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Preliminary survey for Lepidopteran Fauna of Kalrayan Hills, Kallakurichi District, Tamil Nadu, India

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ABSTRACT

To document the lepidopteran fauna of Kalrayan hills, Tamil Nadu, an attempt was made from January to December, 2015 by using aerial netting, light trap and host rearing methods. The results of the survey revealed that, Out of 813 lepidopterans recorded from the study area, 187 butterflies, 27 skippers and 599 moths. They were identified up to subfamily level with the help of standard taxonomic keys of Lepidopterists. It was found that, nine superfamilies *viz.*, Papilionoidea, Hesperioidea, Gelechioidea, Sesioidea, Pterophoroidea, Pyraloidea, Bombycoidea, Geometroidea and Noctuoidea were recognized. Among those, Noctuoidea was found to be dominant with 259 individuals followed by Papilionoidea (187). Among the superfamilies, Papilionoidea recorded with four families *viz.*, Papilionidae, Pieridae, Lycaenidae and Nymphalidae while the superfamily Hesperioidea found with one family Hesperiidae. There were eight moth families *viz.*, Oecophoridae, Sesiidae, Pterophoridae, Crambidae, Shingidae, Geometridae, Uraniidae and Noctuidae were observed under eight superfamilies from the study area using various collection methods. Among them, Noctuidae was the dominant family. Twenty four subfamilies were recorded from the study area comprising both butterflies, skippers and moths *viz.,* Papilioninae, Pierinae, Coliadinae, Lycaeninae, Nymphalinae, Satyrinae, Danainae, Hesperiinae, Xyloryctinae, Sesiinae, Pterophorinae, Schoenobiinae, Spilomelinae,, Sphinginae, Macroglossinae, Ennominae, Microniinae, Noctuinae, Arctiinae, Lymantriinae, Heliothinae, Plusiinae, Aganainae and Erebinae were identified. Among the subfamilies, Noctuinae (106) was predominant followed by Spilomelinae (101).

Key words : *Diversity, Eastern ghats, Fauna, Lepidoptera, Survey, Taxonomy*

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. 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) showed 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 con-

sequently 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).

These 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 enrichments 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 from 1767 onwards by Linnaeus and subsequently Marshall and de Niceville during 1883 - 1890 followed by Hampson during 1892 - 1896. Then, Evans and Talbot were worked on Lepidoptera in 1940's and published book on "Identification of Indian butterflies" and contributed to Lepidoptera taxonomy. 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 fauna of Kalrayan hills, Kallakurichi district of Tamil Nadu.

Materials and Methods

A survey was made to document the lepidopteran insects from Kalrayan hills, Tamil Nadu located at 11.8542°N latitude; 78.6356°E longitude during January – December, 2015 from various ecosystems *viz.,* agricultural land, grassland, bushy areas *etc.* The butterflies were collected using aerial netting during 7:30 to 11:30 am. The collected butterflies were killed 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 through 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 in a month in a particular locality and moths alight on the screen were observed/ collected. The larvae of butterflies and skippers were collected from the field 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

A total of 813 lepidopterans were recorded in the study area and they were identified under the suborder Glossata. The collected specimens were identified up to subfamily level and their abundance is presented in Table 1. Among the three methods employed for lepidopteran collection, aerial netting method was much appropriate for butterfly and skipper due to their diurnal habit, while light trap was effective method to attract nocturnal moths. Least number of lepidopterans was recorded using host rearing (Fig. 1). The results of the present study are corroborates with the report of Fry and Waring (1996) who reported that using light trap was effective method to attract moths while aerial net found better in collecting butterflies as reported by Triplehorn and Johnson (1989).

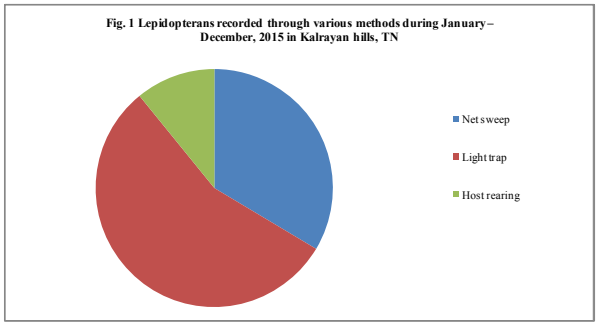

Fig. 1. Lepidopterans recorded through various methods during January–December, 2015 in Kalrayan hills, TN

There were 187 butterflies, 27 skippers and 599 moths were recorded under nine superfamilies in the study area. All 187 butterflies categorized under single superfamily Papilionoidea and they were grouped under four families *viz.*, Papilionidae, Pieridae, Lycaenidae and Nymphalidae. The family Pieridae comprises greatest number of individuals with 72 followed by Nymphalidae with 68 individuals and lowest population was recorded with Lycaenids (14) (Table 1). The results are contradictory to the findings of Kunte *et al.* (2012), who reported 10 subfamilies under Nymphalidae and five subfamilies under Lycaenidae from Garo Hills of Meghalaya. The findings are similar with Kumar and Murugesan (2014), Hussain *et al.* (2011), Rajagopal *et al.* (2011) and Arya *et al.* (2014) as they stated that the dominant butterfly family was Pieridae at Kudankulam area, Arignar Anna Zoological Park, Chennai, Tamilnadu and Kumaun University, Nainital, Uttarakhand respectively. The results are not similar with the findings of Shamsudeen and Mathew (2010) who reported that the Lycaenidae was least during observation at Shendurny wildlife Sanctuary, Kerala.

Further the specimens were confirmed up to subfamily level and presented in Table 1. The results revealed that there were seven subfamilies *viz.*, Papilioninae, Pierinae, Coliadinae, Lycaeninae, Nymphalinae, Satyrinae and Danainae were recognized under the five families. Among them, Pierinae (47) was found to be dominant followed by Papilioninae (33), Danainae (32), Hesperiinae (27), Coliadinae (25), Nymphalinae (24) and Lycaeninae (14). Satyrinae was found to be least and noticed with 12 numbers. Likewise, 27 skippers belong to the superfamily Hesperioidea and categorized under single family Hesperidae. It is further confirmed that all skippers comes under single subfamily Hesperinae.

Seven superfamilies *viz.*, Gelechioidea, Sesioidea, Pterophoroidea, Pyraloidea, Bombycoidea, Geometroidea and Noctuioidea with a total of 599

Table 1. Butterflies and skippers observed during January – December, 2015 in Kalrayan hills, TN

S. No.	Superfamily	Numbers recorded	Family	Numbers recorded	Subfamily	Numbers recorded
1	Papilionoidea	187	Papilionidae	33	Papilioninae	33
			Pieridae	72	Pierinae	47
					Coliadinae	25
			Lycaenidae	14	Lycaeninae	14
			Nymphalidae	68	Nymphalinae	24
					Satyrinae	12
					Danainae	32
2	Hesperioidea	27	Hesperiidae	27	Hesperiinae	27
	Grand Total	**214**				

moths were recorded in the study area. Out of which, Noctuoidea was found to be the highest with 259 individuals followed by 176 pyralids, 76 geometrids, 34 gelechids, 25 pterophorids, 20 bombycoids and 9 sesiids (Table 2). The results are in accordance with outcomes of Bazzaz (1975), who reported that noctuids population was high due to more complex habitats and had more niches.

There were eight moth families recorded from the study area under seven superfamilies. The family, Oecophoridae (34) was the only family identified under Gelechioidea. Similarly, the family Sesiidae (9) was observed under Sesioidea. Pterophoridae was the only family documented under Pterophoroidea with 25 numbers; Pyraloidea comprises one family Crambidae (176) while Bombycoidea recorded with single family Sphingidae (20). Geometrid moths were belongs to two families *viz*., Geometridae (45) and Uraniidae (31) under Geometroidea. The highest number of individuals of moths were recorded in the family Noctuidae with 259 individuals and the least number of individuals was found in Sesiidae (9). The results are in accordance with Srivastava (2002) who stated that Noctuidae was dominant among other family groups in species diversity and numerical strength. The findings of the study is not corroborates with Chandra and Sambath (2013) and Mathew and Rahamathulla (1995) as they reported two families namely Pyralidae and Crambidae under Pyraloidea in Andhra Pradesh and Silent Valley National Park, Kerala respectively.

From the present study, collected moths were identified under 16 subfamilies during the study period. It is similar to the findings of Elanchezhian *et al*. (2014) reported seventeen subfamilies under Noctuidae family at Mukurthi National park. Noctuinae was dominant with 106 individuals followed by Spilomelinae (101), Schoenobiinae (75), Aganainae (54), Ennominae (45), Plusiinae (36), Xyloryctinae (34), Microniinae (31), Arctiinae (28), Pterophorinae (25), Heliothinae (14), Erebinae (12), Sphinginae (11) and least numberswas observed in three subfamilies *viz*., Lymantriinae (9), Macroglosiinae (9) and Sesiinae (9) (Table 2). Only one subfamily Microniinae was reported under the family Uraniidae. It is in contrary to the findings of Chandra and Sambath (2013) who recorded two subfamilies under Uraniidae *viz*., Microniinae and Epipleminae in Tawang District, Arunachal Pradesh.

Conclusion

Among the group of insects, Lepidoptera serves as reliable indicator of plant diversity as they depend directly on plants and particular set of environmental factors prevailing in the study area. Many species, act as herbivores, pollinators and food for insectivores. The diversity of this insect group is vital

Table 2. Super families comprising moths recorded during January – December, 2015 in Kalrayan hills, TN

S. No.	Superfamily	Numbers recorded	Family	Numbers recorded	Subfamily	Numbers recorded
1	Gelechioidea	34	Oecophoridae	34	Xylorctinae	34
2	Sesioidea	9	Sesiidae	9	Sesiinae	9
3	Pterophoroidea	25	Pterophoridae	25	Pterophorinae	25
4	Pyraloidea	176	Crambidae	176	Scoenobinae	75
					Spilomelinae	101
5	Bombycoidea	20	Sphingidae	20	Sphinginae	11
					Macroglossinae	9
6	Geometroidea	76	Geometridae	45	Ennominae	45
			Uraniidae	31	Microniinae	31
7	Noctuoidea	259	Noctuidae	259	Noctuinae	106
					Arctiinae	28
					Lymantrinae	9
					Heliothinae	14
					Plusiinae	36
					Aganainae	54
					Erebinae	12
	Grand Total	599				

for food web and food chain so as to maintain a natural balance in the ecosystem. The study on Lepidopteran diversity of Kalrayan hills of Eastern Ghats provided the base information for initiating the further studies pertaining to conservation and also to unearth the presence of species and their richness to prepare a check list. Therefore, an extensive survey is essential for few consecutive years to furnish the complete Lepidoptera diversity of the locality.

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