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Diversity of fauna as one of indicator of forest management in Tahura Wan Abdul Rachman

B S Dewi[1,4], S P Harianto[1], I G Febryano[1], D I Rahmawati[1] and N Dewara[1], N Tokita[2], S Koike[3]

[1,]Forestry Department, Faculty of Agriculture, University of Lampung, Indonesia

[2] Nippon Veterinary and Life Science University, Musashino Shi, Tokyo, Japan

[3.]Tokyo University of Agriculture and Technology, Fuchu Shi, Tokyo, Japan

E-mail: bainahsariwicaksono12@gmail.com

Abstract. Taman Hutan Raya Wan Abdul Rachman (Tahura WAR) is located at Lampung Province, Indonesia. University of Lampung as the state university has mandatory around 1.134 hectare to manage from Tahura WAR as Forest Education. Research has been done in this area. The purpose of the research is identifying biodiversity of fauna in Forest Education of University of Lampung at Tahura WAR. The research has been done from March to May 2018 (dry season) and October to December 2018 (rainy season). Each month collected data was consisted of six days observation. The method of the research is using traps, it is to lay the traps on the surface of soil by plastic bucket, with 72 traps at different location that separated by study site. The research result were found big black ants, small black ants, mosquitoes, millipedes, crickets, spiders, termites, snails, glomerides, small red ants, big red ants, frogs, small scorpion, caterpillar and dung beetle. Diversity Index of Shannon Wienner classified Tahura WAR as moderate which indicate the forest has good maintain as the aspect of ecology and the aspect of sustained of forest.

Keywords: Tahura WAR, Forest Education, diversity fauna, trap.

1. Intruduction
Indonesia is one of the centers of world biodiversity and is known as a megabiodiversity country. This high biodiversity is natural richness that can provide versatile benefits and has vital and strategic benefits, as the basic capital of national development and is the lungs of the world that are absolutely needed both in present and future [1]. In addition, Indonesia is an archipelago that has a wide range that varies, from the narrow to the broad, from the flat, hilly and mountainous, where the flora, fauna and microbial life are very diverse.

Based on the description of the biogeographic region, Indonesia has a very important and strategic position in terms of richness and diversity of plant species and their ecosystems. Data [2] estimates that there are 38,000 plant species (55% endemic) in Indonesia, while for the diversity of vertebrate animals including 515 types of mammals (39% endemic), 511 species of reptiles (30% endemic), 1531 species

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[4] To whom any correspondence should be addressed (bainahsariwicaksono12@gmail.com)

of birds (20% endemic) and 270 amphibian types (40% endemic). One place where there is still a high diversity of fauna is in Tahura WAR in utilization blocks and protected blocks.

Forest Park (Tahura) is one of the conservation forests that has a function as a natural conservation area for the purpose of collection of natural and artificial plants and animals, native or non-native, which are used for research, science, education to support cultivation, culture, tourism, and recreation [3]; [4]. Tahura is also an area of life support system, especially in regulating the water system, maintaining soil fertility, preventing erosion, maintaining the balance of microclimate, and preserving biodiversity. Therefore, this study was conducted to determine the biodiversity of fauna in the Forest of Lampung University Education in Tahura WAR.
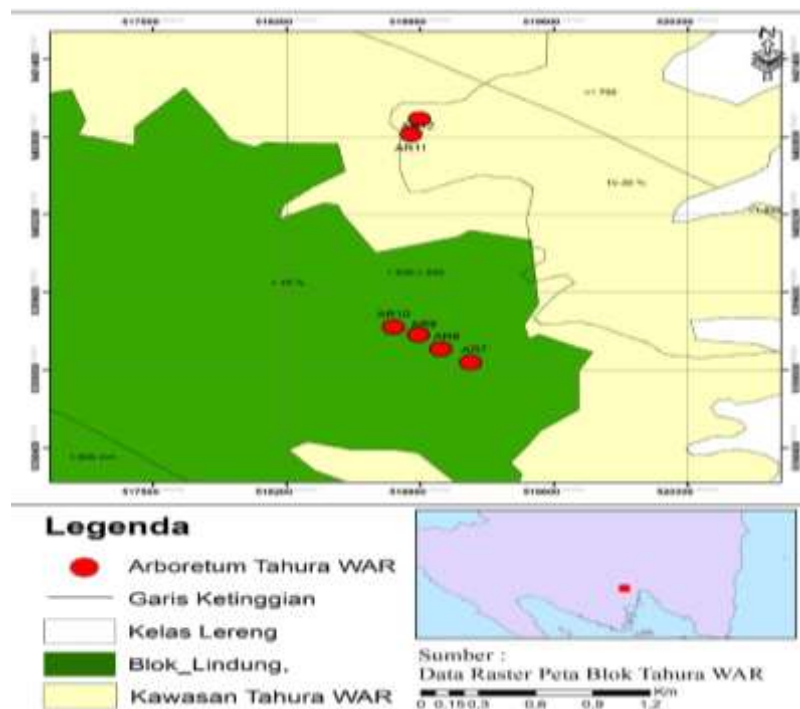
2.1. Research methods

2.1. Time and location research

Data collection for 6 days is carried out from March to May 2018 (dry season) and October to December 2018 (rainy season) in the Utilization Block and Protection Block in Integrated conservation education forest (ICEF) of Lampung Universityin Tahura WAR. Tools that are pens, tallysheets, buckets, hoes, wire, plastic cups, cameras, and materials consist of feces and air. The map of the research location is presented in figure 1 and figure 2
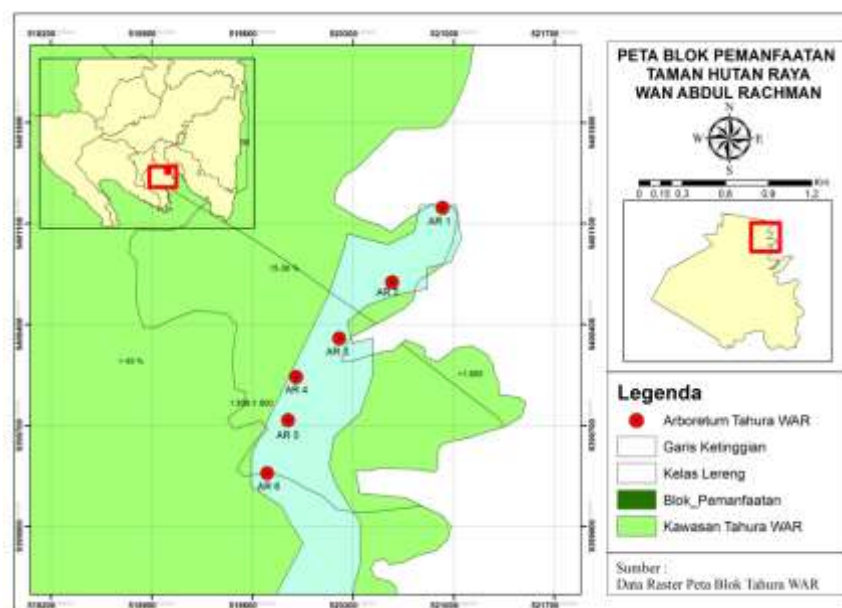
Figure 1. Map of research location at Utilization Block of ICEF Lampung Universityin Tahura [5].

Figure 2. Map of research location at Protected Block of ICEF Lampung University in Tahura [5].

2.2 Methods for research

The method used is the trap method with deer stool bait, because the stool is easily obtained in the Tahura WAR area. The trap is made by connecting a plastic cup in the middle of the bucket mouth that is given dirt (on average weighing 20 g), then a plastic bucket filled with 150 ml of water. The trap is assembled until the surface of the bucket is parallel to the soil ground [6].

Species diversity is calculated using the Shannon-Wienner Index [7]; [1]; [8]; [9] with the formula as following:

$$H' = -\sum_{i=1}^{n} Pi \ln Pi \; where, Pi = \frac{ni}{N}$$

Explanation:

H' = diversity index Shannon-Wienner

ni = total of individual species 1.

N = individual number all types

The criteria for the Shannon-Wienner (H ') diversity index are as follows:

H' ≤ 1   = low diversity

1 < H' < 3 = moderate diversity

H' ≥ 3   = high diversity

Evenness index is obtained using a formula [10]:

$$J = \frac{H'}{H \; Max} \; or \; -\sum \frac{pi \ln pi}{\ln S}$$

Explanation:

H' = diversity index Shannon-Wienner

J   = Equity index

S   = total spesies

Equity index criteria
(J): 0 < J ≤ 0,5   = Depressed community
0,5 < J ≤ 0,75   = Labile community
0,75 < J ≤ 1   = Stable community

The abundance of a type of dung beetle in a particular area can be calculated using the formula [11].

$$e = \frac{H}{LogS}$$

Explanation:
e   = abundance index
H   = diversity index
S   = total spesies

3. Result and discussion

3.1 Diversity of Fauna species in the Utilization Block
The diversity of fauna species in March-May 2018 and October-November 2018 found 16 species of fauna consisting of large black ants, small black ants, large red ants, small red ants, spiders, mosquitoes, glomerides and so on. Data on fauna diversity are presented in table 1.

Table 1. Diversity of Fauna species in the Utilization Block.

No	Month	Total Species	Number of Individuals	Hi	R	E
1	March	14	247	1,82	2,36	0,69
2	April	14	318	1,66	2,22	0,63
3	May	13	307	1,61	2,10	0,63
4	October	16	578	1,51	2,36	0,72
5	November	14	265	1,91	2,33	0,67
6	December	14	311	1,77	2,22	0,54

Note: Hi =….Hi or H'?; R = ….; E = …..

The highest diversity of fauna in October 2018 with the number of species found was 16 species and 578 individuals. The species most commonly found are large black pseudo. This is because ants can adapt well to their environment. The species that are the least found are rats. The diversity index in this month belongs to the medium category. This can prove that the fauna population within the Utilization Block can still maintain its population even though there are many disturbances from other components, and the existing forest is still in good condition and must be maintained therefore the fauna habitat is not disturbed. Diversity index can also be used to measure community stability. Community stability is the ability to keep conditions stable even though there are disruptions to their components.

The evenness of fauna in October 2018 was classified as a stable community with a value of 2.36. The species density index indicates the stability of a community. The smaller the evenness index value of species, the spread of species is not evenly distributed, meaning that in this community there is no dominating species therefore it is probably no competition in finding a need for life. Richness of fauna species is included in low species richness with a value of 0.72. Low species richness indicates that the existing species are not evenly distributed in the habitat, only a few species of fauna are found.

The lowest diversity of fauna species in May 2018 with the number of species found as many as 13 species with 307 individuals. The diversity index this month is in the medium category with a value of 1.66. This shows that the diversity of the population in it is still relatively good and the condition of the surrounding forest is also classified as good. Evenness index value is equal to 2, 10 which includes the

stable community. This means that the population in it is still stable and even. The richness index value is included in the low category, this is because the number of species found is not proportional to the number of individuals that exist. This means that species richness is still low for the number of individuals with high values.

3.2 Fauna diversity in the Protection Block Tahura WAR.
The most common species are 16 species. Species found are large black ants, small black ants, large red ants, small red ants, spiders, flexible and so on. Data on fauna diversity in Blok Protected are presented in table 2.

Table 2. Fauna diversity in the Protection Block Tahura WAR.

No	Month	Total Species	Number of individual	H'	R	E
1	March	14	355	1,45	2,21	0,53
2	April	14	351	1,49	2,22	0,53
3	May	15	356	1,53	2,21	0,55
4	October	15	304	2,00	2,27	0,67
5	November	14	301	2,02	2,28	0,67
6	December	14	292	1,87	2,29	0,64

Note: Hi =….H' or Hi ..see Table 2 ?; R = ….; E = …..

The highest species diversity occurred in November with a value of 2.02. Higher diversity on average occurs at the end of the year, ie from October to December compared to the beginning of the year. At the end of the year diversity tends to be low. The lowest diversity occurs in March. This is because the dry season is the beginning of the year, while at the end of the year is the rainy season. This is supported by [12] statement that the factors that influence the value of species diversity (H ') are environmental conditions, weather, number of species and distribution of individuals in each type. Species diversity is defined as the number of species and their respective abundance in an area [13]. Species diversity can describe stability in a community, which means the ability to keep conditions stable.

Average type of richness index is moderate. The highest species richness occurred in December with a value of 2.29. Richness types have different values, but the difference is not significant. This is because Tahura WAR has been used as an educational forest and is also used by the surrounding community, therefore the location is disrupted by human activities. In addition, the land cover has begun to decrease. Nevertheless the place is not classified as severely damaged because there are still many fauna species. A decreased habitat is severely damaged if no species are found. This is in line with [14] study that habitats that are in good condition and far from human disturbances have many species.

The average species evenness index is labile, but the highest evenness occurs in October and November with a value of 0.67. The smaller the evenness index value of species, the spread of species is not evenly distributed, its mean that in this community there is no dominating species therefore there is probably no competition in finding a need for life. This is supported by [13] that if 0.50 <E <0.75 the community community is declared stable.

The 15 species found consist of large black ants, small black ants, mosquitoes, millipedes, crickets, spiders, termites, snails, glomerides, small red ants, large red ants, frogs, small scorpions, caterpillars and dung beetles. Large black ants are the most found fauna compared to other fauna. Every month more than 100 ants are found different from other animals found in less than 100 individuals. This is because ants are easily adapted fauna, besides ants are insects that form regular colonies therefore in a habitat many ants can be found at once. in line with [15]; [16] that ants have regular colonies and are divided

according to their respective duties. In addition, the presence of ants in March-May tends to be higher than in October-December. Ants like the dry season, the dry season occurs at the beginning of the year while the end of the year is the rainy season. Therefore, more ants are found at the beginning of the year.

4. Conclusion
The most diverse species of fauna found in the Block Utilization of Tahura WAR is in November 2018, this shows a moderate diversity of species. This shows that the biodiversity in it is still quite stable and the condition of the forest surrounding the Tahura WAR is still maintained. The diversity of fauna species in the Protected Block is more commonly found with the number of species as many as 16 species. This is because in the Protected Block, the forest is still very well maintained and rarely reached or visited by the community for gardening?.

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