et al., 2018). However, there is lack of specific data and information on microplastic pollution within the area.

In fact, the mussels can attach on bridge and another rough surface. The fast growth rate makes it accessible to found. The previous findings on microplastic pollution between cage cultured fish and wild fish found that wild fish was most polluted with microplastic (Yusof et al., 2017). The research covered only an area in Setiu Wetlands, Terengganu. However, fishes are not filter feeders like mussels. There is a question mark on bivalve species, whether wild mussels are most polluted with microplastics. This research provided evidence on trends of microplastic pollution from estuarine ecosystem. Moreover, statistical analysis can show the significant different between source of pollution.

1.3 Objective of Study

The study is on estuarine ecosystem at Sungai Laloh. The project aims to get actual data on microplastic pollution from the location. The following objectives are identified for achieve aim of project:

1. To identify the trends of microplastic present in the mussel and sediment sample at estuarine of Sungai Laloh.
2. To determine the characteristic of microplastic present based on colour and size.
3. To identify the functional group of polymers microplastic present.
4. To compare abundance of microplastic pollution based on total weight between wild mussel and cultured mussel.

1.4 Scope and Limitations of Study

This study consisted of laboratory experimental work to provide actual trends on microplastic pollution. The scope of this study is on the green mussels (*P. viridis*) and sediments located in estuarine of Sungai Laloh, Kampung Pasir Putih from October to November 2020. In-situ parameters analysed include dissolved oxygen (DO), pH, temperature, salinity, conductivity and turbidity. Water quality checker YSI ProPlus and turbidimeter HACH 2100Q were used for in-situ analysis. The estuarine level can be detected from different concentration of salinity water.

Lab analysis includes preparation, pre-treatment or density separation, digestion and analysed. In density separation, concentrated sodium chloride (NaCl) solution was used. Besides, only GF/C glass microfiber filters was used in this study. Physical characteristics included colour and sizes were identified by using stereomicroscope HSZ600 that located at School of Civil Engineering. In addition, Attenuated Total Reflection Fourier Transform Infrared (ATR FT-IR) from Faculty of

Science was used to identified the types of polymer plastic present. The comparison was identified in percentage and statistical software used to validate the data. The limitation of this study was the location only cover Sungai Laloh, Kampung Pasir Putih. Besides, only one sampling Point for both cultured and wild mussels were involved in the study.

1.5 Significant of Study

In this study, the outcome provided the actual polymer plastic that polluted Sungai Laloh. It is suitable to be use as baseline data for estuarine in strait of Johor. As we know, different plastics have different uses and application in daily life. Those, by identified the source might help to reduce the pollution in future. For instance, PP and PE are polymer plastics that usually use for container. In addition, EVA generally used for fishing robes. Marine live have high possibility to misunderstood plastic as food. Even mussels are good filter feeder which able to clean waters, the data from sediments sample can be additional evidence on current level of pollution. Last but not least, from the comparison, it's might help to locate the suitable location of cultured mussels and with preventive measures in the future.

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