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# DIVERSITY OF LEPIDOPTERAN INSECTS OF PACHAIMALAI HILLS, TIRUCHIRAPPALLI DISTRICT, TAMIL NADU

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**ABSTRACT**
To document the lepidopteran diversity of selected localities of Pachaimalai hills, Tamil Nadu, a preliminary survey was made from January to December, 2015. During the survey, the diversity of lepidopterans was recorded by using aerial netting, light trapping and host rearing methods. The results showed that a total of 984 lepidopterans were observed, out of which, 230 butterflies, 32 skippers and 722 moths. The collected/observed lepidopterans were diagnosed up to subfamily level by using taxonomic keys. Nine superfamilies were recorded under the suborder Glosatta, among them, Noctuoidea was found dominant with 312 individuals followed by Papilionoidea (230). Under Papilionoidea, Nymphalidae was predominant with 78 numbers followed by Pieridae (69), Papilionidae (54) and Lycaenidae (29) while the superfamily Hesperioidea found with one family Hesperiidae (32). Eight families consisting moth insects were noticed, in which, Noctuidae (312) was found superior followed by Crambidae (208), Geometridae (56), and Oecophoridae (42). Out of 24 subfamilies identified, Spilomelinae was found to be superior with 112 numbers followed by Noctuinae (111). The diversity of lepidopterans depend on the presence of host plant resources as indicated by the individuals recorded under the families like Noctuidae and Crambidae, which has wide host range.

## INTRODUCTION

In class Insecta, Lepidoptera is placed as the second largest order (Benton, 1995). They are distinguished from other insects by their wings which are more or less densely covered with minute scales of various colours. Earlier, Lepidoptera comprising an enormous number of different species is further divided into two sub-orders Heterocera or moths and Rhopalocera or butterflies. An estimate by Alfred *et al.* (1998) reported the occurrence of about 1,42,500 species of Lepidoptera from the globe and diversity within Lepidoptera from the Indian subcontinent revealed that the group comprises over 50,000 species and many more subspecies distributed over 84 families and 18 superfamilies. In the world, about 19,238 species were documented by Heppner (1998). In the Indian subcontinent, about 1,501 species of butterflies were reported (Gaonkar, 1996).

Most of the species feed on green plants and consequently can be in direct competition with man, requiring counter measures and control, many are aesthetic, through their diversity and association with vegetation may reflect the ecological stability of natural environments and persistence of their own populations. They are an integral part of most natural ecosystems. Lepidopterans have important ecosystem roles as they form an important part of food web and act as good pollinators and bioindicators in addition it enhances the aesthetic value of our environment (Atluri *et al.*, 2004).

The butterflies are playing as best indicators of quality habitat and sensitive indicators of climatic change in the current scenario (Venkata Ramana, 2010). The sub-order Heterocera (moths) has many important roles in forest ecosystems as herbivores and as food for various predatory and parasitic organisms. Many of them were serious pests of agricultural, horticultural and plantation crops (Young, 1997). Ecosystem enrichment activities like pollination of many plant species is done by butterflies and they are the reliable species for population and community ecology studies (Pollard, 1991). A close association between butterflies and plants and their lives are interlinked with each other (Feltwell, 1986), which leads to different patterns in their distribution depending on the availability of their food plants.

Many studies have been conducted with respect to taxonomy, demographic population, economic role and diversity of Lepidoptera in various regions of our country by many lepidopterists. In the recent past, Varshney (1994), Gupta (1997), Srivastava (2002), Kunte (2000) and Sambath (2014) were worked on butterflies and moth taxonomy and diversity studies in various parts of the country. The diversity of Lepidoptera in the Western ghats region were studied to a maximum extent while certain pockets of Tamil Nadu are not studied especially small hilly tracts of Eastern Ghats. In this context, an attempt was made to initiate to document the Lepidoptera diversity of Pacahimalai hills area, Tiruchirappalli District, Tamil Nadu.

## MATERIALS AND METHODS

A survey was made to document the lepidopteran insects

from selected localities of Pacahimalai hills, Tamil Nadu located at 11.4487ºN latitude; 77.4462ºE longitude in Tiruchirappalli District of Tamil Nadu during January - December, 2015 from various ecosystems *viz.,* agricultural land, grassland, bushy areas *etc.* The butterflies were observed/collected twice a month in randomly selected localities of the hills using aerial netting during 7:30 to 11:30 am. The collected butterflies were killed by using the killing jars containing a piece of cotton soaked in ethyl acetate for one hour. Single specimen representing each group was caught with aerial net having aluminum handle and consisting of a metal ring, about 45mm across, which supports a conical net, made of nylon, with a minimum depth of 70 to 80 cm (28 to 32 inches).

For moth collection, white cloth sheet (10'×6') was hung between two vertical poles. A 100-watt incandescent lamp was used as a light source throughout the night (Chandra and Sambath, 2013). Any moths that alight on the screen was recorded or collected in jars just after sunset between 18.00 - 23.00 hr. The light trap was operated twice a month in a particular locality and moths alight on the screen were observed/ collected. The larvae of butterflies and skippers were collected from various habitats and were reared with their respective food material. The dried leaves were replaced with fresh ones frequently and waste bits and pieces were removed. After adult emergence, they were collected and preserved for identification. The killed specimens were removed and transferred individually into rectangular envelopes were made from semi-transparent, rigid, grease proof, light weight paper, such as high quality tracing paper (90-95 gsm). Later the specimens were fixed on the spreading board using entomological pins (size 001/002/003). For identification, the butterfly and skipper wings were cleared and mounted on glass slide following the procedure given by Triplehorn and Jhonson (1989). The collected lepidopteran insect specimens were diagnosed upto superfamily level by following the keys of Dugdale (1988), Holloway (1989) and Richard and Davies (2013). The confirmed superfamilies were further diagnosed upto family and subfamily level by following the dichotomous keys provided by Hampson (1892), Evans (1932), Triplehorn and Johnson (1989), Solis and Mitter (1992), Schmidt (1998) and Talbot (2013).

## RESULTS AND DISCUSSION

The results of survey revealed that a total of 984 lepidopterans were recorded from the study area and they were identified under the suborder Glossata, following the Classification of Kristensen *et al.* (2007) and further the lepidopterans were identified upto subfamily level. Among the methods employed for lepidopteran collection, aerial netting was recorded 262 numbers while light trap attracted 624 nocturnal lepidopterans and the host rearing recorded a least (98) (Table 1). The results of the present study corroborates with the findings of Fry and Waring (1996) who reported that using light trap was effective method to attract moths while aerial netting found better in collecting butterflies as reported by Triplehorn and Johnson (1989).

From the study, nine superfamilies were recorded in which, two superfamilies *viz.*, Papilionoidea and Hesperioidea comprises butterflies and skippers with 230 and 32 numbers respectively from Pachaimalai hills area. A total of 722 moths were collected from the study area belongs to seven superfamilies, out of which, Noctuoidea was found to be dominant with 312 individuals followed by Pyraloidea (208), Geometroidea (94), Gelechioidea (42), Pterophoroidea (31), Bombycoidea (25) and Sesioidea (10) (Table 2). The results are supported by Bazzaz (1975), who reported that the population dynamics of Noctuoidea was high due to more complex habitats and had more niches.

The results showed that Nymphalidae was dominant with 78 individuals followed by Pieridae (69), Papilionidae (54) and least population was recorded under Lycaenidae (29) under the superfamily Papilionoidea (Table 3). The results are in tune with the findings of Shamsudeen and Mathew (2010), Krishna and Swamy (2014) and Patil and Shende (2014), they reported that Nymphalidae was predominant in their collections. The results are in accordance with the findings of Shamsudeen and Mathew (2010) who reported that the family Lycaenidae was recorded with least population when compared to other families in Shendurny wildlife Sanctuary, Kerala. Under the superfamily Hesperioidea, the only family Hesperiidae was witnessed with 32 individuals from Pachaimalai hills.

From the survey, it was evidenced that one subfamily Papilioninae was identified under the family Papilionidae, two subfamilies Pierinae and Coliadinae were witnessed under the family Pieridae, Lycaeninae was the only subfamily recorded under Lycaenidae, three sub families namely Nymphalinae, Satyrinae and Danainae were recorded under the family Nymphalidae. Similarly, Hesperiinae was the only family recorded under Hesperiidae in the study area. Among them, Papilioninae was found to be dominant with 54 individuals followed by Pierinae (43), Danainae (36), Hesperiinae (32), Nymphalinae (29) and Lycaeninae (28) (Table 3). Fourteen individuals were recorded under Satyrinae and found to be least. The results are in contrary to the report

**Table 1: Lepidopterans recorded in Pachaimalai hills, Tamil Nadu during January - December, 2015 using various methods**

| S. No. | Collection methods | Total Lepidopterans |
|---|---|---|
| 1 | Aerial netting | 262 |
| 2 | Light trap | 624 |
| 3 | Host rearing | 98 |
| Grand Total | | 984 |

**Table 2: Superfamilies of Lepidoptera recorded during January - December, 2015 in Pachaimalai hills, Tamil Nadu**

| S.No. | Superfamily | Total numbers recorded |
|---|---|---|
| 1 | Papilionoidea | 230 |
| 2 | Hesperioidea | 32 |
| 3 | Gelechioidea | 42 |
| 4 | Sesioidea | 10 |
| 5 | Pterophoroidea | 31 |
| 6 | Pyraloidea | 208 |
| 7 | Bombycoidea | 25 |
| 8 | Geometroidea | 94 |
| 9 | Noctuoidea | 312 |
| Grand Total | | 984 |

**Table 3: Families and Subfamilies of Papilionoidea and Hesperoidea recorded during January - December, 2015 in Pachaimalai hills, Tamil Nadu**

| S.No. | Superfamily | Family | Total numbers recorded | Subfamily | Total numbers recorded |
|---|---|---|---|---|---|
| 1 | Papilionoidea | Papilionidae | 54 | Papilioninae | 54 |
| | | Pieridae | 69 | Pierinae | 43 |
| | | | | Coliadinae | 26 |
| | | Lycaenidae | 29 | Lycaeninae | 28 |
| | | Nymphalidae | 78 | Nymphalinae | 29 |
| | | | | Satyrinae | 14 |
| | | | | Danainae | 36 |
| 2 | Hesperioidea | Hesperiidae | 32 | Hesperiinae | 32 |
| Grand Total | | | | | 262 |

**Table 4. Families and Subfamilies comprising moths recorded during January - December, 2015 in Pachaimalai hills, Tamil Nadu**

| S.No. | Superfamily | Family | Total numbers recorded | Subfamily | Total numbers recorded |
|---|---|---|---|---|---|
| 1 | Gelechioidea | Oecophoridae | 42 | Xyloryctinae | 42 |
| 2 | Sesioidea | Sesiidae | 10 | Sesiinae | 10 |
| 3 | Pterophoroidea | Pterophoridae | 31 | Pterophorinae | 31 |
| 4 | Pyraloidea | Crambidae | 208 | Schoenobiinae | 96 |
| | | | | Spilomelinae | 112 |
| 5 | Bombycoidea | Sphingidae | 25 | Sphinginae | 14 |
| | | | | Macroglossinae | 11 |
| 6 | Geometroidea | Geometridae | 56 | Ennominae | 56 |
| | | Uraniidae | 38 | Microniinae | 38 |
| 7 | Noctuoidea | Noctuidae | 312 | Noctuinae | 111 |
| | | | | Arctiinae | 31 |
| | | | | Lymantriinae | 21 |
| | | | | Heliothinae | 28 |
| | | | | Plusiinae | 35 |
| | | | | Aganainae | 68 |
| | | | | Erebinae | 18 |
| Grand Total | | | | | 722 |

of Kunte *et al.* (2012) who found that 10 subfamilies under Nymphalidae and five subfamilies under Lycaenidae from Garo Hills of Meghalaya. The butterfly species preferred specific habitats amidst the forest ecosystems; the temporal and spatial distribution of the butterfly species was directly correlated with the floral diversity and ecological conditions of the region. Thus, butterflies are ubiquitous creatures, and exhibit unique evolutionary adaptations that enable them to associate with diversified ecosystems (Atluri *et al.,* 2012). High butterfly diversity including legally protected species has also been reported in agri-horticulturalecosystems (Das *et al.*, 2016)

There were eight families comprising moths recorded from the study area. Among them, Noctuidae was recorded highest with 312 individuals followed by Crambidae (208), Geometridae (56), Oecophoridae (42), Uraniidae (38), Pterophoridae (31), Sphingidae (25) and Sessidae (10) (Table 4). This is in accordance with Srivastava (2002) who stated that Noctuidae was dominant among other family groups in species diversity and numerical strength. The results indicated that, there were 16 subfamilies identified under seven superfamilies during the study period. Two subfamilies were recorded under Crambidae *viz.,* Spilomelinae (112) and Schoenobiinae (96). Similarly, Sphinginae (14) and Macroglossinae (11) were the two subfamilies reported under Sphingidae. Seven subfamilies *viz.,* Noctuinae (111), Aganainae (68), Plusiinae (35), Arctiinae (31), Heliothinae (28), Lymantiinae (21) and Erebinae (18) were grouped under Noctuidae (Table 4). Among the moth subfamilies, Spilomelinae (112) was found to be dominant followed by Noctuinae (111), Schoenobiinae (96) and Aganainae (68).

Oecophoridae recorded with single subfamily Xylorctinae (42). Likewise, Sesiidae comprises single subfamily Sesiinae (10) while Pterophorinae (31) was the only subfamily recorded under the family Pterophoridae, Ennominae was the only subfamily recorded under Geometridae with 56 numbers, Uraniidae comprises single subfamily Microniinae (38). It is in contrary to Chandra and Sambath (2013) who recorded two subfamilies under Uraniidae *viz.*, Microniinae and Epipleminae. Elanchezhian *et al.* (2014) reported seventeen subfamilies under Noctuidae family at Mukurthi National park.

## CONCLUSIONS

Lepidopterans serve as herbivores which depend on various plants for food and enlisted as pests of crops. They are effective pollinators and also serve as a host for insectivores. Diversity of lepidopterans not only indicates the presence of host plant and also shows undisturbed habitat, less human intervention and deforestation. It also plays a major role in bio-indicator of environmental changes, so the results of the study provided the baseline information for diversity of this group. From the study, Nine superfamilies were recorded, Noctuoidea was found dominant with 312 individuals followed by Papilionoidea (230). Under Papilionoidea, Nymphalidae was

predominant with 78 numbers, Hesperioidea found with one family Hesperiidae (32). Eight families consisting moth insects were noticed, Noctuidae (312) was found superior followed by Crambidae (208). The diversity of lepidopterans depend on the presence of host plant resources as indicated by the individuals recorded under the families like Noctuidae and Crambidae, which has wide host range. Even though, an intensive survey is needed in the succeeding years so as to prepare a final checklist of butterflies and moths and also to plan for conservation strategies.

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