

Riparian Vegetation of Suhuyon River, North Sulawesi

Ratna Siahaan^{*)} and Parluhutan Siahaan^{*)}

Biology Department, Faculty of Mathematics and Natural Sciences, University of Sam
Ratulangi, Manado

E-mail: ratna245_siahaan@yahoo.com

Abstract. Riparian vegetation has important ecological roles in maintaining river quality. The declining of riparian vegetation will cause to decreasing of water quality and aquatic and terrestrial biodiversities. This study aimed to analyze riparian vegetation of Suhuyon River, North Sulawesi. Vegetation analysis method used in this study from upstream to downstream in February to July 2015. The method applied in vegetation analyzing was quadrat line transect. The plot size was 2 m x 2 m for undergrowth up to 1.5 m height. Riparian vegetation will be analyzed descriptively with several indices i.e. Shannon-Wiener diversity index (H'), Evenness Index, and Sorensen Similarity Index. Riparian zone has been used as agricultural land and settlements. Riparian plants are coconuts, bananas, mangoes, langsat, durio and arenga palm. Vegetation habitus are shrubs, epiphytes, lianas, and small trees. Riparian vegetation are classified into Acanthaceae, Amaranthaceae, Araceae, Aspleniaceae, Asteraceae, Athyroaceae, Caesalpiniaceae, Caryophyllaceae, Costaceae, Fabaceae, Magnoliaceae, Malvaceae, Marattiaceae, Melastomaceae, Mimosaceae, Moraceae, Myrtaceae, Lamiaceae, Piperaceae, Poaceae, Rubiaceae, Selaginellaceae, Thelypteridaceae, dan Verbenaceae. Riparian vegetation were found 36 species and 24 families. Diversity index of undergrowth riparian vegetation of Suhuyon River are moderate from upstream to downstream, i.e. 2.70; 2.73 and 2.25. Evenness values of third station showed the dominance of certain species. Evenness values are respectively from upstream to downstream i.e. 0.89; 0.91 and 0.83. Similarity index of riparian vegetation showed that undergrowth riparian vegetation is different i.e. 44% and 56% .

Keyword: Riparian vegetation, Suhuyon River, North Sulawesi

Introduction

Suhuyon River is one of several rivers that end up to Ranoyapo Watershed. Suhuyon River flows through two districts, South and Southeast Minahasa District then join into Ranoyapo River before heading to Amurang Gulf, South Minahasa. Suhuyon river is a tributary of the main Ranoyapo River of Watershed Ranoyapo. Suhuyon River is located in the middle part of Ranoyapo Watershed

Land use of Ranoyapo Watershed is critically now. The Department of Public Works (2012) reported that land use of Ranoyapo Watershed is dominated by mixed farmings (60.78%) and only the remaining 23, 14% secondary forest and 0.87% primary forest. Land conversion from forest to non-forest can reduce the water quality of Ranoyapo River.

The upper and mid Ranoyapo Watershed has important ecological functions i.e. area of land and water conservations and a supplier

of litter into water bodies that will improve the water quality of the river. Function of water bodies is inseparable from riparian zone that is frequently affected by river water. Riparian vegetation has important role in fish productivity (Allan 1995; Johnson et al. 1995). Riparian vegetation is habitat for terrestrial wildlife (Mitsch and Gosselink 1993) and a place for animals to hiding, spawning and nursering (Mitsch and Gosselink 1993; Sparks 1995; Jones et al. 1999).

Generally, upper and middle part watershed used as farmland. Pollutants originating from agriculture carried by the water (runoff) towards the river. Riparian vegetation acts as a buffer between the river and the land. These pollutants can be controlled by riparian vegetation (Tourbier 1994) before runoff from the surrounding watershed runs through the riparian zone. The pollutants contained in the runoff are trapped in the roots of riparian vegetation. Not only as trapper, riparian vegetation also maintains water quality by regulating the temperature

of the water (Mitsch and Gosselink 1993; Bailey 1995), river bank erosion control (Jones et al., 1999) and sedimentation (Jones et al., 1999).

The changing of land use in the Ranoyapo Watershed can degrade the quality of the upstream Ranoyapo. The most rapid changes carried out in the zone riparia. Villagers generally change riparia zone in the form of forest to agriculture such as rice fields and mixed gardens. Studies of riparian vegetation of Suhuyon River has never been reported yet. This research was conducted to analyze the structure riparian vegetation of Suhuyon River.

Methods

Purposive random sampling method was applied into determining the representative research stations from up to down. The chosen stations were located at Liandok Village (South Minahasa District) for upstream, Beringin Village (South Minahasa District) for middle and Kalait Village (Southeast Minahasa Regency) for downstream Suhuyon River (Figure 1). Suhuyon River is located in middle of Ranoyapo Watershed. The study was conducted at the end of the rainy (February 2015) to the dry seasons (July 2015).



Figure 1. Reserch station distribution on Sihuyon River - Ranoyapo Watershed

Riparia is area adjacent to the river that periodically affected by floods (Gosselink et al. 1980; Huffman and Forsythe 1981; Mitsch and Gosselink, 1993; Naiman et al. 2005). Plants that grow there are called riparian vegetation. Riparia zones were known by field observations and infromation from people along Suhuyon River.

The method used in vegetation analyzing was quadrat line transect. Analysis carried out on undergrowth vegetation, namely ferns, lianas, herbs, shrubs and grasses. Observations were made at three observation points in each section of the river. The plot size was 2 m x 2 m for undergrowth up to 1.5 m height) (Soerianegara and Indrawan 2008).

Riparian vegetation was analyzed descriptively with several indeces i.e. Shannon-Wiener diversity index (H') (Krebs 1972; Magurran 1991), Evenness Index (Odum 1996), and Sorensen Similarity Index (Odum 1996; Fachrul 2006).

Results and Discussion

Land use along Suoyon river was dominated by mixed garden and settlements. People cultivated plants on riparian zone such as coconuts, bananas, mangoes, langsat (*Lansium domesticum*), durio (*Durio zibethinus*) and arenga palm (*Arenga pinnata*). Vegetation habitus are shurbs, *epiphytes*, lianas, and small trees. Riparian vegetasi were found 36 species and 24 families. Riparian vegetation families were Acanthaceae, Amaranthaceae, Araceae, Aspleniaceae, Asteraceae, Athyroaceae, Caesalpiniaceae, Caryophyllaceae, Costaceae, Fabaceae, Magnoliaceae, Malvaceae, Marattiaceae, Melastomaceae, Mimosaceae, Moraceae, Myrtaceae, Lamiaceae, Piperaceae, Poaceae, Rubiaceae, Selaginellaceae, Thelypteridaceae, and Verbenaceae. Species richness and the families number between Liandok dan Beringin Villages were not diffrent but different to Kalait Village (Figure 1).

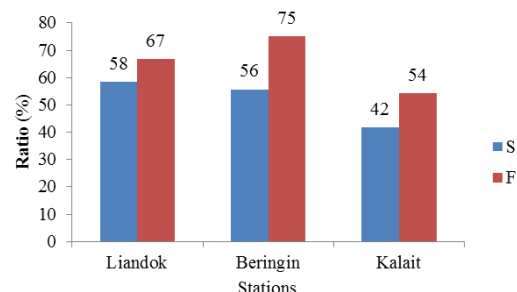


Figure 1. Ratio of species richness (S) and the families number (F) from up to down Suhuyon River

Species diversity indices were respectively from upstream to downstream, namely 2.70; 2.73 and 2.25 (Figure 2). The H' value of the upper and middle were not different, but different to down river. Magurran (1988) classified value of diversity index into several levels. If the value $H' < 2$ then the value H' is low, if the value of $H' = 2-3$ then classified as moderate and if the value of $H' > 3$ then it is high. Based on the classification, diversity index of riparian vegetation of Suhuyon River are moderate class. This was due to riparia zone already used as agricultural land. Utilization of riparian zones for farming and settlement will reduce riparian vegetation diversity.

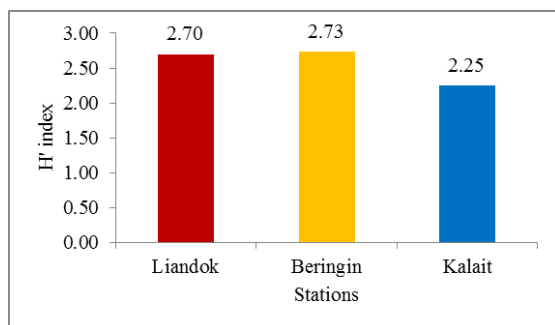


Figure 2. Diversity Index (H') from up to down Suhuyon River

Evenness values were respectively from upstream to downstream i.e. 0.89; 0.91 and 0.83 (Figure 3). Magurran (1988) stated that if the value of evenness is closer to the maximum value (1) then the number of individuals of each species is almost the same. Evenness values of third station showed the dominance of certain species. This dominance could be caused by adaptability of vegetation to utilize existing resources.

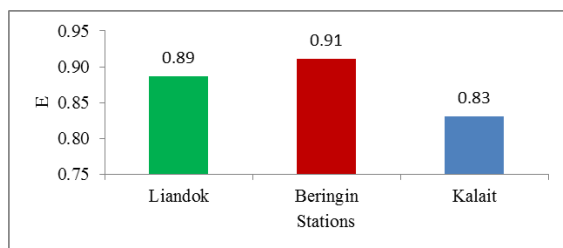


Figure 3. Evenness Index (E) from up to down Suhuyon River

Similarity index of riparian vegetation were 44% and 56% (Table 1). This indicated that undergrowth riparian vegetation of three stations was different to each other. The

difference was due to the some species are only found at one station and the difference in abundance.

Table 1. Similarity Index from up to down Suhuyon River

Stations	Similarity Index		
	Liandok	Beringin	Kalait
Liandok	-	44%	44%
Beringin		-	56%
Kalait			-

Conclusion

Riparian plants were cultivated along Suhuyon River from up to down are coconuts, bananas, mangoes, langsung, durio and arenga palm. Vegetation habitus are shrubs, epiphytes, lianas, and small trees. Riparian vegetasi were found 36 species and 24 families. Diversity index of undergrowth riparian vegetation of Suhuyon River was moderate from upstream to downstream, i.e. 2.70; 2.73 and 2.25. Evenness values of third station showed the dominance of certain species. Evenness values were respectively from upstream to downstream i.e. 0.89; 0.91 and 0.83. Similarity index of riparian vegetation showed that undergrowth riparian vegetation was different i.e. 44% and 56% .

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