



ROLE AND TYPES OF INSECTS IN SETTLEMENT AREAS OF SUNGAI PINANG VILLAGE IN SAMARINDA CITY

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Abstract

The presence of arboreal insects in residential areas became indicator that the area is still overgrown with vegetation, whether flowering or not. The existence of vegetation in residential areas is referred to as Ruang Terbuka Hijau (RTH). The types of arboreal insects in Kelurahan Sungai Pinang Dalam Kota Samarinda have never been reported. This study aims to determine the role of the diversity of arboreal insect species in residential areas in Kelurahan Sungai Pinang Kota Samarinda. The sampling method for arboreal insects is a direct collection method using a sweeping net with a residential transect method for a month, once every two days in the morning and evening. The steps carried out in this study were collecting samples of arboreal insects, identifying and analyzing data on the index values of diversity, richness, evenness and dominance. The results showed that 26 genera of arboreal insects were found which were classified into 18 families and 8 orders. The diversity index value (H') of arboreal insect species in the morning is 2.7601 and in the afternoon is 2.4901. The dominance index value (C) obtained in the morning is 0.0880 and in the afternoon is 0.1192. For the evenness value, obtained in the morning of 0.8471 and in the afternoon of 0.8056. For the value of the wealth index (R), which was obtained in the morning was 4.1373 and in the afternoon was 3.6711. The results of data analysis show that the residential area in Kelurahan Sungai Pinang Dalam Kota Samarinda still has Ruang Terbuka Hijau (ecologically good) for arboreal insect life.

Keywords: Role, arboreal insects, settlements, index value

INTRODUCTION

The green open space (RTH) area in the residential area is part of the open space in the residential area which has natural potential as a buffer zone for groundwater and also as an

ecosystem for insects. Besides that, green open space is needed in residential areas as a contributor to oxygen and absorbs carbon dioxide (Santoso et al., 2012).



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Insects are a group of animals with jointed legs (arthropods). Insects can be found in almost all types of environments except in the oceans. The number of members is the largest compared to other living groups. Insects also have a high degree of adaptation (Siregar et al., 2014).

The presence of insects can be used as a bioindicator in an ecosystem. An ecosystem can be said to be balanced or stable if the level of insect diversity in it is high and if the ecosystem is not balanced or unstable, then the level of insect diversity is low (Ramadhan et al., 2020). Purwatiningsih (2014) adds that the presence of insects in an area is indispensable as an indicator of biodiversity, ecosystem health and landscape degradation. Insects have a level of sensitivity to change so that this factor affects the presence of insects in nature, especially arboreal insects, one of which has an important role as pollinator insects. pollinator insects are insects that help in the pollination process in plants.

One type of insect that can be used as a bioindicator is from the arboreal insect group. The hallmark of this group of insects is to have a pair or more wings. Wings in arboreal insects are formed from thin strands of skin that can be moved by muscles attached to the base of the wing in the body wall. The shape of the wings on arboreal insects is very different from each other so that this difference is the determining factor in classifying them. According to Pracaya (2008), Wings on arboreal insects are divided into several types, namely diptera (insects with a pair of wings), coleptera (insects with covering wings), lepidoptera (insects with scaly wings),

hemiptera (insects with webbed/membrane wings) and orthoptera (insects with straight wings).

Taradipha et al. (2019), explained that the existence of green open space areas in residential areas began to decrease due to the growing development of residential areas both in terms of physical and ecological aspects. Changes and reductions in the area of green open space can cause problems in the form of decreasing the quality of environmental parameters so that the area cannot become a natural habitat for arboreal insects.

Sungai Pinang Dalam Village is included in Sungai Pinang District which is a division of North Samarinda District since December 2010. The area of Sungai Pinang Dalam Village is 8,978 km² with a population of ±38,000 people (Anonim, 2021). In the residential area in Sungai Pinang Dalam Village, there is still an area of green open space that is still quite wide and is overgrown by wild plants and plants that are deliberately planted by local residents so that the area can become a habitat for arboreal insect species. Based on the description above, the authors are interested in knowing the role, type and diversity index of arboreal insects that exist in residential areas in Sungai Pinang Dalam Village, Samarinda City so that they can be a source of information for others to find out the diversity of arboreal insect species in the residential area.

METHODS

This research was carried out from October to November 2021. Sampling of arboreal insects was carried out in a residential area in

Sungai Pinang Dalam Village, Samarinda City and identification of arboreal insects was carried out at the Laboratory of Animal Ecology and Systematics, FMIPA, Mulawarman University, Samarinda. The tools used in this research are sweeping net, glass bottle, magnifying glass, scissors, label paper, tweezers, triangle paper, sample box, sample bottle, digital camera, stationery, cotton and insect identification book. The materials used are 4% formalin and aquadest. Insect samples that have been obtained were identified to the genus level by using the book: Key to Insect Determination (Bland & Jaques, 2010; Borror et al., 1996; Capinera, 2008; Lestari et al., 2018; Perveen, 2017; Pohl et al., 2015; Pracaya, 2008; Purnomo, 2010; Purwatiningsih, 2014; Puspitarini & Fernando, 2021). Sampling of arboreal insects using a sweeping net using the transect method (lane). Sampling was carried out in 2 times, namely in the morning at 07.00-11.00 WITA and in the afternoon at 15.00-17.00 WITA for 30 days with an interval of one day. The captured arboreal insects were then put into a glass bottle to be anesthetized with 4% formalin (beetle, grasshopper). For butterflies, HVS paper is used as a storage place. Then label the sample.

DATA ANALYSIS

Species Diversity (H')

Species diversity (H') of arboreal insects obtained was calculated using the Shannon-Wiener diversity index formula (Yudiawati and Pertiwi, 2020) as follows:

$$H' = - \sum_{i=1}^n P_i \ln P_i$$

Description:

H' : Diversity index Shannon-Wiener

P_i : The proportion of individuals of type i to all species

$$P_i = \frac{n_i}{N}$$

n_i : Number of individuals of a species

N : Total individuals of all types

Species Richness (R)

For the species richness (R) of arboreal insects obtained, it is calculated using the Margalef species richness index formula (Akbar, et al., 2019) as follows:

$$R = (S - 1) / \ln N$$

Description:

S : Number of All Species

N : Total number of individuals

where :

$R < 2,5$: Specific richness values are at a low level

$2,5 > R < 4$: The value of species richness is at a moderate level

$R > 4$: Specific richness values are at a high level

Species Evenness (e)

To analyze the species evenness data (e) of viable arboreal insects, it is calculated using the Pielou (Yudiawati and Pratiwi, 2020) Species Evenness Index formula (e) Pielou (Yudiawati and Pratiwi, 2020) as follows:

$$e = \frac{H'}{\ln S}$$

Description:

H' : Diversity index

S : Number of taxa

Where the evenness index criterion has a relationship with the dominance index value so that the evenness index value will not be more than 0 to 1.

Species Dominance (C)

The dominance of species (C) of arboreal insects obtained was calculated using the Simpson dominance index formula (Maesyaroh and Supriatna, 2021) as follows:

$$C = \sum (n_i/N)^2$$

Description:

n_i : number of individuals per species

N: Total all individuals

RESULTS AND DISCUSSION

Based on research that has been carried out in the residential area of Sungai Pinang Village in Samarinda City, 26 genera of arboreal insects, which are included in 17 families and 8 orders, can be seen in Table 1.

Table 1. Arboreal insects in the residential area of Sungai Pinang Dalam sub-district, Samarinda City

No.	Taxa			Time	
	Ordo	Family	Genus	Morning (ind)	Afternoon (ind)
1.	Coleoptera	Cerambycidae	<i>Monochamus</i>	2	1
2.	Hemiptera	Alydidae	<i>Leptocoris</i>	5	11
		Coreidae	<i>Acanthocephala</i>	16	5
		Dictyopharidae	<i>Dictyophara</i>	4	0
		Pentatomidae	<i>Thyanta</i>	7	5
3.	Homoptera	Cicadellidae	<i>Bothrogonia</i>	16	3
4.	Hymenoptera	Apidae	<i>Apis</i>	73	59
			<i>Xylocopa</i>	53	35
		Vespidae	<i>Ropalidia</i>	22	22
			<i>Vespa</i>	19	13
			<i>Amata</i>	4	4
5.	Lepidoptera	Erebidae	<i>Acraea</i>	9	2
			<i>Hypolimnas</i>	12	5
		Nymphalidae	<i>Junonia</i>	8	0
			<i>Papilio</i>	12	5
			<i>Pieris</i>	8	6
		Pieridae	<i>Eurema</i>	6	10
			<i>Daphnis</i>	1	0
6.	Mantodea	Mantidae	<i>Mantis</i>	2	2
7.	Odonata	Coenagrionidae	<i>Pseudagrion</i>	2	0
			<i>Neurothermis</i>	13	15
		Libellulidae	<i>Orthetrum</i>	25	24
			<i>Rhyothemis</i>	3	1
			<i>Tholymis</i>	9	6
8.	Orthoptera	Acrididae	<i>Valanga</i>	61	67
		Tetrigidae	<i>Tetrix</i>	29	4
Total	8 Ordo	18 Family	26 Genus	421	305

In Table 1 it can be seen that the types of arboreal insects found in the settlement area of Sungai Pinang

Village, Samarinda City in the morning were 421 individuals (26 genera), more than those found in the

afternoon as many as 305 individuals (22 genera). The percentage of insect presence in the morning and evening can be seen in Figure 1. This is due to the nature of arboreal insects which are more active in the morning. According to Siregar et al. (2014), the presence of arboreal insects in the morning has a different community structure from the afternoon and evening, namely the number is more in the morning. This

indicates that arboreal insects are more active in the morning. Purwatiningsih (2014), added that some arboreal insects have a role as pollinator insects that are active from morning to noon. The orders Hymenoptera and Lepidoptera are a group of insects that have many roles as pollinators. Insects of this group are needed by plants for the pollination process.

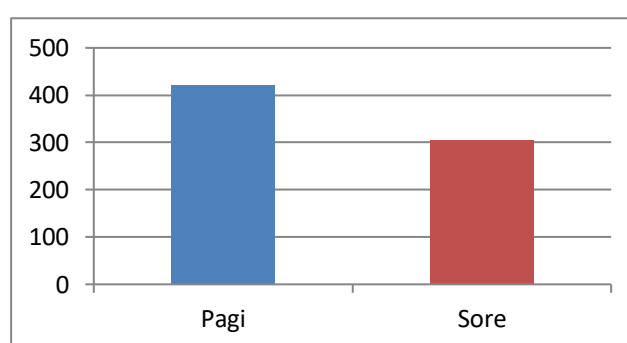


Figure 1. Percentage of arboreal insects found in the morning and evening in residential areas in Sungai Pinang Dalam Village, Samarinda City.

In Figure 2, it can be seen that the order Hymenoptera has the highest number of individuals found both in the morning and in the afternoon. The orders Odonata and Mantodea are the

least orders found in residential areas in Sungai Pinang Dalam Village, Samarinda City. This is because arboreal insects are more active in the morning.

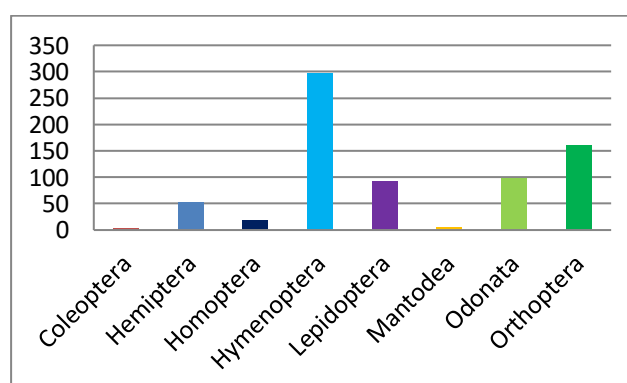


Figure 2. The percentage of arboreal insect orders in residential areas in Sungai Pinang Dalam Village, Samarinda City.

According to Sutra (2015), the presence of arboreal insects in the morning has a different community

structure from the afternoon and evening. This indicates that arboreal insects are more active in the morning.

The presence of insects is largely determined by the presence of imago stage feed (plant nectar) and the availability of immature stage feed (plant leaves). Widhiono & Sudiana, (2015) said that hymenoptera is one of the most important pollinating insects/pollinators by both wild plants and agricultural crops. The diversity is very dependent on the diversity of plants as a source of food.

According to Allifah et al. (2020), the volume of nectar in flowers

is mostly produced by flowers that begin to bloom in the morning and begin to decrease in number towards the afternoon so that it affects the number of visits by arboreal insects to plants.

Based on the research that has been done, the values of diversity, dominance, evenness and richness of arboreal insect species are obtained as follows:

Table 2. Richness index (R), diversity (H'), evenness (e) and dominance (C) of arboreal insect species in residential areas in Sungai Pinang Dalam Village

Parameter	Value of INDEX	
	Morning	Afternoon
H'	2,7601	2,4901
C	0,0880	0,1192
<i>e</i>	0,8471	0,8056
R	4,1373	3,6711

From Table 2, the value of H' in the morning is 2.7601 and in the afternoon is 2.4901. This value indicates that the diversity of arboreal insects in residential areas in Sungai Pinang Dalam Village is classified as moderate based on the Shanon-Wiener formula. According to Andani et al. (2017), the value of the diversity index of arboreal insects has an important value in showing the level of species diversity in a community. This relates to the balance in the distribution of individuals for each species. In the research conducted by Taradipha et al. (2019), the presence of insects in the factory area has a high index value of insect species diversity. This is because these insects are tolerant of the environment around the factory which has a high level of disturbance and utilizes available feed resources, namely the formation of new habitats

in the form of gardens. Insects have a high adaptability and this is the key for insects to survive even in bad environmental conditions.

For the value of the dominance index (C) in Table 2, a value of 0.0880 was obtained in the morning while in the afternoon a value of 0.1192 was obtained. The value of the dominance index can be used as an indicator to determine the type of arboreal insects that dominate a community. According to Maesyaroh & Supriatna (2021), a low dominance index value indicates that there is no dominant individual in the community and can be stated otherwise if the dominance index value is high. So it can be said that the dominance index value of arboreal insects in residential areas in Sungai Pinang Dalam Village is included in the low level which indicates that there

are no individual arboreal insects that dominate in the area.

In addition to the diversity and dominance index values, the evenness index value (e) was also obtained in the study of arboreal insect species in residential areas in Sungai Pinang Dalam Village using the Pielou formula. The evenness index value obtained was 0.8471 in the morning and in the afternoon the value was 0.8056. This value indicates that the even distribution of arboreal insect species in the area is stable. Yudiawati & Pertiwi (2020) stated that the evenness index of arboreal insects in the settlement area in Sungai Pinang Dalam Village was evenly distributed, indicating whether or not arboreal insects were dominant in the area. The evenness index value has a value of not more than 0-1. This value can be used to determine the presence or absence of dominant arboreal insects in a community. If in a community of arboreal insects are evenly distributed, it indicates that there are no arboreal insects that dominate in that community. However, if there is one arboreal insect species that dominates in a community, the arboreal insects in it are not evenly distributed.

For the index of species richness (R) of arboreal insects obtained in residential areas in Sungai Pinang Dalam Village, Samarinda City, a value of 4.1373 was obtained in the morning and a value of 3.6711 in the afternoon. From the results of this analysis, the index of species richness of arboreal insects in residential areas in Sungai Pinang Dalam Village is in the medium category. The species richness index is an index used to determine the number of species in a community. This type of wealth index

is strongly influenced by the total number of individuals found in the settlement area of Sungai Pinang Dalam Village. If the Margelaf species richness index is greater, it is certain that the diversity index will also be higher. The species richness index will be higher in a community with a larger number of species than in a community with a few species. Thus, the more species identified, the higher the species richness (Tarihora, 2020; Hidayatullah et al., 2018).

CONCLUSION

From this study, 26 genera of arboreal insects were found which were classified into 18 families and 8 orders. The diversity index value (H') of arboreal insects was 2.7601 in the morning and 2.4901 in the afternoon. The dominance index value (C) obtained in the morning is 0.0880 and in the afternoon is 0.1192. For the evenness value, it was obtained in the morning of 0.8471 and in the afternoon of 0.856. For the value of the wealth index (R), which was obtained in the morning was 4.1373 and in the afternoon it was 3.6711. This index value states that the condition of the residential area in Sungai Pinang Dalam Village, Samarinda City is still ecologically good and supports the presence of arboreal insects.

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