

# Ant Community (Hymenoptera: Formicidae) at Ghimbo Potai Traditional Prohibited Forest, Kampar, Riau

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**Abstract.** Forest becomes essential natural resource that greatly sustain the existence of flora and fauna diversity, including ant species. The presence of ants can be used as bio-indicator for habitat condition. On the other hand, forest conversion threatens the live of ants. The purpose of this study was to determine the diversity of ant and its composition at three different habitats, namely secondary forest, disturbed habitat and rubber plantation. The study had been conducted in February 2020 using pitfall traps that deployed for 72 hours. This research recorded from the three studied habitats as many as 16 species from seven tribes and four subfamilies. The rubber plantation and disturbed habitat had moderate diversity of ant, indicated from its  $H'$  value range between 1 to 3, while the secondary forest became the lowest in the diversity of ant with  $H'$  less than 1.

**Keywords:** Ant, conversion, rubber plantation, secondary forest

## 1. Introduction

Forest is a natural resource with great potential in supporting flora and fauna diversity [1]. Indonesia is a country that very famous because of its very large forested area. Riau Province has 6.2-million-hectare forest from 8.2 million hectare of total province area [2]. As the need for new area to support human activities has driven the increase of forest conversion into plantations and settlements. This will cause the changes or loss of biotic and abiotic factors from forest. Changes in forest conditions impact to the balance of ecosystem, resulting in disruption of organism in forest, including soil fauna. Soil fauna highly depend on their undisturbed habitat, hence the presence and population density of soil animal are largely determined by environmental factors in that area itself [3].

The most common soil fauna are insects and ants compose most portion of insect species [4]. Ants are found in almost all ecosystems. They have an important role in ecosystem, especially help decomposing organic materials. The sensitivity of ants toward environmental changes can be used as bio-indicator of habitat condition [5]. In Riau Province, among disturbed habitats is Ghimbo Potai Forhibited Forest. This forest is located close to residential area which makes it vulnerable to disturbance



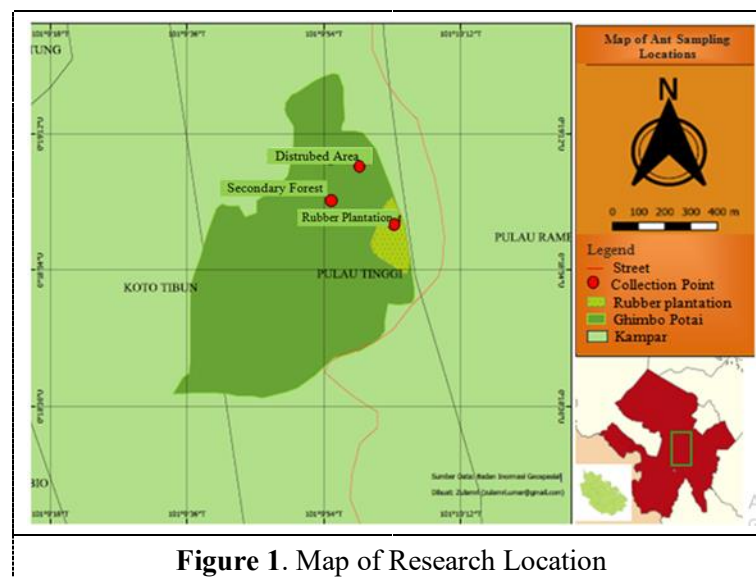
imposed from human activities. Human activities within and in surrounding of this area can potentially cause disturbance to forest ecosystem.

The diversity of ants in Sumatra was previously reported [6-14]. There was no previous research on ant community conducted at Ghimbo Potai Traditional Prohibited Forest, which then made this study important to see the diversity and evenness of ants in several habitat types in this protected forest.

## 2. Materials and Methods

### 2.1 Study sites

Research was carried out in February 2020 which is located in the Ghimbo Potai Adat Ban forest, located in Kampar Regency, Riau Province. Ant identification was carried out at the Invertebrate Animal Taxonomy Laboratory, Faculty of Mathematics and Natural Sciences, Andalas University, Padang.



**Figure 1.** Map of Research Location

### 2.2 Sampling

This research used pitfall trapset in three locations, namely rubber plantations, disturbed (transition) area and secondary forests. Sampling plots were determined purposively. Three plots were installed at study sites. Each plot contained five traps with one-meter interval between traps. Trap were placed at ground level by installing a plastic cup containing Kahle's solution. Traps were protected against nature element by installing roof. The traps were set for 72 hours, repeated two times with three days' interval between sessions. The samples obtained were then sorted and mounted, before identification commenced, using taxonomy keys from appropriate identification guides [15, 16].

### 2.3 Measurement of environmental factors

Environmental factors such as soil pH, soil temperature, air temperature, humidity, and litter thickness were measured at each study site.

### 2.4 Data analysis

Identified species were tabulated to count total species and individuals. Ecological indices then calculated to count species diversity ( $H'$ ) and habitat evenness ( $E'$ ) [17]

### 2.5 Species Diversity Index

$$= - \sum (p_i \ln p_i)$$

Information:

$H'$  = Shannon-Wiener Diversity Index,

$p_i$  = the proportion of individual species  $i$  to all species ( $p_i = n_i / N$ ),

$\ln$  = natural logarithm

## 2.6 Species Evenness Index

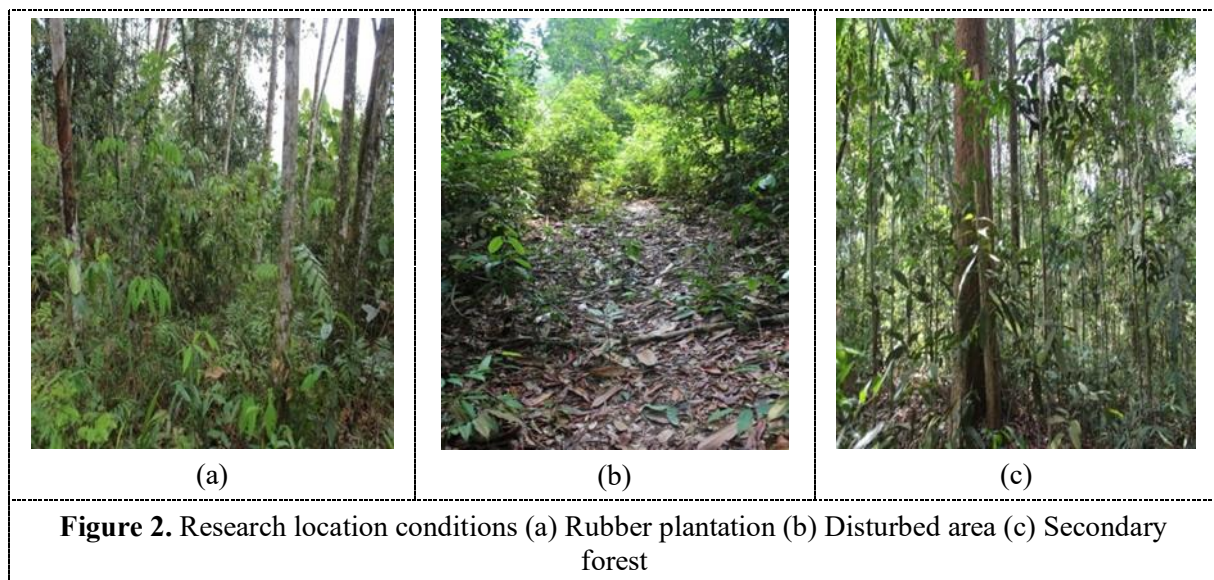
$$E = \frac{H'}{\ln s}$$

Information:

$H'$  = Shannon-Wiener diversity index

$S$  = Number of species

$\ln$  = Natural logarithm



## 3. Results and Discussion

A total of 16 ant species from seven tribes and four sub-families were collected from Ghimbo Potai Forhibited Forest, Kampar, Riau. The highest species number was observed at disturbed area where 132 individuals which later identified into 13 species and four subfamilies. The second highest was at secondary forest habitat (165 individuals, nine species, four subfamilies). At rubber plantation, there were seven species, three sub-families that identified from 158 individuals (Table 1).

The large number of species found in disturbed areas probably because of the observed species more to be tramp ant species that prominently adaptive to disturbance imposed by humans. Disturbed habitats tend to facilitate certain ant species, especially in supporting food availability for tramp ants [17]. The next largest number of species was found at secondary forest (nine species from four subfamilies). Despite being the second highest, this habitat observed to contain more ant individuals (165 individuals) than other habitats. Among collected individuals from this habitat, *Aphaenogaster* sp. (subfamily Myrmicinae) was significant in number as 155 individuals of this species collected. The number of *Aphaenogaster* species was found due to the large amount of food reserves in the secondary forest habitat, so that it could support the life of the ants. The genus *Aphaenogaster* is a scavenger, eating various arthropods and other small invertebrates [19].

Only seven species of three subfamilies, identified from 158 individuals sampled, were collected from the rubber plantation. The rubber plantation is monoculture, which may cause less variable vegetation and leaf litter thickness. This situation provided less resources for ants to live in, hence only certain adaptive species were found here. Intensive fertilization to the soil and frequent passing by human were among other probable causes. Intensive soil processing will potentially remove decomposed plant materials which in most of time act as organic mulch and source of organic matter where soil biota grows and develops [20].

**Table 1.** Species and individual inventory from GhimboPotaiTraditional Prohibited Forest, Kampar, Riau

No.	Subfamily Latin name	Number of individuals/habitat			Total
		RP	DA	SF	
	<b>I. Ectatomminae</b>				
1	<i>Gnamptogenys</i> sp.			1	1
	<b>II. Formicinae</b>				
2	<i>Anoplolepisgracilipes</i>	37	6	2	45
3	<i>Camponotus</i> sp.	1		2	3
4	<i>Dinomyrmexgigas</i>		1	1	2
5	<i>Euprenolepisprocera</i>		2		2
6	<i>Polyrhachisarmata</i>		6	1	7
	<b>III. Myrmicinae</b>				
7	<i>Aphaenogaster</i> sp.	3	9	155	167
8	<i>Crematogasterlongipilosa</i>	43	10		53
9	<i>Meranoplus bicolor</i>		1	1	2
10	<i>Pheidoles</i> p.2		1		1
11	<i>Pheidoles</i> p.4	2	54		56
	<b>IV. Ponerinae</b>				
12	<i>Anochetus</i> sp.			1	1
13	<i>Diacammaindicum</i>	7	5		12
14	<i>Odontomachus</i> simillimus		3		3
15	<i>Odontomachus</i> srixosus		1	1	2
16	<i>Odontoponeradenticulata</i>	65	33		98
<b>Total Individuals</b>		<b>158</b>	<b>132</b>	<b>165</b>	<b>455</b>
<b>Total Species</b>		<b>7</b>	<b>13</b>	<b>9</b>	<b>16</b>
<b>Total Subfamily</b>		<b>3</b>	<b>3</b>	<b>4</b>	<b>4</b>
<b>Total Tribe</b>		<b>5</b>	<b>6</b>	<b>6</b>	<b>7</b>

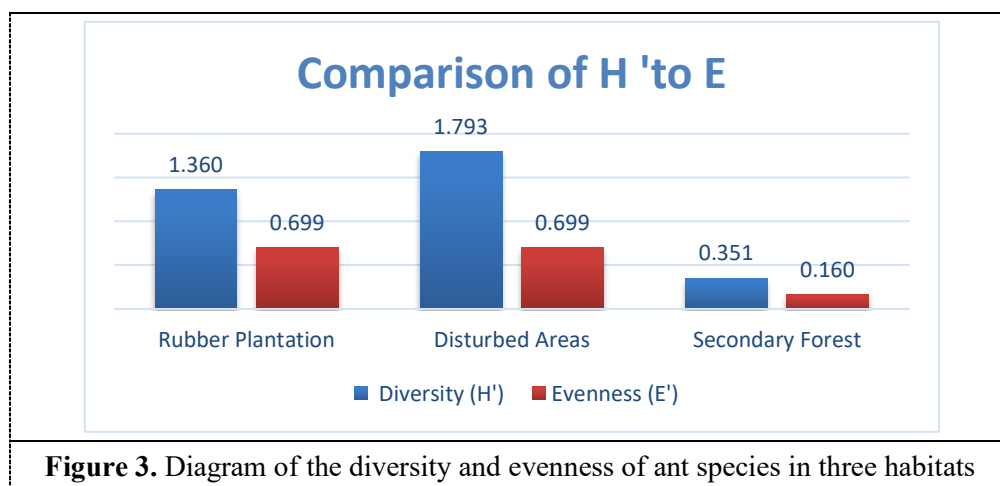
Remark: RP (Rubber Plantation), DA (Disturbed Area), SF (Secondary Forest).

*Odontoponeradenticulata* with 65 individuals was species with the most individuals recorded from rubber plantation. This species belongs to subfamily Ponerinae that known to be adaptive to with human interference and disturbed habitats. Genus *Odontoponera* is reported to be abundance in human residence as they are easy adapting and resourcing the disturbed area to support their colonies [21]. *Pheidole* sp. 4 (Myrmicinae) was species with the highest individual number at disturbed area. *Pheidole* was reported to be dominant ant group in the world [22]. This genus has ability to forage and nest in many unfavorable habitats [23]. It distributes across Indo-Malaya region, where there are 52 species of this genus [24].

At secondary forest *Aphaenogaster* sp. (Myrmicinae) became the highest in individual number (155 individuals). This *Aphaenogaster* species was found abundance at the vast mesic hardwood forests of North East America [19]. *Aphaenogaster* is scavenger, eating a variety of arthropods and other small invertebrates they can find [25].

### 3.1 Species Diversity and Evenness

Rubber plantation and disturbed areas were indicated as habitat with moderate ant diversity, noticed from index value between 1 to 3. Secondary forest was observed to have low ant diversity as its index value less than 1 (Figure 3). Factors such as competition for existing resources and the presence of more dominant species could be the reasons for low species diversity in certain habitat [26]. The evenness between rubber plantation and disturbed forest was moderate ( $E = 0.699$ ). Secondary forest had the lowest evenness with other two habitats ( $E = 0.160$ ) (Figure 3). The low evenness at secondary forest habitat was probably due to the existing dominant ant species, *Aphaenogaster* sp. It was established that if evenness value  $\geq 0.75$ , meaning the species evenly distributed across habitats; if evenness value between 0.50 and 0.75, meaning that species fairly distributed across habitats; and if evenness value  $\leq 0.50$ , species were unevenly distributed [27].



## 4. Conclusion

The study overall recorded 16 species, 7 tribe sand four subfamilies at three different habitats in Ghimbo Potai Traditional Prohibited Forest Kampar, Riau. The disturbed habitat recorded 13 species, while at rubber plantation with nine species, and only seven species at secondary forest. Rubber plantation and disturbed area were indicated as habitats with moderate ant diversity, while secondary had low ant diversity.

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