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Locusts (Acrididae) Diversity in Gunung Bunder Forest Park

Sri Rahayu*, Sulistiyawati
Biology Education Department, Faculty of Science and Technology, UIN Sunan Kalijaga Yogyakarta
Jl. Marsda Adisucipto No 1 Yogyakarta 55281, Indonesia. Tel. +62-274-540971, Fax. +62-274-519739.
*Email: sri.rahayu527@gmail.com

Abstract. *Rahayu S, Sulistiyawati. 2017. Locusts (Acrididae) Diversity in Gunung Bunder Forest Park. Proc Internat Conf Sci Engin 1: 49-53.* The aim of this study was to know the grasshopper diversity in Gunung Bunder Forest Park. Sampling plots were done by purposive sampling method. Grasshoppers were catched by a sweeping net and glue trapping. The result of the research were as follows: grasshopper diversity (H'=1.32), the number of individuals (n=1127), dominance index (D=0.4) and the species evenness index (E=0.55). Grasshopper species found are *Phlaeoba fumosa, Stenocatantops splendens, Stenocatantops angustifrons, Eucoptacra sp., Chondracris rosea, Valanga nigricornis, Leptacris sp., Gastrimargus marmoratus, Trilophidia annulata, Oedaleus infernalis, Oxya japonica* and *Caryanda spuria*.

Keywords: Acrididae, Grasshopper, Gunung Bunder Forest Park

INTRODUCTION

Gunung Bunder Forest Park is located in Desa Bunder, Patuk, Playen, Gunung Gading subdistrict (BKSDA, 2007). The village is in the region of Bunder Stakeholder Forest Resort. Gunung Bunder Forest is located at an altitude of 110 meters to 200 meters above sea level with rainfall of 1,900 mm/year and the average air temperature is 27,7º C (Utami and Indrayani, 2013).

Gunung Bunder Forest Park was production forest that become conservation forest by the Minister of Forestry No. 353/ Menhut-II / 2004 on Function Change of Forest Area Bunder plots 11, 15, 20, 21 and Banaran plots 19, 22, 23, 24 area ± 617 ha located in Gunung Kidul Regency of Yogyakarta. Special Region into Forest Park (MoF, 2007).

Flora of Bunder Forest are dominated by eucalyptus (*Melaleuca leucadendron*), acacia (*Acacia auriculiformis*), mahogany (*Swietenia macrophyla*), Albizia Buto (*Albizia sp*), and various agroforestry crops such as breadfruit (*Artocarpus cummini*), and cashew (*Anacardium occidentale*).

Bird is the only fauna that have been studied. Grasshoppers (Acrididae) have never studied yet (Haryono, personal communication, March 22, 2016). It is interesting necessary to study the diversity of grasshopper in Gunung Bunder Forest Park.

MATERIALS AND METHODS

Time and Place of Research

The research were done for 2 months (June-July 2016). The research includes two resort namely Stakeholder Forest Resort Bunder and Resort Stakeholder Forest Banaran.

Equipment and Materials Research

The tools used in data collection is a sweep net, glue trapping, plastic bottle that, small jars, thermo-hygrometer, lux meter, soil tester, Global Position System (GPS), compass, rope measured length, paper labels, stationery, camera and insect identification book. While the materials used are chloroform 70% and cotton.

Method of Collecting Data

Sampling plots were done by purposive sampling method, by selecting four plots which have a different structure vegetation.

Sampling is done by making main transect line with a length of 2000 m following the path of the trail. Every 20 m on the main transect perpendicular secondary transects made along 20 m to the right and to the left. On each transect secondary made observation area with an area of 500 m2 (20 mx 25 m)

Grasshoppers were trapped using a sweeping net and glue. Sweeping were carried on at a low herbaceous vegetation, shrubs and grasses by using a sweep net which swung as much as 15 swings and repeated 3 times. Glue method is done to trap locusts seen in high vegetation.

Identification was done based on morphological characteristics and matched with references.

Measurement of abiotic factors include air temperature, air humidity, soil pH and light intensity. Measurement of temperature and humidity using a thermo-hygrometer, the pH of the soil using a soil tester and light intensity using a lux meter.

Data Analysis Technique

a. Species diversity index

To determine the species diversity index, we use Shannon-Wienner formula (Southwood, 1971)

$$H' = -\Sigma ni / N \ln ni / N$$

Explanation:

H ' = Shannon Diversity Index-Wienner
ni = Number of individuals of a species
N = The total number of individuals arrested
If the value of H'<1 = low diversity, 1<H'<3 = moderate diversity, H'>3 = high diversity (Magurran, 1988).

b. Species evenness index (E)
Evenness index (Evenness) is calculated by Pielou formulations.

$$e = H' / \ln S$$

Information:
H ' = Shannon Diversity Index-Wienner
S = Number of species

Evenness value ranges between 0 and 1. A value of 1 if an abundance of each species approximately has uniform number.

c. Relative abundance

Relative abundance is used to determine the proportion of species abundance. The formula is as follows:

$$KR = \frac{ni}{N} \times 100\%$$

Information:
ni = Number of individuals in the *i* kind
N = The total number of individuals

RESULTS AND DISCUSSION

Based on the results of the study, total locusts traped were 1127 individuals, consist of 12 species belong o seven subfamilies, covering subfamily Acridinae, Hemiacridinae, Catantopinae, Coptacridinae, Cyrtacanthacridinae, Oedipodinae and Oxyinae. Relative density for each species are presented in Table 1.

Table 1. Grasshopper Species Found in Gunung Bunder Forest Park.

No	Subfamily	Species	Number of Individuals	RD (%)
1.	Acridinae	*Phlaeoba Fumosa*	275	24.4
2.	Catantopinae	*Stenocatantops splendens*	601	53.34
		Stenocatantops angustifrons	129	11.45
3.	Coptacridinae	*Eucoptacra sp.*	12	1.09
4.	Cyrtacantha-cridinae	*Chondracris rosea*	3	0.30
		Valanga nigricornis	9	0.80
5.	Hemiacridinae	*Leptacris sp.*	3	0.30
6.	Oedipodinae	*Gastrimargus marmoratus*	2	0.18
		Trilophidia annulata	13	1.12
		Oedaleus infernalis	16	1.45
7.	Oxyinae	*Oxya japonica*	31	2.72
		Caryanda spuria	32	2,81

RD = Relative Density

Parameters measured in this study included the number of species, the number of idividu, diversity index, dominance and evenness index (Table 2).

Table 2. Parameters Measured in Research.

Parameter	Amount
Number of species / species	12
number of individuals	1127
diversity Index	1.37
dominance	0.4
Species evenness index	0.55

Diversity of a living being cannot be separated from environmental inferences. Environmental factors measured in this study include air temperature, humidity, and light intensity (Table 3).

Table 3. Environmental Parameters Measured in the Research.

Environmental parameters	Value
Air temperature	31.50 ° C
Humidity	83.43%
Soil moisture	80%
soil pH	7
Light intensity	004 lux

Based on Table 1 it can be seen that the number of species of grasshoppers (Acrididae) found in Gunung Bunder Forest Park are as many as 12 species belong to 7 subfamily. The most common species found is from the subfamily Oedipodinae, which have three species found. Subfamily Catantopinae, Cyrtacanthacridinae and Oxyinae each have two species. Subfamily Coptacridinae, Hemiacridinae and Acridinae are subfamily with the fewest number of species found, that

is only one species (Table 1). The high diversity of subfamily Oedipodinae are similar according to the results of research conducted by Raghavender and Vastrad. Oedipodinae is a subfamily that has the highest species richness in forest ecosystems (Raghavender and Vastrad, 2017).

Of the 12 species found, *Stenocatantops splendens* is the most abundant species, namely 601 individuals (RD = 53.34%) (Table 1). *Stenocatantops splendens* is widely spread in Asia tropical and sub-tropical (Zhu, et al., 2013). In Indonesia Stenocatntops splendens can be found in Borneo, Java, Maluku, Papua and Sumatra (Sharma, 2012). The high number of Stenocatantops splendens possible because host plants Stenocatantops splendens coverage is very broad. *Stenocatantops splendens* eat herbaceous plants and grasses (Hsiao, et. Al., 2017). In this study, the intensity for encounter Stenocatantops splendens are very high. *Stenocatantops splendens* found throughout the hours of observation. Based on the research results by Erniwati (2009), *Stenocatantops splendens* active from 08:00 to 12:00.

The second highest individual after *Stenocatantops splendens* is *Phlaeoba fumosa* namely 275 individuals (KR = 24.4%) (Table 1). Sulistiyowati (2015) also report that *Phlaeoba fumosa* is the species most commonly found. Sharma (2012) also showed that the genus Phlaeoba experienced a population peak in July (20.97%) and August (19.47%). In this month an increase in relative humidity of the soil affects vegetation growth enhancement of plants. According Wilemse (2001), Orthoptera population is closely related to vegetation, because plants are the source of food. Phlaeoba grasshopper host plants such as grasses Fumosa (Hsiao et al., 2017).

Fewest individual found are Gastrimargus marmoratus (Table 1). The low number of individuals found was due to the main habitat is the grasslands. Gastrimargus genus is widely distributed in tropical grasslands of Africa, Asia and Australasia. In addition Gastrimargus marmoratus host range is low. Gastrimargus marmoratus is graminivorous, so only eat the plants of the family of grasses. Gastrimargus prefers moist habitats than Oedaleus, but both are equally genus are graminivorous (Song, 2010).

The lowest individual found is *Chondracris rosea* (Figure 22) and *Leptacris sp* which is only 3 individuals (Table 1). The low number of *Chondracris rosea* found possible because of the lack of host plants at Gunung Bunder Forest Park. The main host of *Chondracris rosea* is a plant citrus, soybean, cotton, potato, rice, sugar cane and corn. According to Srinivasan and Prabakar (2013), habitat of *Chondracris rosea* is maize and bananas. Suhail (2001) showed that *Chondracris rosea* is found in a cornfield. The main host plant Chondracris rosea in Gunung Bunder Forest Park is corn. However, these plants are found only in some plots and its existence depends on the activity of farmers. *Chondracris rosea* are distribute in China, Java, Philippines, and India. *Chondracris rosea* perfect green for camouflage with the environment. This locust is able to fly at a distance of 15-20 m, showing reddish wings (Bhowmik, 1986). Chondracris rosea can be found in May to September (Narzari and Sarmah, 2015).

Leptacris sp belong the subfamily Hemiacridinae. This grasshopper insects are polyphagus, which can cause severe damage to almost all types of plants in the world. Hemiacridinae prefer habitats such as tall grass and rice. After eating rice, Hemiacridinae will be moved to the prairie ecosystem and lays eggs in a safe area. In addition to rice plants, the locust also like maize, millet, sugar cane, sorghum and beans (Akhtar et al., 2014). In Gunung Bunder Forest Park, *Leptacris sp* found in peanuts and corn crops.

Valanga nigricornis The Gunung Bunder Forest Park has a relatively low density that is only 0.8% (Table 1). The number of adult individuals found are 9. The low number of mature individuals is because at the time of observation newly hatched locust were there or still in the nymph stage. Valanga nigricornis population reach its peak in September and April (Atim, 1987). According Wilemse (2001), Orthoptera population is closely related to vegetation, because plants are the source of food.

Table 2 shows the grasshopper diversity in Gunung Bunder Forest Park. The level of diversity is evidenced by the Shannon-Wiener diversity index. According to analysis by the index Shannon-Whinner, locusts in Gunung Bunder Forest Park has a value H '= 1.32 (Table 2). Values are classified in the medium category. Diversity of species is strongly influenced by temperature, rainfall, humidity, type of soil and vegetation types.

The average temperature of Gunung Bunder Forest Park is 27,7º C (Utami and Indrayani, 2013). Temperature alone is not really affect on the abundance and distribution patterns grasshopper (Sharma, 2012). When humidity appropriate, these insects are not so sensitive to extreme temperatures. According to Sharma (2012), the peak of locust populations are at a temperature of 29 º C with 94% humidity. In this study, the average temperature from morning until noon reached 31,5º C and humidity 83.34% (Table 3). Thus the diversity numbers of locusts in Gunung Bunder Forest Park are not in the high category.

Rainfall Gunung Bunder Forest Park reached 1,900 mm/year (Utami and Indrayani, 2013). Rainfall affects the growth of plants as a food source of grasshopper (Raghvender and Vastrad, 2017).

Dominance index describes the presence or absence of species that dominate other species. Dominance index values ranged from 0-1 (Juliana et al., 2012). If the dominance index value close to or equal to 1, then the area is dominated by a particular species, and vice versa. The calculations show that the dominance index value close to 0 (zero), namely 0.4. (Table 2). This shows that there are not dominance species. Number of individuals Oxya japonica, Caryanda spuria, Trilophidia annulata, Eucoptacra sp. and Oedaleus infernalis almost the same. Each of which is 31, 32, 13, 12 and 16 individuals (Table 1).

Species evenness index illustrates the distribution of species in the community. Evenness index value close to 0 indicates that the distribution of species in a relatively uneven communities, while the evenness index values approaching or equal to 1 indicates that the distribution of species in the community evenly (Wicaksono et al., 2001). Evenness index in this study is worth 0.55 (Table 2). This shows that the spread of individuals of each species in the community is relatively evenly distributed.

CONCLUSIONS

The species of grasshoppers (Acrididae) found in Forest Park Bunder Gunung namely Phlaeoba Fumosa, Stenocatantops splendens, Stenocatantops angustifrons, Eucoptacra sp., Chondracris rosea, Valanga nigricornis, Leptacris sp., Gastrimargus marmoratus, Trilophidia annulata, Oedaleus infernalis, Oxya japonica and Caryanda spuria. Diversity of grasshoppers (Acrididae) in Gunung Bunder Forest Park was included in the medium category (H '= 1.32).

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