Diversity of Annelids in the Kapuas and Melawi Rivers

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Article Info

Key word:
Diversity of animals
Phylum Annelida
Kapuas river
Melawi river

Article history:
Received: 25/01/2019
Revised: 28/08/2019
Accepted: 18/09/2019

ABSTRACT

The presence of Annelida animals in water is one indicator of polluted water. The purpose of this research was to determine the diversity of Annelida phylum in the Kapuas and Melawi rivers. This research used an exploratory method to determine the diversity of annelids in the Kapuas and Melawi rivers. Sampling was carried out in 2 regions representing the left and right sides of the river, both upstream and downstream of the river. The findings of the research show that there are two classes of annelid phyla, namely the Oligochaeta and Hirudinae classes. Oligochaeta class is represented by Tubifex sp, Lumbricus terrestris, and Pharetima sp. species while Hirudinae class is represented by Haemodipsa sp. Species. The number of Annelids found in the Kapuas river for Tubifex sp. numbered 7 species, Lumbricus terrestris numbered 53 species and Pharetima sp. numbered 14 species. The number of Annelids found in the Melawi river for Tubifex sp. numbered 1 species, Lumbricus terrestris numbered 23 species, Pharetima sp. numbered 8 species and Haemodipsa sp amounted to 2 species. The presence of Tubifex sp. in the Kapuas and Melawi rivers shows that the quality of the river waters begins to be polluted.

Introduction

Sintang Regency is one of the districts in the province of West Kalimantan. Sintang Regency is drained by two major rivers, the Kapuas river (1000 km) and the Melawi river (600 km) with a width of ± 250 m and a depth of 12-16 m. Melawi River is one of the largest rivers in West Kalimantan province. Melawi River is a Kapuas tributary that empties right in the middle of the city of Sintang which then ends in the Kapuas river, right in the middle of the city of Sintang (Herawati, 2015 and BAPPEDA in Sintang District, 2018).

The utilization of the Kapuas Sintang river waters is quite diverse, such as for transportation, agricultural irrigation, tap water, recreation areas and becoming a domestic waste disposal site. The Kapuas River plays an important role for people who live along the river. (Septiani, 2013).

Settlements and population activities along the Kapuas and Melawi rivers can cause river pollution and can reduce river quality (Bustami, 2010; Septiani, 2013 and Mahyudin, 2015). Decreasing river quality due to pollution can change the community structure of aquatic organisms in it (Sasangko, 2015 and Warman, 2014). Changes in the quality of waters greatly affect the lives of biota that live on the bottom of the water. This is because the river

is a habitat for many species of fish and other organisms such as macrozoobenthos. Septiani (2013) revealed that the river is a habitat for macrozoobenthos, one of which is the Annelid phylum.

Annelida phylum is one group of worms that have segmented bodies. In general, Annelida lives in various places that are relatively settled on a substrate (Ulfah, 2012, Kusnandi, 2015, Nangin, 2015) so that its existence can provide a picture of water condition where it lives (Kusnandi, 2013). Annelids are organisms classified as macrozoobenthos. One species of Annelida is leeches which are organisms that can still be found in polluted environments, so that they are included in tolerant organisms (Kusnandi, 2013).

This Annelida group plays an important role in the food chain, because it is one of the links in the process of decomposing organic matter and food sources for other organisms (Juwita, 2017). Other Annelide species such as Tubifex sp can also be used as indicators of pollution due to their ability to live in polluted water conditions (Suminto, 2014).

The results of Septiani (2013) study regarding the quality of the waters of the Kapuas river indicate that there is a diversity of macrozoobenthos animals which indicate polluted water. Based on this background, it is necessary to conduct an exploration of Annelida phylum in the Kapuas and Melawi rivers in Sintang District. The purpose of this study was to determine the diversity of Annelids in the Kapuas river region and Melawi river in Sintang District.

Materials and methods

The research methods used is a qualitative approach. This type of research is descriptive exploratory with the aim of describing the diversity of Annelida in the Kapuas and Melawi river.

The design in this study consisted of 2 river areas, the Kapuas and Melawi rivers which represent the left and right parts, both upstream and downstream. The design area of the section can be seen in Figure 1.

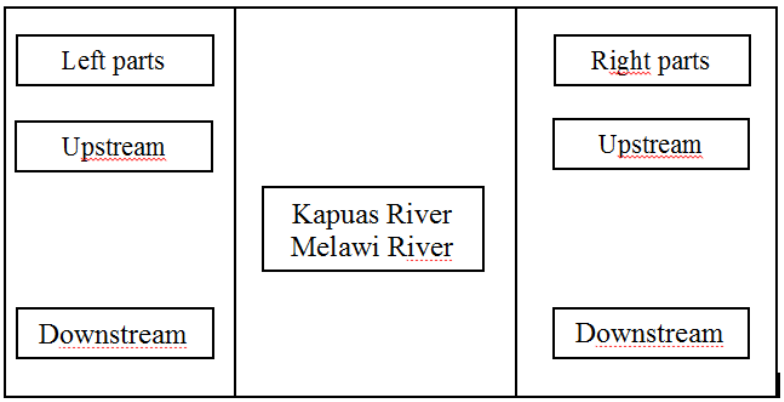

Figure 1. Design area of river section (Research Document, 2018)

The population in this study was all Annelids in the Kapuas and Melawi rivers in Sintang District. Samples are the Annelida phylum which located in the upstream and downstream areas of the Kapuas and Melawi rivers in Sintang District. Sampling was carried out in June 2018. Sampling used a purposive sampling method based on consideration of locations around the Kapuas and Melawi rivers not far from the river bank.

Sampling was carried out at 8 points, that are 4 points in the Kapuas river area and 4 points in the Melawi river, in the left side and right side of the river (upstream and downstream). Before sampling, the size of the sampling site was determine, and the size was 30cm X 30cm. After that, that sampling site was dig as deep as 20cm. Annelida on the surface were directly observed (Septiani, 2013). The observation was done using the observation sheet. The observations were did in the morning until noon. Observation of the

findings will be identified by observing the morphological characteristics, determining the number of species and determining the species of the phylum Annelida with the book Rusyana (2011), Campbell (2003) and Indriwati (2016). The location of the study can be seen in Figure 2.

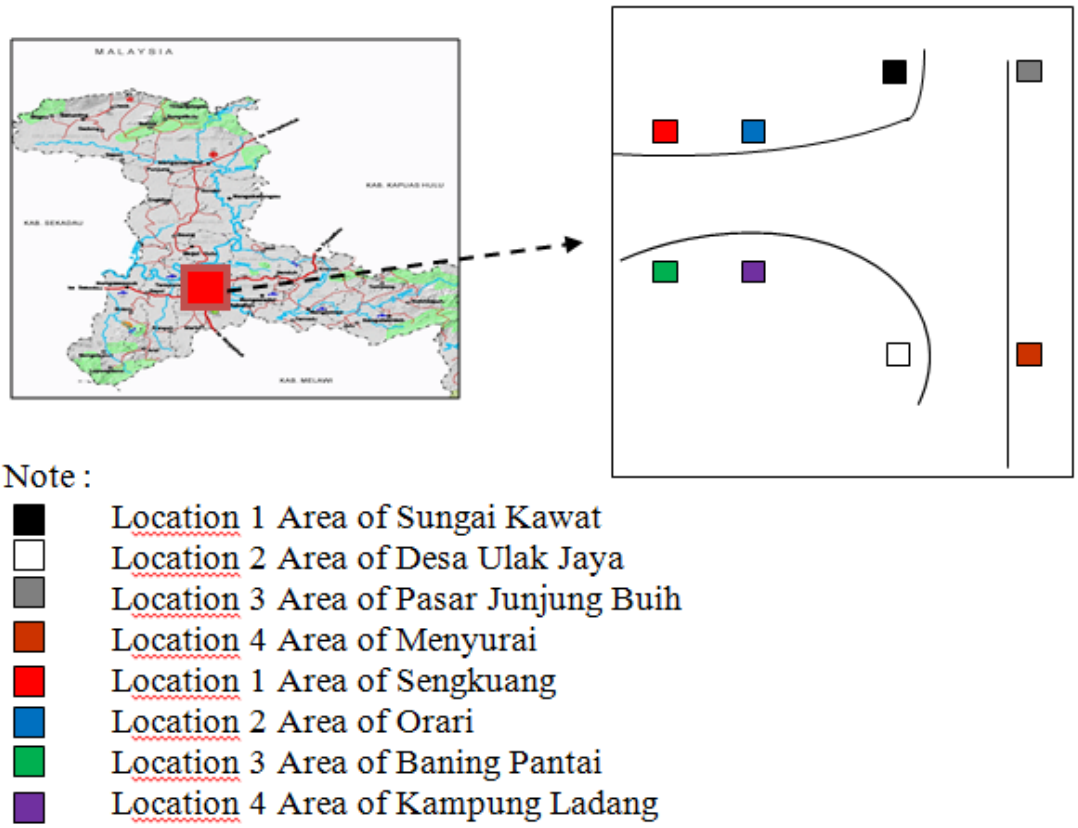

Figure 2. Research Location (Research Document, 2018)

Results and Discussion

The observations results in the Kapuas and Melawi river regions indicate that there are two classes of Annelid phyla, which are; the Oligochaeta and Hirudinae classes. The Oligochaeta class is represented by *Tubifex sp*, *Lumbricus terrestris* and *Pharetima sp.* while the Hirudinae class is represented by *Haemodipsa sp*.

Determination of the Oligochaeta class and the Hirudinae class are based on their body characteristics. The observations regarding the characteristics of the Oligochaeta class show that its body consists of segments, has a clitellum and its body color is red to brownish. This is in line with Mulyawan (2016), that Oligochaeta has a character with little seta, prostomium which is located at the anterior end and has a clitellum (behind the prostomium).

The observations results regarding the characteristics of the Hirudinae class show the characteristics of its body segments have suction devices; the color is white to blackish. According to Rukmana (2008) Hirudinae live in fresh water, sea water and damp (wet) places, have two suckers, one on the face (around the mouth) and one behind (around the anus). The species from the two classes can be seen in Figure 3.

Figure 3. Species from the Annelide phylum (Research Document, 2018)

Observations regarding the presence of Annelids show that the composition of Annelida in the Kapuas and Melawi rivers varies. This is in accordance with the discovery of the Oligochaeta and Hirudinae classes. The presence or composition of Annelida in the Kapuas and Melawi rivers can be seen in Table 1 and Table 2.

Table 1. Existence of Annelids in four locations of the Kapuas River

Week	Annelida Types		St. 1	St. 2	St. 3	St. 4
1	Oligochaeta	*Tubifex sp.*	-	-	-	-
		Lumbricus terretris	4	2	7	2
		Pharetima sp.	-	1	2	2
	Hirudinae	*Haemodipsa*	-	-	-	-
		Hirudo medicinalis	-	-	-	-
2	Oligochaeta	*Tubifex sp.*	-	7	-	-
		Lumbricus terretris	4	6	2	4
		Pharetima sp.	1	4	-	1
	Hirudinae	*Haemodipsa*	-	-	-	-
		Hirudo medicinalis	-	-	-	-
3	Oligochaeta	*Tubifex sp.*	-	-	-	-
		Lumbricus terretris	8	6	2	6
		Pharetima sp.	-	1	-	2
	Hirudinae	*Haemodipsa*	-	-	-	-
		Hirudo medicinalis	-	-	-	-

Table 2. Existence of the number of Annelids in four Melawi River locations

Week	Annelida Types		St. 1	St. 2	St. 3	St. 4
1	Oligochaeta	*Tubifex sp.*	-	-	-	-
		Lumbricus terretris	3	5	-	2
		Pharetima sp.	1	-	2	2
	Hirudinae	*Haemodipsa*	-	-	-	-
		Hirudo medicinalis	-	-	-	-
2	Oligochaeta	*Tubifex sp.*	-	-	-	-
		Lumbricus terretris	2	2	-	-
		Pharetima sp.	-	1	-	-
	Hirudinae	*Haemodipsa*	-	-	1	-
		Hirudo medicinalis	-	-	-	-
3	Oligochaeta	*Tubifex sp.*	-	-	1	-
		Lumbricus terretris	5	1	-	3
		Pharetima sp.	-	2	-	-
	Hirudinae	*Haemodipsa*	-	-	1	-
		Hirudo medicinalis	-	-	-	-
Total			11	11	5	7

The existence of the number of Annelida phyla in the Kapuas and Melawi rivers can clearly be illustrated through the graph as shown in Figure 4 and Figure 5.

The results of observations in Table 1 and Figure 4 in the Kapuas river show that in the first week in all locations no Annelida species were found, especially *Tubifex sp*. This is because the ambient temperature in the Kapuas river region is quite high, around 35 °C-45 °C. Chilmawati (2015) mention that the temperature range allowed for the maintenance of silk worms is between 25°C - 30 °C.

The number of *Tubifex sp* was found were 7 and only can be found in location 2 on the Kapuas River. The finding of *Tubifex sp* was because the river area was found in a residential area that provides food and nutrition for the survival of *Tubifex sp.* Chilmawati (2015) said that the higher the organic matter in the media will increase the number of organic particles and bacteria so that it can increase the amount of food in the media and affect the population and length of *Tubifex sp.*

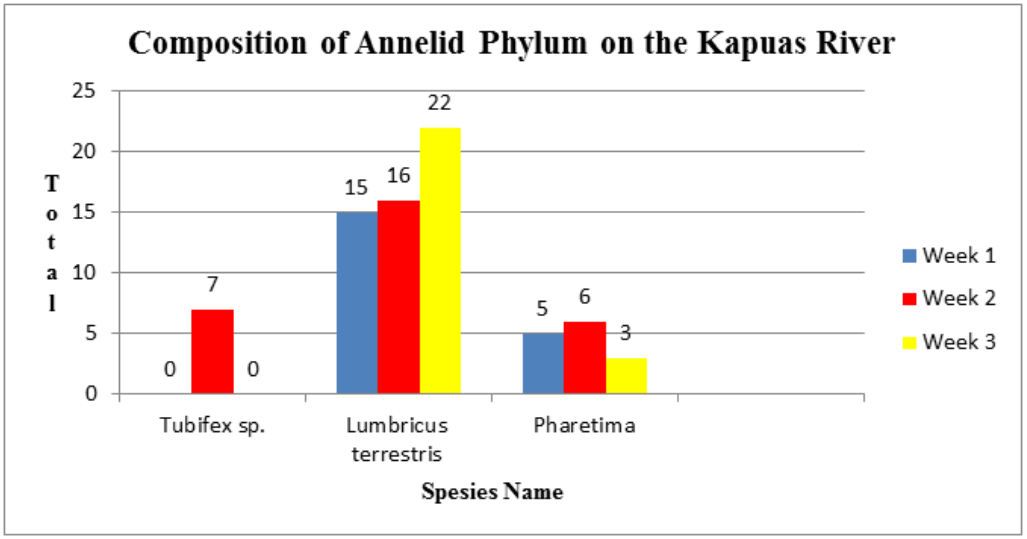

Figure 4. Graph of composition of Annelid Phylum on the Kapuas River

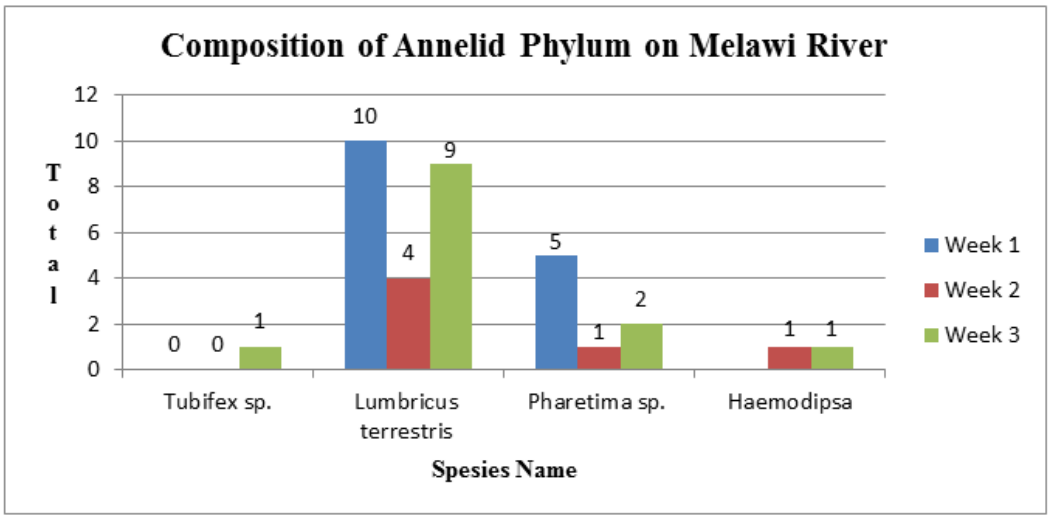

Figure 5. Graph of composition of Annelid Phylum on Melawi River

The observations results in Table 1 and Figure 4 on the Kapuas river also show that in all locations *Lumbricus terrestris* and *Pharetima sp.* were found. The total number of *Lumbricus terrestris* is 53 species and *Pharetima sp* is 14 species. This is because the substrate in the form of moist soil contains a lot of food and nutrients. The high frequency of rainfall also affects the number of Annelids. Brata (2017) revealed that the living conditions of earthworms are influenced by several factors including humidity (28-42%), temperature (23°C-26°C), availability of organic matter, and acidity (6,8-7,2).

The observations results in Table 2 and Figure 5 on the Melawi River indicate that the *Tubifex sp* was only found in the third week for 3 locations with 1 species only. This is because the river area is close to the market so there is availability of food and nutrients for the survival of *Tubifex sp*. Chilmawati (2015) revealed that the higher organic matter will increase the number of organic particles and bacteria so that it can increase the amount of food and affect on the population of *Tubifex sp*. Functionally earthworms can be grouped into three, such as 1). Waste organic matter eater, compost eater, and green manure eater, 2). Fertile soil or wet soil eater, and 3). Soil eater (Milasari, 2013).

The observations results in Table 2 and Figure 5 on the Melawi River also show that in all locations there are *Lumbricus terrestris* and *Pharetima sp.* This is because the substrate for both of those species are suitable, which is moist soil, contains a lot of food and nutrients and supported by rainfall in the second week. This is in accordance with Mulyawan (2016) that earthworms prefer moist conditions. Earthworms live in the type of organic material derived from plant remains and earthworms living are influenced by several factors including humidity, temperature and availability of organic matter (Brata, 2017).

Total *Lumbricus terrestris* found were 23 species and *Pharetima sp* were 8 species. One species of the Hirudinae class is *Haemodipsa sp*., 2 species were found. *Haemodipsa sp* was found in the second and third weeks at site 3. This was also supported by the availability of nutrients for the survival of Haemodipsa sp. According to Kazanci (2015) the availability of food organisms, substrate, water depth, water flow, size and properties of water bodies, hardness, water pH and temperature, minimum concentration of dissolved oxygen, turbidity and salinity of water are the most important factors affecting leech distribution (*Haemodipsa sp*).

Tubifex sp. can live in polluted waters (Iswanti, 2012, Agustinus, 2016 and Ngatung, 2017), with pink bodies (Assanthi, 2014). *Tubifex sp* is able to survive because of its ability to do respiration at low oxygen pressures. *Tubifex sp.* can be used as an indicator of pollution because of its ability to

live in polluted water conditions (Suminto, 2014). The presence of *Tubifex sp* is influenced by seasonal factors and organic matter (Safrina, 2015, Suprayudi, 2013 and Kusumorini, 2017).

According to Alamsyah (2013) the chemical composition of earthworms includes crude protein 60-72%, fat 7-10%, ash 8-10%, and energy 900-1400 calories. The activity of *Lumbricus terrestris* or earthworms can change soil structure, groundwater flow, nutrient dynamics and plant growth; its existence is not important for healthy soil systems but is a "bioindicator" of healthy soils that have a beneficial function for the ecosystem (Sari, 2014, Juwita 2017 and Widiastuti, 2018). The body shape of *Pharetima sp.* is segmented body lengths (Yulipriyanto, 2010, Darmawiyanti, 2013 and Firmansyah, 2017). *Haemodipsa sp*. life attaches to leaves in moist areas. This animal is an ectoparasite like a leech.

Conclusion

Based on the results of the study there are two classes of annelid phyla, such as Oligochaeta and Hirudinae classes. Oligochaeta class is represented by *Tubifex sp, Lumbricus terrestris*, and *Pharetima sp* while Hirudinae class is represented by *Haemodipsa sp*. The presence of *Tubifex sp* species in the Kapuas River and Melawi River shows that the quality of river waters is low, or it is polluted waters.

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