Scientific Reports in Life Sciences 5 (4): 38-48
DOI: https://doi.org/10.5281/zenodo.11080891

Insects' monthly abundance and habitation behavior observed in Palamalai region, Tamil Nadu

J. Sornapriya[*1], M. Lekeshmanaswamy[1]

[1]*PG and Department of Zoology, Kongunadu Arts and Science College (Autonomous), G.N Mill Post, Coimbatore, Tamilnadu, India.*
[*]*Email: swarnapriya122@gmail.com , ml_swamy64@yahoo.co.in*

Received: 17 December 2023 / Revised: 15 March 2024/ Accepted: 26 April 2024/ Published online: 29 April 2024.

How to cite: Sornapriya, J., Lekeshmanaswamy, M. (2024). Insects' monthly abundance and habitation behavior observed in Palamalai region, Tamil Nadu, Scientific Reports in Life Sciences, 5(4), 39-48. **DOI**: https://doi.org/10.5281/zenodo.11080891

Abstract

Insects are one of the most successful organisms of the tropics and have survived many geological changes in the past and play crucial roles in ecosystem functioning. The present study examined insects' monthly abundance and habitation behavior in the Palamalai region, Periyanaickenpalyam road from November 2020 to JULY 2021. The order Hymenoptera was rich in our area .n=6, Genera (n=13) and species (36) followed by the Lepidoptera family (n=10), genera (n=17), and species (n=21). According to the species diversity, Orthoptera were less in number (n=2). In monthly observation Hymenoptera were abundant in May (n=268) followed by Lepidoptera in July (82spp), coleopterans were rich in February moth (n=65), and Orthoptera abundant in June n=18. The Hemiptera (n=8, march), Odonata (n=8, December) and Diptera (n=6, march) were less in our area. The habitation behaviors of insects were observed in different areas like residential, open fields and agricultural areas. In the Simpson calculation, open fields were rich in diversity (n=1.24) agriculture (n=1.16) and residential fields (n=1.13). The diurnal and nocturnal behaviours were also noted. It can be concluded this study provides clue information on insects' monthly abundance with habitation behavior. Statistical works are also made for the accurate assessment of the data by using Alpha diversity measures such as the Simpson index, Shannon index, Margalef's richness index Relative dominance etc. Hymenoptera and Lepidoptera were the most dominant orders in this area. The order Diptera was less in our area. The month-wise and nocturnal and diurnal habitats analysis also made by this study, the months of April and May stood out with maximum diversity.

Keywords: Habitations, insects, month

Introduction

The Phylum Arthropoda and the order insects the very important of all the invertebrates. The study of insects it's very essential for now a day because pollination and seed dispersal are essential for ecological function. The insects' distribution is worldwide. Insect diversity for a large percentage of all biodiversity in the world, with over 1,000,000 insect species described but the present estimation of whole insect biodiversity varies from 5 to 80 million species of insect. Coleoptera are 40% of identified insect species but some entomologists propose that Diptera and Hymenoptera might be as biodiversity or high. Insect ecology is the scientific study of how insects, individually or as a community interact with the surrounding environment or ecosystem (Schowalter, 2006).

Insects play significant roles in ecological science. The nutrients, the pollinated plants, seed dispersal, and maintaining the soil structure and richness, manage populations of other organisms, endow with a main food resource for additional taxonomy (Majer, 1987).

Many insects have significant facilities for long space and dispersal, enabling them to find and colonize isolated resources as these appear. On the other hand, a lot of Insecta species, together with a lot of insects were still unknown, converted into constantly destroyed or extirpated throughout the universe (Miller & Rogo 2001). The Insect species biodiversity is a significant feature in the stability of ecological circumstances (Yi et al., 2012). Insects are important because of their diversity, ecological role, and influence on agriculture, human health, and natural resources (Berembaum, 1995; Adeduntan et al, 2007, Premalatha et al, 2011). Insect diversity has been used in a sight study in biomechanics, climate change, developmental biological systems, ecological systems, evolution biology, genetics, paleo limnology, seed dispersal and physiological science. The structure is more than 58% of the known global biodiversity. They can be found in different types of habitats and contribute to the function and strength of ecosystems (Godfray et al., 2002).

Insect diversity studies conducted in Nigeria have largely been on the insects' biodiversity of particular orders and species of insects. A small amount of have measured the insect population on the whole (Medler, 1980). A detailed investigation of insect-plant interactions is required to reconstruct the evolutionary path and such an approach should involve the determination of behavior, major phytochemicals, and phylogenetic aspects (Becerra, 1997). The insects were abundant in our study area because in our area anthropogenic effects were less in condition. Different types of habitation behaviors were noted example monthly abundance, residential area, open field and agriculture land and diurnal and nocturnal observed. Every species has a significant

role in the environment. Most of the species were diurnal habitats example butterflies, Odonata and Hymenoptera orders. Some of the insects like moths (Lepidoptera) and beetles (Coleopteran) were nocturnal activities. The insect diversity also risks in conditions because some insects like were biting and make allergies for humans. Insect diversity is very essential for the biological life cycle. Examples are pollination, vegetation, and seed dispersal. Each species performed a different ecological function. This study is mainly focused on the abundance and habitation behaviours noted.

Material and methods

The study area of the Palamalai region

The study area had seen rich human interruption mainly starting livestock grazing. The road that connects the Palamalai Hills region (Western Ghats) and Periyanaickenpalaym road is the major entrance path for the study area and it moreover margins the study area beside its southeastern portion for about 1.2 km. The area is nearby with one of the central part area evergreen forests of the Nilgiri (Ooty) queen of the hill, in the Western Ghats mountain range of the Indian peninsula. The major tribal settlement of the area (Palamalai tribes) was nearby. Since the study area was located near the forest edge, there were different human disturbance pressures (Fig. 1).

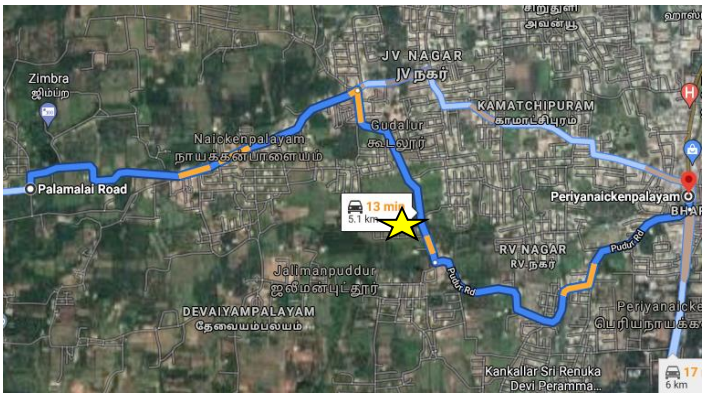

Figure 1. Showing the study area map between Palamalai region

Field observations

The present study was carried out from November 2019 to July 2020 (morning 7.00 am to 7.00 p.m.) Palamalai region, Periyanaickenpalaym road, Coimbatore district, Tamil Nadu. The survey of insects was undertaken along three different transects (Residential area, Open field, and Agriculture field). The Insect species sites were surveyed based on this different area. In this

study, the insect behaviors were also observed i.e. diurnal and nocturnal behaviors of insects. The insects were recorded using the standard transect counting method, counted while walking along the selected transect route of 1 to 2 km, in each habitat. Photographs were taken with a digital camera (Sony W520). The butterflies were recorded using the standard transect counting method (Ishii, 1993).

Measurement of diversity

Shannon-Wiener index (H') diversity index is given as follows

$$H' = -\Sigma Pi \ln (Pi),$$

Where,

Pi=S/N

S= Number of individuals of one species

N= Total number of all individuals in the sample

ln= logarithm to base.

Results

Diversity of insects in Palamalai region, in this diversity the seven different orders were identified Hymenoptera, Coleoptera, Lepidoptera, Diptera, Hemiptera, Orthoptera and Odonata (n=7). The order Hymenoptera were more abundant in Periyanaickenpalayam village, five families Fomicinae, Myrmicinae, Dolichoderinae, Ponerinae, Pseudomyrmicinae (n=5), genus (n=12) and 35 species were occurred. Formicinae, (*Componotus, Oecophylla, Anoplolepsis, Paratrechina)* (n=4), Myrmicinae, (*Monomorium, Tetramorium, Crematogaster, Solenopsis, Phediole)* (n=5), Psedomyrmicinae, (*Tetraponera)* (n=1), Ponerinae genus *Lepidogenysis* (n=1) and Dolichoderinae (*Tapinoma)* (n=1). The order Hymenoptera family Forminae were rich in species (n=15) *Componotus* (*Radiates, Compressus, Irritans, sp., Parius, Sericus, Maculates, sp., Fabricus*) and *Oecophylla smaraginda*, *Anoplosis gracillipies*. In the Ponerinae family, the species were less in number *Lepidogenysis processionalis.* This agrees with the result of who experimental further insect species of butterfly in the secluded area of Okwu Ogbaku forest reserve in Imo State. The lofty numeral of butterflies recorded is a suggestion that they are concerned by plant species in the area, regularly this may result to an increase in the population of caterpillars which has resulted in leaf defoliation. This judgment is in line with that of (Braza, 1990) who recorded an attack on

Falcataria moluccana and *Acacia mangium* by caterpillars of Yellow butterflies (Eurema spp) in nurseries in the Philippines.

The order Lepidoptera second largest order in the study area, family (n=10) Pieridae (Eurema hecabe) n=1, Lycaenidae (Castalius rosimon) n=1, Sphinigidae (*Cephononodes hyles*) n=1, Papliniade (*Papilionidae pallio*, *Papilio demoleus*) n=2, Noctudiae n=2 (*Dysgonia algira*, *Dyspania palmyra*), Erebidae n=3 (*Erebus ephespris*, *Spilosoma Obliqua*, *Nyagminii* sp.), Nympaliadae (*Euploea core, , Junonia hierta, Junonia lemonias, Chaxes bernadrus*) n=4, Eupterotidae n=2 (*Eupterote mollifera, Eupterote* spp), Geometridae, n=2 (Geometridae spp, *Idaea sp.)* and Crambidae n=1(*Maruca vitarata)*, n=15 genus and 18 species are present. It has been revealed that flowers are more noticeable to pollinators and fruits are also more conspicuous to the fruit dispersers, yet although the difference in illustration systems of the insect, flowers and fruit colors have evolved to attract numerous and separate mutualisms (Renoult et al., 2014).

The order Coleoptera were (n=4) families Cerambycidae, scarabaeid, Buprestid, and Coccinellidae followed by Genus *Agapanthia*, *Protaetia*, *Sternocera* and *Harmonia* (n=4) and Species (n=4) *Villosoviridescens, Affinis, sp.,* and *Axyridis.* The order of Odonata were one family Libelluidae, (n=3) *Diplacodes trivialis, Orthetrum triangulare* and *Orthimis ferruginea* present. According to (Nadkan and Nalini, 2000) environment might be very complex. For example, relation between insects and plant diversity had not been looked at in huge detail, they not have the potential variation between insect communities at the ground canopy level. The order Hemiptera family Pyrrhocoridae (*Dysdercus sp.)* Belostomatidae, (Lethocerus *indicus*) and orthoptera family Gryllidae (*Acheta Domesticks, Gryllodes Sigillatus*) each order n=2 species occurred. The order Diptera was very less in the family Dolichopodidae n=1 (*Sciapus* s*p*.) Periyanaickenpalayam village. Related to the findings of (Yager et al. 2017) on the diversity of insects in and around the Federal University of Agriculture, Makurdi which lies in the southern Guinea savanna zone of Nigeria the results of this study showed that the study area has high insect diversity. This may be attributed to the rich plant cover of the study area.

Similar to the findings of (Yager et al. 2017) on the diversity of insects in and around the Federal University of Agriculture, Makurdi which lies in the southern Guinea savanna zone of Nigeria the results of this study showed that the study area has high insect diversity. Few ant genera as Crematogaster and Pheidole of Myrmicinae, Camponotus of Formicinae and Leptogenys of Ponerinae were mostly found everywhere (Sornapriya & Varunprasth, 2018).

Table 1. Showing that monthly abundance of insect diversity in NOV- JUL

Orders	November	December	January	February	March	April	May	June	July	Total
Hymenoptera	152	200	148	100	169	254	268	153	85	1529
Lepidoptera	62	56	29	35	46	58	64	71	82	503
Coleoptera	49	51	54	65	58	49	56	46	48	476
Hemiptera	4	3	5	1	8	6	4	4	6	41
Odonata	4	8	5	6	2	1	0	1	1	28
Diptera	5	1	3	2	6	2	4	2	1	26
Orthoptera	15	12	18	16	8	5	2	2	3	81

Table 1 shows the monthly abundance of insect diversity in NOV- JUL, in this monthly abundance the order Hymenoptera mostly occurred (n=1529) followed by the order Lepidoptera (n=503), Coleoptera (n=476), Orthoptera (n=81) and Hemiptera (n=41). The order Odonata (n=28) and Deptira (n=26) were less in the Periyanaickenpalayam area. Hymenoptera was rich in MAY (n=568) month because of the sunny season the ants are abundant in condition. The coleopteran was rich in February (n=65), Diptera rich in March (n=6) and less in July and December month (n=1). The order is Hemiptera rich in March (n= 8) and less in February. Lepidoptera is mostly abundant in June (n-71) and July (n=82) and less in January (n=29). The order Odonata is rich in (December n=8) and Orthoptera (January n=18), both orders were less in APR- JUL month.

Table 2 shows the insect order observed in different areas (Residential areas, Open fields, Agriculture land). The order Hymenoptera was much in agricultural land (n=534) because most of the agricultural land is organic land so there is no use of pesticides and less in open fields (n=490). The order Coleoptera, Diptera and Hemiptera are more abundant in Residential areas (n=191) (n=12) (n=16) and less in Open fields (n=135), (n=6), (n=12). The Lepidoptera order is rich in agricultural land (n=255) and open field area (n=192). The order Odonata was rich in residential areas (n=12) and smaller amounts of agricultural land (n=6). The Orthoptera were abundance in open fields (n=38) and less in agricultural land (n=15). Habitat has several definitions. For

example, (Yager et al., 2017; Southwood, 1987) in their review of insect adaptation to habitat, define habitat as the area of the environment that provides required resources during the life of an insect (Yager et al., 2017) (Southwood, 1987; Kennedy, 1985) Such definitions tend to view habitat in a general way from the perspective of insect needs and often argue that spatial variability is due, in part, to properties of dynamic systems (Southwood, 1987; May 1986). Furthermore, with habitat defined as such, we are not provided with readily repeatable, independent decisions.

Table 2. Showing the habitation behavior of insects

S.NO	Orders	Residential area	Open field	Agriculture land
1	Hymenoptera	505	490	534
2	Lepidoptera	56	192	255
3	Coleoptera	191	135	150
4	Hemiptera	16	12	13
5	Odonata	12	10	6
6	Diptera	12	6	8
7	Orthoptera	28	38	15

Table 3 showing, in Shannon the open field (n=1.24) is rich in insect diversity and the residential land (n=1.13) were less in diverse. Species richness depends mainly in the structural diversity of the animal and the equitability component is dependent on the stability of the physicochemical conditions (Kennedy, 1985; Yela & Harrera, 1993). Insects are a significant apparatus in most natural and transformed landscapes. They play important functional roles that ensure the delivery of a variety of ecosystem services which are important for some aspects of human occupation such as agriculture, tourism and natural resource use (May, 1986; Yela & Herrera, 1993; Tscharntke et al., 2005; Ramesh et al., 2010).

Table 3. Showing the Diversity indices in different areas

Diversity indices	**Residential area**	**Open field**	**Agriculture land**
Dominance_D	0.4402	0.3808	0.3878

Simpson_1-D	0.5598	0.6192	0.6122
Shannon_H	1.137	1.224	1.16
Evenness_e^H/S	0.4453	0.4859	0.4557
Brillouin	1.118	1.207	1.145
Menhinick	0.2445	0.2356	0.2235
Margalef	0.8943	0.8845	0.871
Equitability_J	0.5843	0.6291	0.5961
Fisher_alpha	1.051	1.037	1.019
Berger-Parker	0.6159	0.5549	0.5443

Table 4 shows, the seven different types of Order Hymenoptera, Coleoptera, Diptera, Hemiptera, Lepidoptera, Odonata and Orthoptera. In order and family differentiated into different activities (Diurnal and Nocturnal) and different Habitats are observed. The habitats of Diurinal and Nocturnal (Indoor, garden areas, agriculture land, scrub, diverse, attached to the lights, vegetated area, rock area, above the water bodies, short grass..etc.) were noted. Most of the insects in Diurnal habituated. This procedure has proved useful, however, even for vagile taxa such as Chrysomelidae (Choi & Miller, 2013).

Table 4. Shows the activity of insects (Diurnal/ Nocturnal)

Order	**Family**	**Activity**	**Habitats**
Hymenoptera	Formicinae	Diurnal	Indoor, diverse
	Myrmicinae	Nocturnal	Garden areas
	Dolichoderinae	Diurnal	Agriculture lands
	Ponerinae	Nocturnal, diurnal	Trees attached to the lights
	Pseudomyrmicinae	Diurnal	Scrub
	Vespidae	Nocturnal	Attached to the lights
Lepidoptera	Pieridae	Diurnal	Vegetated area
	Sphingidae	Nocturnal	Attached to the lights
	Paplinidae	Nocturnal	Attached to the lights
	Noctuidae	Nocturnal	Vegetated area

	Erebidae	Diurnal	Scrub and rock areas
	Nympalidae	Nocturnal	Above water bodies
	Eupterotidae	Diurnal	Short grass
	Geometridae	Nocturnal	Attached to the lights
	Crambidae	Diurnal	Diverse
	Lycaenidae	Nocturnal	Indoor
Coleoptera	Cerambycidae	Diurnal	Diverse
	Scarabeidae	Nocturnal	Indoor
	Buprestidae	Diurnal	Short grass
	Coccinellidae	Nocturnal	Diverse
	Meloidae	Diurnal	Attached to the trees
Hemiptera	Pyrrhocoridae	Diurnal	Scrub
	Belostomatidae	Diurnal	Agriculture lands
	Apidae	Diurnal	Grass
	Membracidae	Nocturnal	Attached to the lights
Odonata	Libelluidae	Diurnal	Short grass
Diptera	Dolichopodidae	Nocturnal	Attached to the lights
	Bibionidae	Diurnal	Vegetated area
Orthoptera	Gryllidae	Diurnal	Diverse

Conclusion

During this study of November 2020 to July 2021, a total of 29 families, 47 genera and 74 species were recorded in Palamalai region, Western Ghats Coimbatore district. Monthly-wise species were noted. In this study, we observed three different habitation behaviors, most of the insects present in open field. The present study will yield valuable information on ant species availability in this region. Finally, to sum up, this study provides little information about the monthly abundance and habitation behavior of insects. In a future study, we developed to research different insects order in different areas and months.

References

Adeduntan, S. A., Ofuya, T., Fuwape, J. (2005). Environmental effects of insect herbivores and logging on tree species diversity in Akure Forest Reserve (Aponmu), Nigeria. Applied Tropical of Agriculture, 9: 12-8.

Becerra, J. X. (1997). Insects on plants: macroevolutionary chemical trends in host use science. 11: 253–256.

Berembaum M. R. (1995). The chemistry of defense: theory and practice. In: Chemical Ecology: The chemistry of Biotic Interaction (T. Eisner & J. Meinwald, editors). Washington D.C. The National academy Press. 483: 1–16.

Braza, RD. (1990). New records of major insect pests attacking Paraserianthes falcataria in the Philippines. Nitrogen Fixing Tree Research Reports, 8:147–148.

Choi, S.W., Miller, J.C. (2013). Species richness and abundance among macro moths: A comparison of taxonomic, temporal and spatial patterns in Oregon and South Korea. The Entomological Society of Korea and Wiley Publishing Asia Proprietary Limited.

Godfray, H. C. J., Lewis, O. T., Memmott, J. (2002). Studying insects in the tropics. Philosophical transactions of the royal society of London series. 354:1811-1824.

Ishii, M. (1993). Transet count of butterflies, In: Decline and conservation of butterflies in Japan II, .91-101.

Kennedy,J. S. (1985). Migration, behavioral and ecological. In M. A. Rankin [ed.], migration, mechanisms and adaptive significance. Contributions in marine science supplement, vol. Marine Science Institute, Port Aransas, Tex 27: 5-26.

Majer, J. D. (1987). The conservation and study of invertebrates in remnants of native vegetation. In D. A. Saunders, G. W. Arnold, A. A. Burbridge, and A. J. M. Hopkins (eds). Nature Conservation: The Role of Remnants of Native Vegetation. Surrey Beatty and Sons, Sydney. 333– 335.

May, R. M. (1986). The search for patterns in the balance of nature: advances and retreats. Ecology 67: 1115-1126.

Medler, J. T. (1980). Insects of Nigeria-check list and bibliography. Memoirs of the American Entomological Institute.

Miller, S.E., Rogo, L.M. (2001). Challenges and opportunities in understanding and utilization of African insect diversity. Cimbebasia. 17: 197–218.

Nadkarn, M., Nalini, M. (2000). Ecology and Conservation of a Tropical Cloud Forest: Ecology and conservation of tropical cloud forests, Oxford University Press. 315 - 317

Premalatha, M., Abbasi, T. (2011). Energy-efficient food production to reduce global warming and ecodegradation: The use of edible insects. Renew Sustainable Energy, 15:4357-60.

Ramesh, T., Hussain, K.J., Selvanayagam, M., Satpathy, K.K., Prasad, M.V.R. (2010). Patterns of diversity, abundance and habitat association of butterflies communities in heterogeneous landscapes of Department of Atomic Energy (DAE) Campus at Alpakkam, South India. International Journal of Biodiversity and Conservation. 2: 75-85.

Renoult, J. P., Valido, A., Jordano, P., Schaefer, H. M. (2014). Adaptation of flower and fruit colors to multiple, distinct mutualists. New Phytologist. 201(2): 678–686. http://doi.org/10.1111/nph.12539

Schowalter, T. D. (2006). In: Insect ecology, an ecosystem approaches (2(illustrated) Ed.). Academic Press. 572.

Sornapriya,J, Varunprasth,k. (2018). Diversity and abundance of Ants in Periyanaickenpalayam village of Coimbatore district, Tamil Nadu. Journal of Entomology and Zoology Studies, 6(3): 1378-1384.

Southwood, T. R. E. (1987). Ecological aspects of insect migration. In D. J. Aidley [ed.], Animal migration. Society for experimental biology seminar series 13, Cambridge University, Cambridge, England. Habitat and insect biology. Bull. Entomological Society of America, 33: 211-214.

Tscharntke, T., Klein, A.M., Kruess, A., Steffan- Dewenter, I., Thies, C. (2005). Landscape perspectives on agricultural intensification and biodiversity: Ecosystem service management. Ecology letters, 8: 857-874.

Yager, G. O., Agbidye, F. S., Adma, E. S. (2017). Insect Species Diversity and Abundance in and around Federal University of Agriculture, Makurdi Forestry Nursery, Benue State, Nigeria. Asian Journal of Biology. 4(4): 1

Yela, J. L., C. M. Herrera. (1993). Seasonality and life cycles of woody plant-feeding noctuid moths (Lepidoptera: Noctuidae) in Mediterranean habitats. Ecological entomology, 18: 259-269.

Yi, Z., Jinchao, F., Dayuan, X. (2012). A comparison of terrestrial arthropod sampling methods. Journal of Resource and Ecology, 3:174-82.