ANT SPECIES COMPOSITION OF DIFFERENT HABITAT TYPES IN MUNICIPALITY OF TUBIGON, BOHOL

College of Agriculture and Natural Resources
BOHOL ISLAND STATE UNIVERSITY
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A Thesis
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In Partial Fulfillment
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Bachelor of Science in Forestry

REJAY ALADAD ARQUILLANO

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APPROVAL SHEET

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ABSTRACT

Ants are a group of insects that perform several roles, such as pollination. Ecological studies of urban ants have documented changes in species composition in different habitat types, hence, this study sought to determine the ant species composition and environment association within different habitat type of the urban area in Tubigon Bohol. Ants were sampled using a combination of different collection methods within the 20mx20m plots. The study was able to document twenty-one (21) ant species under five (5) sub-family belonging to nine (9) genera. Forest remnant had the highest number of species, followed by vacant lot, while the community garden had the lowest. Environmental factors such as canopy cover, cloud cover, foliage height, soil and air temperature is associated with ant species. These findings indicates the importance of strengthening conservation management strategies to support the survival of this species inhabiting the area.

Chapter 1

THE PROBLEM AND ITS SCOPE

Rationale

According to National Geographic, ants are common insects, but they have some unique capabilities. More than 10,000 known ant species occur around the world. They are especially prevalent in tropical forests, where they may be up to half of all the insects living in some locations. Enthusiastically social insects, ants typically live in structured nest communities that may be located underground, in ground-level mounds, or in trees. In arid Australian woodlands, ants are the most important post dispersal seed predators and they can reduce seedling recruitment (Andersen, 1987). Ant nests also affect soil properties, which influence plant abundance, density, and composition (Carlson et al., 2002). Additionally, ants are commonly used as bioindicators because they are highly diverse and important in ecosystem function (Rosenberg et al., 1986), with changes in ant species richness and composition often reflecting changes in other invertebrate groups (Majer, 1983).

Environmental changes typically result in shiftss in the abundances of ant functional groups (Ottonetti et al., 2006). Ants can be classified into functional groups based on distribution and behavior in which s often respond similarly to disturbance or stress. Ants have been used to assess land use conversion, as they can reflect environmental change, and their response to these changes have been useful in the identification of bioindicators. (Andersen 1995). Ants

respond to a variety of disturbance and have served as bioindicators to assess effects of forest clearing, road construction, mining, and agriculture (Middeljans, 2013). Urbanization is one of the major threats to biodiversity. It involves conversion of natural habitat to buildings, sealed surface, and roads. It is resulting habitat loss and fragmentation, change in local climates and hydrology, pollution, which in turn result in biotic homogenization and reduction in the biological uniqueness (Blair, 2001). Ecological studies of urban ants have documented changes in species richness and species composition in urban habitat fragment of different size as well as along the urban to rural gradient (Philpott et al., 2006).

Philippines has high diversity of ants' habitat but many species are still undescribed. A study of ant species diversity of ants (Figueras et al., 2013) determined in karst limestone habitats in selected areas in Davao Oriental it showed moderate species diversity, 23 ant species recorded. While they found caves to be the least populated, five opportunist ant species found in the caves had a high degree of habitat disturbance. Vegetation leaf litter depth, and disturbance were the factors observe affecting ant species (Figueras et al., 2013).

The high diversity of ants in the Philippines makes inventory studies interesting, with a wide variety of species to encounter. Ant surveys can detect the presence of invasive species and provide insights into the biogeography of the islands, a baseline for pre-operation inventories of mining sites and a measure of post-mining or post-logging remediation. There is much to be done

and discovered, and many opportunities await the Filipino. There are many interesting study sites in the Philippines. Each island or province has its own opportunities. The ant faunas of the large central islands remain unexplored (Alpert et al., 2012).

Philippines may include more endemic species than currently recognize. Forest inhabiting, endemic ants are strongly affected and threatened by extinction with range restricted taxa being more threatened. This is a significant danger for species in the Visayas Island where forest have been diminished to a few remnant spots on Panay, Negros, Siquijor, Cebu, Bohol (Ong et al., 2002).

The ant populations of Bohol Island are still unexplored hence, this indicates that research and fieldwork are necessary. For this reason, a study conducted in selected urban area of the municipality of Tubigon, Bohol, was performed with the aim to determine the ant species composition within the selected region of Bohol.

Literature Background

The following related citation served as bases of the study:

Ants

Ants are diverse organisms that have an impact on their surrounding environment (Sparling et al., 1997). Ants are one of the dominant organisms on land (Agosti et al., 2000). If all the world's ants were combined, it is estimated that they would weigh about as much as all human beings (Hölldobler et al., 1994). They also participate in every part of the trophic system (Carroll and Janzen, 1973, Trager, 1998). They play a major role in dispersing seeds for many plant species, chief predators of insects and other arthropods (Mirenda et al., 1980), and other invertebrates (Whitcomb et al. 1973, Jackson et al., 1998), and vertebrates' prey on them for food (Reiss et al., 2001). Ants circulate and aerate more soil in the tropics than do earthworms, thus moving nutrients throughout the landscape (Lobry de Bruyn and Conacher, 1990, Hölldobler and Wilson, 1994). In a study of Formica cinereamontana Emery, (Baxter and Hole, 1967) found that mineral soil in the upper half to two-thirds of a representative mound consists of about 85% B horizon material. Ants also fill diverse niches including soil (Tschinkel, 2003), rotting logs (Chen et al., 2002), trees (Djieto-Lordon and Dejean, 1999), leaf litter (Leponce et al. 2004), acorns (Pratt and Pierce 2001) and twigs (Armbrecht et al., 2003).

Ants are a group of insects that perform several roles, such as pollination (Luo et al., 2012), predation (Ward-Fear et al., 2010), and seed dispersal

(Lengyel et al., 2010). Ants are important for studies of the influence of local factors, because their communities are considered interactive and heavily influenced by local processes such as intra- and inter-specific competition (Andersen et al., 2012).

Uno and colleagues,(2010) found ant species composition to differ with habitat type where abundance was lowest in forest. Site characteristic varied with habitat type, forest was larger, had more woody plants, higher woody plants richness, more branches, and leaf litter whereas lots and gardens had higher forb richness, density, and more bare ground. Differences in vegetation did not correlate with ant richness, but several vegetation factors correlated with differences in ant species composition. Additional factors relating to soil, nests, or microclimatic factors may also be important for urban ant communities. Implications for biodiversity conservation in urban ecosystem are discussed. (Uno et al., 2010).

Ants are excellent candidates for biodiversity studies because of their high richness, numerical dominance, a good taxonomic base, ease of collection, stationary nesting habits that allow them to be resampled over time, sensitivity to environmental change, and interactions with other organisms (Agosti et al., 2000).

A common species in the Philippines, *Solenopsis geminata*, also called fire ants, is a common pest in households and agricultural areas. It is highly polymorphic, with a wide range of sizes between major and minor worker (Blair, 2001). There are unidentified specimens of *Solenopsis* subgenus *Diplorhoptrum*,

which are tiny, monomorphic ants, collected by Perry Buenavente from a transect studies on Mt. Palali, Nueva Vizcaya Province, Luzon Island and two mountains in Mindanao Island (DMG, unpubl. notes). There are also specimens of an unidentified species from a transect study of Mt. Isarog, Bicol Region, Luzon Island (Alpert et al., 2004).

Urban area

Global urbanization is rapidly expanding and most of the world humans now live in the cities. Most ecological studies have, however, focused on protected areas. Amy and colleagues, (2015), sampled ants across Manhattan's urban habitat mosaic, at sites with varying levels of chronic environmental stress and found that high stress urban medians had less variability in ant composition both within and among sites than either urban parks or urban forest, the lowest stress habitat, urban forest had significantly more accumulated species and a higher stress habitat, and urban parks, which have intermediate levels of chronic environmental stress, also have intermediate levels of variation in among sites species composition. The findings suggest that fine scale heterogeneity in the chronic stress urban habitat may be an underappreciated, but important structuring force for urban animal communities. (Amy et al., 2015).

The reliability of ants as bioindicators of ecosystem condition is dependent on the consistency of their response to localized habitat characteristics, which maybe, modified by larger scale effects of habitat fragmentation and loss. (Valerie et al., 2007) assessed the relative contribution of habitat fragmentation,

habitat loss and with-in patch habitat characteristics in determining ants' assemblages. They found fragmentation effects on species were confounded by the effects of habitat characteristic explained more than twice the amount of species variation attributable to fragmentation and four times the variation explained by the habitat loss. The study indicates that with-in patch habitat characteristic are the predominant drivers of ant composition (Valerie et al., 2007).

Land use change causes undesirable effects such as biodiversity decline, altered community structure and reduced ecosystem services. Changes in species composition and disrupted trophic interactions between pests and their natural enemies. We studied the effects of forest habitat transformation on the community structure of ants, which include major biological control agents. Ants were collected by hand in combination with tuna and sugar baiting on three strata, leaf litter, soil and tree. Few ant's species were shared among different among land use type. Conversion of remnant forested habitats to plantations and forested habitats are similar (Ratna et al., 2015).

With the increase in urbanization globally, there is an increased need to understand the ecology of forest fragments in urban and urbanizing landscapes. Although urban forest is known to be relatively lacking in plants whose seeds are dispersed by ants, little is known about the effects of urbanization on the community composition and behavior of forest dwelling ants. Urbanization was found to be associated with changes in microhabitat characteristics and a

concomitant characteristic and a concomitant simplification of the ant community (Thompson and McLachlan. 2006).

THE PROBLEM

Statement of the Problem

The main objective of the study is to determine species composition of ants.

Specifically, it aimed to answer the following:

1. Determine the species composition of ants in different habitat types in terms of:
   1.1 Community garden;
   1.2 Vacant lots; and
   1.3 Forest remnants?
2. Determine the environmental factors that can influence ants' species composition?
3. Which habitat type have similar ant species composition?

Significance of the Study

The findings of this study should provide valuable insight to the following group and individuals:

Academe. This study was placed in the office of the Department of Forestry and Environmental Science at the BISU-Bilar Campus. This would serve as a reference and additional material to be used for ant study in the researcher for further research.

Local Community. The result of the study would give basic knowledge to the community on how to manage and preserve habitat of different species especially in urban areas. It would help to encourage everyone to minimize the conversion of some biodiversity area into buildings infrastructure.

Department of Environment and Natural Resources. This study serves as a guide for the preservation of the biodiversity in different habitat especially in urban area. Also provide information on ant's species composition, and on how to manage especially converted area.

Researchers. The study would served as their guidelines or referral for similar studies. The findings of this study would provide new related literature to the researchers. Especially to student of forestry, environmental science to have their knowledge to preserve habitat in urban area.

RESEARCH METHODOLOGY

Research Environment

The researcher chooses urban municipality in Bohol for the collection of data of the study. The municipality of Tubigon is one of the urban areas in Bohol with coordinates 9° 57'N 123° 58'E and have a total area of 81.87km. located 51 kilometers from Tagbilaran city and the nearest seaport in Bohol to Cebu City. The three sites were selected based on their different habitat characteristics; forest remnants, community garden, vacant lots. The study was conducted from January to March 2022 (Figure 1).

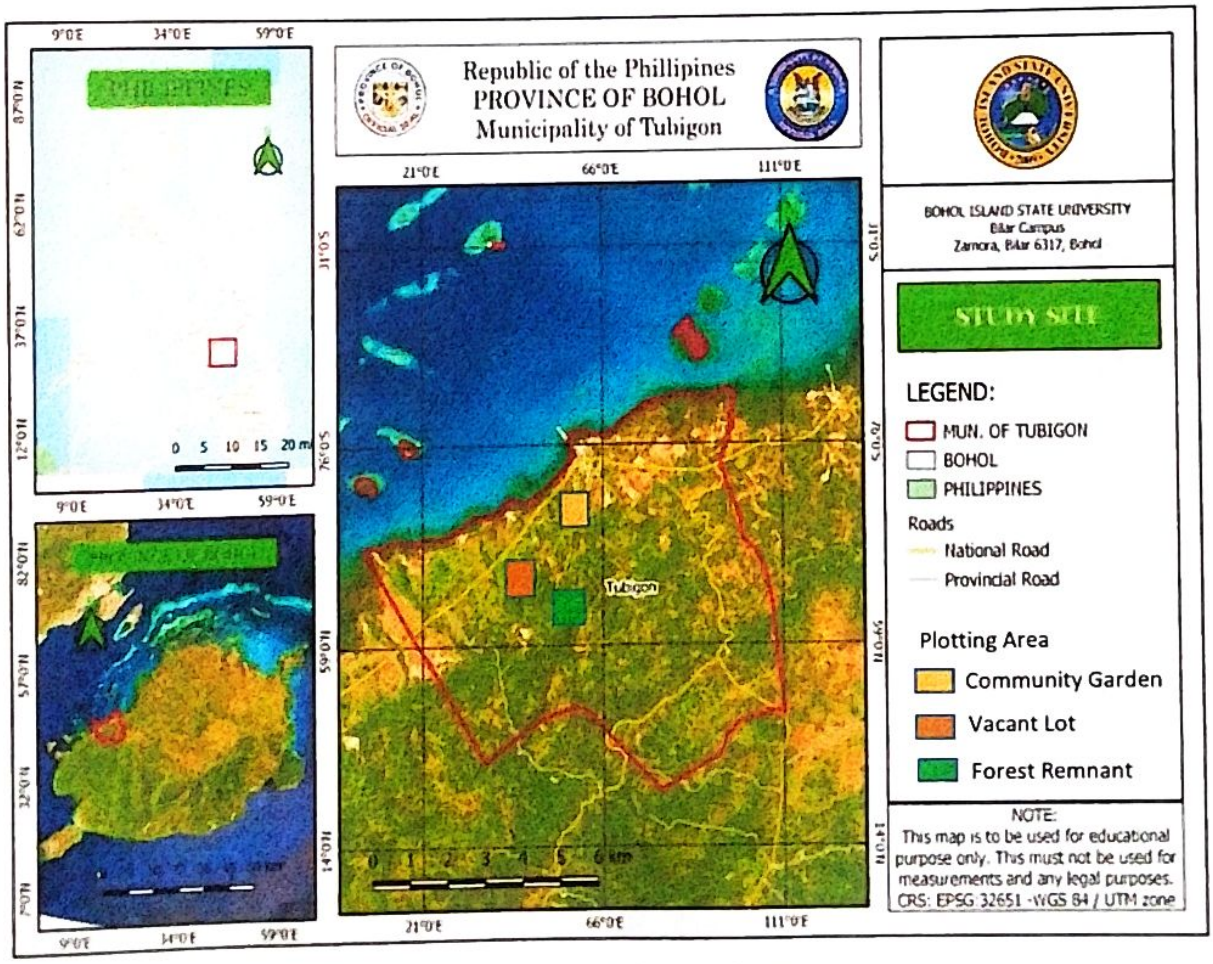

Figure 1. Location of the study area.

Research Design

All ants sampling in the study were collected from 15 sampling points in one plot, at 5m intervals. Pitfall traps made of plastic were used to trap the ants. Pitfall trapping was performed for short (days) and long (continuously) durations. This method is used to estimate the species composition of ants in an area. In community by integrating both forager (Greenslade 1973) (Figure 2).

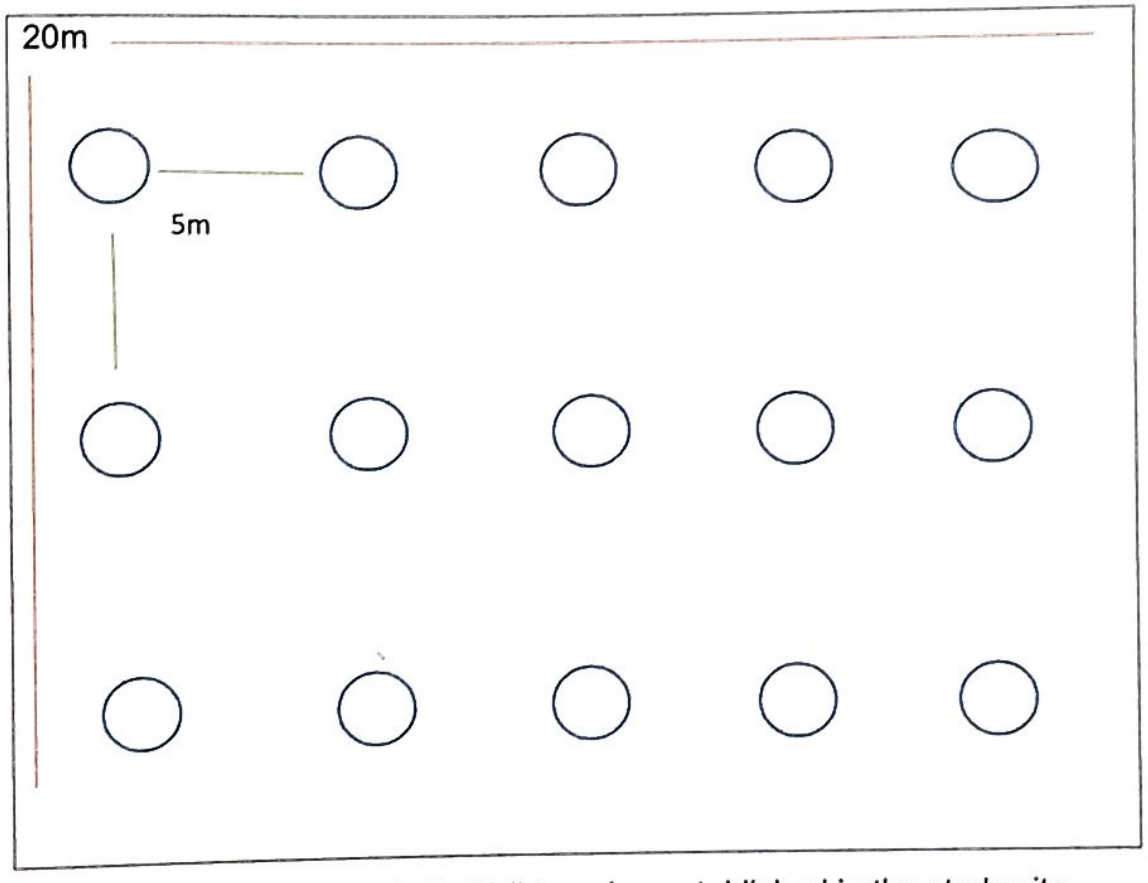

Figure 2. Layout of pitfall trapping established in the study site.

Instrument / Materials

The following instruments and materials were used in this study. Global Positioning system (GPS) used to obtained the coordinates and elevation. Hotdog, vials or twirl bags for collected sample baiting ants. Ethanol, forceps, timer, containers used for the pitfall traps. Measuring tape, portable microscope used to view and identify ant under digital microscope. Field notebook used to record about the appropriate information of ant's sample.

Procedure

Coordination with the sites in charge. The researcher sought authorization from the local municipal and barangay government authorities before conducting the field survey so that they would be properly informed about the purpose of the study.

Collection of the Primary Data. The actual collections of ants using baiting and pitfall trapping were done accordingly in the site. Established 15-baiting station per plot with 5-meter interval distributed in a (20x20m). Using hotdog, attract ants to points where they collected (Figure 3).

Figure 3. Actual collections of samples using pitfall trapping.

Environmental Factors. Information in the environment in the study site which contribute greatly to the value of any specimen and necessary for the study. Soil temperature, air temperature, relative humidity, habitat classification, vegetation type or dominant plant species including slope aspect, and elevation. Percentage of ground cover, measured the point frame (Figure 4).

Figure 4. Actual collection of soil temperature in the soil surface.

Specimen processing. Process the specimen collected by sorting, dissecting, labeling, identifying, separating morph species, maximizing the value. In ant specimen preparation sorting the samples collected from the field. It is important to separating ant specimens from such a mix can be tedious work, preventing damage the specimen. The most important is to put label of every specimen collected (Figure 5).

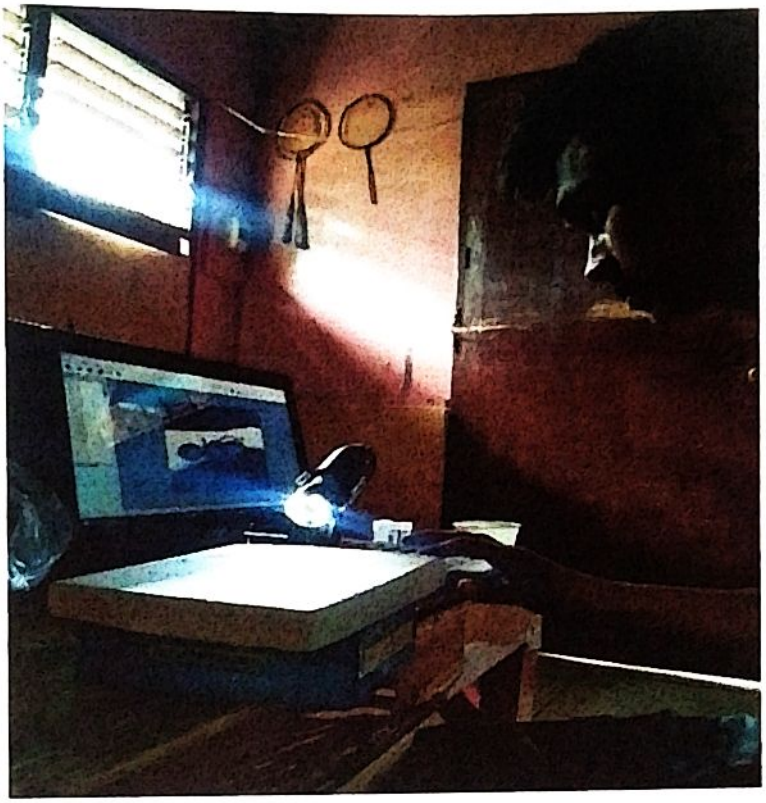

Figure 5. The actual process of specimen sorting, separating from mix species.

Statistical Analysis

All collected data was tabulated and computed with the help of the statistician. In analyzing the environmental factors in habitat type, correlate with ant species composition using Canonical Correspondence Analysis. The data was summarized and organized in tabular form. In comparing species composition of ants in different habitats. Using the Bray-Curtis Hierarchical Cluster Analysis (HCA). All composition analyses will be conducted with PAST (Hämmer et al. 2001).

$$\text{HCA:} \qquad BCij = \frac{2C}{Si+Sj}$$

Where:

i & j - are the two sites,

Si - is the total number of specimens counted in the site i

Sj – is the total number of specimens counted on j

Cij – is the sum of only the lesser count for each species found in both sites.

DEFINITION OF TERMS

Urbanization – conversion of natural habitat to buildings, sealed surface, and roads.

Ant species Composition – identifying of the arrangement of ant's species in their way of living in their community.

Habitat – the place or the environment of the group.

Habitat disturbance– transformation affect communities in many ways either by altering the balance of competitive interactions often in effect resetting the process of competitive exclusion, or by clearing space for colonization of new organism.

Community garden – gardened collectively utilize landscape area.

Forest remnants – an ecological community containing flora and fauna that has not been significantly disturbed by agriculture, logging, pollution, development or others destructive activities.

Vacant lots – a land that has no building or no one occupy.

Chapter 2

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter deals with the presentation of findings and analysis of data. Analysis on the data were made on the different habitat type, community garden, vacant lots, and forest remnants. The data were collected and presented in tables, analyzed, interpreted and presented as follows.

Ants Species composition in different habitat type.

Within the Municipality of Tubigon, different ant species were found in different habitat types (Table 1). Fourteen of nine Formicidae species (Ants) observe in different habitat types in the Municipality of Tubigon (Figure 6). In community garden there were five species observed, namely: *Anoplolipes gracilipes*, *Colobopsis truncata*, *Colobopsis macrocephala*, *Notuncos capitatus*, *Tapinoma medanocephalom*. Of these species there were four genera namely: *Anoplolepis, Colobopsis, Notuncos, Tapinoma*, under two sub-families Formicinae, Dolichoderinae. The Sub-Family Formicinae represented in community garden in terms of number of species.

In vacant lots there were seven species observed, namely: *Paratrechina longicornis*, *Colobopsis macrocephala*, *Colobopsis abdita*, *Colobopsis camelus*, *Simopone wilburi*, *Simopone rex*, *Carebara diversa*. These species belonged to five genera, namely: *Paratrechina, Colobopsis, Simopone, Carebara*, under four

sub-families Formicinae, Dorylinae, Myrmicinae, Dolichoderinae. Mostly Formicinae represented the highest no. of species and followed by the Dorylinae in the vacant lot.

In forest remnants there were nine species observed, namely: *Anoplolipes gracilipes, Colobopsis truncata, Colobopsis macrocephala, Notuncos capitatus, Simopone silens, Tapinoma medanocephalom, Carebara diversa, Odontomachus opaciventris, Laptogyns* sp. These species belong to eight genera, namely: *Anoplolepis, Colobopsis, Notuncos, Simopone, Tapinoma, Carebara, Odontomachus, Laptogenys,* under to five sub-families Formicinae, Dorylinae, Dolichonderinae, Myrmicinae, Dolichoderinae. The most represented sub-families are Formicinae and Ponerinae in Forest remnants (Table 1).

Table 1. Total no. of ant species in different habitat types

		No. of Species		
Sub-Family	**Genera**	**Community Garden**	**Vacant lots**	**Forest Remnants**
Formicinae	*Anplolipes*	1	-	1
	Colobopsis	2	3	2
	Paratrechina	-	1	-
	Notuncos	1	-	1
Dolichoderinae	*Tapinoma*	1	-	1
Myrmicinae	*Carebara*	-	1	1
Dorylinae	*Simopone*	-	2	1
Ponerinae	*Odontomachus*	-	-	1
	Laptogenys	-	-	1
Total		5	7	9

Species Account

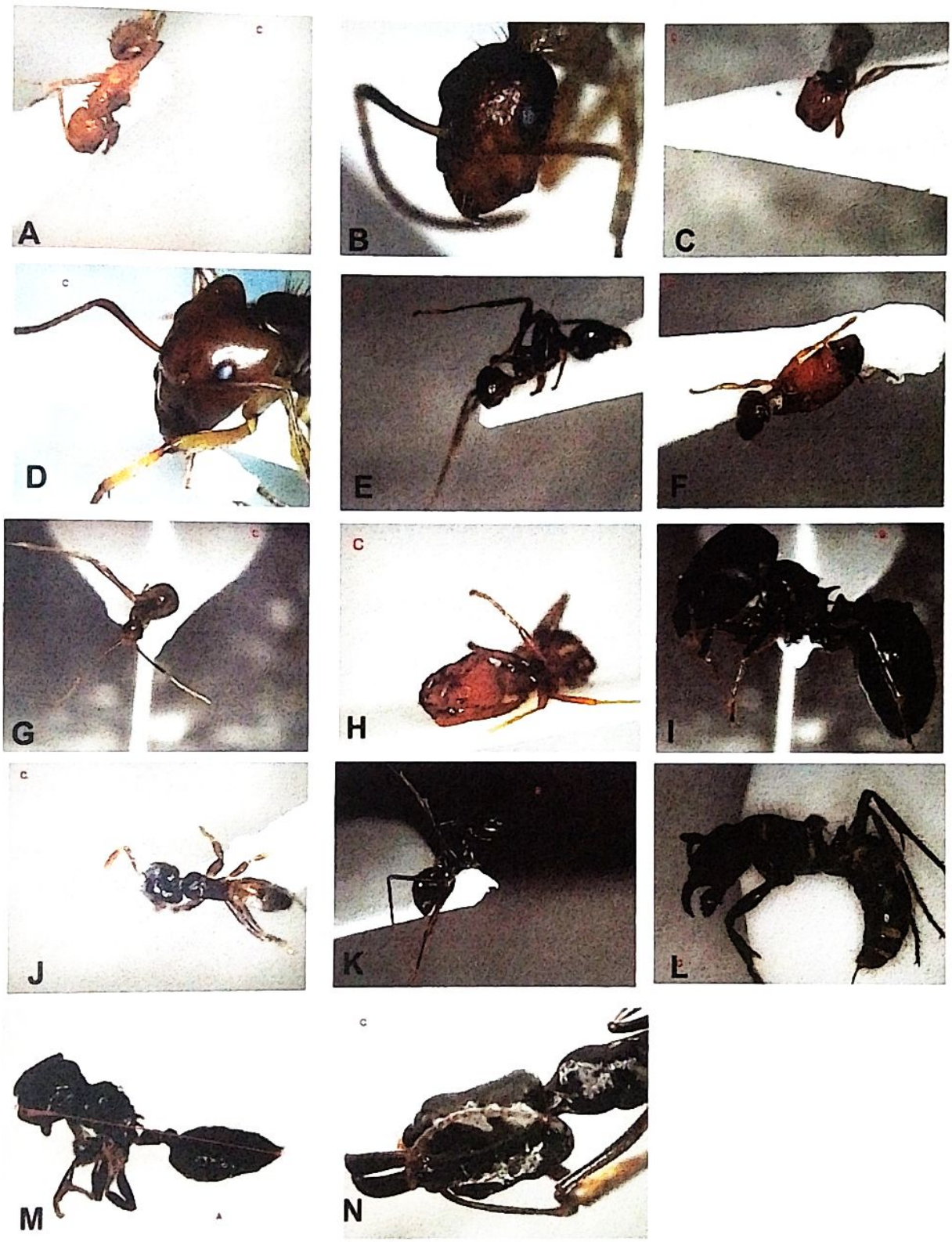

Figure 6. Fourteen of nine Formicidae species (Ants) observe in different habitat types in the Municipality of Tubigon. A. *Anoplolipes gracilipes*, B. *Colobopsis truncate*, C. *Colobopsis macrocephala*, D. *Notuncos capitatus*, E. *Paratrechina longicornis*, F. *Colobopsis obdita*, G. *Colobopsis camelus*, H. *Tapinoma medanocephalum*, I. *Carebara diversa*, J. *Simopone silens*, K. *Odontomachus opaciventris*, L. *Laptogenys* sp. M. *Simopone wilburi*, N. *Simopone rex*.

Environmental factors influence ants' species composition

The canonical correspondence analysis (CCA) was performed to assess the relationship of ant's species into the environment. The analyses showed that some species relied to environmental factors. Based on the data of canonical correspondence the ant's species namely: *Colobopsis truncata*, *Notuncos capitatus* were positively associated with the environmental factors such as, cloud cover, slope, elevation, canopy cover. The species *Simopone silens, Laptogenys* sp, *Odontomachus opaciventris*, were positively associated with the environmental factors such as, wind and foliage height. The species *Anoplolipes gracilipes* positively associated with relative humidity.

Some species showed no significant interaction with environmental factors. The species *Simopone wilburi, Colobopsis obdita, Carebara diversa*, *Simone rex*, *Colobopsis camelus*, *Paratrechina longicornis*, were not associated with the environmental factors, and appear to tolerate a wide variety of environmental factor. This lack of interaction was most pronounced in species observed in the vacant lots (Figure 7).

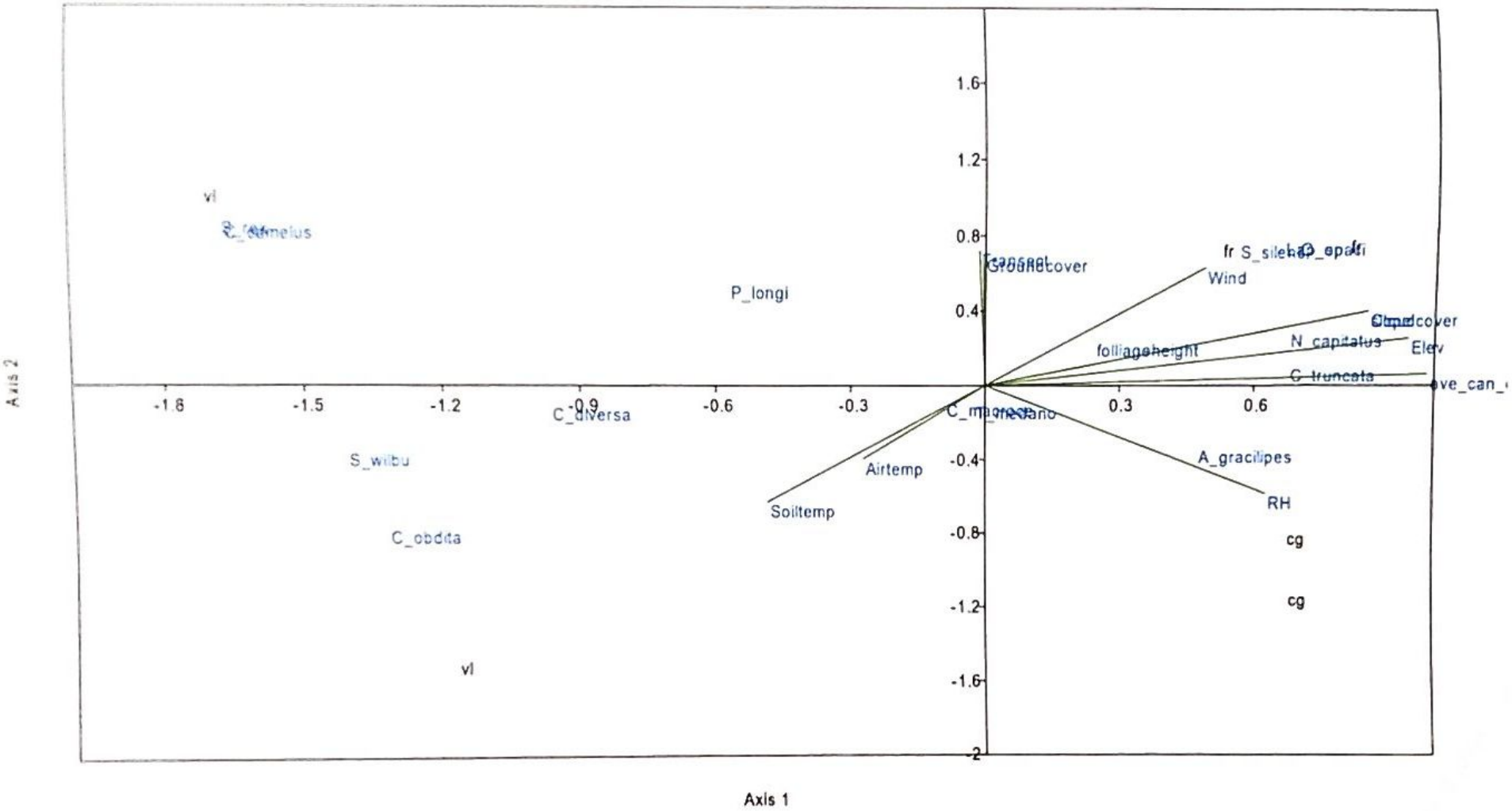

Figure 7. Canonical Correspondence Analysis (CCA) of ants and its habitat characteristic association. Eigenvalue of axis 1. 0. 3358, axis 2. 0.1092. fr - forest remnant, vl - vacant lot, cg - community garden. RH- Relative Humidity, Elev- elevation, ave_can- average canopy cover, airtemp- air temperature, soiltemp- soil temperature. C_obdita- *Colobopsis obdita*, C_macro- *Colobopsis macrocephala*, A_gracilipes- *Anoplolipes gracilipes*, P_longicornes- *Paratrechina longicornes*, C_diversa- *Carebara diversa*.

Similar of ant species composition in different habitat type

The dendrogram shows that there were similar of ant species composition in different habitat types. There were three groups of species composition, the first major group is the subfamily of Formicinae this group presented in different habitat type. Forest remnants and community garden had the same group of composition. There were four most dominant species *Anoplolipes gracelipes, Colobopsis truncata*, *Colobopsis macrocephala*, *Notuncos capitatus* belong to the sub family of Formicinae. These four species presented in the Forest remnant and Community garden. While the vacant lot is dissimilar of ant's species composition. It composes of Formicinae with four species *Paratrechina longicornis*, *Colobopsis obdita, Colobopsis camelus*, *Colobopsis macrocephala*, different type of species from forest and community garden and Dorylinae with two species. The cophenetic correlation of this analysis reach the value to 0.95, which means the samples collected is confident (Figure 8).

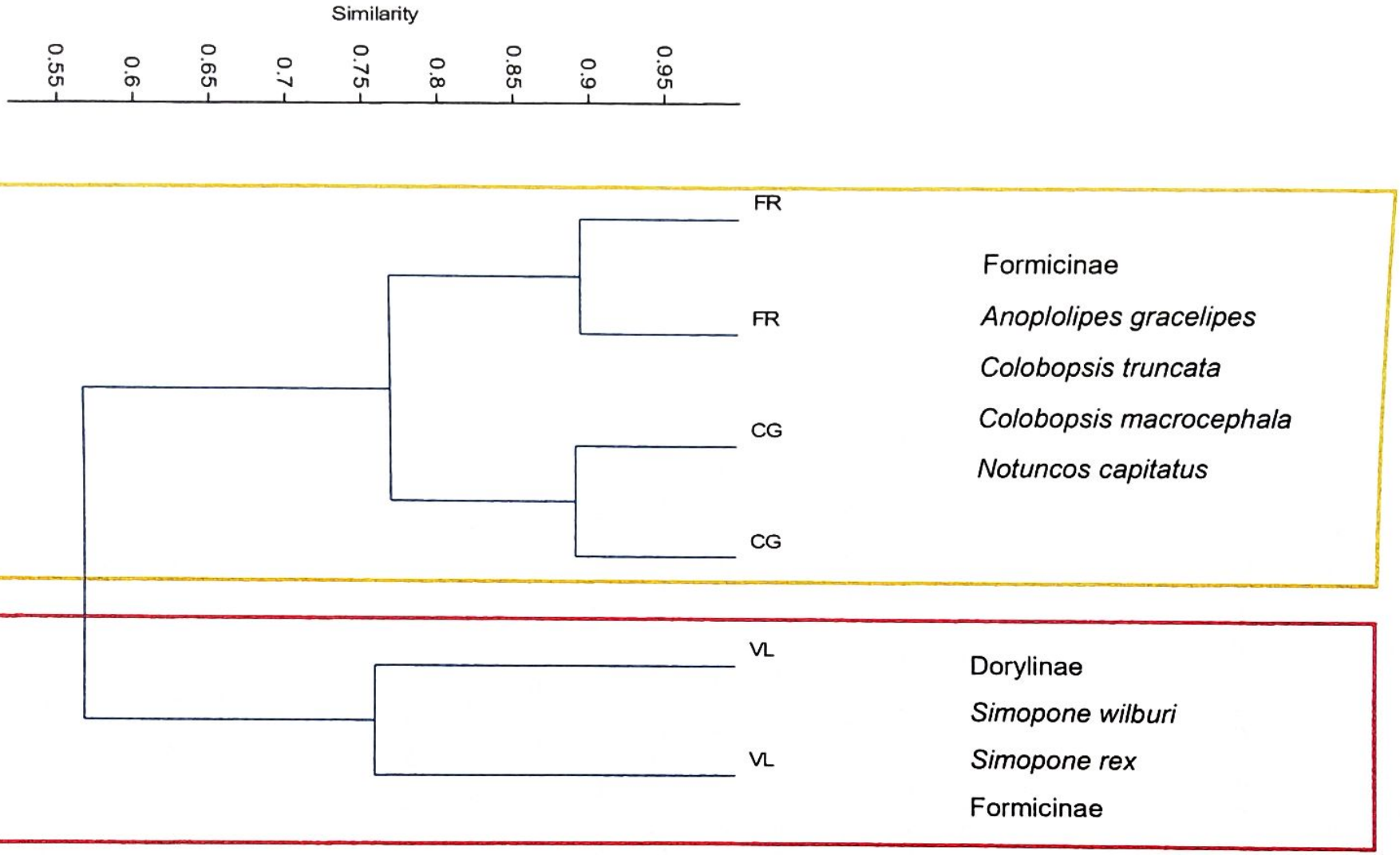

Figure 8. The dendogram with six sampling plots generated through PAST software using Bray-Curtis Similarity Index. FR- forest remnant, CG- community garden, VL- vacant lot.

Chapter 3

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary of Findings

Based on the analysis, it was found out that there were similar ant species composition in different habitat types. Forest remnants had the highest number of species. And the vacant lot had the second highest number of the species. The community garden has the lowest number of ant's species. Environmental factors found associated with some ant species. Mostly species from the forest were observe to be associated with environmental factors. The vacant lot has the second highest number of species but some species showed no significance interaction to the environmental factors. Forest remnant and community garden had similar species composition. The dominant species of the two habitats were *Anoplolipes gracelipes, Colobopsis truncata*, *Colobopsis macrocephala*, *Notuncos capitatus*, belong to sub-family of Formicinae.

Conclusions

Based on the finding of the study it was concluded that, different habitat type have different species and species composition. The forest had the higher numbers of species composition. Vacant lot had the second highest and the community garden the lowest number of species. It can also be concluded that

some species relied to environmental factors. Some of these diverse species are impacted by environmental factors. However, some species showed no significant interaction with environmental factors. it should be noted that species found in the vacant lot often lacked environmental dependencies. HCA result showed that Forest remnants and community garden have similarity group of ant species composition with the sub-family of Formicinae with four species dominating in the two-habitat types. Vacant lot is dissimilar of ant's species composition. It composes of Formicinae with four species.

Recommendations

Based on the summary of findings and conclusions the following recommendations are hereby suggested:

1. DENR and LGU's should promote tree planting activities especially in vacant lot to preserve ant's habitat.
2. Strengthening conservation management strategies to support the survival of this species inhabiting the area.
3. Stop converting forest area to preserve ant species in urban area.
4. It is further recommended to conduct more related study in ants especially in destructive area.

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APPENDICES

APPENDIX A

Data on the collection of samples of ants in Community Garden (Quadrat 1)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-07-08-2022				9:00am				
Sample Code: T1- Q1 DAY		Quadrat Size: 20x20			Longitude: 123.96187				Latitude: 9.95149				
Locality: Tubigon, Bohol					Elevation (masl):				Slope: 3-8%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, hand collect				Bait Type: Hotdog				
Air Temperature: 30.8°C					Soil Temperature: 28.2°C				Relative Humidity: 79%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	21	Community garden	plant	light	<50%	75%	0-25	Opportinistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	14	Community garden	plant	light	<50%	75%	0-25	Opportinistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	11	Community garden	plant	light	<50%	75%	0-25	Opportinistic	Urban/Cultivated	Disturbed
Formicinae	Notoncus capitatus	Hand collect		1	Community garden	plant	light	<50%	75%	0-25	Soil	Urban/Cultivated	Disturbed
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	21	Community garden	plant	light	<50%	75%	0-25	Opportinistic	Urban/Cultivated	Disturbed
ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-07-08-2022				Time: 9:00pm				
Sample Code: T1- Q1 NIGHT		Quadrat Size: 20x20			Longitude: 123.961892				Latitude: 9.951518				
Locality: Tubigon, Bohol					Elevation (masl):				Slope: 3-8%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 30.4°C					Soil Temperature: 27.8°C				Relative Humidity: 79%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	18	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	10	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	21	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	18	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed

APPENDIX B

Data on the collection of samples of ants in Community Garden (Quadrat 2)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-07-08-2022				Time: 9:00am				
Sample Code: T1- Q2 DAY		Quadrat Size: 20x20			Longitude: 123.962233				Latitude: 9.950842				
Locality: Tubigon, Bohol					Elevation (masl):				Slope: 3-8%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 31.2°C					Soil Temperature: 28°C				Relative Humidity: 79%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	23	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	18	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	11	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	8	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Notoncus capitatus	Pitfall trap	Hotdog	6	Community garden	plant	light	<50%	75%	0-25	Soil	Urban/Cultivated	Disturbed
ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-07-08-2022				Time:				
Sample Code: T1- Q2 NIGHT		Quadrat Size: 20x20			Longitude: 123.962742				Latitude: 9.951021				
Locality: Tubigon, Bohol					Elevation (masl):				Slope: 3-8%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 30.4°C					Soil Temperature: 28°C				Relative Humidity: 79%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	13	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	8	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	21	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	26	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed
Formicinae	Notoncus capitatus	Pitfall trap	Hotdog	8	Community garden	plant	light	<50%	75%	0-25	Opportunistic	Urban/Cultivated	Disturbed

APPENDIX C

Data on the collection of samples of ants in Vacant Lot (Quadrat 1)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-11-12-2022				Time: 9:00am				
Sample Code: T2- Q1 DAY			Quadrat Size: 20x20		Longitude: 123.935264.E				Latitude: 9. 914993.N				
Locality: Panadtaran, Tubigon, Bohol					Elevation (masl):				Slope: 0-3%				
Sample Type:			Sampling Duration: 3 hrs		Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 31°C					Soil Temperature: 28°C				Relative Humidity: 80%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	23	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Paratrechaina longicornis	Pitfall trap	Hotdog	9	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis obdita	Pitfall trap	Hotdog	11	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis camelus	hand collection		1	vacant lot	grass	light	clear	0%	0-25	soil	grassland	secondary
Dorylinae	Simopone wilburi	hand collection		1	vacant lot	grass	light	clear	0%	0-25	soil	grassland	secondary
Dorylinae	Simopone rex	hand collection		1	vacant lot	grass	light	clear	0%	0-25	soil	grassland	secondary
Myrmicenae	Carebara diversa	Pitfall trap	Hotdog	8	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	19	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-11-12-2022				Time: 9:00pm				
Sample Code: T2- Q1 NIGHT			Quadrat Size: 20x20		Longitude: 123.934998.E				Latitude: 9.914773.N				
Locality: Panadtaran, Tubigon, Bohol					Elevation (masl):				Slope: 0-3%				
Sample Type:			Sampling Duration: 3 hrs		Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 30.4°C					Soil Temperature: 28°C				Relative Humidity: 86%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	16	vacant lot	grass	light	clear	0%	0-25	Opportinistic	grassland	secondary
Myrmicenae	Carebara diversa	Pitfall trap	Hotdog	11	vacant lot	grass	light	clear	0%	0-25	Soil	grassland	secondary
Formicinae	Colobopsis obdita	Pitfall trap	Hotdog	7	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	19	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	17	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dorylinae	Simopone wilburi	Pitfall trap	Hotdog	9	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary

APPENDIX D

Data on the collection of samples of ants in Vacant Lot (Quadrat 2)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-11-12-2022				Time: 9:00pm				
Sample Code: T2- Q2 DAY		Quadrat Size: 20x20			Longitude: 123.935042				Latitude: 9.91473				
Locality: Panadtaran, Tubigon, Bohol					Elevation (masl):				Slope: 0-3%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 31.4°C					Soil Temperature: 28°C				Relative Humidity: 73%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	22	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Paratrechaina longicornis	Pitfall trap	Hotdog	13	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis obdita	Pitfall trap	Hotdog	7	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis camelus	hand collection		1	vacant lot	grass	light	clear	0%	0-25	soil	grassland	secondary
Dorylinae	Simopone rex	hand collection		1	vacant lot	grass	light	clear	0%	0-25	soil	grassland	secondary
Myrmicenae	Carebara diversa	Pitfall trap	Hotdog	9	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	19	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-11-12-2022				Time: 9:00pm				
Sample Code: T2- Q2 NIGHT		Quadrat Size: 20x20			Longitude: 123. 935297				Latitude: 9. 915998				
Locality: Panadtaran, Tubigon, Bohol					Elevation (masl):				Slope: 0-3%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 30.6°C					Soil Temperature: 28.2°C				Relative Humidity: 86%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Colobopsis camelus	Pitfall trap	Hotdog	11	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dorylinae	Simopone wilburi	Pitfall trap	Hotdog	8	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dorylinae	Simopone rex	Pitfall trap	Hotdog	13	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	21	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Formicinae	Paratrechaina longicornis	Pitfall trap	Hotdog	11	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	22	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary
Myrmicenae	Carebara diversa	Pitfall trap	Hotdog	6	vacant lot	grass	light	clear	0%	0-25	opportunistic	grassland	secondary

APPENDIX E

Data on the collection of samples of ants in Forest Remnant (Quadrat 1)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-14-2022				Time: 9:00am				
Sample Code: T3- Q1 DAY		Quadrat Size: 20x20			Longitude: 123.945226.E				Latitude: 9.912112.N				
Locality: Ilijan sur, Tubigon, Bohol					Elevation (masl):				Slope: 18-30%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 30°C					Soil Temperature: 26°C				Relative Humidity: 79%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	24	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	22	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Notoncus capitatus	Pitfall trap	Hotdog	21	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Ponerinae	Odontomachus opaciventris	Pitfall trap	Hotdog	22	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	23	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	23	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Ponerinae	Laptogenys sp	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Formicinae	Paratrechaina longicornis	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	wood	forest	primary
ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-14-2022				Time: 9:00pm				
Sample Code: T3- Q1 NIGHT		Quadrat Size: 20x20			Longitude:123.945226.E				Latitude: 9.912112.N				
Locality: Ilijan sur, Tubigon, Bohol					Elevation (masl):				Slope: 18-30%				
Sample Type:		Sampling Duration: 3 hrs			Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 29.8°C					Soil Temperature: 25°C				Relative Humidity: 73%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	19	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	17	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	13	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	7	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Myrmicenae	Carebara diversa	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Dorylinae	Simopone silens	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Formicinae	Paratrechaina longicornis	Pitfall trap	Hotdog	11	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary

APPENDIX F

Data on the collection of samples of ants in Forest Remnant (Quadrat 2)

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-15-2022				Time: 9:00am				
Sample Code: T3- Q2 DAY	Quadrat Size: 20x20				Longitude: 123.945203.E				Latitude: 9.913317.N				
Locality: Ilijan sur, Tubigon, Bohol					Elevation (masl):				Slope: 18-30%				
Sample Type:	Sampling Duration: 3 hrs				Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 29.9°C					Soil Temperature: 26°C				Relative Humidity: 79°C				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	9	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	19	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Notoncus capitatus	Pitfall trap	Hotdog	16	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Ponerinae	Odontomachus opaciventris	Pitfall trap	Hotdog	14	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	19	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	19	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Ponerinae	Laptogenys sp	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Formicinae	Paratrechaina longicornis	Hand collect		1	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary

ANT DATA SHEET													
Observer: Rejay A. Arquillano					Date: March-15-2022				Time: 9:00pm				
Sample Code: T3- Q2 NIGHT	Quadrat Size: 20x20				Longitude: 123.945203.E				Latitude: 9.913317.N				
Locality: Ilijan sur, Tubigon, Bohol					Elevation (masl):				Slope: 18-30%				
Sample Type:	Sampling Duration: 3 hrs				Method: Pitfall trap, baiting, hand collect				Bait Type: Hotdog				
Air Temperature: 28.2°C					Soil Temperature: 26.4°				Relative Humidity: 78%				
Sub-Family	Latin Name	Method	Bait Type	Frequency	Habitat Type	Ground Cover	Wind	Cloud Cover	Ave. Canopy Cover over site (%)	Foliage Height Profile (cm)	Nest Type	Habitat Type Nest Occurs In	Vegetation Type Surrounding the Nest
Formicinae	Colobopsis macrocephala	Pitfall trap	Hotdog	21	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Dolichoderinae	Tapinoma medanocephalum	Pitfall trap	Hotdog	20	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Colobopsis truncata	Pitfall trap	Hotdog	11	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Formicinae	Anoplolipes gracilipes	Pitfall trap	Hotdog	16	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary
Myrmicenae	Carebara diversa	Pitfall trap	Hotdog	9	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Dorylinae	Simopone silens	Pitfall trap	Hotdog	6	Forest	leaf litter	moderate	<50%	85%	100-150	soil	forest	primary
Formicinae	Paratrechaina longicornis	Pitfall trap	Hotdog	14	Forest	leaf litter	moderate	<50%	85%	100-150	opportunistic	forest	primary

APPENDIX G

ANT SURVEY DATA SHEET

Observer: _____ Date: _____ Time: _____

Sample code: _____ GPS coordinates: _____

Locality: _____

Habitat type: _____ Elevation: _____ Slope: _____ Aspect: _____

Sample type: _____ Sampling duration: _____

Quadrat size/Trap size/Litter volume/Habitat type: _____

Nest type: _____

Temp (air): _____ Temp (soil): _____ Relative humidity (Rn): _____ Wind: _____

Insolation: _____

Percentage Ground Cover

Bare: _____ Litter: _____ Stone: _____ Plant: _____ Other: _____

Soil description: _____ Litter depth: _____

Foliage Height Profile (cm):

Point 1: 0-25: _____ 25-50: _____ 50-100: _____ 100-150: _____ 150-200: _____

Point 2: 0-25: _____ 25-50: _____ 50-100: _____ 100-150: _____ 150-200: _____

Point 3: 0-25: _____ 25-50: _____ 50-100: _____ 100-150: _____ 150-200: _____

Point 4: 0-25: _____ 25-50: _____ 50-100: _____ 100-150: _____ 150-200: _____

Dominant taxa in Foliage Height Profile (FHP): _____

_____

Percentage Canopy Cover

Point 1: _____ Point 2: _____ Point 3: _____ Point 4: _____

Dominant Canopy Taxa: _____

Notes:

APPENDIX H

Habitat Description Form*

Describer:_____ Date: _____

Locality:_____ Elevation/Coordinates: _____

Air Temperature: _____ Soil Temperature: _____

Humidity: _____ pH: _____

1. Slope: _____
2. Vegetation Type: _____
3. Height: a) of emergent trees: _____
   b) Of canopy: _____
4. DBH: a) of emergent trees: _____
   b) Of canopy: _____
5. Tree Taxa, emergent and canopy: _____
6. Canopy Epiphytes: _____
7. Grasses or Sedges: _____
8. Canopy Vines: _____
9. Understory Plants: _____
10. Ground Cover: _____
11. Pandan density: _____
12. Ficus density: _____
13. Other fruit density: _____
14. Musa density: _____
15. Pitcher plant density: _____

16.Moss density: _____

17.Leaf litter cover: _____

18.Humus cover, depth: _____

19.Soil type, moisture: _____

20.Fallen logs: _____

21.Exposed rocks: _____

22.Water type, distance: _____

23.Dist. To anthropogenic clearing: _____

24.On site disturbances: _____

Remarks:

Density Index: Absent-0; Rare-20%; Moderate-40%; Common-80%; Abundant-100%

*Adapted from **Heaney LR. 2001.** Island Biogeography, Paradigm Lost? Frontiers of Biogeography **2**, 94-97

APPENDIX I

Instruction on Habitat Description*

1. Slope-describe the degree of the slope and contour of the land (e.g. mountainous, undulating, flat, etc.). Topography were have bearing on the susceptibility in degradation.

2. Vegetation Type- note whether the vegetation is primary, secondary, or disturb vegetation. Indicate the type and the state of vegetation indices degree of disturbance.

3. Height- approximate the height of emergent and canopy trees. It differs in every type of vegetation as well as in elevation.

4. Tree taxa- refers to the general tree type of the dominant vegetation, e.g. dipterocarp or the genera is provided among dominant species. The type of vegetation differs in every type of forest and may as well indicate degree of disturbance.

5. Canopy epiphytes- provide identification of epiphytes found on the tree canopy e.g. ferns, orchids, pitcher plants, etc. Epiphytes differ in the different types of elevation as well as the habitat type.

6. Canopy vines- climbing plants on the body of trees on the canopy may be described or identified. It can be additional habitat type for certain animals. Some flowering plants are sources of food for birds, bats, civets and other climbing animals.

7. Understory Plants- identifies the species of plants found below canopy. It can indicate the kind of habitat and may also provide food for terrestrial mammals.

8.Groundcover plants- describes and identifies the ground cover plants (moss, ferns, seedlings, etc.). Some as the understory plants and mat indicate susceptibility to erosions or soil fertility.

9. Grasses/Sedges- indicates the presence or absence, density, and identifies species of both. It can indicate disturbance since presence of grass or sedges is associated with sunlight penetration. It is also a characteristic in the tops of high-altitude mountains.

10. Pandan density- indicate the pandan density species are the food source for harpy fruit bats (*Harpyonecteris whiteheadi*) and thus it indicates its presence. Other animals also eat its fruits.

11. Fig tree density- it indicates the presence of fig tree (*Ficus sp.*). It is primary source for the short-nosed bat (*Cynopterus brachtotis*) and other fruit bats. Other animals also eat it.

12. Other fruit density- indicates the density of other fruiting trees, palms, etc. Fruit-bearing plants are indication of the density of other animals.

13. Musa density- indicate the density of wild banana, abaca and other *Musa spp*. Banana grooves are the main habitat for the long-tongued bat (*Macroglossus minimus*). It is also eaten by other species of bats and other animals such as civets and monkeys.

14. Pitcher Plant density-indicate the abundance of pitcher plants and where these are situated. It indicates degree of disturbance since it inhabits primary, undisturbed forest. It is also the microhabitat of frogs under genus *Pelophryne.*

15. Moss abundance-indicate the abundance of moss and where they are situated. It is the indicative of the type of forest particularly mossy forest and is present in areas with greater moisture.

16. Leaf litter cover- indicates the presence or absence, depth and state. It indicates presence of moisture and vegetation cover.

17. Fallen logs- indicates the presence or absence of fallen logs and state of decomposition. It indicates degree of disturbance in the area.

18. Exposed rocks- indicates the presence or absence and density of exposed rocks. It indicates the state of erosion in the area.

19. Water type, distance- describe the type of water source or body of water present in and around the vicinity, and the distance from the camp or either points in elevation. It indicates animal density since most animals congregate in areas with abundant water supply.

20. Distance to Anthropogenic clearing- estimate metric distance to any form of clearing and indicate the type of clearing (farm, kaingin, etc.). It indicates the actual and potential source of disturbance.

21. On site disturbance- describe and differentiate any type of natural disturbance or man-made disturbance in the area. It is identified as to natural or man-made may have management implications and thud may be considered in report writing when providing recommendations.

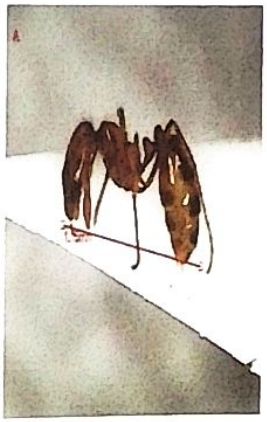
* Adapted from **Heaney LR. 2001.** Island Biogeography, Paradigm Lost? Frontiers of Biogeography **2**, 94-97

APPENDIX J

Image of ants collected in different habitat types.


Sub-Family: Formicinae
Scientific Name: *Anoplolepis gracilipis*


Sub-Family: Formicinae
Scientific Name: *Colobopsis truncata*

Sub-Family: Formicinae
Scientific Name: *Colobopsis macrocephala*


Sub-Family: Formicinae
Scientific Name: *Notuncos capitatus*


Sub-Family: Dolichoderinae

Scientific Name: *Tapinoma medanocephalum*


Sub-Family: Formicinae

Scientific Name: *Paratrechina longicornis*


Sub-Family: Formicinae

Scientific Name: *Colobopsis abdita*


Sub-Family: Myrmicenae

Scientific Name: *Carebara diversa*


Sub-Family: Dorylinae

Scientific Name: *Simopone silens*


Sub-Family: Ponerinae

Scientific Name: *Odontomachus opaciventris*

Sub-Family: Ponerinae

Scientific Name: *Laptogenys* sp.

Sub-Family: Dorylinae

Scientific Name: *Simopone wilburi*

Sub-Family: Dorylinae

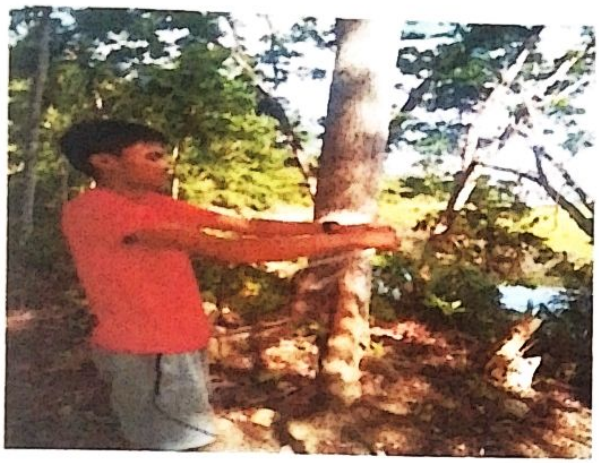
Scientific Name: *Simopone rex*

Sub-Family: Formicinae

Scientific Name: *Colobopsis camelus*

APPENDIX K

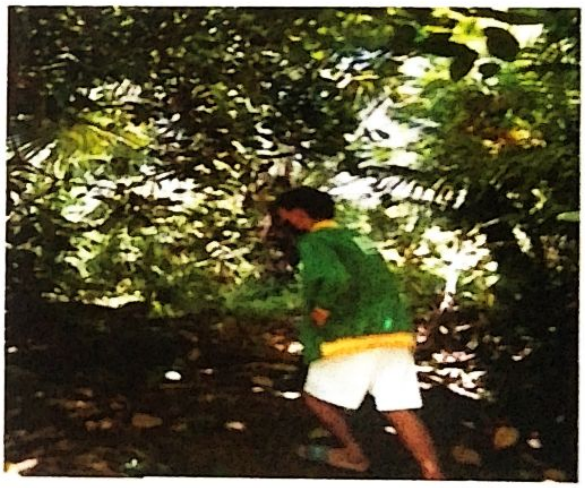
Documentation



Relative Humidity data collection

Sorting of ant species

Plotting



Surveying

Soil temperature data collection

Collecting samples from pitfall trapping

APPENDIX L

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY
College of Agriculture and Natural Resources
Forestry and Environmental Science Department
Bilar Campus,Zamora, Bilar, Bohol

October 25, 2021

ENGR. WILLIAM R. JAO
MUNICIPAL MAYOR
MUNICIPALITY OF TUBIGON

Sir:

Greetings!

In partial fulfillment of the requirements for the degree of Bachelor of Science in Forestry, I am asking permission from your good office to conduct a study entitled "ANT SPECIES COMPOSITION OF DIFFERENT HABITAT TYPES IN MUNICIPALITY OF TUBIGON BOHOL".

In line with this, i would like to ask permission to conduct the study in three different sites in the Municipality of Tubigon; the community garden/Tubigon plaza, vacant lots/Brangay Panadtaran, forest remnants/Barangay Ilijan Sur. In this regard, the undersigned request approval of your good office to conduct the data gathering on November-December, 2021.

I am looking forward for your approval. Thank you so much and God bless!

Sincerely yours,

REJAY A. ARQUILLANO
BSF Student

Noted by:

REIZL P. JOSE, PhD
Thesis Adviser

Approved by:

ENGR. WILLIAM R. JAO
Municipal Mayor

Recommending Approval:

NOEL T. LOMOSBOG PhD
Dean, CANR

MARIETTA C. MACALOLOT, PhD
Campus Director

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY
College of Agriculture and Natural Resources
Forestry and Environmental Science Department
Bilar Campus,Zamora, Bilar, Bohol

October 25, 2021

VIRGINIA A. TUNGA
BARANGAY CAPTAIN
ILIJAN SUR, TUBIGON, BOHOL

Ma'am:

Greetings!

In partial fulfillment of the requirements for the degree of Bachelor of Science in Forestry, the researcher is asking permission from your good office to conduct a study entitled "ANT SPECIES COMPOSITION OF DIFFERENT HABITAT TYPES IN MUNICIPALITY OF TUBIGON BOHOL".

In line with this, I would like to ask permission to conduct the study in your barangay, as one of my study site is forest remnants. In this regard, the undersigned request approval of your good office to conduct the data gathering on November-December, 2021.

The researcher is looking forward for your approval. Thank you so much and God bless!

Respectfully yours,

REJAY A. ARQUILLANO
Student Researcher

Noted by:

REIZU P. JOSE, PhD
Thesis Adviser

Recommending Approval:

NOEL T. LOMOSBOG PhD
Dean, CANR

Approved by:

HON. VIRGINIA A. TUNGA
Brgy Captain