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Full Length Research Paper

An Opportunistic Record of Moths (Lepidoptera) Diversity in Fragmented Habitats of Hosanagara taluk, Shivamogga district, Karnataka, Southern India.

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ABSTRACT

Lepidoptera is the second largest and the most diverse order of class Insecta which comprises of both moths and butterflies. Moths are keystone species and indicators of forest health. Study on diversity of Moths was conducted in agricultural land, forest and urban areas of Huligadde, Kammacchi and Amrutha villages of Hosanagara taluk by using light trap and opportunistic survey method. Study revealed a total of 172 species belongs to the 37 families 20 sub-families and 324 genera. Noctuidae is the most dominant family with 47.7% which is followed by Bombycoidea, Geometroidea and Pyraloidea with 16.38%, 15.75% and 13.21% each. Calliduloidea, Drepanidae, Cossidae, Thyridoidea, Lecithoceridae and Uraniidae are contributed very less. High diversity was observed in agricultural fields, followed by forest and urban habitat, moths are considered as pest to the agricultural crops, highest diversity in cropland indicates the dependence of moths to the vegetation type. The habitat sharing of Moth species represents 14 species are common in all three habitats.

1. Introduction

Western ghat is one among the 34 global biodiversity hotspot and one among the 8 biodiversity “hottest hotspots” in the world and also designated as UNESCO world heritage site. (Bhatt and Magurran 2006). It harbours rich biodiversity with many endemic flora and fauna (Mayers *et al.*, 2000). Lepidoptera is the second largest and the most diverse order of class Insecta, which comprises of both moths and butterflies (Benton, 1995, Powell 2009), Moths contribute more than 85% of all known lepidopterans, and over 12,000 species belonging to 41 families have been reported from Indian subcontinent region (Chandra 2007). Subhalaxmi *et al.*, (2011) reported 418 species from northern Western Ghats. Sekhon and Singh (2015) reported 41 species of Eribidae moths from the Western Ghats. Their distribution depends on the vegetation pattern and are adapted to variety of climatic conditions like temperature, humidity, rainfall. Moths play an important role as ecological indicators of floral diversity. As majority of the Moths are host-specific and caterpillars depends mainly on plants for feeding through this way flora and vegetation of the forest contributes more towards their population and diversity. (Common 1990; Usher and Keiller, 1998; Kitching *et al.*, 2000). Most of the species are nocturnal in nature and important part of food chain as primary herbivore, prey species, key pollinators, seed dispersal agents and they convert the green leaf into green manure which facilitates the growth of forest vegetation by this way maintain the ecosystem balance. (Rao *et al.*, 2022; Maarit *et al.*, 2013).

Moths are the pests for agriculture, horticulture, plantation crops and also for forest vegetation. Current study reveals the importance of moths in the study area. The populations of moth species were decreasing due to the deforestation, agricultural expansion, pesticides, artificial light, invasive species and loss of their natural habitats (Mahajan, 2004). The fragmented areas include both the natural vegetation, plantation, ponds with frequent human exploitations of resources for farming and daily life. In insects the particular taxa butterflies, moths, dragonflies and damselflies are used as the bio-indicators to reflect the environmental changes. Thus, the biodiversity in fragmented areas needs more attention for conservation biology and ecology.

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2. Materials and methods:

2.1 Study area:

Hosanagara taluk belongs to the Shivamogga district which lies in the central part of Western Ghat of Karnataka locally called as malnad region. It is famous for lush greenery with plentiful rainfall. Hosanagara lies between 13°48'0" N to 14°6'0" N and 75°18'0" E to 75°45'0" E. The area receives an average yearly rainfall of 1830 mm and average annual temperature of 24.2° C. (Saadath and Naik 2023). The present study was conducted in three villages such as Huligadde, Kamachi and Amrutha. The natural vegetation composed of dry deciduous forests, moist deciduous forests, semi-evergreen, and evergreen forest types. On the basis of vegetation study area is divided into 3 distinct habitats such as site-1, site-2 and site-3 which comprises of agricultural land, forest and urban area with wetland. The different sampled locations in the Shivamogga are represented in map.

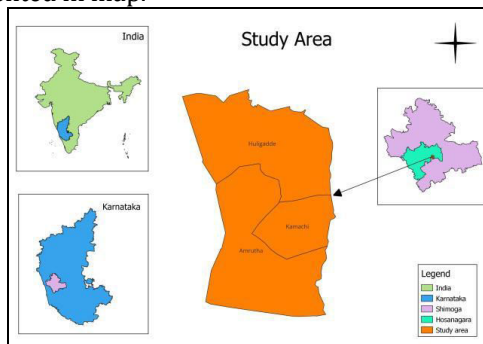


Fig 1: Sampling location of study area (QGIS, 2024).

2.2 Methods:

Moth inventory of Hosanagara taluk was carried out from January 2022 to August 2024. Sampling of Moths was done by light trap method, by keeping white light illuminated with a 10-watt fluorescent rechargeable torches hanging to 7m x 4m white cloth which is tied between two trees in selected grids. Observation was done at night hours (6:30 PM to 11:00 PM) and early morning (4:30 AM to 6:00 AM) for 2-3 consecutive days (Fig-1). No specimens were collected during the study. Opportunistic survey method is also followed, by taking photographs of moths which are attracted to artificial light sources. Photographic evidence of the entire moth's species was taken by using camera Nikon D5200 with Tamron 300mm macro lens and smart phones. Identification of the moths were done on the basis of their morphological characters up-to species level based on the keys provided by (Hampson, 1894), Moths of India field guide by Sanjay Sondhi (2024). Online portals such as Indian Biodiversity, Moths of India, iNaturalist was used for the identification. Then categorized into families, sub families and genera.



Fig 2: The light trap used for moths observation

3. Results and Discussion:

4012 individuals of 172 species are recorded from the study area, belongs to the 37 families 20 sub-families and 324 genera. Noctuoidea is the most dominant family with 47.7% which is followed by Bombycoidea, Geometroidea and Pyraloidea with 16.38%, 15.75% and 13.21% each. Calliduloidea, Drepanidae, Cossidae, Thyridoidea, Lecithoceridae and Uraniidae are contributed very less. (Graph 1).

Table: 1 - Moths species and genera representing different families and sub families in study area

Sl. No	Super family	Family	Sub-family	Genera (genus)	Scientific name	Habitat Type		
						Site 1	Site 2	Site 3
1	Bombycoidea	Eupterotidae	Euperotinae	Eupterote	<i>Eupterote cf mollifera</i>	-	+	+
2	Bombycoidea	Eupterotidae	Euperotinae	Eupterote	<i>Eupterote sp</i>	+	-	-
3	Bombycoidea	Eupterotidae	Euperotinae	Eupterote	<i>Eupterote undata</i>	+	-	-
4	Bombycoidea	Eupterotidae	Euperotinae	Ganisa	<i>Ganisa plana</i>	-	+	+
5	Bombycoidea	Eupterotidae	Euperotinae	Ganisa	<i>Ganisa sp</i>	+	-	-
6	Bombycoidea	Bombycidae	Bombycinae	Ocinara	<i>Ocinara sp.</i>	-	+	-
7	Bombycoidea	Bombycidae	Bombycinae	Bombyx	<i>Bombyx mori</i>	-	+	-
8	Bombycoidea	Saturniidae	Saturniinae	Actias	<i>Actias maenas</i>	+	-	-
9	Bombycoidea	Saturniidae	Saturniinae	Actias	<i>Actias selene</i>	-	-	+
10	Bombycoidea	Saturniidae	Saturniinae	Antheraea	<i>Antheraea mylitta</i>	+	-	+

11	Bombycoidea	Saturniidae	Saturniinae	Attacus	<i>Attacus atlas</i>	+	+	-
12	Bombycoidea	Saturniidae	Saturniinae	Cricula	<i>Cricula andrei</i>	-	+	+
13	Bombycoidea	Saturniidae	Saturniinae	Loepa	<i>Loepa katinka</i>	+	-	-
14	Bombycoidea	Sphingidae	Macroglossinae	Agrius	<i>Agrius convolvuli</i>	-	+	+
15	Bombycoidea	Sphingidae	Macroglossinae	Ampelophaga	<i>Ampelophaga rubiginosa</i>	+	-	-
16	Bombycoidea	Sphingidae	Macroglossinae	Cephonodes	<i>Cephonodes spp</i>	+	-	-
17	Bombycoidea	Sphingidae	Macroglossinae	Daphnis	<i>Daphnis neri</i>	+	+	-
18	Bombycoidea	Sphingidae	Macroglossinae	Theretra	<i>Theretra nessus</i>	-	+	+
19	Bombycoidea	Sphingidae	Macroglossinae	Theretra	<i>Theretra oldenlandiae</i>	-	-	+
20	Bombycoidea	Sphingidae	Macroglossinae	Theretra	<i>Theretra pallicosta</i>	+	-	+
21	Bombycoidea	Sphingidae	Sphinginae	Acherontia	<i>Acherontia lachesis</i>	+	-	-
22	Bombycoidea	Sphingidae	Sphinginae	Acherontia	<i>Acherontia styx</i>	-	+	+
23	Bombycoidea	Sphingidae	Smerinthinae	Ambulyx	<i>Ambulyx moorei</i>	-	-	+
24	Bombycoidea	Sphingidae	Macroglossinae	Hippotion	<i>Hippotion gracilis</i>	-	+	-
25	Bombycoidea	Sphingidae	Macroglossinae	Macroglossum	<i>Macroglossum afflictitia</i>	+	-	-
26	Bombycoidea	Sphingidae	Smerinthinae	Marumba	<i>Marumba dyras</i>	-	+	-
27	Bombycoidea	Sphingidae	Sphinginae	Meganoton	<i>Meganoton analis</i>	+	-	+
28	Bombycoidea	Sphingidae	Sphinginae	Psilogramma	<i>Psilogramma casuarinae</i>	+	-	-
29	Bombycoidea	Sphingidae	Sphinginae	Psilogramma	<i>Psilogramma vates</i>	+	-	+
30	Calliduloidea	Calliduloidea	Callidulinae	Tetragonus	<i>Tetragonous catamitus</i>	-	+	-
31	Drepanidae	Drepanoidea	Drepaninae	Phalacra	<i>Phalacra vidhisara</i>	+	+	-
32	Geometroidea	Geometridae	Geometrinae	Agathia	<i>Agathia hilarata</i>	-	-	+
33	Geometroidea	Geometridae	Geometrinae	Agathia	<i>Agathia magnificentia</i>	+	-	-
34	Geometroidea	Geometridae	Geometrinae	Berta	<i>Berta chrysolineata</i>	-	+	-
35	Geometroidea	Geometridae	Geometrinae	Comibaena	<i>Comibaena attenuata</i>	-	-	+
36	Geometroidea	Geometridae	Geometrinae	Comostola	<i>Comostola laesaria</i>	+	-	-
37	Geometroidea	Geometridae	Geometrinae	Comostola	<i>Comostola pyrrhogona</i>	+	+	-
38	Geometroidea	Geometridae	Ennominae	Charissa	<i>Charissa obscurata</i>	+	-	+
39	Geometroidea	Geometridae	Geometrinae	Chlorocoma	<i>Chlorocoma sp</i>	+	-	-
40	Geometroidea	Geometridae	Geometrinae	Dysphania	<i>Dysphania percota</i>	-	+	-
41	Geometroidea	Geometridae	Geometrinae	Ectropis	<i>Ectropis sp</i>	+	-	-
42	Geometroidea	Geometridae	Geometrinae	Hemithea	<i>Hemithea sp</i>	-	+	-
43	Geometroidea	Geometridae	Geometrinae	Protuliconemis	<i>Protuliconemis partita</i>	+	-	+
44	Geometroidea	Geometridae	Ennominae	Trotopera	<i>Trotopera Sp.</i>	+	-	-
45	Geometroidea	Geometridae	Desmobathrinae	Naxa	<i>Naxa textilis</i>	+	-	+
46	Geometroidea	Geometridae	Ennominae	Chiasmia	<i>Chiasmia eleonora</i>	+	+	-
47	Geometroidea	Geometridae	Ennominae	Chiasmia	<i>Chiasmia nora</i>	+	-	-
48	Geometroidea	Geometridae	Ennominae	Fascellina	<i>Fascellina plagiata</i>	-	-	+
49	Geometroidea	Geometridae	Ennominae	Hypomecis	<i>Hypomecis cineracea</i>	-	+	-
50	Geometroidea	Geometridae	Ennominae	Menophra	<i>Menophra sp</i>	-	+	-
51	Geometroidea	Geometridae	Ennominae	Ourapteryx	<i>Ourapteryx clara</i>	+	-	-
52	Geometroidea	Geometridae	Ennominae	Ourapteryx	<i>Ourapteryx marginata</i>	-	-	+
53	Geometroidea	Uraniidae	Microniinae	Acropteris	<i>Acropteris sp.</i>	-	+	-
54	Geometroidea	Geometridae	Sterrhinae	Problepsis	<i>Problepsis vulgaris</i>	+	+	-
55	Geometroidea	Geometridae	Sterrhinae	Scopula	<i>Scopula sp</i>	+	-	-
56	Geometroidea	Geometridae	Sterrhinae	Traminda	<i>Traminda mundissima</i>	-	+	-
57	Geometroidea	Uraniidae	Microniinae	Micronia	<i>Micronia aculeata</i>	+	-	-
58	Geometroidea	Uraniidae	Epipleminae	Epiplema	<i>Epiplema sp</i>	-	+	-
59	Lasiocampoidea	Lasiocampidae	Lasiocampinae	Gastropacha	<i>Gastropacha pardale</i>	+	+	-
60	Lasiocampoidea	Lasiocampidae	Lasiocampinae	Trabala	<i>Trabala vishnou</i>	+	-	+
61	Noctuoidea	Erebidae	Arctiinae	Amata	<i>Amata Sp.</i>	-	-	+
62	Noctuoidea	Erebidae	Arctiinae	Amata	<i>Amata passalis</i>	+	+	-
63	Noctuoidea	Erebidae	Arctiinae	Ammatho	<i>Ammatho cuneonotatus</i>	+	+	-
64	Noctuoidea	Erebidae	Arctiinae	Arctiini	<i>Arctiini sp</i>	-	-	+
65	Noctuoidea	Erebidae	Arctiinae	Asura	<i>Asura miltochrista sp</i>	-	+	-
66	Noctuoidea	Erebidae	Arctiinae	Cretonotos	<i>Cretonotos gangis</i>	-	-	+
67	Noctuoidea	Erebidae	Arctiinae	Cretonotos	<i>Cretonotos transiens</i>	+	+	-
68	Noctuoidea	Erebidae	Arctiinae	Cyana	<i>Cyana arama</i>	-	+	-
69	Noctuoidea	Erebidae	Arctiinae	Cyana	<i>Cyana dudgeoni</i>	-	-	+
70	Noctuoidea	Erebidae	Arctiinae	Cyana	<i>Cyana peregrine</i>	+	-	+
71	Noctuoidea	Erebidae	Arctiinae	Cyana	<i>Cyana sigma</i>	-	+	-
72	Noctuoidea	Erebidae	Arctiinae	Eressa	<i>Eressa confinis</i>	+	-	-
73	Noctuoidea	Erebidae	Arctiinae	Estigmene	<i>Estigmene vittata</i>	-	-	+

74	Noctuoidea	Erebidae	Arctiinae	Hemonia	<i>Hemonia orbiferana</i>	-	+	-
75	Noctuoidea	Erebidae	Arctiinae	Macrobrochis	<i>Macrobrochis gigas</i>	+	-	-
76	Noctuoidea	Erebidae	Arctiinae	Mangina	<i>Mangina argus</i>	-	+	+
77	Noctuoidea	Erebidae	Arctiinae	Miltochrista	<i>Miltochrista obsoleta</i>	-	+	-
78	Noctuoidea	Erebidae	Arctiinae	Miltochrista	<i>Miltochrista sp.</i>	+	-	-
79	Noctuoidea	Erebidae	Arctiinae	Nepita	<i>Nepita conferta</i>	-	-	+
80	Noctuoidea	Erebidae	Arctiinae	Nyctemera	<i>Nyctemera coleta</i>	+	+	-
81	Noctuoidea	Erebidae	Arctiinae	Olepa	<i>Olepa ricini</i>	+	-	+
82	Noctuoidea	Erebidae	Arctiinae	Pangora	<i>Pangora matherana</i>	-	-	+
83	Noctuoidea	Erebidae	Arctiinae	Syntomoides	<i>Syntomoides imaon</i>	+	+	-
84	Noctuoidea	Erebidae	Arctiinae	Teulisna	<i>Teulisna sp</i>	+	-	-
85	Noctuoidea	Noctuidae	Plusiinae	Thysanoplusia	<i>Thysanoplusia orichalcea</i>	+	-	+
86	Noctuoidea	Erebidae	Arctiinae	Trischalis	<i>Trischalis subaurana</i>	-	+	-
87	Noctuoidea	Erebidae	Arctiinae	Utetheisa	<i>Utetheisa pulchella</i>	-	-	+
88	Noctuoidea	Erebidae	Calpinae	Dierna	<i>Dierna patibulum</i>	+	-	-
89	Noctuoidea	Erebidae	Calpinae	Eudocima	<i>Eudocima homaena</i>	+	+	-
90	Noctuoidea	Erebidae	Calpinae	Eudocima	<i>Eudocima materna</i>	+	+	-
91	Noctuoidea	Erebidae	Calpinae	Eudocima	<i>Eudocima phalonia</i>	-	-	+
92	Noctuoidea	Erebidae	Calpinae	Eudocima	<i>Eudocima sp</i>	+	-	-
93	Noctuoidea	Erebidae	Calpinae	Eudocima	<i>Eudocima salaminia</i>	-	-	+
94	Noctuoidea	Erebidae	Lymantriinae	Artaxa	<i>Artaxa digramma</i>	-	+	+
95	Noctuoidea	Erebidae	Lymantriinae	Artaxa	<i>Artaxa sp</i>	+	-	-
96	Noctuoidea	Erebidae	Erebinae	Bastilla	<i>Bastilla analis</i>	-	+	+
97	Noctuoidea	Erebidae	Erebinae	Bastilla	<i>Bastilla arctotaenia</i>	+	+	-
98	Noctuoidea	Erebidae	Erebinae	Bastilla	<i>Bastilla crameri</i>	-	-	+
99	Noctuoidea	Erebidae	Erebinae	Bastilla	<i>Bastilla joviana</i>	-	+	-
100	Noctuoidea	Erebidae	Erebinae	Chalciope	<i>Chalciope mygdoni</i>	-	+	+
101	Noctuoidea	Erebidae	Erebinae	Dysgonia	<i>Dysgonia latifascia</i>	+	-	-
102	Noctuoidea	Erebidae	Erebinae	Dysgonia	<i>Dysgonia torrida</i>	-	+	-
103	Noctuoidea	Erebidae	Erebinae	Erebus	<i>Erebus ephesperis</i>	-	+	+
104	Noctuoidea	Erebidae	Erebinae	Erebus	<i>Erebus macrops</i>	+	+	-
105	Noctuoidea	Erebidae	Hypeninae	Hypena	<i>Hypena proboscidalis</i>	+	-	-
106	Noctuoidea	Erebidae	Catocalinae	Ischyja	<i>Ischyja manlia</i>	+	+	-
107	Noctuoidea	Erebidae	Erebinae	Mocis	<i>Mocis frugalis</i>	-	+	-
108	Noctuoidea	Erebidae	Erebinae	Nagia	<i>Nagia linteola</i>	+	+	-
109	Noctuoidea	Erebidae	Lymantriinae	Somena	<i>Somena scintillans</i>	+	+	+
110	Noctuoidea	Erebidae	Erebinae	Spirama	<i>Spirama helicina</i>	-	+	-
111	Noctuoidea	Erebidae	Erebinae	Spirama	<i>Spirama retorta</i>	+	+	+
112	Noctuoidea	Erebidae	Erebinae	Sympis	<i>Sympis rufibasis</i>	-	+	-
113	Noctuoidea	Erebidae	Erebinae	Thyas	<i>Thyas coronata</i>	+	+	-
114	Noctuoidea	Erebidae	Erebinae	Trigonodes	<i>Trigonodes hyppasia</i>	+	-	-
115	Noctuoidea	Noctuidae	Noctuinae	Spodoptera	<i>Spodoptera litura</i>	+	+	-
116	Noctuoidea	Noctuidae	Noctuinae	Spodoptera	<i>Spodoptera sp</i>	-	-	+
117	Noctuoidea	Erebidae	Lymantriinae	Arctornis	<i>Arctornis sp</i>	-	-	+
118	Noctuoidea	Erebidae	Lymantriinae	Calliteara	<i>Calliteara grotei</i>	+	+	-
119	Noctuoidea	Erebidae	Lymantriinae	Calliteara	<i>Calliteara sp</i>	+	-	-
120	Noctuoidea	Erebidae	Lymantriinae	Euproctis	<i>Euproctis sp</i>	-	+	-
121	Noctuoidea	Erebidae	Lymantriinae	Lymantria	<i>Lymantria concolor</i>	+	-	+
122	Noctuoidea	Erebidae	Lymantriinae	Lymantria	<i>Lymantria mathura (male)</i>	-	-	+
123	Noctuoidea	Erebidae	Lymantriinae	Lymantria	<i>Lymantria spp</i>	-	+	-
124	Noctuoidea	Erebidae	Lymantriinae	Nygmiini	<i>Nygmiini sp</i>	-	+	-
125	Noctuoidea	Erebidae	Lymantriinae	Olene	<i>Olene mendosa</i>	+	-	+
126	Geometrioiae	Geometridae	Geometrinae	Oospila	<i>Oospila</i>	-	+	-
127	Noctuoidea	Erebidae	Lymantriinae	Orgyia	<i>Orgyia postica</i>	+	-	+
128	Noctuoidea	Erebidae	Lymantriinae	Orvasca	<i>Orvasca bicolor</i>	+	-	+
129	Noctuoidea	Erebidae	Lymantriinae	Orvasca	<i>Orvasca postica</i>	-	-	+
130	Noctuoidea	Erebidae	Lymantriinae	Orvasca	<i>Orvasca subnotata</i>	+	+	-
131	Noctuoidea	Erebidae	Lymantriinae	Orvasca	<i>Orvasca sp</i>	+	-	-
132	Noctuoidea	Erebidae	Lymantriinae	Perina	<i>Perina nuda</i>	-	+	+
133	Noctuoidea	Erebidae	Pangraptinae	Egnasia	<i>Egnasia sp</i>	-	-	+
134	Noctuoidea	Noctuidae	Bagisarinae	Chasmina	<i>Chasmina candida</i>	+	+	-
135	Noctuoidea	Noctuidae	Dyopsinae	Cyclodes	<i>Cyclodes omma</i>	-	+	+
136	Noctuoidea	Nolidae	Chloephorinae	Carea	<i>Carea angulata</i>	+	-	+

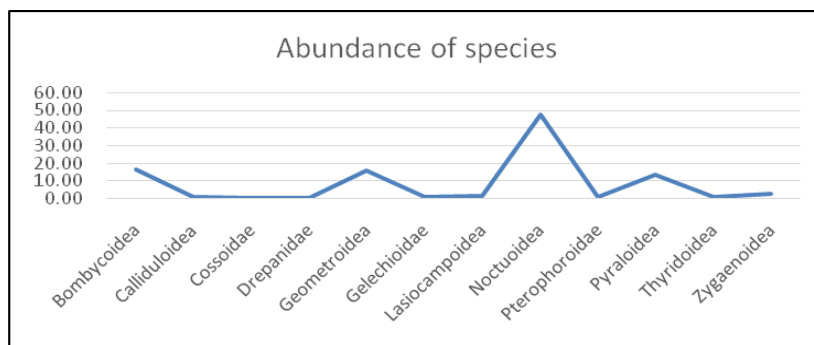
137	Noctuoidea	Nolidae	Eligminae	Eligma	<i>Eligma narcissus</i>	-	+	-
138	Noctuoidea	Nolidae	Nolinae	Nola	<i>Nola lucidalis</i>	+	-	-
139	Noctuoidea	Nolidae	Nolinae	Nolidae	<i>Nolidae sp</i>	-	+	-
140	Pterophoridae	Pterophoridae	Pterophorinae	Sphenarches	<i>Sphenarches sp</i>	+	-	-
141	Pyraloidea	Pyralidae	Galleriinae	Achroia	<i>Achroia grisella</i>	-	+	+
142	Pyraloidea	Crambidae	Spilomelinae	Cnaphalocrocis	<i>Cnaphalocrocis medinalis</i>	+	-	+
143	Pyraloidea	Crambidae	Spilomelinae	Chabulina	<i>Chabulina onychinalis</i>	+	-	-
144	Pyraloidea	Crambidae	Spilomelinae	Conogethes	<i>Conogethes punctiferalis</i>	+	+	-
145	Pyraloidea	Crambidae	Spilomelinae	Diaphania	<i>Diaphania indica</i>	+	-	+
146	Pyraloidea	Crambidae	Spilomelinae	Endocrossis	<i>Endocrossis flavibasalis</i>	-	+	-
147	Pyraloidea	Crambidae	Spilomelinae	Filodes	<i>Filodes fulvidorsalis</i>	+	-	+
148	Pyraloidea	Crambidae	Spilomelinae	Glyphodes	<i>Glyphodes actorionalis</i>	-	+	+
149	Pyraloidea	Crambidae	Spilomelinae	Glyphodes	<i>Glyphodes bivitalis</i>	+	-	-
150	Pyraloidea	Crambidae	Spilomelinae	Hymenia	<i>Hymenia perspectalis</i>	-	-	+
151	Pyraloidea	Crambidae	Spilomelinae	Hymenia	<i>Hymenia sp</i>	-	+	-
152	Pyraloidea	Crambidae	Spilomelinae	Maruca	<i>Maruca vitrata</i>	+	+	-
153	Pyraloidea	Crambidae	Spilomelinae	Metoecca	<i>Metoecca foedalis</i>	+	-	+
154	Pyraloidea	Crambidae	Spilomelinae	Nausinoe	<i>Nausinoe geometralis</i>	-	+	-
155	Pyraloidea	Crambidae	Spilomelinae	Nausinoe	<i>Nausinoe pueritia</i>	+	+	-
156	Pyraloidea	Crambidae	Spilomelinae	Pachynoa	<i>Pachynoa xanthochyta</i>	+	-	-
157	Pyraloidea	Crambidae	Spilomelinae	Palpita	<i>Palpita annulifer</i>	-	+	+
158	Pyraloidea	Crambidae	Spilomelinae	Parapoynx	<i>Parapoynx fluctuosalis</i>	-	+	+
159	Pyraloidea	Crambidae	Spilomelinae	Parotis	<i>Parotis marginata</i>	+	-	-
160	Pyraloidea	Crambidae	Spilomelinae	Sameodes	<i>Sameodes cancellais</i>	-	+	-
161	Pyraloidea	Crambidae	Spilomelinae	Spoladea	<i>Spoladea recurvalis</i>	+	-	+
162	Pyraloidea	Crambidae	Spilomelinae	Terastia	<i>Terastia egialealis</i>	-	+	+
163	Zygaenoidea	Limacodidae	Limacodinae	Birhamoides	<i>Birhamoides junctura</i>	-	+	-
164	Zygaenoidea	Limacodidae	Limacodinae	Parasa	<i>Parasa hilaris</i>	+	+	-
165	Zygaenoidea	Limacodidae	Limacodinae	Parasa	<i>Parasa lepida</i>	-	-	+
166	Zygaenoidea	Limacodidae	Limacodinae	Parasa	<i>Parasa sp</i>	-	+	-
167	Zygaenoidea	Zygaenidae	Chalcosiinae	Cyclosia	<i>Cyclosia papilionaris</i>	+	-	-
168	Zygaenoidea	Zygaenidae	Chalcosiinae	Eterusia	<i>Eterusia aedea</i>	-	+	+
169	Cossoidae	Cossidae	Metarbelidae	Xyleutes	<i>Xyleutes persona</i>	-	-	+
170	Thyrididae	Thyrididae	Siculodinae	Calindoea	<i>Calindoea spp</i>	-	-	+
171	Gelechioidea	Lecithoceridae	Torodorinae	Deltoplastis	<i>Deltoplastis spp.</i>	-	-	+
172	Geometroidea	Uraniidae	Epipleminae	Phazaca	<i>Phazaca sp</i>	+	-	-

Table 2: Diversity index of moth species in the study area

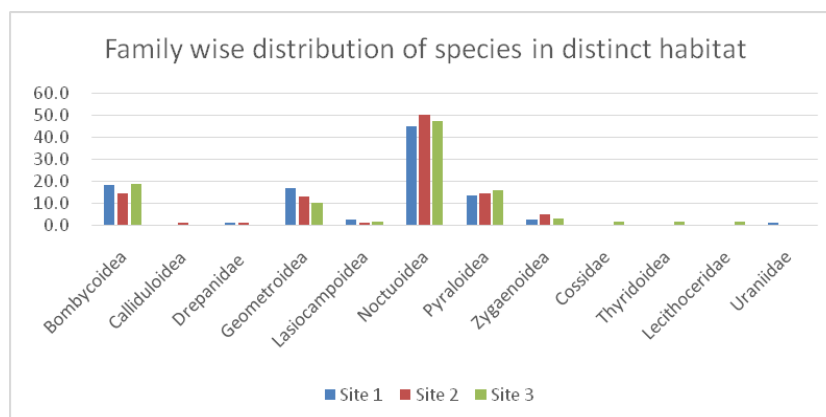
	Site 1	Site 2	Site 3
Taxa_S	111	91	84
Individuals	1315	1862	835
Dominance_D	0.01196	0.009767	0.00379
Simpson_1-D	0.889	0.7902	0.6862
Shannon_H	3.966	3.46	3.342
Evenness_e^H/S	0.9559	0.7571	0.5154

The data shows that overall species diversity was highest 111 in study site 1 (cropland) followed by site 2 (Forest) and site 3 (urban area) with 91 and 84 individuals each. Maximum value of Simpson diversity was recorded in the site 1 (0.889) followed by site 2 (0.7902) and site 3 (0.6862) it represents the highest diversity in the study area. The evenness index is also 1 in agricultural vegetation (site 1) compared to the forest and urban area ie., 0.9559. More number of individuals was sighted in Forest vegetation (1862) compared to agricultural and urban. Dominance index showed highest species dominance in agricultural habitat. Cropland play an important role in the completion of life cycle of the moths, many caterpillars of moths are pest to the agricultural crops. The domination of moths in the agricultural vegetation can be because of its dependence on the agricultural crops. Moths also host on many floral of the forest including weeds, hence forest also supports moth diversity as much as the croplands.

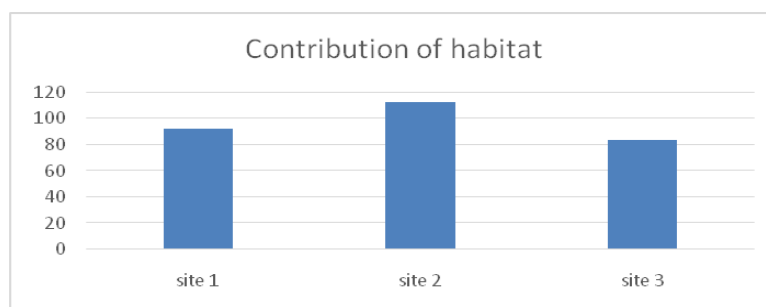
In three distinct habitats natural forest contributed highest number of species which is followed by crop land and urban area. Highest documentation of Noctuoidea is observed in natural forest followed by urban area and agricultural land. Bombycoidea was highest in urban area followed by agricultural land and less number observed in natural forest. Geometroidea was highest observed in urban area than in natural forest and urban area. Pyraloidea was observed more in urban area compared to natural forest and agricultural land. The diversity indices represents the species distribution in the study area in which the Simpson diversity index is 0.78 closer to 1 represents less diversity in the study area



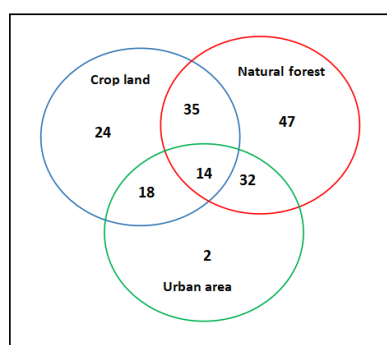
Graph 1: Family wise distribution of moths in the study area



Graph 2: Family wise distribution of moths in distinct habitats of study area



Graph 3: Habitat contribution of moths in the study area



Graph 4: Habitat sharing of moth species

The habitat sharing of Moth species in the study area (Graph 4) represents 14 species are common in all three habitats. Number of species are more in Natural forest which is followed by crop land and urban area with 47, 24 and 2 species respectively. In that urban area contributes very less number of species. 35 species are sharing two types of habitats that is natural forest and crop land, 18 species are common in both urban area and crop land, where as 3 species are documented in both natural forest and urban area.

Moths are seasonal in their occurrence and are sensitive to the climatic and habitat changes that influences their diversity and distribution (Ramkumar *et al.*, 2010). Ecologically helpful as a key pollinator for the some of the flowering plants and also being sensitive to the climatic changes indicates the habitats, landscapes disturbances and ecological health of the ecosystems. The conservation of the flora and fauna helps to maintain the ecological balance in the ecosystem.

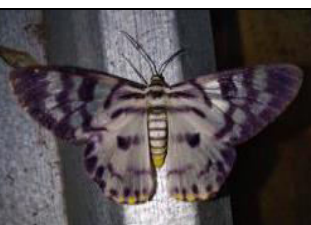
Acknowledgement:

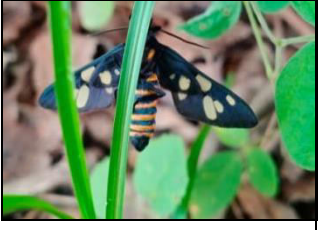
Authors are grateful to Dr. Karthikeyan. S., Authors also thank to Raksha K V for helping in identification and friends who helped for the study.

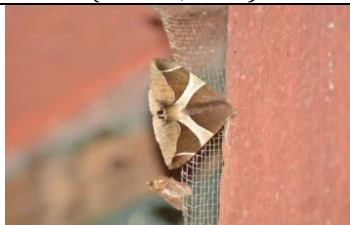
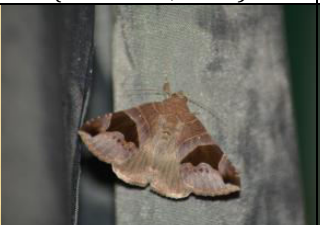
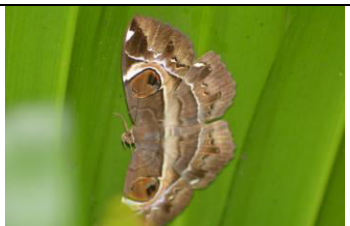
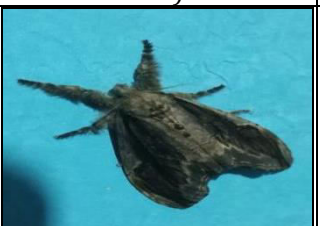
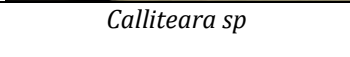
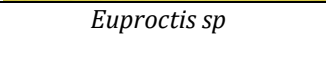
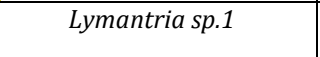
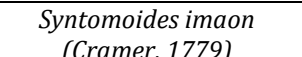
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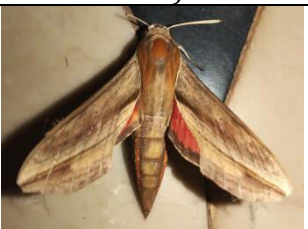
Table 4: Images of Moths

			
<i>Eupterote mollifera</i> (Walker, 1865)	<i>Spoladea recurvalis</i> (Fabricius, 1775)	<i>Mocis frugalis</i> (Fabricius, 1775)	<i>Somena scintillans</i> (Walker, 1856)
			
<i>Ganisa plana</i> (Walker, 1855)	<i>Actias selene</i> (Hübner, 1807)	<i>Attacus taprobanis</i> (Moore, 1882)	<i>Cricula agria</i> (Jordan, 1909)
			
<i>Agrius convolvuli</i> (Linnaeus, 1758)	<i>Daphnis nerii</i> (Linnaeus, 1758)	<i>Theretra oldenlandiae</i> (Fabricius, 1775)	<i>Theretra pallicosta</i> (Walker, 1856)
			
<i>Maruca vitrata</i> (Fabricius, 1787)	<i>Psilogramma vates</i> (Butler, 1875)	<i>Naxa textilis</i> (Walker, 1856)	<i>Semiothisa eleonora</i> (Villers, 1789)
			
<i>Hypomecis cineracea</i> (Moore, 1888)	<i>Ischyja manlia</i> (Cramer, 1776)	<i>Menophra</i> sp.	<i>Pachynoa xanthochyta</i> (Turner, 1933)
			
<i>Ourapteryx clara</i> (Matsumura, 1910)	<i>Comibaena attenuata</i> (Warren, 1896)	<i>Dysphania percota</i> (C. Swinhoe, 1891)	<i>Hemithea</i> sp

			
<i>Hemithea sp</i>	<i>Tropopera Sp.</i>	<i>Conogethes punctiferalis</i> (Guenée, 1854)	<i>Amata passalis</i> (Fabricius, 1781)
			
<i>Chiasmia eleonora</i> (Cramer, 1780)	<i>Ganisa sp</i>	<i>Erebus macrops</i> (Linnaeus, 1768)	<i>Protuliconemis partita</i> (Walker, 1861)
			
<i>Traminda mundissima</i> (Walker, 1861)	<i>Scopula sp</i>	<i>Ectropis sp</i>	<i>Chlorocoma sp</i>
			
<i>Micronia aculeata</i> (Guenée, 1857)	<i>Trabala vishnou</i> (Lefèbvre, 1827)	<i>Ammatho cuneonotatus</i> (Walker, 1855)	<i>Eupterote undata</i>
			
<i>Creatonotos gangis</i> (Linnaeus, 1763)	<i>Creatonotos transiens</i> (Walker, 1855)	<i>Cyana arama</i> (Moore, 1859)	<i>Cyana sp</i>
			
<i>Eterusia aedea</i> (Linnaeus, 1763)	<i>Cyclosia papilionaris</i> (Drury, 1773)	<i>Nyctemera coleta</i> (Stoll, 1782)	<i>Eressa confinis</i> (Walker, 1854)
			

<i>Metoeca foedalis</i> (Guenée, 1854)	<i>Mitochrista</i> sp	<i>Olepa ricini</i> (Fabricius, 1775)	<i>Teulisna</i> sp
			
<i>Trischalis subaurana</i> (Walker, 1863)	<i>Dierna patibulum</i> (Fabricius, 1794)	<i>Eudocima materna</i> (Linnaeus, 1767)	<i>Eudocima salaminia</i> (Cramer, 1777)
			
<i>Comostola pyrrhogona</i> (Walker, 1866)	<i>Eudocima homaena</i> (Hübner, 1816)	<i>Artaxa digramma</i> (Boisduval, 1844)	<i>Artaxa</i> sp
			
<i>Bastilla analis</i> (Guenée, 1852)	<i>Bastilla arctotaenia</i> (Guenée, 1852)	<i>Bastilla joviana</i> (Stoll, 1782)	<i>Dysgonia torrida</i> (Guenée, 1852)
			
<i>Erebus ephesperis</i> (Hübner, 1827)	<i>Spirama</i> sp	<i>Nagia linteola</i> (Guenée, 1852)	<i>Spirama helicina</i> (Hübner, 1824)
			
<i>Spodoptera litura</i> (Fabricius, 1775)	<i>Charissa obscurata</i> (Denis & Schiffermüller, 1775)	<i>Calliteara</i> sp	<i>Calliteara grotei</i> (Moore, 1859)
			
<i>Calliteara</i> sp	<i>Euproctis</i> sp	<i>Lymantria</i> sp.1	<i>Syntomoides imaon</i> (Cramer, 1779)
			

			
<i>Lymantria sp.2</i>	<i>Lymantria sp.3</i>	<i>Lymantria sp.4</i>	<i>Lymantria concolor</i> (Walker, 1855)
			
<i>Egnasia sp</i>	<i>Chasmina candida</i> (Walker, 1865)	<i>Cyclodes omma</i> (van der Hoeven, 1840)	<i>Psilogramma casuarinae</i> (Walker, 1856)
			
<i>Parapoynx fluctuosalis</i> (Meyrick, 1899)	<i>Chabulina onychinalis</i> (Guenée, 1854)	<i>Conogethes punctiferalis</i> (Guenée, 1854)	<i>Diaphania indica</i> (Saunders, 1851)
			
<i>Endocrossis flavibasalis</i> (Moore, 1868)	<i>Filodes fulvidorsalis</i> (Geyer in Hübner, 1832)	<i>Hymenia sp.</i>	<i>Barsine sp</i>
			
<i>Glyphodes bivitalis</i> (Guenée, 1854)	<i>Nausinoe pueritia</i> (Cramer, 1780)	<i>Sameodes cancellalis</i> (Zeller, 1852)	<i>Sameodes sp.</i>
			
<i>Birthamoides junctura</i> (Walker, 1865)	<i>Parasa hilaris</i> (Meyrick, 1913)	<i>Parasa sp</i>	<i>Comostola laesaria</i> (Walker, 1861)

			
<i>Daphnis nerii</i> (Linnaeus, 1758)	<i>Dysgonia latifascia</i> (Warren, 1888)	<i>Phazaca</i> sp.	<i>Thysanoplusia orichalcea</i> (Fabricius, 1775)
			
<i>Hypena proboscidalis</i> (Linnaeus, 1758)	<i>Orvasca</i> sp	<i>Macroglossum afflictitia</i> (Butler, 1875)	<i>Artaxa</i> sp
			
<i>Orvasca subnotata</i> (Walker, 1865)	<i>Orvasca bicolor</i> (Heylaerts, 1892)	<i>Thyas coronate</i> (Fabricius, 1775)	<i>Nola lucidalis</i> (Walker, 1864)
			
<i>Maruca vitrata</i> (Fabricius, 1787)	<i>Problepsis vulgaris</i> (Butler, 1889)	<i>Hippotion gracilis</i> (Butler, 1875)	<i>Glyphodes actorionalis</i> (Walker, 1859)
			
<i>Xyleutes persona</i> (Le Guillou, 1841)	<i>Nepita conferta</i> (Walker, 1854)	<i>Phalacra vidhisara</i> (Walker, 1860)	

1.