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COLLEMBOLA POPULATION AND DISTRIBUTION IN THE LITTER OF THREE TYPES OF LAND USED ON BUNGO DISTRICT JAMBI PROVINCE, INDONESIA

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Abstract

The study had been conducted on February to July 2014. It was determined the population and distribution of Collembola on litter in the three types of land used, secondary forest, rubber plantation and oil palm plantation. This study was used belt quadrat methods with measure 25 x 25 cm2. Generally, total individual of Collembola were found 248. Total Index diversity was 1.76.

Keywords: Bungo District; Collembola; Distribution; Litter; Population.

1. Introduction

The litter is a place for decomposing where organism and microbe conduct it. It is also a place to food stockpile for organisms that live in the litter. One of the organisms that live in the litter area is Springtails (Suhardjono *et al.*, 2012).

Collembola has act as decomposer that gives sustainability to the ground. Besides that, the act of Collembola is combined materials that decomposed from soil level to up surface level. So that, it will created a good fertility habitat. Barnes (1997) state that Collembola is an organism that able to process the combining organic material to soil surface level. Except that, Collembola is also an animal that accumulated with many organic materials (Ganjari, 2008).

The present of Collembola has wide spread to several lands, Bungo District in Jambi Province. This land is an area that happened rapidly change in it. For instance, forestland becomes rubber plantation and rubber plantation becomes oil palm plantation. After all, this study is conducted to know the population and distribution of Collembola in this area; also it is to know about the diversity of Collembola on litter in this area.

2. Materials and Methods

This study had been conducted between February to July 2014 on the three types of land used (Secondary Forest, Rubber Plantation and Palm Oil Plantation) in Bungo District, Jambi Province, Indonesia. In each land, it was taken 6 point of samplings; there are two points at first border, two points at the middle and the others at the second border. Each point was repeated three times. This study was used belt transect with size 25 x 25 cm^2. The sampling collection was done with collecting the litter that in transect. Then, sample was put in plastic bag that had been labeled. After that, the sample was brought to lab for extracting using *Barlese Tullgreen* for 72 hours. The down side of the tool was put a thing that had been added alcohol 95%. Next, the sample was filtered and divided into several groups, and then it was identified in Laboratorium of Animal Ecology, Faculty of Mathematics and Natural Sciences, University of Andalas. It also takes place in Laboratorium of Zoology, Indonesia Sciences Institute (LIPi), Indonesia. After that, the sample was calculated to find the diversity index value using formula after Magurran, 2004.

3. Results and Discussions

In general, Collembola on the three types of land used (Secondary forest, Rubber Plantation, and Oil Palm Plantation) is found 19 species that it belongs to into nine Families with total 248 Individuals. In general, the highest number of individual is Family Entomobryidae and species of *Ascocyrtus* sp., and the lowest number of individual is Family Sminthurididae with species *Sphaeridia* sp., (Table 1).

Based on the three types of land, the highest density in total is found on the secondary forest with 322, 64 ind/m^2, and oil palm plantation is the lowest density in total with 149, 33 ind/m^2. The high and low of density values on the three types of land is because the competition between predator and Collembola, also between Collembola itself with different species. Rizali *et al.,* (2002) found that ant; "tungau", Coleoptera larvae and spiders are predator of Collembola. Besides that, present or absent of food sources give serious effect on density of Collembola (Jucevia and Maleis, 2005).

Based on the Family and Species numbers, the highest is Family Entomobryidae (Secondary Forest with 61,33 ind/m^2, Rubber Plantation with 85,33 ind/m^2 and Oil Palm Plantation with 56,00 ind/m^2) and species of *Ascocyrtus* sp. (secondary forest with 56,00 ind/m^2, rubber plantation with 66,67 ind/m^2 and oil palm plantation with 32,00 ind/m^2). The high density of *Ascocyrtus* sp. is happened because the habitat is match for it to live. Even though, these species can be found on the different geographical area. Suhardjono *et al., (*2012) said that Family of Entomobryidae with the species of *Ascocyrtus* sp. was a species that can be found on wet habitat, has food source and different geographical areas.

The lowest density of Family and Species is on secondary forest with Family Oncopoduridae 2.67 ind/m^2 and species of *Oncopodura* sp. 2.67 ind/m^2. Rubber Plantation is found Family Cyphoderidae and Paronellidae with 2.67 ind/m^2 each, also species of *Cyphoderopsis* sp. 2.67 ind/m^2, and *Pseudoparonella* sp. 2.67 ind/m^2). Oil palm plantation is found Family Hypogastruridae with 5.34 ind/m^2, spesies *Ceratophysella* sp. 2.67 ind/m^2, and *Xenylla* sp. 2.67

ind/m^2 (Table 1). Less numbers of food source in the nature, happening competition, and natural disaster like flood, and other different geographical area affects the low density of Family and Species. Suhardjono *et al.,* (2012) said that Collembola is affected by the source of food in nature, the presenting of competition, the geographical of a habitat. Russel *et al.,* (2004) also state natural disaster like flood is one of the factors that the decreased or extinguished of animal population like Collembola and other organisms. It will make stressed to organism for living. Besides that, it will also make the decreasing of mortality.

Table 1: Density (ind/m^2), Relative Density (%), Frequency (%) of Collembola was on the Litter in the three types of Lands at Bungo District, Jambi Province.

No	Location / Point Sampling	Secondary Forest						Perkebunan Karet						Perkebunan Sawit					
		Part 1		Part 2		Part 3		Part 1		Part 2		Part 3		Part 1		Part 2		Part 3	
		D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR
I	**Arrhopalitidae**													5.34	4.55				
1	*Collophora* sp													5.34	4.55				
II	**Cyphoderidae**	2.67	2.44							2.67	4.16								
2	*Cypoderopsia* sp	2.67	2.44							2.67	4.16								
III	**Entomobryidae**	61.33	56.10	56.00	46.67	45.33	48.57	17.33	51.99	29.33	45.83	85.33	80.01	56.00	47.73	10.67	57.14	5.34	40.01
3	*Acrocytus* sp	2.67	2.44	10.67	8.89			2.67	7.99			8.00	7.50						
4	*Ascocytus* sp	56.00	51.22	45.33	37.78	34.67	37.14	14.67	43.99	26.67	41.67	66.77	62.51	32.00	27.27	8.00	42.86	5.34	40.01
5	*Homidia* sp					8.00	8.57							2.67	2.27				
6	*Rambutsinella* sp	2.67	2.44			2.67	2.86			2.67	4.16	10.67	10.00	13.33	11.36	2.67	14.28		
7	*Willosia* sp													8.00	6.82				
IV	**Hypogastruridae**	2.67	2.44	2.67	2.22	5.34	5.72					8.00	7.50	5.33	4.54				
8	*Ceratophysela* sp											5.33	5.00	2.67	2.27				
9	*Xenyla* sp	2.67	2.44	2.67	2.22	5.34	5.72					2.67	2.50	2.67	2.27				
V	**Isotomidae**	34.67	31.71	56.00	46.67	34.67	37.14	10.67	32.01	26.67	41.68	10.67	10.00	34.67	29.55	5.34	28.58	8.00	59.99
10	*Folsomides* sp	18.67		50.67	42.23	32.00	34.29	10.67	32.01	26.67	41.68	10.67	10.00	34.67	29.55	5.34	28.58	8.00	59.99
1	*Isotomi*			2.	2.														

		D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR	D	DR
11	*des* sp			67	22														
12	*Isotomiella* sp	16.00	14.64	2.67	2.22	2.67	2.86												
VI	**Neanuridae**	**8.00**	**7.32**	**2.67**	**2.22**	**2.67**	**2.86**	**5.34**	**16.00**					**16.00**	**13.64**	**2.67**	**14.28**		
13	*Ceratemeria* sp			2.67	2.22											2.67	14.28		
14	*Friesea* sp	5.34	4.88					5.34	16.00					16.00	13.64				
15	*Oudemansia* sp	2.67	2.44			2.67	2.86												
VII	**Oncopoduridae**			**2.67**	**2.22**					**2.67**	**4.16**	**2.67**	**2.50**						
16	*Oncopodura* sp			2.67	2.22					2.67	4.16	2.67	2.50						
VIII	**Paronellidae**					**2.67**	**2.86**			**2.67**	**4.16**								
17	*Bromacanthus* sp					2.67	2.86												
18	*Pseudoparonella* sp									2.67	4.16								
IX	**Sminthuridae**					**2.67**	**2.86**												
19	*Sphaeridia* sp					2.67	2.86												
Total		109.33	100	120.00	100	93.33	100	33.34	100	64.00	100	106.66	100	117.33	100	18.67	100	13.34	100
Total Density each Land		322.64						203.99						149.33					

Note: D= Density and DR= Density Relative

Table 2: Diversity Index and Equitability Index of Collembola on the Litter at the three types of land used.

	The Land		
Parameter	Secondary Forest	Rubber Plantation	of Oil Palm Plantation
H'	1.54 a	1.48 a	1.77 a
E	0.57	0.64	0.77

Note: using *t* test with 95% of confidence level.

Diversity and Equitability Index of Collembola on the Litter are found that each land was diverse enough. Based on the diversity index test, it can be seen that the highest value was oil palm

plantation with 1.77 and the lowest was rubber plantation with 1.48. However, According to criteria of diversity index value, these belong to medium level of diversity index.

Diversity of Collembola in this study is higher than Kebun Raya Unmul Samarinda is 0.92. (Trimurti, 2010). High and low of diversity index value are affected by the numbers of species and individual (odum, 1998). These can be proof that Collembola on Bungo District found 19 species with 9 Families and 248 Individuals at the litter. On the other hand, Kebun Raya Unmul Samarinda only found three families with 95 individuals of Collembola.

Equitability index of Collembola on Litter in the three types of land used is belongs to quite spreading. It can be proof that if the value of E'=0 means the equitability each species is difference. When the E'=1 means that the equitability of each species is quite same. (Magurran, 2004). In this study, all the equitability value is almost into one. It means these quite the same.

Table 3: Similarity Index of Collembola on Litter at three types of land used.

Land Used	Secondary Forest	Rubber Plantation	Oil Palm Plantation
Secondary Forest	-	68.84 %	39.35 %
Rubber Plantation	-	-	59.63 %
Oil Palm Plantation	-	-	-

Based on the similarity index of Collembola on Table 3, it clear that the high value of similarity index is found between secondary forest and rubber plantation with 68.84%. The lowest value is between secondary forest and oil palm plantation with 39.35%.

From the data above, it can be concluded that two lands had same criteria of Collembola and one is not because both of them had value more than 50%. According to Kendeigh (1980), if a community that said the same must has value of similarity index value more than 50%.

4. Conclusions and Recommendations

Based on all the data above, it can take a conclusion that Collembola diversity in these belongs to medium level and had the same level of similarity. In this study, there are needed some further research like to find out about how the Collembola behavior in the nature, reproduction behavior of Collembola in this area and others.

Acknowledgements

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