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Studies on Moth Distribution (Insecta: Lepdioptera: Heterocera) in Gandhisagar Wildlife Sanctuary Mandsaur and Neemach Districts of Madhya Pradesh, Central India

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ABSTRACT: Moths are lepidopteron insect primarily nocturnal, potentially bio-indicators, decomposer, prey forestry and agricultural pests, and night time pollinators. For the moth diversity in the Gandhisagar Wildlife Sanctuary, Mandsaur and Neemach districts of Madhya Pradesh the current study will be the first to report on species diversity, species composition, and abundance. In the year 2022 to 2024, a comprehensive survey was carried out in the forest areas of Gandhisagar Wildlife Sanctuary and its environs from March to December. In the course of the investigation, we identified 148 species, 121 genera, 44 subfamilies and 17 families under 10 superfamilies from the study area. The family Erebidae 49 species was dominant, followed by Crambidae 28 species, Geometridae 23 species, Noctuidae 15 species, Sphingidae 8 species, Notodontidae 5, Limacodidae 4 species, Nolidae and Saturniidae 3 species each, Euteliidae and Lasicocampidae 2 species each. The other families are Bombycidae, Hybaleidae, Eupterotidae, Pterophoridae and Thyrididae one species each were the least recorded families. The study revealed that there were noteworthy variations found in the moth faunal diversity in the Gandhisagar Wildlife Sanctuary Madhya Pradesh.

Keywords: Lepidoptera, Moths, Nocturnal, Pests, Pollinator, Diversity, Gandhisagar Wildlife Sanctuary.

INTRODUCTION

Madhya Pradesh is the Central Indian state and home to some of the unique and richest biodiversity in the country, protected under different categories like national parks, wildlife sanctuaries, tiger reserves and biosphere reserves (Ramakrishna *et al*., 2006; Chandra, 2011). Among these, Gandhisagar Sanctuary wildlife is a famous and situated on the northern boundary of Mandsaur and Neemach districts in Madhya Pradesh, India. It is spread over an area of 368.62 km^2 (142.32 sq mi) adjoining Rajasthan state in India. It was notified in 1974 and more area was added in 1983. The Chambal River passes through the sanctuary dividing it into two parts. The western part is in Nimach district and eastern part is in Mandsaur district. It is in the Khathiar-Gir dry deciduous forests ecoregion. This region is known a Nimar region which touches its border with Rajasthan thus more of less knows as dry region thus vegetation is also not so dry and we will find many rocky patches during safari drive. The forest of this sanctuary is part of Khathiar-Gir dry deciduous forest thus here we will find trees like Salai, Kardhai, Dhawda, Tendu, Palash etc. It is part of World famous Chaturbhuj Nala rock shelters are also part of same Gandhisagar wildlife sanctuary. This sanctuary is spread over the area surrounding to Gandhi Sagar dam backwater.

The order Lepidoptera is one of the most recognized and popular insect order which includes moths and butterflies. They are amongst four most species diverse orders along with Coleoptera, Diptera and Hymenoptera (Pathania *et al*., 2014). Moths account for 85% of the lepidopteran population, and the remaining 15 % are butterflies and skippers (Pathania, *et al*., 2009). Moths are characterized by drably colored scales on the body, epiphysis on the foreleg, different types of antennae, phytophagous and predominantly nocturnal nature (Srivastava, 2002; Chandra *et al*., 2013; Singh *et al*., 2017; Kathirvelu *et al*., 2019). They are very sensitive to climate changes and vegetation alterations, making them an important group for monitoring climate and habitat changes (Thomas, 2005; Lees and Zilli 2019). Moths and butterflies contribute to essential ecosystem processes such as pollination, herbivore and decomposition in many terrestrial biomes (Lewis, 2001; Lomov *et al*., 2006; Chandra *et al*., 2019; Paunikar *et al*., 2021). They are also considered vital for ecosystem services because of various roles such as forestry agricultural and other vegetable crops pests (Beeson, 1942; Browne, 1968; Joshi *et al*., 2004; Nair, 2007; Sharma *et al*., 2008; Paunikar and Sharma, 2022a), food for mammals andbirds (Vaughan, 1997; Wilson *et al*., 1999) and night pollinators (Macgregor *et al*., 2015; Singh *et al*., 2022a). Moths are strongly associated with vegetation structure and composition, which makes them a suitable indicator taxon for various ecological

studies (Chandra *et al*., 2019; Singh *et al*., 2022a). Moth communities are receiving increasing conservation interest (Scalercio *et al*., 2009; Sondhi *et al*., 2018; Paunikar *et al*., 2023a), because of high sensitivity to the environmental change and proved to be powerful indicator of forest disturbance (Kitching *et al*., 2000; Summerville *et al*., 2004; Kendrick, 2009; Sondhi *et al*., 2016; Paunikar *et al*., 2023b).

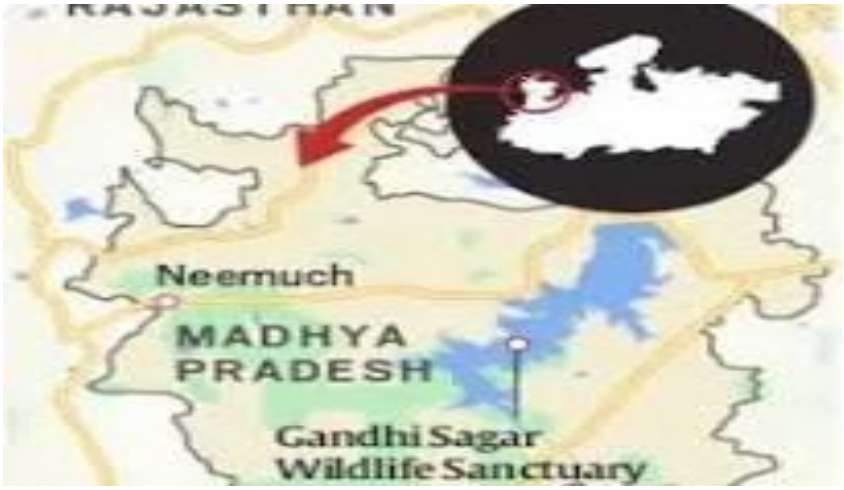
Recently, scientists estimated to Lepidoptera comprises 166, 320 described species belonging to 143 families in 43 superfamilies distributed globally, except for Antarctica. In India, Lepidoptera are known by 13,124 species in 3,668 genera, 101 families and 31 superfamilies. Of which, 1379 species are butterflies and the remaining 11,745 species are moths (Singh *et al*., 2024).

The various Lepidopterists have been carried out to investigate the moth diversity in different parts of the Madhya Pradesh, since eighteen century. The major works have been done by Cotes and Swinhoe (1886-89) in six volumes of "*A Calalogue of Moths of India*" included 120 species from Madhya Pradesh. Hampson (1892, 1894, 1895 and 1896) and Bell and Scott (1937) published in five volumes of "*Fauna of British India*" included 76 species from central India. Ramakrishna *et al*. (2006) documented moth fauna of National Parks of Madhya Pradesh and Chhattisgarh. Chandra and Nema (2007) compiled the moth diversity from Central India including Madhya Pradesh & Chhattisgarh includes 313 species/subspecies of moths belonging to 221 genera and 25 families. Chandra and Nema (2003, 2008); Chandra (2009); Chandra and Sambath (2016ab); Sambath, (2017; 2018a; 2018b; 2020, 2022); Sambath and Nair (2023); Paunikar *et al*. (2024) reported the moth diversity of different National Parks, Wildlife Sanctuaries, Tiger Reserves and Biosphere Reserves of Madhya Pradesh. Singh *et al*. (2022b) compiled the 226 species of moth from Madhya Pradesh.

In the present investigation we are concentrated on the lepidopteron- Moth species assemblage's in the forest areas of Gandhisagar Wildlife Sanctuary, Madhya Pradesh state of Central India.

MATERIALS AND METHODS

Site Study. The study on moth diversity was carried out in Gandhisagar Wildlife Sanctuary which is spread two districts, Mandsaur and Neemach belongs to Western Madhya Pradesh region. It is located at 24.670556 N, 75.788056 E. It is located in the rain shadow and therefore receives only around 400-500 mm of average rainfall in the monsoon.



Source: Web-Map of Gandhisagar Wildlife Sanctuary, Neemach and Mandsaur district of Madhya Pradesh.

Moth Specimen Collection and Observation by Light Trap Method. A mercury light trap method was used for the collection of moth. This is most common method of collecting nocturnal moths that hide or rest during the day in places where they are unlikely seen. Large number of moths caught at night using a light trap. White cloth screen (3 × 3.5) was hanging between two poles and extended forward over the ground slightly away from the direct source of mercury light placed.

Preservation and Identification of Specimens. The collected moth species were pinned, stretched and preserved in fumigated insect boxes. The photographic collection as well as preserved specimens from sites was identified with the help of identification key and available literature by Hampson (1892-1896), Bell and Scott (1937); Barlow (1982); Kirti and Singh (2015, 2016); Shubhalaxmi (2018); Kirti *et al*. (2019); Kalawate *et al*. (2024). Besides the above mentioned literature, a number of web resources including www.jpmoths.org; moths of India (http://www.mothsofindia.org/; Sondhi *et al*. (2024) were used for the purpose of identification.

RESULT AND DISCUSSION

The moth species identified belonging to 148 species, 121 genera, 44 subfamilies and 17 families under 10 superfamilies from the study area presented at Table 1, Fig. 1 & 2 with Plate. The family Erebidae 49 species (33.10%) was dominant, followed by Crambidae 28 species (18.91%), Geometridae 23 species (15.54%), Noctuidae 15 species (10.13%), Sphingidae 8 species (5.40%), Notodontidae 5 (3.37%), Limacodidae 4 species (2.70%), Nolidae and Saturniidae 3 species (2.02%), Euteliidae and Lasicocampidae 2 species each (1.35%), Furthermore, Bombycidae, Hybaleidae

Eupterotidae, Pterophoridae and Thyrididae one species each (0.67%) respectively were the least recorded families. The maximum genera was found in family Erebidae 40 genera was a first runner, followed by Crambidae 25 genera, Geometridae 17 genera, Noctuidae 10 genera, Sphingidae 6 genera, Limcodidiae and Notodontidae 4 genera each, Saturniidae and Nolidae 3 genera each and Lasiocampidae 2 genera. The other families Bombycidae, Hybaleidae, Eupterotidae, Euteliidae and Thyrididae one genus each were the least recorded from the study area. The findings illustrate that the family Erebidae is widely distributed and abundant which corroborates the findings of Sambath and Nair (2023); Paunikar *et al.* (2024) who reported the dominance of Erebidae moths in the Sanjay-Dubri national Park and Ratapani Wildlife Sanctuary of Madhya Pradesh.

The highest abundance of the Erebidae family in the study is represented by the subfamily and Arctiinae (36.73%), Erebinae (32.65%) and Lymantrinae (18.36%) that constitutes the most species-rich subfamily of Erebidae. The second highest Crambidae family in the study is represented by the subfamily and Spilomelinae (50.00%) and Pyraustinae (25.00%) that constitutes the most species-rich subfamily of Crambidae. The Geometridae family is the third highest represented by subfamily Ennominae (56.52%), Sterrhinae (21.73%) and Geometrinae (17.39%) respectively and fourth highest species under Noctuidae family represented by subfamily Noctuiinae (53.33%). Their abundance can be explained by the occurrence of diverse habitats rich in forest tree, grasses and several crop plants preferred by the members by the species under the families Erebidae, Crambidae, Geometridae and Noctuidae.

Table 1: Checklist MothFauna of Gandhisagar Wildlife Sanctuary, Mandsaur and Neemach districts of Madhya Pradesh.

Sr. No.	Superfamily	Family	Subfamily	Species Name	Author, Year
1.	Bombycoidea	Eupteroidae	Eupterotinae	*Eupterote undata*	(Blanchard, 1844)
2.	Bombycoidea	Bombycidae	Bombycinae	*Trilocha varians*	(Walker, 1854)
3	Bombycoidea	Sphingidae	Macroglossinae	*Cephonodes hylas*	(Linnaeus, 1771)
4	Bombycoidea	Sphingidae	Macroglossinae	*Hippotion celerio*	(Linnaeus, 1758)
5	Bombycoidea	Sphingidae	Macroglossinae	*Hippotion boerhaviae*	(Fabricius, 1775)
6	Bombycoidea	Sphingidae	Macroglossinae	*Nephele hespera*	(Fabricius, 1775)
7	Bombycoidea	Sphingidae	Macroglossinae	*Theretra oldenlandiae*	(Fabricius, 1775)
8	Bombycoidea	Sphingidae	Macroglossinae	*Theretra alecto*	(Linnaeus, 1758
9	Bombycoidea	Sphingidae	Smerinthinae	*Marumba dyras dyras*	(Walker, 1856)
10	Bombycoidea	Sphingidae	Sphinginae	*Agrius convolvuli*	(Linnaeus, 1758)
11	Bombycoidea	Saturniidae	Saturniinae	*Actias selene*	(Hubner, 1806)
12	Bombycoidea	Saturniidae	Saturniinae	*Attacus atlas*	(Linnaeus, 1758)
13	Bombycoidea	Saturniidae	Saturniinae	*Antheraea paphia*	(Linnaeus, 1758)
14	Geometroidea	Geometridae	Ennominae	*Ascotis selenaria*	(Denis-Schiffermüller, 1865)
15	Geometroidea	Geometridae	Ennominae	*Biston suppressania*	(Guenee,1854)
16	Geometroidea	Geometridae	Ennominae	*Chiasmia fidoniata*	(Guenee,1858)
17	Geometroidea	Geometridae	Ennominae	*Chiasma cf. nora*	(Walker, 1861)
18	Geometroidea	Geometridae	Ennominae	*Chiasmia eleonora*	(Cramer,1780)
19	Geometroidea	Geometridae	Ennominae	*Chiasmia emersaria*	(Walker, 1861)
20	Geometroidea	Geometridae	Ennominae	*Zamarada excisa*	(Hampson, 1891)
21	Geometroidea	Geometridae	Ennominae	*Hyperythra lutea*	(Stoll, 1781)
22	Geometroidea	Geometridae	Ennominae	*Isturgia disputaria*	(Guenee, 1858)
23	Geometroidea	Geometridae	Ennominae	*Hyposidra talaca*	(Walker, 1860)
24	Geometroidea	Geometridae	Ennominae	*Hypomecis infixaria*	(Walker, 1860)
25	Geometroidea	Geometridae	Ennominae	*Petelia medardaria*	Herrich-Schäffer, 1865)
26	Geometroidea	Geometridae	Ennominae	*Scardamia metallaria*	(Guenée, 1858)
27	Geometroidea	Geometridae	Ennominae	*Cleora injectaria*	(Walker, 1860)
28	Geometroidea	Geometridae	Sterrhinae	*Tramanda mundissima*	(Walker, 1861)
29	Geometroidea	Geometridae	Sterrhinae	*Scopula pulchellata*	(Fabricius, 1794)
30	Geometroidea	Geometridae	Sterrhinae	*Scopula emissaria*	(Walker, 1861)
31	Geometroidea	Geometridae	Sterrhinae	*Scopula caesaria*	(Walker, 1861)
32	Geometroidea	Geometridae	Sterrhinae	*Scopula cuneilinea*	(Walker, 1861)
33	Geometroidea	Geometridae	Geometriinae	*Pelagodes falsaria*	(Prout, 1912)
34	Geometroidea	Geometridae	Geometriinae	*Aporandria specularia*	(Guenee, 1858)
35	Geometroidea	Geometridae	Geometriinae	*Maxates veninotata*	(Warren, 1894)
36	Geometroidea	Geometridae	Geometriinae	*Thalassodes quadraria*	(Guenee (1857)
37	Hyblaeoidea	Hyblaeidae	-	*Hyblaea puera*	(Cramer, 1777)
38	Lasiocampoidea	Lasiocampidae	Lasiocampinae	*Metanastria hyrtaea*	(Cramer, 1782)
39	Lasiocampoidea	Lasiocampidae	Lasiocampinae	*Trabala vishnou*	(Lefebvre, 1827)
40	Noctuoidea	Notodontidae	Cerurinae	*Neocerura liturata*	(Walker, 1855)
41	Noctuoidea	Notodontidae	Spataliinae	*Allata argentifera*	(Walker, 1862)
42	Noctuoidea	Notodontidae	Phalerinae	*Antheua servula*	(Drury, 1773)
43	Noctuoidea	Notodontidae	Dicranurinae	*Netria viridescens*	(Walker, 1855)
44	Noctuoidea	Notodontidae	Pygaerinae	*Spatalia argentifera*	(Walker, 1862)
45	Noctuoidea	Erebidae	Aganainae	*Asota ficus*	(Fabricius, 1775)
46	Noctuoidea	Erebidae	Aganainae	*Asota caricae*	(Fabricius, 1775)

47	Noctuoidea	Erebidae	Aganainae	*Digama hearseyana*	(Moore, 1859)
48	Noctuoidea	Erebidae	Anobinae	*Plecoptera reflexa*	(Guenee, 1852)
49	Noctuoidea	Erebidae	Arctiinae	*Acantholipes miser*	(Butler, 1883)
50	Noctuoidea	Erebidae	Arctiinae	*Aemene taproboris*	(Walker, 1854)
51	Noctuoidea	Erebidae	Arctiinae	*Aloa lactinea*	(Cramer, 1777)
52	Noctuoidea	Erebidae	Arctiinae	*Amata cyssea*	(Stoll, 1782)
53	Noctuoidea	Erebidae	Arctiinae	*Argina astrea*	(Drury, 1773)
54	Noctuoidea	Erebidae	Arctiinae	*Brunia antica*	(Walker, 1854)
55	Noctuoidea	Erebidae	Arctiinae	*Creatonotos gangis*	(Linnaeus, 1758)
56	Noctuoidea	Erebidae	Arctiinae	*Creatonotos transiens*	(Walker, 1855)
57	Noctuoidea	Erebidae	Arctiinae	*Eressa confinis*	(Walker, 1854)
58	Noctuoidea	Erebidae	Arctiinae	*Estigmene perrotteti*	(Guerin-Meneville, 1844)
59	Noctuoidea	Erebidae	Arctiinae	*Mangina astrea*	(Drury, 1773)
60	Noctuoidea	Erebidae	Arctiinae	*Olepa ricini*	(Fabricius, 1775)
61	Noctuoidea	Erebidae	Arctiinae	*Rajendra biguttata*	(Walker, 1855)
62	Noctuoidea	Erebidae	Arctiinae	*Spilarctia obliqua*	(Walker, 1855)
63	Noctuoidea	Erebidae	Arctiinae	*Syntomoides imaon*	(Cramer,1779)
64	Noctuoidea	Erebidae	Arctiinae	*Utetheisa lotrix*	(Cramer, 1779)
65	Noctuoidea	Erebidae	Arctiinae	*Utetheisa pulchelloides*	(Hampson, 1907)
66	Noctuoidea	Erebidae	Arctiinae	*Hypocala restrata*	(Fabricius, 1794)
67	Noctuoidea	Erebidae	Erebinae	*Trigonodes hyppasia*	Cramer, (1779)
68	Noctuoidea	Erebidae	Erebinae	*Achea janata*	(Linnaeus, 1758)
69	Noctuoidea	Erebidae	Erebinae	*Pericyma cruegeri*	(Butler, 1886)
70	Noctuoidea	Erebidae	Erebinae	*Cyana puella*	(Drury, 1773)
71	Noctuoidea	Erebidae	Erebinae	*Bastilla algira*	(Linnaeus, 1767)
72	Noctuoidea	Erebidae	Erebinae	*Bastilla conficiens*	(Walker, 1858)
73	Noctuoidea	Erebidae	Erebinae	*Chalciope mygdon*	(Cramer, 1777)
74	Noctuoidea	Erebidae	Erebinae	*Disgonia algira*	(Linnaeus, 1767)
75	Noctuoidea	Erebidae	Erebinae	*Fodina cuneigera*	(Butler, 1889)
76	Noctuoidea	Erebidae	Erebinae	*Grammodes geometrica*	(Fabricius, 1775)
77	Noctuoidea	Erebidae	Erebinae	*Mocis frugalis*	(Fabricius, 1775)
78	Noctuoidea	Erebidae	Erebinae	*Mocis undata*	(Fabricius, 1775)
79	Noctuoidea	Erebidae	Erebinae	*Ophiusa triphaenoides*	(Walker, 1858)
80	Noctuoidea	Erebidae	Erebinae	*Ophiusa tirhaca*	(Cramer, 1777)
81	Noctuoidea	Erebidae	Erebinae	*Spirama retorta*	(Clerck, 1764)
82	Noctuoidea	Erebidae	Erebinae	*Hypena abysisinialis*	(Gueree, 1854)
83	Noctuoidea	Erebidae	Lymantriinae	*Artaxa digramma*	Boisduval, 1844)
84	Noctuoidea	Erebidae	Lymantriinae	*Artaxa guttara*	(Walker, 1855)
85	Noctuoidea	Erebidae	Lymantriinae	*Euproctis lunata*	(Walker, 1855)
86	Noctuoidea	Erebidae	Lymantriinae	*Lymantria incerta*	(Walker, 1855)
87	Noctuoidea	Erebidae	Lymantriinae	*Lymantria marginata*	(Walker, 1855)
88	Noctuoidea	Erebidae	Lymantriinae	*Lymantria serva*	(Fabricius, 1793)
89	Noctuoidea	Erebidae	Lymantriinae	*Lymantria mathura*	(Moore, 1865)
90	Noctuoidea	Erebidae	Lymantriinae	*Perina nuda*	(Fabricius,1787)
91	Noctuoidea	Erebidae	Lymantriinae	*Orvasca subnotata*	(Walker, 1865)
92	Noctuoidea	Erebidae	Scoliopteryginae	*Anomis flava*	(Fabricius, 1775)
93	Noctuoidea	Erebidae	Pangraptinae	*Episparis liturata*	(Fabricius, 1787)
94	Noctuoidea	Eutellidae	Stictoperinae	*Lophoptera illucida*	(Walker, 1865)
95	Noctuoidea	Eutellidae	Stictoperinae	*Lophoptera squammigera*	(Guenee, 1852)
96	Noctuoidea	Noctuidae	Condicinae	*Condica illecta*	(Walker, 1865)
97	Noctuoidea	Noctuidae	Eriopinae	*Callopistria maillardi*	(Gueree, 1854)
98	Noctuoidea	Noctuidae	Heliothinae	*Helicoverpa armigera*	(Hubner, 1805)
99	Noctuoidea	Noctuidae	Noctuinae	*Mythimna separata*	(Walker, 1865)
100	Noctuoidea	Noctuidae	Noctuinae	*Mythimna unipuncta*	(Haworth, 1809)
101	Noctuoidea	Noctuidae	Noctuinae	*Spodoptera litura*	(Fabricius, 1775)
102	Noctuoidea	Noctuidae	Noctuinae	*Spodoptera frugiperda*	(Smith, 1797)
103	Noctuoidea	Noctuidae	Noctuinae	*Spodoptera exigua*	(Hubner, 1808)
104	Noctuoidea	Noctuidae	Noctuinae	*Agrotis biconica*	(Kollar, 1844)
105	Noctuoidea	Noctuidae	Noctuinae	*Agrotis segetum*	(Denis & Schiffermuller 1775)
106	Noctuoidea	Noctuidae	Noctuinae	*Agrotis ipsilion*	(Hufnagel, 1766)
107	Noctuoidea	Noctuidae	Plusiinae	*Chrysodeixis eriosoma*	(Doubleday, 1843
108	Noctuoidea	Noctuidae	Plusiinae	*Thysanoplusia orichalcea*	(Fabricius, 1775)
109	Noctuoidea	Noctuidae	Bagisarinae	*Xanthodes transversa*	(Guenée, 1857)
110	Noctuoidea	Noctuidae	Acontiinae	*Aedia leucomelas*	(Linnaeus, 1758)
111	Noctuoidea	Nolidae	Chloephorinae	*Carea angulata*	(Fabricius, 1793)
112	Noctuoidea	Nolidae	Wastermanniinae	*Wastermannia superba*	(Hubner, 1823)
113	Noctuoidea	Nolidae	Eariadinae	*Earias vittella*	(Fabricius, 1794
114	Pterophoroidea	Pterophoridae	Pterophorinae	*Hellinsia homodactyla*	(Walker, (1864)
115	Pyraloidea	Crambidae	Acentropinae	*Haritalodes derogata*	(Fabricius, 1775)
116	Pyraloidea	Crambidae	Acentropinae	*Eoophyla peribocalis*	(Walker, 1859)
117	Pyraloidea	Crambidae	Acentropinae	*Parapoynx diminutalis*	(Snellen, 1880)
118	Pyraloidea	Crambidae	Acentropinae	*Parapoynx stagnalis*	(Zeller, 1852)

119	Pyraloidea	Crambidae	Crambinae	*Chilo suppressalis*	(Walker, 1863)
120	Pyraloidea	Crambidae	Crambinae	*Chilo partellus*	(Swinhoe, 1885)
121	Pyraloidea	Crambidae	Spilomelinae	*Agroteria scissalis*	(Walker, 1866)
122	Pyraloidea	Crambidae	Spilomelinae	*Agrotera basinotata*	(Hampson, 1891)
123	Pyraloidea	Crambidae	Spilomelinae	*Agathodes ostentalis*	(Geyer, 1837)
124	Pyraloidea	Crambidae	Spilomelinae	*Cnaphalocrocis medinalis*	(Guenee, 1854)
125	Pyraloidea	Crambidae	Spilomelinae	*Cydalima laticostalis*	(Gueree, 1854)
126	Pyraloidea	Crambidae	Spilomelinae	*Cydalima conchylalis*	(Guenee, 1854)
127	Pyraloidea	Crambidae	Spilomelinae	*Conogethes punctiferalis*	(Guenee, 1854)
128	Pyraloidea	Crambidae	Spilomelinae	*Diaphania indica*	Saunders, 1851)
129	Pyraloidea	Crambidae	Spilomelinae	*Synclera traducalis*	(Zeller, 1852)
130	Pyraloidea	Crambidae	Spilomelinae	*Glyphodes bicolor*	(Swainson, 1821)
131	Pyraloidea	Crambidae	Spilomelinae	*Maruca vitrata*	(Fabricius, 1787)
132	Pyraloidea	Crambidae	Spilomelinae	*Pygospila tyres*	(Cramer, 1779)
133	Pyraloidea	Crambidae	Spilomelinae	*Sameodes cancellalis*	(Zeller, 1852)
134	Pyraloidea	Crambidae	Spilomelinae	*Spoladea recurralis*	(Fabricius, 1787)
135	Pyraloidea	Crambidae	Pyraustinae	*Herpetogramma licarsisalis*	(Walker, 1859)
136	Pyraloidea	Crambidae	Pyraustinae	*Lamprophaia ablactalis*	(Walker, 1859)
137	Pyraloidea	Crambidae	Pyraustinae	*Omiodes analis*	(Snellen, 1880)
138	Pyraloidea	Crambidae	Pyraustinae	*Pleuroptya balteata*	(Fabricius, 1798)
139	Pyraloidea	Crambidae	Pyraustinae	*Pycnarmon cribrata*	(Fabricius, 1794)
140	Pyraloidea	Crambidae	Pyraustinae	*Paliga machoeralis*	(Walker, 1859)
141	Pyraloidea	Crambidae	Pyraustinae	*Pyrausta panopealis*	(Walker, 1859)
142	Pyraloidea	Crambidae	Schoenobiinae	*Scirpophaga incertulus*	(Walker, 1863)
143	Thyridoidea	Thyrididae	Striglininae	*Striglina scitaria*	(Walker, 1862)
144	Tortricoidea	Tortricidae	Olethreutinae	*Loboschiza koenigiana*	(Fabricius, 1775)
145	Zygaenoidea	Limacodidae	Limacodinae	*Birthamoides junctura*	(Walker, 1865)
146	Zygaenoidea	Limacodidae	Limacodinae	*Miresa albipuncta*	(Herrich-Schäffer, 1854)
147	Zygaenoidea	Limacodidae	Limacodinae	*Parasa pastoralis*	(Butler, 1885)
148	Zygaenoidea	Limacodidae	Limacodinae	*Thosea tripartita*	(Moore, 1884)

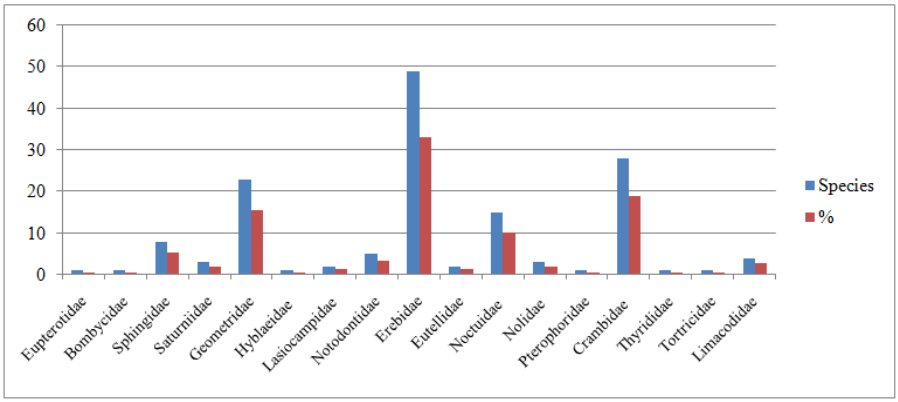


Fig. 1. Graph showing families wise of moths with species in percentage.

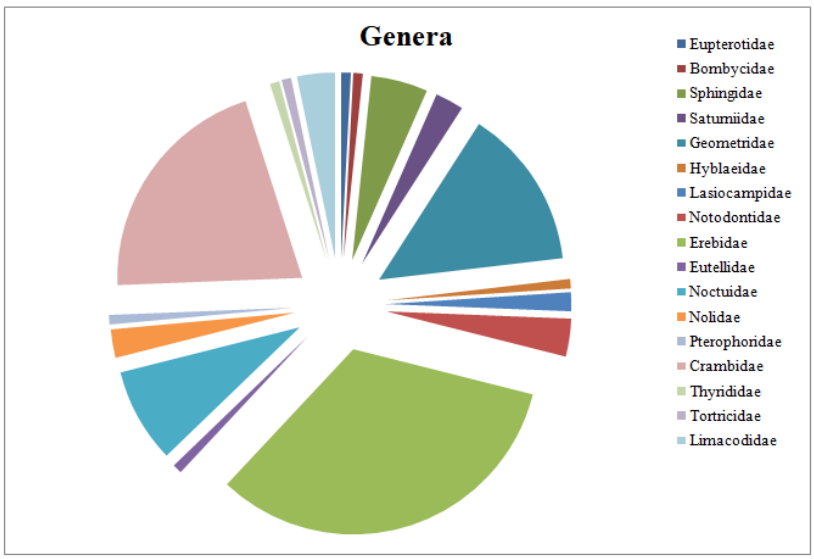
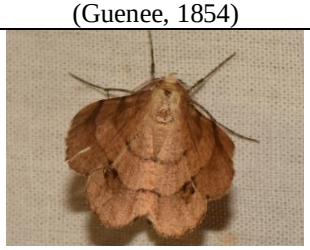


Fig. 2. Graph showing families wised number of moth with genera.

Moth Diversity of Gandhisagar Wildlife Sanctuary, Mandsaur and Neemach, Madhya Pradesh

 *Synclera traducalis* (Zeller, 1852)	 *Eoophyla peribocalis* (Walker, 1859)	 *Parotis marginata* (Hamson, 1893)	 *Sploaeda recurvalsv* (Fab. 1775)
 *Agathodes ostentalis* (Geyer, 1837)	 *Bradina diagonalis* (Walker, 1866)	 *Eressa confinis* (Walker, 1854)	 *Achaea janata* (Linnaeus, 1758)
 *Chalciope mygdon* (Cramer, 1777)	 *Syntomoides imaon* (Cramer 1779)	 *Cydalima laticostalis* (Guenee, 1854)	 *Asota caricae* (Fab., 1775)
 *Chiasmia emersaria* (Walker 1861)	 *Maxates veninotata* (Warren, 1894)	 *Hyperythra lutea* (Stol., 1781)	 *Hypocidra talaca* (Walk., 1860)
 *Spodoptera litura* (Fabri., 1775)	 *Chrysodeixis eriosoma* (Doub., 1843)	 *Hyblaea puera* (Cram., 1777)	 *Trabala vishnou* (Lefe., 1827)
 *Metanastria hyrtaca* (Cram., 1779)	 *Eupterote undata* (Blanchard, 1844)	 *Agrius convolvuli* (Linn., 1758)	 *Antheraea mylitta* (Drury, 1773)

CONCLUSIONS

The present work has been carried out to elucidate a preliminary checklist of moth fauna from Gandhisagar Wildlife Sanctuary, Madhya Pradesh which has not been explored previously. The present investigation, we identified 148 species, 121 genera, 44 subfamilies and 17 families under 10 superfamilies from the study area. The family Erebidae 49 species was dominant, followed by Crambidae 28 species, Geometridae 23 species, Noctuidae 15 species, Sphingidae 8 species, Notodontidae 5, Limacodidae 4 species, Nolidae and Saturniidae 3 species each, Euteliidae and Lasicocampidae 2 species each. The other families are Bombycidae, Hybaleidae, Eupterotidae, Pterophoridae and Thyrididae one species each were the least recorded families. Erebidae, Crambidae, Geometridae and Noctuidae families remains the most species rich and the most abundant from the study sites. Although preliminary, the study will provide valuable baseline data for moth diversity of the area that has not been reported.

FUTURE SCOPE

The present study has been carried out to elucidate a fauna which was previously unknown and it is a small step towards a complete taxonomic understanding of moth species from the Gandhisagar Wildlife Sanctuary of Madhya Pradesh. The researchers and other conservationist can collect a lot of information based on the study of that place later on. This research will serve as a further study on the moth diversity of other wildlife sanctuary of different states of the country. It will be helpful for future generation for further study to assess this important lepidopteran insects.

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REFERENCES

Barlow, H. S. (1982). *An introduction to the moths of South East Asia*. Malayan Nature Society, Kuala Lumpur. 305 pp.

Beeson, C. F. C. (1941). The Ecology and Control of Forest Insects of India and Neighboring Countries. New Delhi, India.

Bell, T. R. D. and Scott, F. B. (1937). Fauna of British India, including Ceyon and Burma. Moths–Volume 5, Sphingidae, Taylor and Francis, London. 537 pp.

Browne, F. G. (1968). Pests and diseases of forest plantation Trees. Clarendon Press, 1330.

Chandra, K. (2009). *Insecta: Lepidoptera: Heterocera*. *Fauna of Pachmarhi Biosphere Reserve, Conservation Area Series*, Zoological Survey of India, Kolkata, *39*, 337-354.

Chandra, K. and Sambath, S. (2016a). Insecta: Lepidoptera: Heterocera (Moths). In: *Faunal Diversity of Singhori Wildlife Sanctuary, district Raisen, Madhya Pradesh, Fauna of Conservation Area series, 57*, 185-215.

Chandra, K. (2011). Insect fauna of states and union territories in India, pp. 189-218. In: Uniyal V P, Shrivastava, A. (Eds.), Arthropods and their Conservation in India (Insects and Spiders). ENVIS Bulletin: Wildlife and Protected Areas, Dehradun, Wildlife Institute of India, *14*, 1-232.

Chandra, K. and Nema, D. K. (2008). Moths of Bandhavgarh National Park, Madhya Pradesh. *Records of the Zoological Survey of India*, *108*(2), 95-110.

Chandra, K. and Nema, D. K. (2003). Moths of Pench Tiger Reserve, Seoni, Madhya Pradesh. *Journal of Tropical Forestry*, *19*(1-2), 68-78.

Chandra, K. and Nema, D. K. (2007). Insecta: Lepidoptera: Heterocera. In: Fauna of Madhya Pradesh including Chhattisgarh, State Fauna Series 15 (Part: I), Zoological Survey of India, 347-418.

Chandra, K. and Sambath S. (2016b). Insecta: Lepidoptera: Heterocera (Moths). In: *Faunal Diversity of Veerangana Durgawati Wildlife Sanctuary, district Damoh, Madhya Pradesh, Fauna of Conservation Area series*, *56*, 173-213. Zool. Surv. India.

Chandra, K., Kumar, V., Singh, N. Raha, A., Sanyal, A. K. (2019). *Assemblages of Lepidoptera in Indian Himalaya through Long Term Monitoring Plots:* 1-457. Published by the Director, Zool. Surv. India, Kolkata.

Chandra, K., Pandey, R., Bhandari, R. and Sambath, S. (2013). Diversity of hawk moths (Lepidoptera: Sphingidae) in Veerangana Durgavat Wildlife Sanctuary, Damoh, Madhya Pradesh. *Biological Forum– An International Journal, 5*(1), 73-77.

Cotes, E. C. and Swinhoe, C. C. (1889). *A Catalogue of Moths of India*. Part I- VI: Sphinges, Bombyces, Noctues, Pseudo- Deltoids and Deltoids, Geometrites, Pyrales, Crambites, Tortrices and Addenda. Orders of trustees of Indian Museum, Calcutta, India, 40 pp.

Hampson, G. F. (1892). *The Fauna of British India, including Ceylon and Burma. Moths-Volume 1, Saturniidae to Hypsidae.* Taylor and Francis, London, 527pp+333figs.

Hampson, G. F. (1894). *The Fauna of British India, including Ceylon and Burma. Moths-Volume 2, Arctiidae, Agrostidae, Noctuidae*.Taylor and Francis, London, 609pp+325figs.

Hampson, G. F. (1895). *The Fauna of British India, including Ceylon and Burma. Moths-Volume 3, Noctuidae (cont.) to Geometridae*. Taylor and Francis, London, 546pp+226figs.

Hampson, G. F. (1896). *The Fauna of British India, including Ceylon and Burma. Moths-Volume 4. Pyralidae*. Taylor and Francis, London, 594pp+287figs.

Joshi, K. C., Kulkarni, N., Roychoudhury, N., Chandra, S. and Barve, S. (2004). A study of insects from Kanha National Park. *Journal of Tropical Forestry*, *20*(III & IV), 58-74.

Kalawate, A. S., Palot, M. J., Valappil, B., Tripathy, B. and Banerjee, D. (2024). *A Field Guide to common Butterflies and Moths (Lepidoptera) of Western Ghats*. Published by Director, Zool. Surv. of India. Kolkata.i-206 p.

Kathirvelu, C., Ayyasamy, R. and Karthikeyan, M. (2019). Preliminary checklist of moths (Lepidoptera: Glossata) of Annamalai Nagar, Tamil Nadu. *Journal of Applied and Natural Science*, *11*(2), 404-409.

Kendrick, R. C. (2007). The conservation assessment of moths in Hong Kong. In Kendrick, R.C. (ed.) Proceedings of the First South East Asian Lepidoptera

Conservation Symposium, Hong Kong 2006. pp. 71-82. Kadoorie Farm & Botanic Garden, Hong Kong.
Kirti, J. S. and Singh, N. (2015). *Arctiid Moths of India, Volume 1*. Nature Books, New Delhi, India, 205pp.
Kirti, J. S. and Singh, N. (2016). *Arctiid Moths of India, Volume 2*. Nature Books, New Delhi, India, 214pp.
Kirti, J. S., Chandra, K., Saxena, A. and Singh, N. (2019). *Geometrid Moths of India*. Nature Books of India, New Delhi, 296pp.
Kitching, R. L., Orr, A. G., Thalib, L., Mitchell, H., Hopkins, M. S. and Graham, A. W. (2000). Moth assemblages as indicators of environmental quality in remnants of upland Australian rain forest. *Journal of Applied Ecology*, *37*, 284-297.
Lees, D. C. and Zilli, A. (2019). *Moths: Their biology, diversity and evolution*. Natural History Museum, London, 208.
Lewis, O. T. (2001). Effects of experimental selective logging on tropical butterflies. *Biological Conservation*, *15*, 389–400.
Lomov, B., Keith, D. A., Britton, D. R. and Hochuli, D. F. (2006). Are butterflies and moths useful indicators for restoration monitoring? A pilot study in Sydney's Cumberland Plain Woodland. *Ecological Management and Restoration*, *7*, 204–210.
MacGregor, C. A., Pocock, M. J. O., Fox, R. and Evans, D. M. (2015). Pollination by nocturnal Lepidoptera, and the effects of light pollution: a review. *Ecological Entomology*, *40*(3), 187-198.
Nair, K. S. S. (2007). *Tropical Forest Insect Pest Ecology impact and management*. M.S. Dissertation, University of Cambridge Press New York.
Pathania, P. C. and Kumari, Anita (2009). A primary report on Rhopalocera diversity (Lepidoptera) from districtUna of Himachal Pradesh, India. *Biological Forum — An International Journal, 1*(2), 80-88.
Pathania, P. C., Sharma Sunita and Gill, A. K. (2014). Hawk moths (Lepidoptera: Sphingidae) from North-West Himalaya along with collection housed in National PAU Insect museum, Punjab Agricultural University, Ludhiana, India. *Biological Forum – An International Journal*, *6*(1), 120-127.
Paunikar, S. and Sharma, G. (2022a). Butterfly species diversity and distribution in protected forest areas of North-West Himalaya of India. *Biological Forum–An International Journal, 14*(4), 1004-1015.
Paunikar, S., Kulkarni, N. and Barve, S. (2023b). Moth diversity (Lepidoptera: Heterocera) in the forest ecosystem of Tropical Forest Research Institute (TFRI), campus, Jabalpur, Madhya Pradesh. *International Journal of Entomology Research*, *8*(9), 25-32.
Paunikar, S., Nair, A. and Sambath, S. (2024). Study on diversity of Moth (Lepidoptera: Heretocera) of Ratapani Wildlife Sanctuary and Tiger reserves, Raisen and Sehore district of Madhya Pradesh. *Indian Journal of Tropical Biodiversity*, *32*(1), 66-76.
Paunikar, S., Sharma, G. and Nair, A. (2023a) Moths Diversity (Insecta: Lepidoptera) in the different forest areas of Doon Valley, Uttarakhand. (Eds)., *Biodiversity Conservation and its Application*. pp-12-38. (Published by Kushwaha, S. and Khare, P.).
Paunikar, S. D., Sharma, G. and Sathiskumar, V. S. (2021). Diversity of Moth (Lepidoptera: Heterocera) in different forest areas of North-West Himalaya. *Uttar Pradesh Journal of Zoology*, *42*(24), 925-935.
Ramakrishna, Chandra, K., Nema Ahirwar and Alfred, J. R. B. (2006). Faunal resources of National parks of Madhya Pradesh and Chhattisgarh. *Conservation Area Series*, *30*, 1-123+27.
Sambath, S. (2017). A Report on the moths of Ghatigaon Wildlife Sanctuary. *Bionotes*, *19*(1), 21-23.
Sambath, S. (2018a). On a Collection of moths (Lepidoptera) from Narsinghgarh Wildlife Sanctuary, district Rajgarh, Madhya Pradesh. *Bionotes*, *20*(4), 121-123.
Sambath, S. (2018b). Moth Fauna of Kheoni Wildlife Sanctuary, district, Dewas, Madhya Pradesh. *Bionotes*, *20*(4), 127-129.
Sambath, S. (2020). Insecta: Lepidoptera: Heterocera. In: Faunal Diversity of Bhoj Wetland, Bhopal, Madhya Pradesh, India (A Ramsar Site) *Wetland Ecosystem Series*, *22*, 141-152. Published by the Director, *Zool. Sur. India*.
Sambath, S. (2022). Insecta: Lepidoptera: Heterocera. Faunal Diversity of Nauradehi Wild Life Sanctuary, Madhya Pradesh, *Conservation Area Series. Zoological Survey of India, Kolkata*, *69*, 117-153.
Sambath, S. and Nair, A. (2023). Moths (Lepidopetra: Heterocera) Diversity of Sanjay-Dubri National Park and Tiger Reserve, Sidhi, Madhya Pradesh**.** *Journal of Natural Resources and Development*, *18*(1), 61-69.
Scalercio, S., Infusino, M. and Woiwod, I. P. (2009). Optimising the sampling window for moth indicator communities. *Journal of Insect Conservation*, *13*(6), 583.
Sharma, G., Kumar, R., Pathania P. C. and Ramamurthy, V. V. (2008). Biodiversity of Lepidopterous Insects associated with vegetables in India: A study. *Indian Journal of Entomology*, *70*(4), 369-384.
Shubhalaxmi, V. (2018). *Field Guide to Indian Moths*. Ed.1, pp (VI+461), Birdwing Publisher, India.
Singh, D., Rose, H. S. and Pathania, P. C. (2017). Studies on the selected Economically important Pyraloidea of Punjab, India. *Biological Forum - An International Journal*, *9*(2), 172-176.
Singh, N., Kaur, A., Pathania, P. C., Sharma, N., Kalawate, A., Palot, J., Banerjee, D., Talukdar, A., Lenka, R., Kumari, A., Raha, A. and Joshi, R. (2024). Fauna of India Checklist: Arthropoda: Insecta: Lepidoptera. Version 1.0. Zoological Survey India.
Singh, N., Lenka, R., Chatterjee, P. and Mitra, D. (2022a). Settling moths are the vital component of pollination in Himalayan ecosystem of North-East India, pollen transfer network approach revealed. *Scientific Report*, *12*, 2716.
Singh, N., Pathania, P. C., Joshi, R., Kalawate, A., Shah, S., Ahmad, J., Raha, A., Das, A. and Mazumdar, A. (2022b). Insecta: Lepidoptera (Moths), In: Faunal Diversity of Biogeographic zones of India: Deccan Peninsula. (Published by the Director, Zool. Surv. of India, Kolkata), 487-514.
Sondhi, S., Sondhi, Y., Singh, R. P. and Kunte, K. (2024). *Moths of India.V3.82*. Indian Foundation for Butterflies Trust.https://www.mothsofindia.org.
Sondhi, Y. and Sondhi, S. (2016). A partial checklist of moths (Lepidoptera) of Dehradun, Mussoorie and Devalsari in Garhwal, Uttarakhand, India. *Journal of Threatened Taxa*, *8*, 8756–8776.
Sondhi, Y., Sondhi, S., Shashank, P. R. and Kunte, K. (2018). Moth diversity (Lepidoptera: Heterocera) of Shendurney and Ponmudi in Agastyamalai Biosphere Reserve, Kerala, India, with notes on new records. *Tropical Lepidopterologist Research*, *28*, 66-89.
Srivastava, A. (2002). *Taxonomy of Moths in India*. International book distributors, pp. 1-249.
Summerville, K. S., Ritter, L. M. and Crist, T. O. (2004). Forest moth taxa as indicators of lepidopteran richness and habitat disturbance: a preliminary assessment. *Biological Conservation*, *116*(1), 9-18.

Vaughan, N. (1997). The diets of British bats (Chiroptera). *Mammamalia Review, 27*, 77–94.
Wilson, W. G., Harrison, S. P., Hastings, A. and McCann, K. (1999). Exploring stable pattern formation in models of tussock moth populations. *Journal of Animal Ecol*ogy, *68*, 94–107.

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