The Influence of Forest Ecosystems to Ant Community on Smallholder Oil Palm Plantations at Dharmasraya Regency, West Sumatera Indonesia

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Abstract. Forests are natural ecosystems and changes from these ecosystems will affect the organisms that inhabit them. The ant community (Hymenoptera: Formicidae) is one group of insects that inhabit various ecosystems and is very interesting to learn. The research aimed to study the ant community diversity in palm oil plantation in border of forest. The research was conducted in Gunung Selasih and Sungai Kambut, Dharmasraya Regency, West Sumatera from November 2017-January 2018. The research was formed in survey and Purposive Random Sampling was used to determine study sites. Method of ants collecting used hand collecting, bait trap, and pitfall trap. Samplings identification were conducted in Animal Taxonomy Laboratory, Department of Biology, Faculty of Math and Science, Andalas University. Total of ants collected 3,046 individual consisted of 5 sub-family, 15 genus and 29 species. The results of this research showed that forest ecosystems did not affect the abundance and a diversity of ant community in oil palm plantations. Anoplolepis gracilipes, Odontoponera denticulate and Odontomachus similimus were the dominant species found in oil palm plantations in Dharmasraya Regency, West Sumatra.

1. Introduction
The development of palm oil plantation in Indonesia in every year significantly increased. West Sumatera is one of producer of palm oil plant in Indonesia. There are 10 districts out of 19 districts which are producers of palm oil in West Sumatera. The production of palm oil in West Sumatera from 2011-2015 was 354,445.70 ton; 1,841,580 ton; 426,476 ton; 450,941 ton and 459,793 ton respectively. Dharmasraya and West Pasaman Regency were the biggest producer of palm oil in West Sumatera with the total of production was 246,992 ton and 78,242 ton in 2015. Many efforts have been done by West Sumatera government to increase palm oil production such as extensification by adding the oil palm plantation area. Dharmasraya government has started conducting this policy since 2014 by adding 612, 31 ha of oil palm plantation area [1].

Efforts to increase of oil palm plantation area by clearing the forest was expected to encourage increased production of oil palm plantations. In another side, forest conversion to be oil palm plantation caused negative effect for environment. One of that effect is the decreasing of biodiversity. Deforestation of forest to be plantation play a role in ecosystem and species change. Insect as one of organism that...
live in that ecosystem is interested object to be studied. Ant community is one of insect groups that have large population and stable in all season and year. Therefore, The ant community becomes an important insect colony in forest and agriculture ecosystems. The ant community has been widely used as a bioindicator for environmental assessment such as wildfire, disruption of vegetation, deforestation, mining, waste disposal, and land use factor [2].

Conversion and habitat disruption can change ant species composition so that it affects to tropical interaction change and food web in ecosystem [3]. Rubiana [4] stated that habitat modification and transformation of forest to be rubber and oil palm plantation caused the ant community structure change. Alamsari [5] also reported the ant biodiversity in oil palm plantation were higher than rubber plantation, secondary and primary forest. The existence of predatory ants in an ecosystem enables to suppress herbivore insect due to the predatory insects have wide range of prey.

The role of insect in ecosystem can give positive effect to animal and human. Benefit of insect in the ecosystems can be seen from its role as predator, decomposing the organic material, controlling the pest and pollination. Economically, ant is less useful for human, but in ecology, it plays an important role, it can be used for another animal and plant due to in food chain. Predators are killer for animal, feed whole and half of body its prey and need much prey to its development [6]. The diversity of predatory insect in the ecosystem are important to be studied, especially for the relationship to population suppressing of pest as biological control. Biodiversity of predator in the ecosystem could suppress the loss yield by pest insect (Furlong [7]. Land use change from primary forest to oil palm plantation affected the predator insect biodiversity especially ants [8]. Ants are an important predator and can protect the plant from insect pest [9]. The research aimed to study the diversity of ants in oil palm plantation that border in forest ecosystem in Dharmasraya Regency, West Sumatera.

2. Materials and Methods

2.1. Research Site
The collection of ant samples was carried out on the smallholder oil palm plantations in Gunung Selasih and Sungai Kambut, Dharmasraya Regency, West Sumatera, Indonesia. The ant samples identified at Laboratory of Animal Taxonomy, Department of Biology, Math and Science Faculty, Andalas University. The study conducted from November 2017-January 2018.

2.2. Collection of ant Samples
This study aimed to obtain information about the composition, abundance, diversity, and distribution of ants on smallholder oil palm plantations in Dharmasraya Regency, West Sumatra. Ant samples associated with oil palm plantations were carried out in four farms of 3-5 year olds (+ 2 Ha). Ant sample collection was carried out on the transect line and started from the edge of the forest and entered into the 1,000 m oil palm plantation. On the transect line, 10 oil palm trees were sampled with a distance of 100 m for each sample trees. Ant sample collection was carried out three times with 1 month sampling interval.

The method used for the collection of ant samples were a modification of the quadrant protocol method presented by Hashimoto, Yamane, and Mohamed [10](2001), namely: Honey Bait traps, this method was done by placing bait on each sample oil palm trees. The feed was honey which was dripped on cotton and tied to sample oil palm trees. The bait was installed for 40 - 60 minutes, because the ants needed about 40 - 40 minutes to find food sources. Pitfall traps, this trap was a trap commonly used to collect ground insects, especially ants. The pitfall traps were installed for 24 hours at under of sample oil palm trees. Hand collection, this method collected samples of ants directly around the sample oil palm trees. Ants were collected under weathered wood, shrub trees and others. The hand collection method was carried out for 15 minutes. The ants were collected with honey bait traps, pitfall traps, and hand collecting put into bottles that contained 96% alcohol and were labelled.

2.3. Ant Identification
All of ant samples were sorted and separated based on their morphological differences. Furthermore, the ant samples were identified to species based on the Ref. [11] and a book at the Animal Taxonomy
2.4. Data Analysis
The Shannon-Wiener, Pilou and Simpson indices were used to calculate the diversity, wealth and evenness of ant species. The Primary 5 program was used to calculate the index above. Furthermore, the species value index was calculated to determine the dominant ant species in the oil palm ecosystem in Dharmasraya Regency, West Sumatra, Indonesia.

3. Results and Discussion

3.1. Ant community in oil palm plantation at the study sites
Total of ants collected during the research were 3,046 individual that consisted of 5 sub-families, 15 genus and 29 species. The number of ants collected in Kampung Surau (KP) 943 individuals and 23 species, Kubang Panjang (KP) 692 individuals and 20 species, Muaro Mau (MMu) 517 individuals and 15 species, and Muaro Momong (MMg) 894 individuals and 16 species (Table 1).

In Table 1 it can be seen that A. gracillipes, O. simillimus, and O. denticulata were species with higher abundance than other species. These three species are "tramp" species and are easy to adapt to disturbed ecosystems or agricultural ecosystems such as plantations. A. gracillipes is known by the common name "Yellow Crazy Ant" and is very aggressive towards other ant species and is easily involved in deadly fight [13]. In addition, this species is very dominant and has a large population. The population of this species can suppress the growth of the local population leading to the loss of local species in a location [14].

3.2. Ant community based on distance from forest ecosystem
The results of the research showed that the distance of samples from the forest influenced the composition of the ant community inhabited the oil palm ecosystem in Dharmasraya District (Table 2).

The number of species and abundance of ants in the forest and 100 m from the forest were higher than the other sample locations (Table 2). A. gracillipes, O. simillimus, and O. denticulata were common and abundant species in forest and oil palm ecosystems. C. rogenhoferi and P. longipes were rare species of oil palm ecosystems but were common and abundance species in forest ecosystems. The existence of insects in a agricultural habitat is influenced by several factors, one of which is natural habitat [15]. The distance of forest ecosystems from the sample location in oil palm cultivation affected the richness and abundance of the ant species that inhabit it.

The other cause that possible to promote the existence of ant was the ant ability to move tracking the trace of its species. The ability of tracking due to the guide pheromone. Borror et al. [16]) and Elzinga [17] stated that the insect had a trace tracking guide pheromone to find a food source. A. gracillipes is a species that its existence frequency is high and rise in each distance of forest ecosystem.

Bolton [18] stated A. gracillipes was found in stem and leaves of plant and bush in dry land farming so that its abundance and existence of abundance is higher than other insects. A. gracillipes had highest of total of individual due to the searching of food source was wide so that it is named as scavenger predator because it prey on many types of organism in litter and canopy (little Isopode, myriapode, mollusca, arachnida, and soil insect). The abundance of A. gracillipes was higher than other insects because the food searching is wide, the ability to form super colonies is high so that it spreads up to wide area (10-150 ha) with the density up to 20 workers/ ha. Each nest contained around 4000 individuals. Workers class is a lot, up to 4000 individual per colony so that this insect had a life survival is high, high density of colony and can form big colony in opened land, under stone, rotten wood even in soil especially near to human activity and has ability to survive in disruption area [19]. This insect can adapt and widely spread in agricultural area so that affect the composition of local ant that lives in agricultural area.
| Sub-family / Species | Gunung Selasih | Sungai Kambut |
|----------------------|---------------|---------------|
|                      | *KS  | *KP  | *MMu | *MMg |
| **Dorylinae**        |      |      |      |      |
| Dorylus laevigatus (F. Smith, 1857) | 10   | 0    | 0    | 0    |
| **Formicinae**       |      |      |      |      |
| Anoplolepis gracillipes (F. Smith, 1857) | 272  | 118  | 119  | 318  |
| Camponotus (Tanaemyrmex) sp. 1 | 0    | 11   | 11   | 11   |
| Camponotus (Tanaemyrmex) sp. 2 | 5    | 0    | 0    | 0    |
| Colobopsis leonardii (Emery, 1889) | 0    | 0    | 25   | 18   |
| Colobopsis saundersi (Emery, 1889) | 1    | 0    | 0    | 0    |
| Colobopsis sp.       | 21   | 0    | 0    | 0    |
| Dinomyrmex gigas (Latreille, 1802) | 5    | 4    | 0    | 0    |
| Polyrhachis (Myrma) illaudata (F. Smith, 1858) | 14   | 6    | 4    | 57   |
| Polyrhachis (Myrma) sp. 1 | 0    | 1    | 0    | 0    |
| Polyrhachis (Myrma) sp. 2 | 15   | 1    | 0    | 3    |
| Polyrhachis (Myrmhopla) abdominalis F. Smith, 1858 | 11   | 8    | 16   | 4    |
| **Myrmicinae**       |      |      |      |      |
| Carebara affinis (Forel, 1915) | 1    | 1    | 0    | 3    |
| Cataulacus hispidulus F. Smith, 1865 | 0    | 0    | 15   | 0    |
| Crematogaster (Crematogaster) borneensis Andre, 1896 | 1    | 17   | 12   | 3    |
| Crematogaster (Crematogaster) rogenhoferi Mayr, 1879 | 59   | 133  | 82   | 51   |
| Crematogaster (Orthrocrema) longipilosa Forel, 1907 | 1    | 3    | 0    | 127  |
| Pheidole longipes (Latreille, 1802) | 157  | 6    | 0    | 0    |
| Pheidole plagiaria F. Smith, 1860 | 75   | 75   | 27   | 35   |
| Pheidole sp.         | 0    | 5    | 1    | 0    |
| **Ponerinae**        |      |      |      |      |
| Brachyponera pilidorsalis (Yamane, 2007) | 2    | 0    | 0    | 0    |
| Brachyponera sp.     | 1    | 4    | 0    | 0    |
| Diacamma holosericum (Roger, 1860) | 0    | 0    | 2    | 3    |
| Leptogenys cf. pegeuti (Andre, 1887) | 20   | 2    | 0    | 0    |
| Odontomachus rixosus (F. Smith, 1857) | 24   | 26   | 36   | 28   |
| Odontomachus simillimus F. Smith, 1858 | 38   | 129  | 117  | 162  |
| Odontoponera denticulate (F. Smith, 1858) | 150  | 117  | 34   | 37   |
| Odontoponera transversa (F. Smith, 1857) | 59   | 25   | 16   | 34   |
| **Pseudomyrmicinae** |      |      |      |      |
| Tetraponera pilosa (F. Smith, 1858) | 1    | 0    | 0    | 0    |
Table 2. Community of ant in oil palm plantation with several distance form forest ecosystem

| Species                        | Distance from the forest |
|--------------------------------|--------------------------|
|                                | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| Anoplolepis gracillipes (F. Smith, 1857) | 113 | 147 | 54  | 56  | 12  | 68  | 35  | 90  | 54  | 136  | 62   |
| Brachyponera pilidorsalis (Yamane, 2007) | 1   | 1   |     |     |     |     |     |     |     |      |      |
| Brachyponera sp.               | 2   | 2   | 1   |     |     |     |     |     |     |      |      |
| Camponotus (Tanaemyrmex) sp. 1 | 1   | 20  |     |     |     |     |     |     |     |      |      |
| Camponotus (Tanaemyrmex) sp. 2 | 2   | 1   | 2   |     |     |     |     |     |     |      |      |
| Carebara affinis (Forel, 1915) | 3   | 1   | 1   |     |     |     |     |     |     |      |      |
| Cataulacuss hispidulus F. Smith, 1865 | 2   | 13  |     |     |     |     |     |     |     |      |      |
| Colobopsis leonardi (Emery, 1889) | 17  | 8   |     |     |     |     |     |     |     |      |      |
| Colobopsis saundersi (Emery, 1889) | 1   |     |     |     |     |     |     |     |     |      |      |
| Colobopsis sp.                 | 2   |     |     |     |     |     |     |     |     |      |      |
| Crematogaster (Crematogaster) borneensis Andre, 1896 | 3   | 10  | 1   | 19  |     |     |     |     |     |      |      |
| Crematogaster (Crematogaster) rogenhoferi Mayr, 1879 | 229 |     |     |     |     |     |     |     |     |      |      |
| Crematogaster (Orthocrema) longipilosa Forel, 1907 | 9   | 15  | 15  | 3   | 7   | 23  | 13  | 1   | 18  | 27   |      |
| Diacamma holosericum (Roger, 1860) | 2   |     |     |     |     |     |     |     |     |      |      |
| Dinomyrmex gigas (Latreille, 1802) | 9   |     |     |     |     |     |     |     |     |      |      |
| Dorylus laevigatus (F. Smith, 1857) | 10  |     |     |     |     |     |     |     |     |      |      |
| Leptogenys cf. pequeini (Andre, 1887) | 7   | 12  |     |     |     |     |     |     |     |      |      |
| Odontomachus rixosus (F. Smith, 1857) | 7   | 1   | 1   | 6   | 53  | 13  | 2   | 4   | 1   | 22   |      |
| Odontomachus similimus F. Smith, 1858 | 26  | 25  | 93  | 28  | 68  | 12  | 41  | 62  | 45  | 41   | 5    |
| Odontoponera denticulate (F. Smith, 1858) | 42  | 30  | 48  | 33  | 27  | 37  | 40  | 53  | 8   | 3    | 17   |
| Odontoponera transversa (F. Smith, 1857) | 65  | 7   | 3   | 3   | 3   | 18  | 2   | 28  | 5   |      |      |
| Pheidole longipes (Latreille, 1802) | 158 | 1   | 2   | 1   |     |     |     |     |     |      |      |
| Pheidole plagia F. Smith, 1860 | 17  | 14  | 14  | 18  | 22  | 81  | 25  | 3   | 11  | 7    |      |
| Pheidole sp.                   | 2   | 1   | 2   | 1   |     |     |     |     |     |      |      |
| Polyrhachis (Myrma) illaudata (F. Smith, 1858) | 11  | 9   | 9   | 7   | 2   | 17  | 10  | 5   | 1   | 5    | 5    |
| Polyrhachis (Myrma) sp. 1      | 1   |     |     |     |     |     |     |     |     |      |      |
| Polyrhachis (Myrma) sp. 2      | 1   | 1   | 1   | 2   | 1   | 2   | 1   | 7   | 3   |      |      |
| Polyrhachis (Myrmhopla) abdominalis F. Smith, 1858 | 7   | 13  | 2   | 1   | 5   | 1   | 2   | 4   | 4    |      |      |
| Tetraponera pilosa (F. Smith, 1858) | 1   |     |     |     |     |     |     |     |     |      |      |
| **Grand Total**                | 705 | 267 | 237 | 174 | 216 | 271 | 219 | 254 | 234 | 285  | 152  |

Several species were just found in certain distance from forest ecosystem. *Dinomyrex gigas* and *Colobopsis saundersi* were a species that just found in forest ecosystem and not found in palm oil plantation. These species are form the same genus, *Componotus* so that they have similar character and based on this research, they were just found in forest ecosystem. *D. gigas* is a biggest size in insect and its spread is widely in Asian forest and one of them is in Sumatera island. This ant feeds insect and bird dung so that this insect was widely found in forest because the availability of food source in forest [12].

Species *Dorylus laevigatus* was just found in 700 m form forest ecosystem and was not found in forest ecosystem. The same result was also reported by Rubiana [4], that species was just found in in palm oil plantation ecosystem. It was caused by temperature and humidity factor. High temperature and high light intensity in daytime caused the soil temperature increased so that the soil became dry. This condition encouraged the ant move to the surface to find food source. Based on biology, character of this species is subteran which is it lived in underground and carnivore.

Other species that found was *Tetraponera Pilosa* and just found in 500 m form forest. In 500 m, there was a palm oil plant which it is flowering. This condition released a volatile compound and invited the *T. Pilosa* visited the plant. Based on biology, the character of this species is arboreal which is it lives...
on tree. Suwondo [20] stated that the food availability can determine the abundance so that affects to species that found in that area.

3.3. Diversity and ant evenness index

Based on Table 3, the diversity index of 4 locations is almost similar that is 2.33 in Kampung Surau, 2.17 in Kubang Panjang, 2.19 in Muaro Mau and 2.02 in Muaro Momongan.

Table 3. Total of species (S), total of individual (N), diversity index (H’) and evenness index (E) of ant in location

| Index | Research Sites |
|-------|----------------|
|       | Kampung Surau  | Kubang Panjang | Muaro Mau | Muaro Momongan |
| S     | 23             | 20             | 15        | 16             |
| N     | 943            | 692            | 517       | 894            |
| H’    | 2.23           | 2.17           | 2.19      | 2.02           |
| E     | 0.85           | 0.85           | 0.85      | 0.81           |

*Notes: Total of species (S), Total of individual (N), Diversity index (H’), and evenness index (E)

The diversity index of ant in this research was grouped to moderate which is >1 and < 3. The diversity index of ant in this ecosystem was caused by the ant community in this ecosystem was arranged by many individuals with the abundance of individual was almost same and even just several species were dominant and caused the diversity was moderate.

Based on several distances from forest ecosystem, highest diversity index occurred in 600 m which is 2.25 and the lowest occurred in 200 m which is 1.6. The highest evenness index occurred in 600 m which is 0.87 and lowest index in 1 m which is 0.67. For highest dominance index, it occurred in 100 m which is 0.33 and the lowest occurred in 600 with the value was 0.13.

Table 4. Total of species (S), total of individual (N), diversity index (H’), evenness index (E), dominance index (D) of ant in palm oil plantation based on forest ecosystem.

| Index | Distance from forest (m) |
|-------|--------------------------|
|       | Forest 100 200 300 400 500 600 700 800 900 1000 |
| S     | 18 15 10 13 12 16 15 15 15 13 |
| N     | 721 269 238 174 216 272 219 264 235 285 153 |
| H’    | 2.02 1.64 1.60 1.98 1.89 1.99 2.25 1.82 1.79 1.73 1.92 |
| E     | 0.81 0.67 0.75 0.82 0.80 0.81 0.87 0.78 0.77 0.73 0.78 |
| D     | 0.19 0.33 0.25 0.18 0.20 0.19 0.13 0.22 0.23 0.27 0.22 |

*Notes: Total of species (S), Total of individual (N), Diversity index (H’), and evenness index (E) of plant

Diversity index of ant in this research showed that all index was almost same which is from 1.6-2.1 and grouped to moderate with the value >1 and < 3. Lowest diversity and evenness index occurred in 100 m form the forest ecosystem but in 100 m from forest had highest dominance index form other distance which was 0.33. It was supported by Odum [21] who stated that the diversity and evenness will be high valuable if relative dominance index was low or otherwise. An ecosystem that has high dominance indicates there is a dominant species in that ecosystem and causes the low of diversity and evenness for another species. The dominant species will feed more food, occupy more space so that it affects another species.
### Table 5. Important value index (IVI) of ant in palm oil plantation that bordered to forest ecosystem

| Subfamily/ Species | Important value index |
|--------------------|-----------------------|
|                    | *KS | *KP | *MM | *MMg |
| **Dorylinae**       |     |     |     |      |
| Dorylus laevigatus (F. Smith, 1857) | 0.02 | 0.00 | 0.00 | 0.00 |
| **Formicinae**      |     |     |     |      |
| Anoplolepis gracillipes (F. Smith, 1857) | 0.41 | 0.29 | 0.36 | 0.50 |
| Camponotus (Tanaemyrmex) sp. 1 | 0.02 | 0.05 | 0.06 | 0.04 |
| Camponotus (Tanaemyrmex) sp. 2 | 0.04 | 0.00 | 0.00 | 0.00 |
| Colobopsis leonardi (Emery, 1889) | 0.00 | 0.00 | 0.08 | 0.06 |
| Colobopsis saundersi (Emery, 1889) | 0.01 | 0.00 | 0.00 | 0.00 |
| Colobopsis sp. | 0.05 | 0.00 | 0.00 | 0.00 |
| Dinonyrmex gigas (Latreille, 1802) | 0.02 | 0.02 | 0.00 | 0.00 |
| Polyrhachis (Myrma) illaudata (F. Smith, 1858) | 0.08 | 0.07 | 0.04 | 0.17 |
| Polyrhachis (Myrma) sp. 1 | 0.00 | 0.02 | 0.00 | 0.00 |
| Polyrhachis (Myrma) sp. 2 | 0.09 | 0.02 | 0.00 | 0.04 |
| Polyrhachis (Myrmhopla) abdominalis F. Smith, 1858 | 0.06 | 0.04 | 0.14 | 0.03 |
| **Myrmicinae**      |     |     |     |      |
| Carebara affinis (Forel, 1915) | 0.01 | 0.02 | 0.00 | 0.02 |
| Cataulacus hispidulus F. Smith, 1865 | 0.00 | 0.00 | 0.06 | 0.00 |
| Crematogaster (Crematogaster) borneensis Andre, 1896 | 0.01 | 0.06 | 0.06 | 0.02 |
| Crematogaster (Crematogaster) rogenhoferi Mayr, 1879 | 0.07 | 0.21 | 0.19 | 0.08 |
| Crematogaster (Orthrocrema) longipilosa Forel, 1907 | 0.01 | 0.02 | 0.00 | 0.27 |
| Pheidole longipes (Latreille, 1802) | 0.19 | 0.07 | 0.00 | 0.00 |
| Pheidole plagiaria F. Smith, 1860 | 0.16 | 0.15 | 0.09 | 0.09 |
| Pheidole sp. | 0.04 | 0.05 | 0.02 | 0.00 |
| **Ponerinae**       |     |     |     |      |
| Brachyponera pilidorsalis (Yamane, 2007) | 0.03 | 0.00 | 0.00 | 0.00 |
| Brachyponera sp. | 0.01 | 0.05 | 0.00 | 0.00 |
| Diacamma holosericum (Roger, 1860) | 0.00 | 0.00 | 0.04 | 0.03 |
| Leptogenys cf. pequeuti (Andre, 1887) | 0.06 | 0.02 | 0.00 | 0.00 |
| Odontomachus rixosus (F. Smith, 1857) | 0.09 | 0.08 | 0.19 | 0.06 |
| Odontomachus similimus F. Smith, 1858 | 0.06 | 0.32 | 0.4 | 0.33 |
| Odontoponera denticulate (F. Smith, 1858) | 0.28 | 0.34 | 0.19 | 0.15 |
| Odontoponera transversa (F. Smith, 1857) | 0.16 | 0.1 | 0.07 | 0.12 |
| **Pseudomyrmiciniae** |     |     |     |      |
| Tetraponera pilosa (F. Smith, 1858) | 0.01 | 0.00 | 0.00 | 0.00 |

*Notes: KS=Kampung Surau; KP=Kubang Panjang; MM=Muaro Mau; MMg=Muaro Momong
Distance of 100 m from forest ecosystem was the near location from the forest so that the diversity, vegetation as a place and food source was available because it was almost similar to forest ecosystem. It explained that 100 m from forest was combination of ant species that has undergone adaptation to the habitat that underwent transformation so that the dominance index was high in the nearest location form the forest.

3.4. Important value index (IVI) of ant in forest ecosystem and palm oil plantation

Important value index (IVI) of ant in forest ecosystem and several distances from forest varied from 0.01 up to 0.50. 3 species that had highest IVI which were A. gracillipes, O. denticulate and O. simillimus (Table 4).

A Gracillipes had highest IVI because this species was one of invasive ant. Invasive ant is a type of ant that enters new habitat and occupies it. Effect of this invasion is the environmental change and harm the native species due to the new comer ant will compete with native species. The invasive species can change or reduce the native species abundance so that it will change the biology interaction and function and structure of native ecosystem [22]. This type had high aggressiveness, active in day time and night and also join in other colonies. This condition causes the existence of this species was easy to find in the field.

O. dentuculata was found in all location and in several distances from the forest ecosystem. Yamane [23] stated that it preferred opened place and it was more found in human activity area such as agriculture land, plantation and home yard. Rizali et al. [24] stated that O. denticulate was just found in urban or land that frequently was visited by human. O. odenticulata had highest abundance in residential area because this ant was easy to adapt and active in disruption area that are close to human activity [25]. Brown ([26]) stated that this species is one of epigaecic species which its main habitat in soil surface.

O. simillimus was a common species that found in opened or moderate or disruption habitat such as beach, plantation, settlement and even in grass in university [27]. Satria et al [28] stated that O. simillimus is a common species in yard and green patch in settlement zone, plantation and secondary forest. The nest was commonly found in soil that was near to base of living tree and under shadow, but sometimes was found in paved floor near to house.

4. Conclusions

Based on this research, the level of abundance and diversity of ant was not directly affected by distance from the forest but affected by physical factor such temperature and humidity, vegetation and habitat management. The ant diversity in palm oil plantation that bordered in forest ecosystem had moderate diversity index with the value >1 and <3. The dominant species was A. gracillipes with the important value index (IVI) up to 0.50. A. gracillipes was a species that had highest total of individual than other species both in forest ecosystem and palm oil plantation that bordered to forest ecosystem.

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