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DOI 10.5897/SRE12.481
ISSN 1992-2248 © 2013 Academic Journals
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*Full Length Research Paper*

# Diversity and abundance of insect species at Kota Damansara Community Forest Reserve, Selangor

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Accepted 22 February, 2013

**A study was conducted on the diversity and abundance of insect species at Kota Damansara Community Forest Reserve in order to determine the richness of the forest insect fauna. A total of 774 insects from 13 Orders and 79 Families were recorded. This study shows that Coleoptera (42.63%), Hymenoptera (17.96%), Diptera (10.08%) and Orthoptera (10.85%) were the most dominant Orders in the Forest Reserve. The highest insect diversity was observed in Diptera (Shannon's, H' = 2.67), while Dermaptera, Isoptera, Mantodea and Phasmatodea (Shannon's, H' = 0.00) were the lowest. However, the highest insect evenness was observed in Blattodea (Evenness, E = 0.36). This study also found that the abundance of insects in Kembit zone was the highest (Margalef index, = 8.51) compared to other zone sites.**

**Key words:** Insects, forest, diversity, abundance, evenness.

## INTRODUCTION

This study is about the insects fauna of the Kota Damansara Community Forest Reserve. This area has been chosen because of the less known diversity and abundance of insects in this forest. It was interpreted as a Permanent Forest Reserve in 18 February, 2010 by the Selangor State Government for amenity, education, conservation and research, falling under the authority of the Selangor Forest Department. It is managed in collaboration with local residents and user groups. This forest is a remnant of the former Sungai Buloh Forest Reserve which was established in 1898. It is a rare sample of Lowland Dipterocarp Forest as one of the last Forest Reserves that can still be found in the Petaling District and was last logged in the 1980s.

Many groups of insects were recognized today, for example, the Blattodea, Coleoptera, Dermaptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Mantodea, Neuroptera, Odonata, Orthoptera, Phasmatodea, Phthiraptera,Psocoptera, Thysanoptera and Zoraptera. They are unique in their own way and have an important ecological role for survival of life on Earth. Great insect diversity is indeed an intrinsic part of the Earth's ecosystem. They are what make the ecosystems tick remarked (Samways, 1994).

Many insects are valuable to humans, for example by their pollinating activities. Bees are of the most economically important groups of insects as a result of pollination of agricultural crops (Berenbaum et al., 2006). The recent biological control agent was the manipulation of ants throughout citrus orchards in Asia, which have been developed in Malaysian and Indonesian cocoa plantations (Choate and Drummond, 2011). Furthermore, some of the insects also provide us with honey, silk and other commercial value products; they serve as food for bird, fish and beneficial animals; they perform valuable services as scavenger, and they have been useful in

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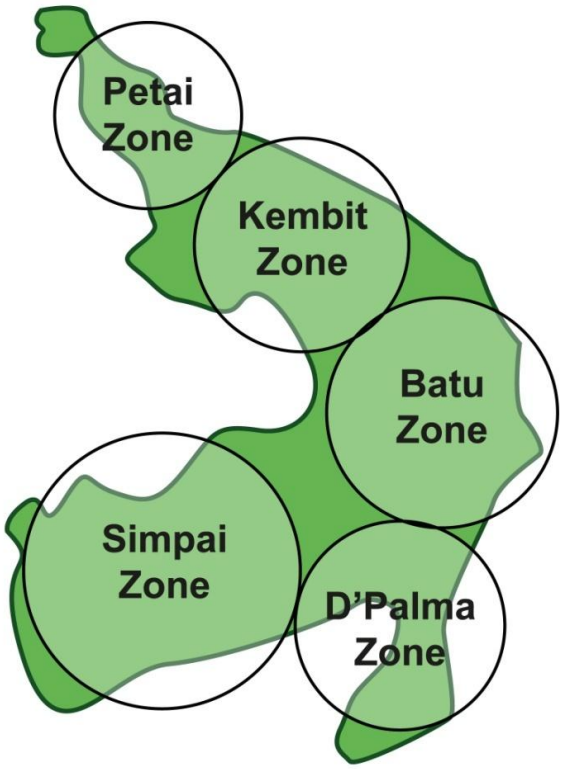



**Figure 1.** The zone locations of insects sampling at the Kota Damansara Community Forest Reserve.

medicine and scientific research. But, some of them are harmful and become pests in agricultural crops and stored products, and some insects transmit diseases to human and other animals (Triplehorn and Johnson, 2005).

The objective of this study is to determine the diversity and abundance of the insect fauna at the Kota Damansara Community Forest Reserve.

## MATERIALS AND METHODS

This study was conducted at the Kota Damansara Community Forest Reserve from the 15th April until 20th April, 2011 on a scientific expedition of biodiversity organized by the Forestry Department of Selangor State and Malaysian Natural Society (MNS). Samples of insects were collected from four sampling areas that is, Simpai zone, Kembit zone, Petai zone and D' Rimba zone (Figure 1). The abiotic data were taken by using luxmeter and hygrometer to measure the light intensity and temperature respectively in each of the zone sites.

Sampling methods in this study were based on Triplehorn and Johnson (2005), and Abdullah and Shamsulaman (2010). Four sampling methods were used that is, collected manually, light trap, malaise trap and pitfall trap. In each zone sites, one malaise trap and 10 pitfall traps were set up from 9.00 am until 7.00 pm, one light trap from 7.00 pm until 11.00 pm and manual collecting were done for 8 h during the day time.

All of the collected specimens were preserved in the 70% ethyl alcohol in the multipurpose containers, and were brought back to the laboratory for pinning and identification. Pre-identification was based primarily on the description by Triplehorn and Johnson (2005), Flowers (2004) and Choate (1999). However, the detailed identification was based on comparison with specimens in the Zoological Museum in the Institute of Biological Sciences, University Malaya and several taxonomic references. The collected specimens were kept in the Zoological Museum of the Institute for future reference.

## RESULTS

In this study, a total of 774 individual of insects from 13 Orders were collected. They are from the Order of Blattodea, Coleoptera, Dermaptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Mantodea, Odonata, Orthoptera, Phasmatodea and Thysanoptera [Table 1 and Figure 2- (number 1 to 54)]. From 83 collected Families, 54 were recognized until genus from 30 subfamilies, where 20 were identified until species within the four days of expedition (Table 2). Of these, only 17 Families were recorded at all zone sites. They are Blaberidae, Blattelidae and Blattidae (Blattodea); Chrysomelidae, Coccinellidae, Elateridae, Scarabaeidae and Tenebrionidae (Coleoptera); Micropezidae (Diptera); Cicadellidae and Issidae (Hemiptera); Braconidae, Formicidae and Ichneumonidae (Hymenoptera) and Acrididae, Gryllidae and Tettigonidae (Orthoptera).

The results show that Coleoptera (42.63%) were the most dominant insects in the Forest Reserve, followed by Hymenoptera (17.96%), Diptera (10.08%) and Orthoptera (10.85%). The rarest insect Order were Dermaptera, Isoptera, Mantodea, Odonata and Phasmatodea that is, lower than 1% (Table 1). However, two of the 13 identified Orders were spatially rarest Orders. They are Mantodea and Phasmatodea, with collection of only one specimen (0.13%) throughout this study (Table 1). Of the collected insects, the Order Diptera has the highest diversity in the Forest Reserve (H' = 2.67), although Coleoptera has the most collected number of individuals with H' = 1.76. This is because chrysomelid species were commonly collected in Simpai and D'Rimba zones. Furthermore, majority of the timber trees were in Petai zone where the greatest number of coccinelid occurred. Five out of 13 Orders have zero diversity index. They are Dermaptera, Isoptera, Mantodea, Phasmatodea and Thysanoptera, with only one family collected during the expedition. Besides that, 44 individuals of thrips from 7 genera and from one family under the Order of Thysanoptera have been collected.

One of the sampling areas that is, the Kembit zone has the highest abundance of insect species with H = 8.51 and 45 Families were being identified. In contrast, the Petai zone has the lowest value of Margalef index (H = 7.35), although most insects have been collected in this zone (Table 3). This could be due to the highest number of Coleoptera being collected in this zone. The richness estimate is based on the number of Families and individual insects at the zone sites.

**Table 1.** Diversity index and Evenness index of the insect community at the Kota Damansara Forest Community Reserve.

| Order | Total of the insects | Total of the Family | Percentage (%) | Diversity index (H') | Evenness index (E) |
|---|---|---|---|---|---|
| Blattodea | 30 | 3 | 3.88 | 1.08 | 0.36 |
| Coleoptera | 330 | 17 | 42.63 | 1.76 | 0.10 |
| Dermaptera | 2 | 1 | 0.26 | 0.00 | 0.00 |
| Diptera | 78 | 20 | 10.08 | 2.67 | 0.13 |
| Hemiptera | 44 | 13 | 5.68 | 2.11 | 0.17 |
| Hymenoptera | 139 | 11 | 17.96 | 1.60 | 0.16 |
| Isoptera | 2 | 1 | 0.26 | 0.00 | 0.00 |
| Lepidoptera | 15 | 6 | 1.94 | 1.58 | 0.28 |
| Mantodea | 1 | 1 | 0.13 | 0.00 | 0.00 |
| Odonata | 4 | 3 | 0.52 | 1.04 | 0.35 |
| Orthoptera | 84 | 5 | 10.85 | 1.37 | 0.33 |
| Phasmatodea | 1 | 1 | 0.13 | 0.00 | 0.00 |
| Thysanoptera | 44 | 1 | 5.68 | 0.00 | 0.00 |
| **Total** | **774** | **83** | **100** | **-** | **-** |


**Figure 2 (number 1-9).** COLEOPTERA. (1-2) Carabidae; (3) Brentidae, *Cylas formicarius*; (4) Scarabaeidae, *Adoretus* sp.; (5-6) Tenebrionidae; (7-8) Chrysomelidae (9) Rhipiceridae.

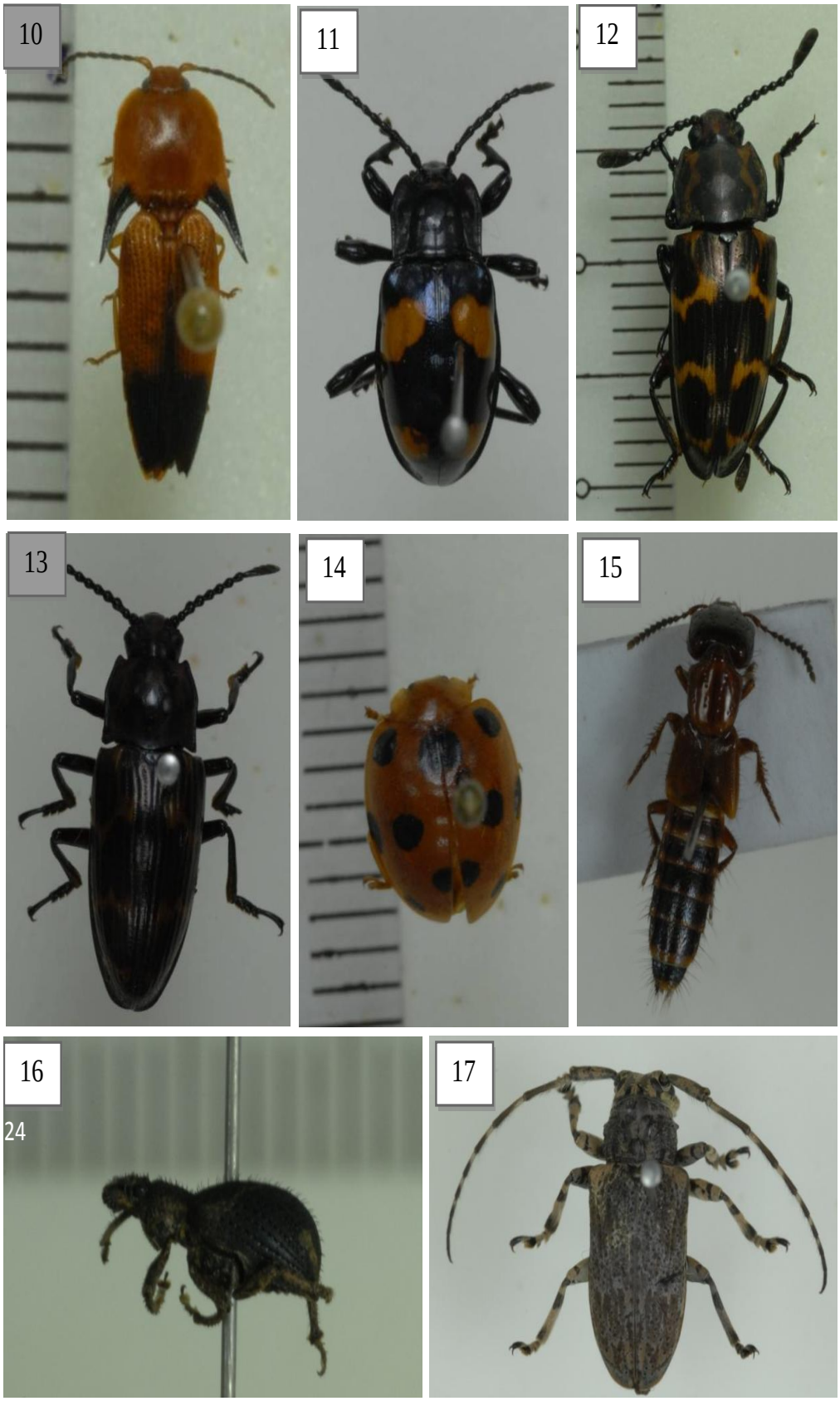



**Figure 2 (number 10-17).** COLEOPTERA (10) Elateridae; (11) Endomychidae; (12-13) Erotylidae; (14) Coccinellidae; (15) Staphylinidae; (16) Curculionidae; (17) Cerambycidae.

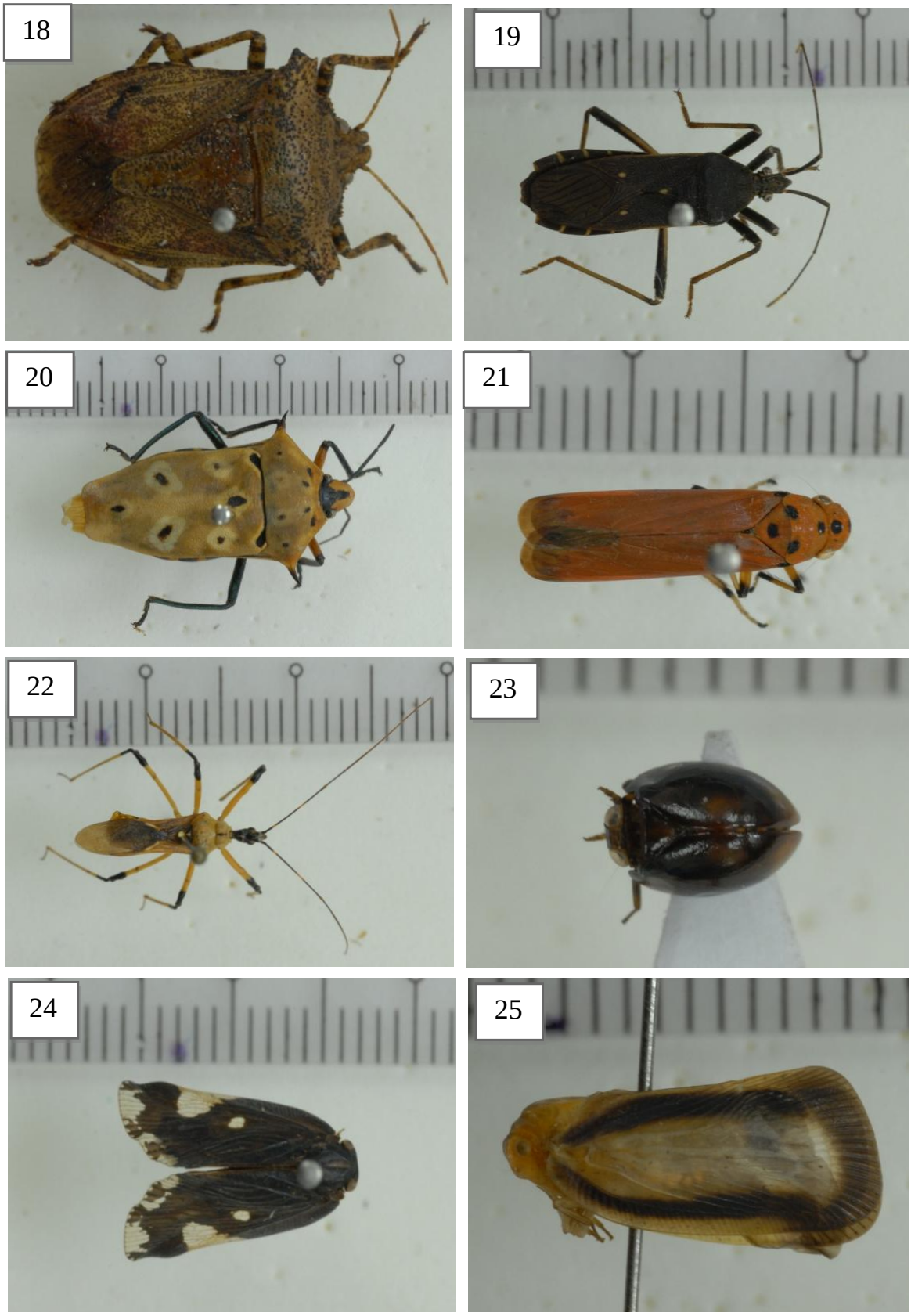



**Figure 2 (number 18-25).** HEMIPTERA.(18) Pentatomidae; (19) Coreidae; (20) Scutelleridae; (21) Cicadellidae, *Bothrogonia ferruginea*; (22) Reduviidae, *Cosmolestes picticeps*; (23) Issidae; (24) Ricanidae, *Ricania* sp.; (25) Flattidae.

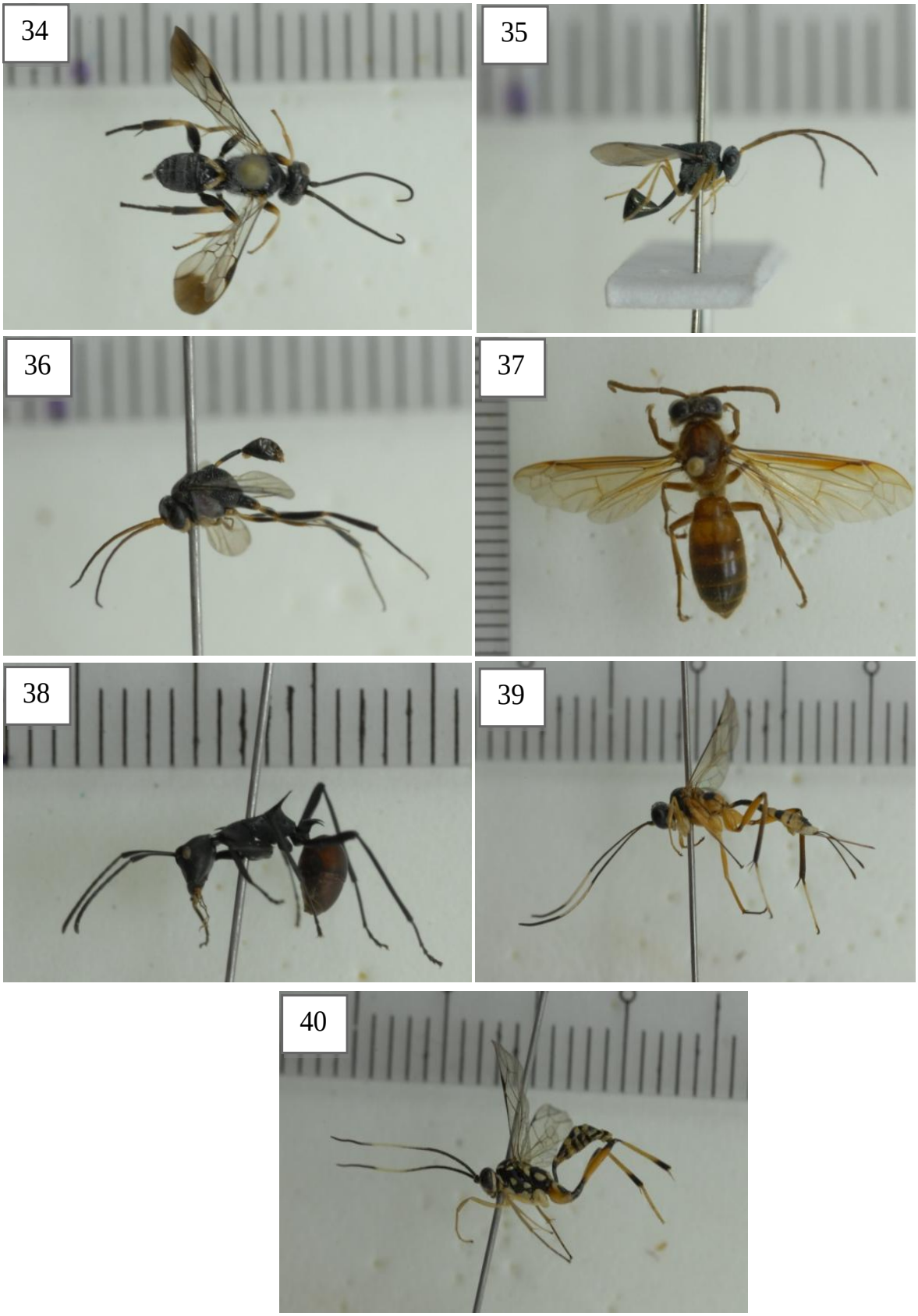



**Figure 2 (number 34-40).** HYMENOPTERA. (34) Braconidae; (35) Eucharitidae; (36) Evaniidae; (37) Vespidae, *Provespa* sp.; (38) Formicidae, *Componotus gigas*; (39-40) Ichneumonidae.


**Figure 2 (number 41-46).** ORTHOPTERA (41) Tetrigidae; (42) Eumastacidae, *Erianthus serratus*; (43) Gryllidae; (44) DERMAPTERA; (45) PHASMATODEA, Heteronemiidae; (46) BLATTODEA, Blattellidae.

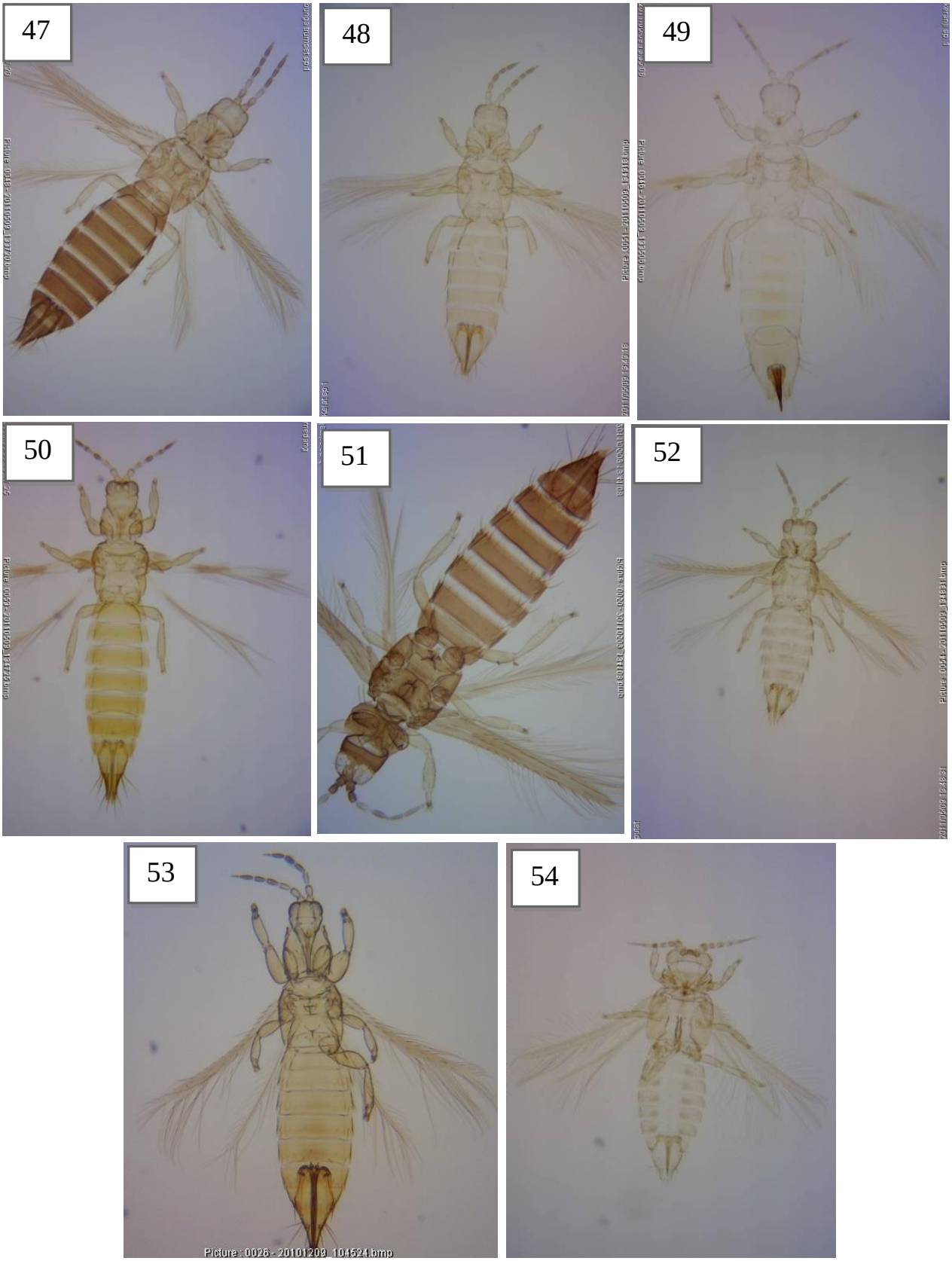



**Figure 2 (number 47-54).** THYSANOPTERA, Thripidae. (47-53) Thripinae. (47) *Thrips florum*; (48) *T. razanii*; (49) *Chaetanaphothrips* sp.; (50) *Isunidothrips serangga*; (51) *Taeniothrips damansarae*; (52) *Scirtothrips* sp.; (53) *Rhamphothrips* sp.; (54) Dendrothripinae, *Pseudodendrothrips* sp.

**Table 2.** List of insect species collected from the Kota Damansara Forest Community Reserve.

| Insects taxon | | | Zone sites | | | | No. of individual | Collection method/s |
|---|---|---|---|---|---|---|---|---|
| **Order** | **Family** | **Species** | **Simpai** | **Kembit** | **Petai** | **D'Rimba** | | |
| | **Blaberidae** | | 2 | 3 | 3 | 1 | 9 | CM, LT |
| **BLATTODEA** | **Blattellidae** | | 6 | 2 | 2 | 3 | 13 | CM, LT |
| | **Blattidae** | | 2 | 4 | 1 | 1 | 8 | CM, LT, PT |
| | | | | | | | | |
| | **Anthribidae** | | 0 | 1 | 2 | 0 | 3 | CM, LT |
| | **Brentidae** | | | | | | | |
| | Cyladinae | | | | | | | |
| | | *Cylas formicarius* | 0 | 0 | 1 | 0 | 1 | LT |
| | | Unidentified sp. | 1 | 0 | 0 | 0 | 1 | CM |
| | **Carabidae** | | | | | | | |
| | Cicindelinae | | | | | | | |
| | | *Neocollyris* sp. | 1 | 0 | 1 | 0 | 2 | CM |
| | | Unidentified sp. | 6 | 0 | 0 | 1 | 7 | CM, LT |
| | **Cerambycidae** | | 1 | 0 | 2 | 0 | 3 | CM, LT |
| | **Chyromelidae** | | 21 | 13 | 8 | 31 | 73 | CM, LT, MT |
| | **Coccinellidae** | | | | | | | |
| | Chilocorinae | | | | | | | |
| | | *Chilocorus* sp. | 0 | 1 | 0 | 2 | 3 | CM |
| **COLEOPTERA** | Epilachninae | | | | | | | |
| | | *Epilachna* sp. | 1 | 0 | 1 | 0 | 2 | CM |
| | | | | | | | | |
| | | Unidentified sp. | 8 | 5 | 139 | 0 | 152 | CM, LT |
| | **Curculionidae** | | 0 | 3 | 2 | 7 | 12 | CM, LT, PT, |
| | | | | | | | | MT |
| | **Elateridae** | | 4 | 3 | 2 | 2 | 11 | CM |
| | **Endomycidae** | | 4 | 2 | 0 | 0 | 6 | CM, LT |
| | **Erotylidae** | | 6 | 0 | 1 | 1 | 8 | CM, LT |
| | **Lycidae** | | 1 | 0 | 0 | 0 | 1 | CM |
| | **Mordellidae** | | 0 | 1 | 0 | 0 | 1 | MT |
| | **Nitidulidae** | | 0 | 0 | 1 | 1 | 2 | PT, MT |
| | **Rhipiceridae** | | 0 | 1 | 0 | 0 | 1 | CM |
| | **Scarabaeidae** | | | | | | | |
| | Melolonthinae | | | | | | | |

**Table 2.** Contd.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | *Phyllophaga* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | Rutelinae | | | | | | | |
| | | *Adoretus* sp. | 1 | 0 | 4 | 2 | 7 | CM, LT, MT |
| | | *Anomala* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | Scarabaeinae | | | | | | | |
| | | *Copris* sp. | 0 | 3 | 0 | 0 | 3 | LT |
| | Sericinae | | | | | | | |
| | | *Maladera* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | **Staphylinidae** | | 0 | 4 | 2 | 0 | 6 | CM, LT, MT |
| | **Tenebrionidae** | | 2 | 4 | 9 | 7 | 22 | CM, LT |
| **DERMAPTERA** | | | 0 | 2 | 0 | 0 | 2 | LT, MT |
| **DIPTERA** | **Asilidae** | | 0 | 0 | 1 | 0 | 1 | CM |
| | **Caliphoridae** | | | | | | | |
| | Chrysomyinae | | | | | | | |
| | | *Chrysomyia* sp. | 0 | 1 | 0 | 1 | 2 | CM |
| | | Unidentified sp. | 2 | 0 | 0 | 0 | 2 | CM, LT |
| | **Cecidomyidae** | | 2 | 0 | 0 | 2 | 4 | CM, LT |
| | **Celyphidae** | | 1 | 0 | 5 | 0 | 6 | CM, LT |
| | **Culicidae** | | 2 | 2 | 3 | 0 | 7 | CM, LT |
| | **Diopsidae** | | 1 | 0 | 0 | 0 | 1 | CM |
| | **Dolichopodidae** | | 4 | 1 | 1 | 0 | 6 | CM |
| | **Drosophilidae** | | | | | | | |
| | Drosophilinae | | | | | | | |
| | | *Drosophila* sp. | 0 | 0 | 1 | 0 | 1 | MT |
| | | Unidentified sp. | 0 | 3 | 2 | 0 | 5 | CM, MT |
| | **Lauxaniidae** | | 0 | 0 | 0 | 1 | 1 | MT |
| | **Micropezidae** | | | | | | | |
| | Taeniapterinae | | | | | | | |
| | | *Rainieria antennaepes* | 2 | 3 | 3 | 2 | 10 | CM, LT, MT |
| | | Unidentified sp. | 6 | 0 | 1 | 0 | 7 | CM, LT, MT |
| | **Muscidae** | | 0 | 1 | 2 | 2 | 5 | CM, MT |
| | **Platystomatidae** | | | | | | | |

**Table 2.** Contd.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | *Platystoma* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | **Sarcophagidae** | | 0 | 1 | 0 | 0 | 1 | MT |
| | **Stratiomycidae** | | 1 | 1 | 1 | 0 | 3 | CM, LT |
| | **Syrphidae** | | 1 | 0 | 1 | 0 | 2 | CM, LT |
| | **Tachinidae** | | 0 | 2 | 0 | 0 | 2 | CM |
| | **Tephritidae** | | 1 | 3 | 0 | 0 | 4 | CM, LT |
| | **Tipulidae** | | 0 | 1 | 0 | 0 | 1 | CM |
| | **Ulidiidae** | | 1 | 1 | 0 | 2 | 4 | CM, LT |
| | **Xylomyidae** | | | | | | | |
| | | *Solva* sp. | 0 | 2 | 0 | 0 | 2 | MT |
| | **Aradidae** | | 0 | 0 | 1 | 1 | 2 | CM |
| | **Cercopidae** | | 2 | 0 | 0 | 1 | 3 | CM, LT |
| | **Cicadellidae** | | | | | | | |
| | Cicadellinae | | | | | | | |
| | | *Bothrogonia ferruginea* | 6 | 0 | 0 | 3 | 9 | CM, LT |
| | Idiocerinae | | | | | | | |
| | | *Idioscopus* sp. | 0 | 0 | 1 | 0 | 1 | MT |
| | | Unidentified sp. | 1 | 0 | 0 | 0 | 1 | CM |
| | Tartessinae | | | | | | | |
| | | *Tartessus ferrugineus* | 1 | 2 | 0 | 1 | 4 | CM, LT |
| **HEMIPTERA** | **Coreidae** | | 0 | 0 | 0 | 2 | 2 | CM, LT |
| | **Derbidae** | | 0 | 0 | 0 | 1 | 1 | CM |
| | **Flattidae** | | 1 | 1 | 0 | 1 | 3 | CM |
| | **Issidae** | | 1 | 1 | 1 | 1 | 4 | CM, LT |
| | **Ricaniidae** | | | | | | | |
| | | *Ricania* sp. | 0 | 0 | 0 | 1 | 1 | CM |
| | **Lygaeidae** | | 1 | 0 | 1 | 0 | 2 | CM, LT |
| | **Membracidae** | | 1 | 0 | 0 | 0 | 1 | CM |
| | **Pentatomidae** | | 0 | 0 | 0 | 1 | 1 | CM |
| | **Scutelleridae** | | 0 | 0 | 1 | 0 | 1 | CM |
| | **Reduviidae** | | | | | | | |
| | Harpactorinae | | | | | | | |
| | | *Cosmolestes picticeps* | 2 | 0 | 0 | 0 | 2 | CM |

**Table 2.** Contd.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unidentified sp. | 5 | 1 | 0 | 0 | 6 | CM |
| | **Apidae** | | | | | | |
| | Apinae | | | | | | |
| | *Trigona* sp. | 0 | 2 | 0 | 0 | 2 | LT |
| | **Aulacidae** | 0 | 0 | 0 | 1 | 1 | MT |
| | **Braconidae** | 3 | 3 | 2 | 3 | 11 | CM, LT, MT |
| | **Eucharitidae** | 0 | 6 | 0 | 2 | 8 | MT |
| | **Evaniidae** | 0 | 0 | 0 | 2 | 2 | MT |
| | **Formicidae** | | | | | | |
| | Formicinae | | | | | | |
| | *Componotus gigas* | 0 | 1 | 3 | 1 | 5 | CM, LT |
| | *Camponotus* sp. | 1 | 1 | 4 | 0 | 6 | LT, MT,PT |
| | *Polyrhachis* (*myrma*) sp. | 2 | 1 | 1 | 0 | 4 | CM,PT |
| | *Polyrhachis* (*myrmhopla*) sp. | 1 | 3 | 1 | 0 | 5 | PT |
| | Myrmicinae | 2 | 1 | 0 | 0 | 3 | LT |
| | Ponerinae | | | | | | |
| | *Leptogenys* sp. | 0 | 2 | 2 | 0 | 4 | LT, MT |
| **HYMENOPTERA** | *Odontoponera transversa* | 2 | 12 | 9 | 4 | 27 | CM, MT,PT |
| | Unidentified sp. | 6 | 7 | 1 | 0 | 15 | LT, MT, PT |
| | **Ichneumonidae** | | | | | | |
| | Campopleginae | | | | | | |
| | *Delopia* sp. | 0 | 1 | 0 | 2 | 3 | CM, MT |
| | *Eriborus* sp. | 1 | 1 | 0 | 0 | 2 | CM |
| | Unidentified sp. | 0 | 0 | 0 | 1 | 1 | MT |
| | Cryptinae | | | | | | |
| | *Echalinus* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | *Goryphus* sp. | 0 | 1 | 1 | 1 | 3 | CM, MT |
| | *Handaoia* sp. | 0 | 1 | 0 | 0 | 1 | MT |
| | *Hemigaster* sp. | 1 | 1 | 0 | 0 | 2 | CM, LT |
| | *Paraphylax* sp. | 0 | 0 | 1 | 1 | 2 | CM, LT |
| | *Takastenus* sp. | 0 | 1 | 0 | 0 | 1 | LT |
| | Unidentified sp. | 0 | 3 | 0 | 5 | 8 | CM, MT |
| | Ichneumoninae | | | | | | |
| | Unidentified sp. but near to *Imeria* sp. | 0 | 1 | 1 | 0 | 2 | CM |

**Table 2.** Contd.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pimplinae | | | | | | | |
| | | *Xanthopimpla* sp. | 0 | 1 | 0 | 0 | 1 | MT |
| | **Pompilidae** | | 0 | 0 | 0 | 4 | 4 | MT |
| | **Pteromalidae** | | 0 | 1 | 0 | 0 | 1 | CM |
| | **Sphecidae** | | 2 | 1 | 2 | 0 | 5 | LT, MT |
| | **Vespidae** | | | | | | | |
| | Vespinae | | | | | | | |
| | | *Provespa* sp. | 1 | 1 | 5 | 0 | 7 | LT |
| | | Unidentified sp. | 3 | 0 | 0 | 0 | 3 | CM, LT |
| **ISOPTERA** | **Rhinotermitidae** | | 1 | 0 | 1 | 0 | 2 | CM, LT |
| **LEPIDOPTERA** | **Arctiidae** | | 0 | 0 | 3 | 0 | 3 | LT |
| | **Lycaenidae** | | | | | | | |
| | | *Sithon nedymond nedymond* | 0 | 0 | 1 | 0 | 1 | CM |
| | **Noctuidae** | | 0 | 1 | 0 | 3 | 4 | CM, LT, MT |
| | **Nymphalidae** | | 0 | 1 | 1 | 0 | 2 | CM, LT |
| | | *Ypthima huedneri* | 2 | 0 | 0 | 0 | 2 | CM |
| | | *Ypthima* sp. | 0 | 0 | 1 | 0 | 1 | CM |
| | **Pieridae** | | | | | | | |
| | | *Eurema sari sodalis* | 0 | 1 | 0 | 0 | 1 | CM |
| | **Pyralidae** | | 0 | 0 | 0 | 1 | 1 | CM |
| **MANTODEA** | **Mantidae** | | 1 | 0 | 0 | 0 | 1 | CM |
| **ODONATA** | **Gomphidae** | | 0 | 1 | 0 | 0 | 1 | CM |
| | **Libelludidae** | | 0 | 0 | 0 | 2 | 2 | CM |
| | Coenagrionidae | | 0 | 0 | 1 | 0 | 1 | LT |
| **ORTHOPTERA** | **Acrididae** | | | | | | | |
| | Oedipodinae | | | | | | | |
| | | *Trilophidia* sp. | 1 | 0 | 0 | 0 | 1 | LT |
| | Oxyinae | | | | | | | |
| | | *Oxya* sp. | 0 | 0 | 1 | 1 | 2 | LT |
| | | Unidentified sp. | 7 | 1 | 10 | 1 | 19 | CM, LT |
| | **Eumastacidae** | | | | | | | |
| | Erianthinae | | | | | | | |
| | | *Erianthus serratus* | 0 | 0 | 0 | 1 | 0 | CM |
| | **Gryllidae** | | 7 | 5 | 17 | 2 | 31 | CM, LT, PT |

**Table 2.** Contd.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Tetrigidae** | 4 | 7 | 9 | 0 | 20 | CM, LT |
| | **Tettigonidae** | 3 | 2 | 4 | 1 | 10 | CM, LT |
| **PHASMATODEA** | **Heteronemiidae** | 1 | 0 | 0 | 0 | 1 | CM |
| **THYSANOPTERA** | **Thripidae** | | | | | | |
| | Dendrothripinae | | | | | | |
| | *Pseudodendrothrips* sp. | 0 | 1 | 0 | 0 | 1 | CM |
| | Thripinae | | | | | | |
| | *Chaetanaphothrips signipennis* | 0 | 2 | 0 | 0 | 2 | CM |
| | *Isunidothrips serangga* | 0 | 9 | 0 | 0 | 9 | CM |
| | *Rhamphothrips* sp. | 0 | 1 | 6 | 0 | 7 | CM |
| | *Rhamphothrips tenuirostris* | 0 | 1 | 0 | 0 | 1 | CM |
| | *Scirtothrips* sp. | 0 | 4 | 0 | 0 | 4 | CM |
| | *Taeniothrips damansarae* | 0 | 0 | 0 | 7 | 7 | CM |
| | *Thrips florum* | 0 | 0 | 0 | 4 | 4 | CM |
| | *Thrips javanicus* | 0 | 0 | 2 | 0 | 2 | CM |
| | *Thrips hawaiiensis* | 0 | 0 | 1 | 0 | 1 | CM |
| | *Thrips razanii* | 0 | 0 | 5 | 0 | 5 | CM |
| | *Thrips unispinus* | 0 | 1 | 0 | 0 | 1 | CM |

CM: Collected manually; PT: Pitfall; MT: Malaise trap; LT: Light trap.

Sixty three percent (63%) of insect were sampled manually where 489 specimens were caught. This is followed by the light trap (21%), which yielded 158 specimens, malaise trap (12%) and pitfall trap (4%) (Table 3). The Order which was highly collected using pitfall trap is Hymenoptera with 17 specimens; light trap, Orthoptera with 47 specimens; collected manually, Coleoptera with 280 specimens and Malaise trap, Hymenoptera with 58 specimens.

Maximum number of insects was recorded during low humidity and high light intensity. For example, the total number of insects during these condition at Petai zone was significantly correlated with minimum humidity (R = 0.6) (Graph 1) and maximum light intensity (R = 0.5) (Graph 2).

## DISCUSSION

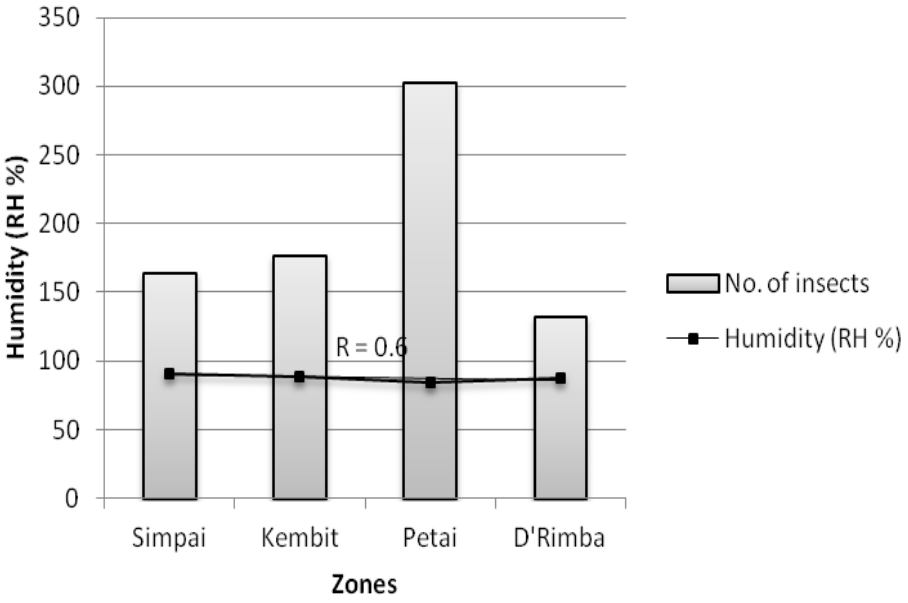
Results of this study show that this forest reserve has high diversity and abundance of insect fauna. The majority of insects found in this forest reserve were Coleoptera. This is because the Families of Chrysomelidae and Coccinellidae occurred most of the time in this study (Table 2). We observed that the coccinellid were the most common and the greatest number of insect species at the bark of timber trees. This could be the reason why the number of insects in the Petai zone was higher compared to the other zones. Furthermore, the light intensity was higher at Petai zone during the time of sampling (Graph 2). In contrast, the D'Rimba zone was lower because the number of insects caught by using the light trap was lower than in the other zone sites. Only three of the collected Orders were nocturnal during the light trap collection within the four days of expedition. They were Orthoptera, Coleoptera and Hymenoptera.

Most of the insects in this study were collected

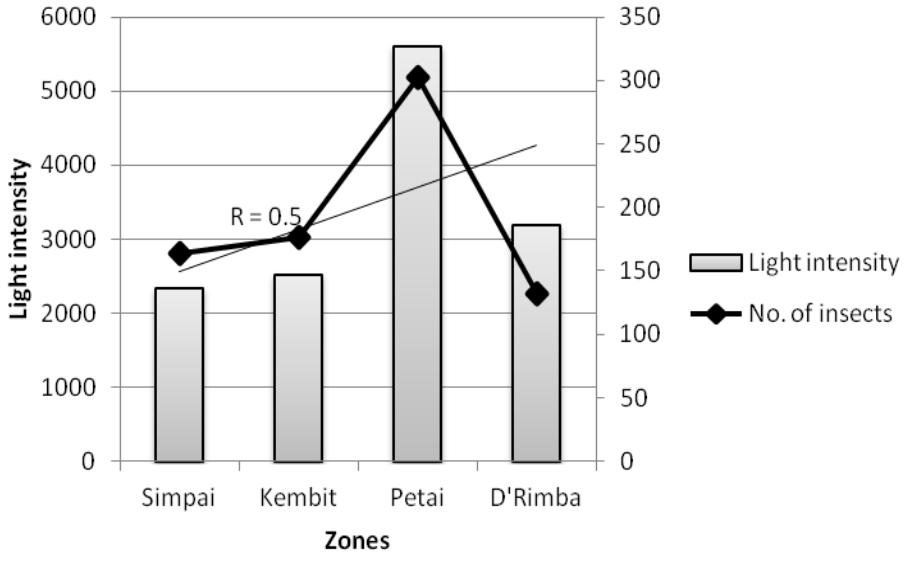
**Table 3.** Sampling methods and species richness of the insects by the zone sites.

| Zone | Trap | | | | No. of insects | No. of Order | No. of Family | Margalef index (H) |
|---|---|---|---|---|---|---|---|---|
| | CM | MT | LT | PT | | | | |
| Simpai | 117 | 0 | 41 | 6 | 164 | 8 | 42 | 8.04 |
| Kembit | 84 | 39 | 38 | 15 | 176 | 9 | 45 | 8.51 |
| Petai | 203 | 29 | 68 | 2 | 302 | 10 | 43 | 7.35 |
| D'Rimba | 85 | 27 | 11 | 9 | 132 | 9 | 40 | 7.99 |
| Total | 489 | 95 | 158 | 32 | 774 | - | - | - |
| Percentage | 63 | 12 | 21 | 4 | | | | |

CM: Collected manually; PT: Pitfall; MT: Malaise trap; LT: Light trap.




**Graph 1.** Number of insect species correlated with humidity at zone sites.




**Graph 2.** Number of insect species correlated with light intensity at zone sites.

manually or visual search method (Table 3). Similar phenomenon has been reported in other studies such as Ellison et al. (2007) who surveyed on the ant collecting in the temperate forest in New York. They found 94% of the ant species were collected by using a combination of litter sampling and hands collections. They also stated that these collection methods are sufficient to determine the species richness. Thus, the results of this study are congruent with Ellison et al. (2007). However, King and Porter (2005) in Florida showed that the hand collection was the least efficient method for estimating an index of combined abundance and richness, whereas baiting was the most efficient sampling method. In contrast, the pitfall trap was the least successful collecting method in this study because it is usually for the crawling insects on the ground.

The forest reserve has diverse vegetation and habitats. The vegetation's diversity and richness indirectly affect insect species diversity and abundance. The structure of vegetation between the different zones could be affecting the existing of insect diversity (Abdullah and Sina, 2009). This study also showed that insect species diversity and abundance are significantly different among zone sites. We recorded 42 Families in Simpai zone, 45 Families in Kembit zone, 43 Families in Petai zone and 40 Families in D'Rimba zone. The vegetation structure at Simpai zone and D'Rimba mostly consist of shrubs, while Kembit consists of higher plants and Petai zone mostly from timber trees or dipterocarp Family.

Extremely low and high temperature, rainfall and vegetation cover have been reported to influence the population density of insects (Nummelin 1996; Wardle and Barker 1997). The forest reserve has diverse topography, vegetative features and climate with splendid natural settings which directly affect the diversity and occurrence of insect species. These needs will comprise, at the very least, food and suitable climatic conditions, and may also include shelter from disturbance and natural enemies (Uniyal and Mathur, 1998). No simple explanation emerges from such comparisons; probably design features, flexible life-cycle patterns, and feeding habits play a part. Relatively, our study supports these circumstances but need further investigation.

From this study, the Kota Damansara Community Forest Reserve is still considered to have a diverse and numerous insect fauna in a city area. However, the results which were being presented in this paper might be the first comprehensive list of insects in the Kota Damansara Community Forest Reserve. Hopefully, there will be a further research study on the insect biodiversity and taxonomy in this area, in order to get better and comprehensive information on those aspects to be documented for future reference.

## ACKNOWLEDGEMENTS

Special thanks go to the Forestry Department of Selangor State and Malaysian Natural Society (MNS) for organizing the scientific expedition of biodiversity at the Kota Damansara Forest Community Reserve. We would like to express our heartiest gratitude to the following members of the expedition for their kind help, that is, Mohd Faezam Mohd Ismail and Khairunnisa Syaripuddin. We are also grateful to En. Azuan for the transportation, to all foresters for forest trail guide and identification of some plants while in the forest and to all staffs that involved in the expedition. Last but not least, we would like to thank Tuan Haji Mokhtar Ibrahim for taking the photographs of the insect specimens; Nurul Ashikin Abdullah and Harlina Md Yunus for helping us in identifying some of the specimens. This research is partially funded by the University Malaya research grant (RG069/09SUS).

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