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Moths (Lepidoptera- Noctuidae) Diversity Assemblages on Three Different Areas of Mukurthi National Park, Western Ghats, India

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ABSTRACT

Lepidoptera is a largest order of insects that includes moths and butterflies. It is the second largest order in the class Insecta. Moth species were identified as ecological indicators like disturbance of land forest as well as cultivable agricultural areas. Lepidoptera and moths plays vital role in dynamics of forest ecosystems, the ecosystem by influencing nutrient cycling and agriculture by serving as defoliators, prey or hosts as carnivores, decomposers, and pollinators. The flora that contributes to the biodiversity of Moths can be grouped into 3 major vegetation types such as (A) Agricultural Areas (B) Shrub Forest (C) Grassland. In the present study of biodiversity moth species compared with three experimental sites and observed 2951 individuals of moths representing 17 sub-families were observed. Among which the Arctiinae sub-family species were highly abundant in all study sites compared with other species. In this experimental finding conclude that Arctiinae rich diversity in (MNP) and other species were predict to immediate protective measures to conserve the forest ecosystems.

KEYWORDS : Moth Diversity, MNP, Lepidoptera, Noctuidae, Western Ghats

Introduction

Indian Agriculture is one of the most significant contributors to the Indian economy. It is the backbone of our economic system. Invertebrates are vital members of ecological communities. They were providing various complicated key role in the ecosystem. Macro and micro faunas revolve to increasing the soil quality through the decompositions services, pollination of plants, biomedical, biotechnological products and aesthetic value to humans, regulation of microclimate and local hydrological processes, suppression of undesirable organisms and detoxification of noxious chemicals. Present days, many invertebrate populations are threatened by human activities because of over exploitation. Insects comprise more than half of the world's known animal species (Wilson, 1992) of which the second largest and more diverse order is Lepidoptera of class Insecta (Benton, 1995). Lepidoptera is probably one of the most suitable groups for most quantitative comparisons between insect faunas to be valid to the ecosystem, many reasons were elaborated by Holloway (1985), especially their abundance, species richness, response to vegetation and climate. Most of the researchers have used Lepidoptera as a model to assess the impact of climate change, habitat disturbance, animal distribution and management practices on forest ecosystems (Willott *et al.,* 2000; Lewis, 2001; Beck *et al*., 2002; Stork *et al.,* 2003; Axmacher *et al.,* 2004). Moths also benefit plants by pollinating flowers while feeding on their nectar, and so help in seed production of the plant. This is not only benefits wild plants but also many of our food crops, which depend upon the moths as well as other insects to ensure a good harvest. Lepidoptera is a large order of insect includes moths and butterflies (both called lepidopteron). It is one of the most widespread and widely recognizable insect orders in the world, encompassing moths and the three super families of butterflies, skipper butterflies, and moth butterflies. Comprising an estimated 1,74,250 species, in 126 families and 46 super families, the Lepidoptera show many variations of the basic body structure that have evolved to gain advantages in lifestyle and distribution. In recent estimates report over 1,27,000 species of moths from all over the world (Alfred *et al.* 1998). Of which, over 12,000 species are recorded from India (Chandra & Nema 2007). Human beings play a very important role since it affects the vegetation directly. In an area with moderate rainfall and frequent fires, tall grasses dominate the ground vegetation (Evans *et al*., 1989). Biological Diversity is that measures have to be taken in order to conserve natural forests, especially tropical forests, which are among the biodiversity hotspots considered as a global priority for conservation (Sayer and Wegge, 1992; Myers *et al*., 2000). The current fire dynamic is one of rapid return fires and more frequent that the earlier time for the study region. Forest fires burned an average of 30% (98km^2/year) of the forests in the landscape of the MWLS each year. At the mid scale of the Nilgiri Biosphere Reserve (NBR), an estimated average of 19% (1,029 km^2/year) of the forests burned every year. At the regional scale of the Western Ghats, average annual burning estimated to cover 17% (28, 306 km^2/year) of the forests. Nilgiri Biosphere Reserve is the first biosphere reserve in India is an important region in the overall biodiversity ranking in South Asia, Considered as an International Biosphere Reserve. According to FAO reported in (2001), the annual deforestation rate in Africa is about twice as high as the global rate (0.3 versus 0.7%). India is one of mega diversity in the world, most of the flora and fauna was endemic to Western Ghats. So the most urgent need for the conservation of the flora and fauna. Noctuidae is one of the dominant and economically important families of the order Lepidoptera. Efforts to assess the influence of forest management activities on biodiversity are challenging due to inadequate knowledge of the current distribution and abundance of many taxa. As expanding human populations put additional pressure on remaining forest resources, understanding patterns of biodiversity within forests and more specifically, the ecological linkages between vegetation and unfamiliar animal taxa, will become increasingly critical to the development of sustainable forest management strategies, Maintenance of biodiversity is one of the primary goals of ecosystem management, the paradigm currently shaping management practices across most public forest land in the Western Ghats. Habitat loss is the leading cause of wildlife decline worldwide. More prevalent than outright destruction however, the habitat fragmentation exhibited especially in tropical regions. In the present study the main objective was to collect, identify and calculate the diversity of species richness and evenness of moth fauna of Mukruthi National Park.

MATERIALS AND METHODS

Study Areas

It is located in the Western Ghats between 76°- 77° 15'E and 11° 15' - 12° 15'N**.** The Nilgiri Biosphere Reserve (NBR) is the first biosphere reserve in India Tamil Nadu (2537.6 km^2), Kerala (1455.4 km^2) and Karnataka (1527.4 km^2). The total area of the Nilgiri Biosphere Reserve is 5,520 sq. km. Mukurthi extends to an area of 76.48 Km^2 at an average elevation of about 2400 m. It lies between 11° 08″ to 11° 37″ N and 76° 27″ E to 77° 4″ E. NBR is characterized by great altitudinal (from 100 m to 2554 m above mean sea level) and climatic gradients. The annual rainfall of the reserve ranges from 500 mm to 7000 mm

with temperature ranging from 0°C during winter to 41°C during summer. The basic parameter of atmospheric temperature, rainfall and humidity were observed in study area during the study period. Moth's species were collected from three different areas site (A) Agricultural Areas, (B) Shrub Forest, (C) Grassland (fifteen study sites). The study was conducted from July 2013 to December 2013. The light traps were setup in to the all study areas in same time rottenly. The moths Sample was collected every month for five consecutive days from 19.00 to 6.00 by using UV lamps (40 w). The UV lamp attracted moths were collected by using a sweeping net (25 Cm diameter). The moths collected were killed by insect killing bottle and stored in specimen vials and securely transported to laboratory. After that the specimen were properly mounted and stored in insect storage boxes. The stored Specimens were identified in to the standard books for fauna of British India and some standard publication references. Data analysis, the species diversity analysis were calculated by using PAST software package (PAST; version = 2.02).

RESULTS AND DISCUSSION

In the present findings Noctuidae family the total number of 71 species of moths belonging to seventeen sub- families were collected during the study period of Mukurthi National Park (MNP). The moth species were collected by using light traps. Moth species has Table. 1. and Fig. 1,2 shows the number of individuals belonging to each family at MNP.

Table- 1. Showed the Noctuidae family (17 sub- families), number of species and number individuals in three different areas.

Sub-family	Number of Species	Number of Individuals in Agricultural Areas	Number of Individuals in Shrub Forest	Number of Individuals in Grassland
Calpinae	2	21	44	19
Euteliinae	1	16	5	13
Acontiinae	15	127	376	156
Aganaidae	1	10	60	22
Aganainae	1	0	3	1
Eriopinae	4	19	68	47
Erebidae	2	16	42	31
Sarrothripinae	1	14	64	45
Stictoperinae	3	45	145	82
Acontiinae	4	11	36	0
Arctiinae	22	230	327	173
Anophelinae	1	23	76	28
Heliothinae	1	8	28	16
Amphipyrinae	1	10	25	12
Hadeninae	5	17	47	0
Chloephorinae	4	0	49	13
Condicinae	3	58	162	111
		625	1557	769

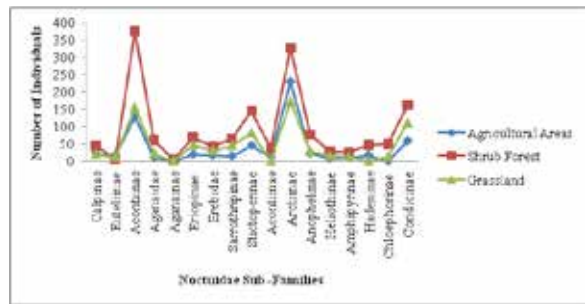

Fig. 1. Graph shown the number of individuals values from the three different study areas during the study period

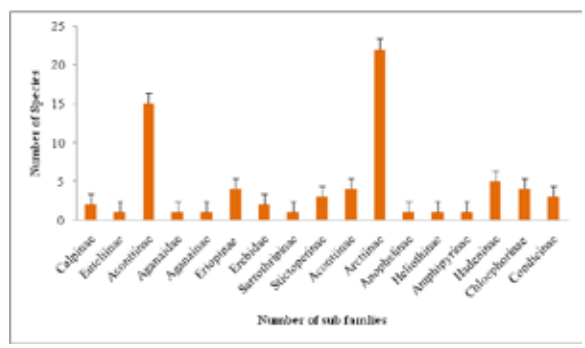

Fig. 2. Graph shown number of species from the three different study areas during the study period.

In the present study we observed 2951 individuals of moths representing 17 sub- families were observed and some specimens were collected for species identification from the experimental sites. The Arctiinae sub-family species were high abundant in all site. (22 species, 730 individuals), followed by Acontiinae (15 Species, 659 individuals), Condicinae, (3 species 331 individuals), Stictoperinae (3 species 237 individuals), Eriopinae (4 species 134 individuals), Anophelinae (1 species 127 individuals), Sarrothripinae (1 species 123 individuals), Aganaidae (1 species 92 individuals), Erebidae (2 species 89 individuals), (2 species 84 individuals), Hadeninae (5 species 64 individuals), Chloephorinae (4 species 62 individuals), Heliothinae (1 species 52 individuals), Amphipyrinae (1 species 47 individuals), Acontiinae (4 species 47 individuals), Euteliinae (1 species 34 individuals), and Aganainae (1 species 4 individuals).

Table. 2. Showed the Taxa_S, Individuals, Dominance_D, Shannon H, Simpson_1-D, Evenness_e^H/S, Menhinick, Margalef, Equitability_J, Fisher_alpha, Berger-Parker, overall Values of Three different study sites.

	Agriculture Areas	Lower	Upper	Shrub Forest	Lower	Upper	Grassland	Lower	Upper
Taxa_S	15	16	17	17	16	17	15	16	17
Individuals	625	625	625	1557	1557	1557	769	769	769
Dominance_D	0.1975	0.1299	0.1587	0.1339	0.1336	0.1524	0.1368	0.1312	0.1569
Shannon_H	2.073	2.206	2.354	2.337	2.243	2.338	2.249	2.215	2.35
Simpson_1-D	0.8025	0.8408	0.8701	0.8661	0.8476	0.8662	0.8632	0.8429	0.8687
Evenness_e^H/S	0.5302	0.543	0.645	0.6089	0.5563	0.6238	0.6322	0.545	0.6392
Menhinick	0.6	0.64	0.68	0.4308	0.4055	0.4308	0.5409	0.577	0.613
Margalef	2.175	2.33	2.485	2.177	2.041	2.177	2.107	2.257	2.408
Equitability_J	0.7657	0.7841	0.8419	0.8249	0.793	0.8312	0.8307	0.7856	0.8386
Fisher_alpha	2.765	2.993	3.225	2.668	2.484	2.668	2.642	2.858	3.077
Berger-Parker	0.368	0.2256	0.2832	0.2415	0.228	0.2678	0.225	0.225	0.2796

The result shows the highest number of moth species (22) belonged to sub-family Arctiinae compare with subfamily Aganainae. Table.2 represents the diversity index of each family of moths at MNP. Fisher's alpha indicates the value is higher in a. agricultural areas (2.765) followed by Shrub forest (2.668) and Grassland value is (2.642). The evenness values were calculated in three different areas followed by site –C Value is 0.6322, site-B Value is 0.6089 and site-A Value is 0.5302 (Table 2) . Shannon diversity indices also were resulted and revels the site B comprises with more individual species (2.337) and least population in site –A (2.073). According to Simpson index the moderate population were seen in site B value is (0.8661) and C value is (0.8667) lowest value in A. (0.8025) and also calculated the dominance_D, Manhinick values and Margalf values.

Conservation of the natural habitats is very essential for the existence of many species of lepidopteron. The biodiversity (diversity index, species richness and evenness) of moth fauna in MNP is mainly due to the rich vegetation in this particular site B as vegetation plays an important role for the existence of insect fauna in a community as it provides the main source of food etc. for insects. For instance, the occurrence of a rich and diversified fauna in some parts of Nilgiri Biosphere region was largely attributed to the conservation of forests in this region (Larsen, 1987). The survival of a large number of endemic species in a community or habitat warrants frequent monitoring of the ecological processes besides adoption of appropriate conservation strategies in order to safeguard its rich genetic diversity (Mathew *et. al.,* 2003). The total number of individuals caught in a trap is an indication of biomass although more care has to be taken in its interpretation than for diversity as the size of a light trap catch can be influenced significantly by the setting of the trap, interference from other lights and lunar cycles (Barlow and Woiwod, 1989).

This work was an attempt to describe some aspects of biodiversity of moth fauna of MNP. Further most work is necessary to carried out, the further collections are essential for getting a detailed periodic estimate of the faunal diversity of moths in this area. Ultimately it is hoped that such work may lead to the development of standard monitoring procedures assessing the value of environmental stability of areas under cultivation for different crops and the prediction and effect on the structure of moth populations of tropical forest destruction.

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REFERENCES

Alfred, J.R.B., A.K. Das., A.K. Sanyal (1998). Faunal Diversity in India. ENVIS Centre Zoological Survey of India, Kolkata: 311–318. | Axmacher, J.C., Tunte, H., Schrumpf, M., Mullerhohenstein, K., Lyaruu, HVM., Fiedler, K.,2004. Diverging diversity patterns of vascular plants and geometrid moths during forest regeneration on Mt. Kilimanjaro, Tanzania. J. Biogeo. 31, 895-904. | Barlow H.S, Woiwod IP. 1989. Moth diversity of a tropical forest in Penninsular Malaysia. Journal of Tropical Ecology, 5: 37-50 | Beck, J., Schulze. C.H., Linsenmair, KE., Fiedler K., 2002. From forest to farmland: diversity of geometrid moths along two habitat gradients on Borneo. J. Trop. Eco. 17, 33-51. | Benton, T.G., 1995. Biodiversity of Handerson Island insects. Bio. J. Linn Soc. 56. 245-259. | Chandra, K. & D.K. Nema (2007). Fauna of Madhya Pradesh (including Chhattisgarh) part-I, State Fauna Series 15: 347. Published by Director, Zoological Survey of India, Kolkata. | Evans, E. W., Briggs, J. M., Finck, E. J., Gibson, D. J., James, S. W., Kaufman,D. W., and Seastedt, T. R., 1989. Is fire a disturbance in grasslands?; in Proceedings of the 11th N. American Prairie Conference. | FAO, 2001. State of the World's Forest. Food and Agriculture Organization of the United Nations, Rome, Italy. | Holloway, J. D., 1985. Moths as indicator organisms for categorizing rain forest and monitoring changes and regeneration processes. Tropical Rain Forest: The Leeds Symposium. 235-242. | Larsen T.B. 1987. The butterflies of the Nilgiri mountains of south India (Lepidoptera: Rhopalocera). Journal of the Bombay Natural History Society, 84(1): 26-54; 84(2): 291-316; 84(3): 560-584 | Lewis, O.T., 2001. Effects of experimental selective logging on tropical butterflies. Biol. Conserv. 15, 389–400. | Mathew, G., Rugmini, P., Binoy, C.F., 2003. Impact of forest fire on insect species diversity. A study in the silent Valley National Park, Kerela, India. Entomon. 28, 105–114. | Sayer, J.A., Wegge, P., 1992. Biological conservation issues in forest management. In: Blockhus, J.M., Dillenbeck, M., Sayer, J.A., Wegge, P. (Eds.), Conserving biological diversity in managed tropical forests. Workshop held at IUCN General Assembly at Perth, Australia, 30 November – 01 December 1990, pp 1–4 | Stork, N.E., Srivastava, D.S., Watt, A.D., Larsen, T.B., 2003. Butterfly diversity and silvicultural practice in lowland rainforests in Cameroon. Biodi. Conserv. 12, 387-410. | Willott, S.J., Lim, D.C., Compton, S.G., Sutton, S.L., 2000 Effects of selective logging on the butterflies of a Bornean rainforest. Biol. Conserv. 14. 1055-1065. | Wilson, EO. 1992. Fluctuations in abundance of tropical insects. American Naturalist, 112: 1017-1045. |