iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** II **Month of publication:** February 2024

DOI: https://doi.org/10.22214/ijraset.2024.58539

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue II Feb 2024- Available at www.ijraset.com

Study the Diversity of Nocturnal Moths in Agricultural Field of Western Maharashtra Region

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Abstract: ***Study of moths is important as they are significant part of the ecosystem. A study on macro-moths was conducted at agricultural field of Western Maharashtra region from month of June 2022 to May 2023. The Main aim of study to acquire the detail information of moths found in agricultural filed of District Satara and Pune. During the study period, a total 2012 specimen's moths were observed. In addition, the number of families recorded from agricultural field of Western Maharashtra is also high, 20 families and 57 species occurred in desired location. Agricultural field of Western Maharashtra shows moths diversity. So, moth diversity was studied from Western Maharashtra from two sites including Phaltan and Baramati taluka respectively. These two sites have a few species in common. In general, Arctiidae, Noctuidae, Pyralidae and Sphingidae dominated both the sites. The Moths were collected by using mercury light traps (160 W). The moth diversity has been studied for the first time from Agricultural field of Western Maharashtra region.***
Keywords: Moths, Diversity, Light trap, Lepidoptera

I. INTRODUCTION

Biodiversity and natural resources form the root of all living system. India is fortunate enough to be ranked sixth among the twelve mega biodiversity country (Singh, 2004). Its biological resources include 50,000 species of plants and 81,000 species of animals including ones belonging to lower phylum. An insect, especially moths played an important role in earth ecosystems and has effect on the environment. Recent recorded report is over 1, 27, 000 species of moths found all over the world and over 12,000 species found in India (Alfred et. al. 1998). Human activity causes threaten to the moth diversity. Now a day's moths are major agricultural pests in many parts of the world. Most of them found in grassland, agricultural and forest ecosystem. Light trapping of lepidopteron has been carried out widely in temperate and tropical regions throughout the world. The long- term status of insect faunas in Western Maharashtra region has attracted minimal research. Time frames and processes of change are poorly understood and have received scant investigation. Light-trapping measures are dependent on moth behavior and local flight variables (Southwood, 1978; Bowden, 1982) and such data have two numerical weaknesses: catches are not unit-area samples; and sampling bias is always present and seldom constant. Western region of Maharashtra State shows great animal diversity. It lies between $18^{o}3'$ N to $18^{o}12'$ N latitude and $74^{o}13'$ E to $74^{o}40'$ E longitude; 548 m above mean sea level.

II. MATERIALS AND METHODS

A. Site Study

Diversity study of moths was carried out in two Districts including Satara and Pune belongs to Western Maharashtra region, Maharashtra. It is located at 18.15^{0} N 74.58^{0} E. It is located in the rain shadow and therefore receives only around 400-500 mm of average rainfall in the monsoon. The water for irrigation is provided by 'Veer Dam' in both zones. Two regions selected for moth collection one was from Satara and another is from Pune District. The site one was Agricultural field of Phaltan taluka at south side of Satara and second site was Baramati taluka, both area are the agriculture ecosystem.

B. 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 x 3.5) was hanging between two poles and extended forward over the ground slightly away from the direct source of mercury light placed.

Specimens are collected with the help of mercury light trap, (160 W) in two sites from District Satara and Pune in Western Maharashtra region. Some specimens were collected from a street lamp lights and on flowers during night by battery traps. Specimens were preserved in research laboratory.

C. Preservation of collected specimens

The dead moths were collected from the two different sites and kept in relaxation chamber. Relaxation process on moths were carried out in a relaxing jar. A relaxing jar, like a killing jar, should have a wide mouth and a tightly fitted lid. Place an absorbent layer in the bottom of the jar. Prepared the material with water and add a little ethyl acetate to inhibit fungus growth. Place a protective layer over the absorbent layer and place moths that need 24 hrs for relaxation. The pinning process was conduct after relaxation process. Pinning was started by inserting the half part of the pin into the center of thorax of moth. After pinning step, the moth specimen was placed into a spreading board, with wings of moth touch to the board. The small pins were used for spreading the wings at a 90° angle on the body. The forewing and hind wing spread on spreading board with the help of pins. The preservation and labeling process carried out after spreading process. The spread moth was preserved into oven at 37°C for 24 hrs. The specimen was labeled, which contain the location from where the specimen was obtained, the date when it was obtained, environment and the name of the collector. Use a permanent ink pen to write the labels. After 24 hrs incubation period, store the preserved moth specimens onto mounting board. After that, use the naphthalene balls for the storage process.

D. Identification of Specimens

The photographic collection as well as preserved specimens from both of sites was identified with the help of identification key, Google lens and available literature. The most of specimens were identified up to family levels.

III. RESULT AND DISCUSSION

In present study, average 167 specimens of moth per month were observed from two sites during June 2022 to May 2023. The total 869 specimens from site I located in Phaltan taluka, District Satara and a total 1143 specimens were observed from site II located in Baramati taluka, District Pune. The observation of specimens was conducted by using light trap method. The twenty families like Arctiidae, Bombycidae, Hyblaeidae, Nymhalidae, Noctuidae, Pyralidae, Sphingidae, Erebidae, Indarbellidae, Oecophoridae, Lymantriidae, Carposinidae, Eucleidae, Gelichidae,Pterophoridae, Psychidae, Eucosmidae, Pterophoridae, Cryptophae and Tortricidae were recorded (Table 1). The 50% families were recorded from both the sites. In fig. 2 shows the number of individuals belonging to each family from two sites in Western Maharashtra reagion. The highest numbers of moths were recorded in family Noctuidae, Pyralidae, Sphingidae and Arctiidae respectively.

Table No. 1 Total number of species were identified from different families of order Lepidoptera [Recorded (+) and Not Recorded (-)]

Sr. No.	Family	Site I	Site II	Total No. of Species
1	*Arctiidae*	+	+	05
2	*Bombycidae*	+	+	01
3	*Hyblaeidae*	-	+	01
4	*Nymhalidae*	+	+	01
5	*Noctuidae*	+	+	19
6	*Pyralidae*	+	+	12
7	*Sphingidae*	+	+	05
8	*Erebidae*	-	+	01
9	*Indarbellidae*	+	-	01
10	*Oecophoridae*	+	-	01
11	*Lymantriidae*	+	-	01
12	*Carposinidae*	+	+	01
13	*Eucleidae*	+	+	01
14	*Gelichidae*	-	+	01
15	*Pterophoridae*	-	+	01
16	*Psychidae*	+	+	01

17	*Eucosmidae*	-	+	01
18	*Pterophoridae*	+	+	01
19	*Cryptophae*	+	-	01
20	*Tortricidae*	+	-	01
Total No. of Species		15	15	57

The 19 different species were recorded from family Noctuidae. A total 57 species belonging to twenty families were identified from site I and Site II. The lowest number of specimens was recorded from some families including Bombycidae, Hyblaeidae, Nymhalidae, Erebidae, Indarbellidae, Oecophoridae, Lymantriidae, Carposinidae, Eucleidae, Gelichidae, Pterophoridae, Psychidae, Eucosmidae, Pterophoridae, Cryptophae and Tortricidae.

The species diversity were observed according to families (Table No.2). A total 15 families were recorded from site I (Phaltan Taluka) and 15 families from site II (Baramati Taluka). In both sites, the Noctuidae was the most abundant in both species richness and abundance. *Pyrallidae* was second most abundant family in agricultural field of both the sites. In this study, we also found a close relationship between plant species richness and moth diversity, the highest moth diversity recorded in vegetable field.

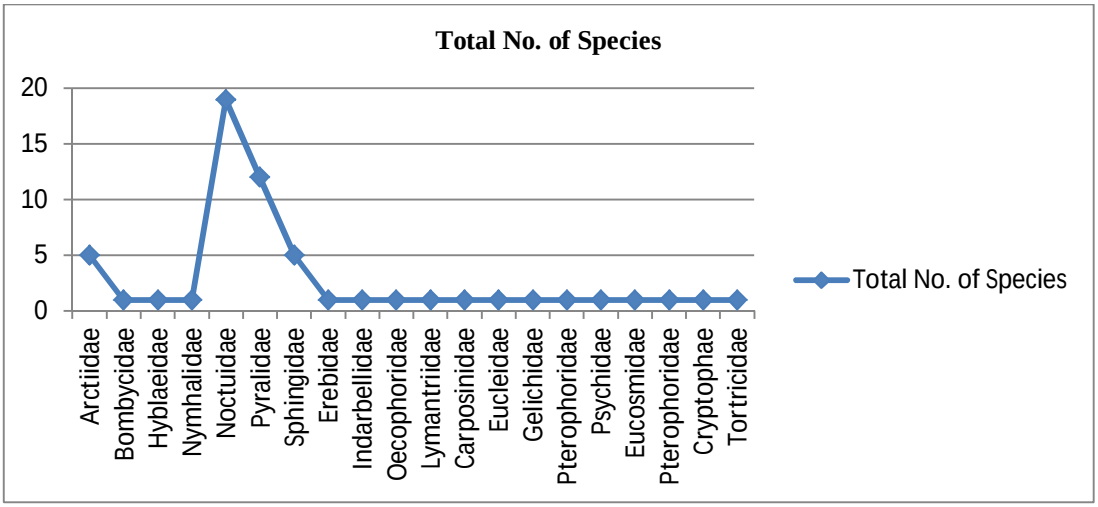

Fig. 1. Graph of species distribution in identified families

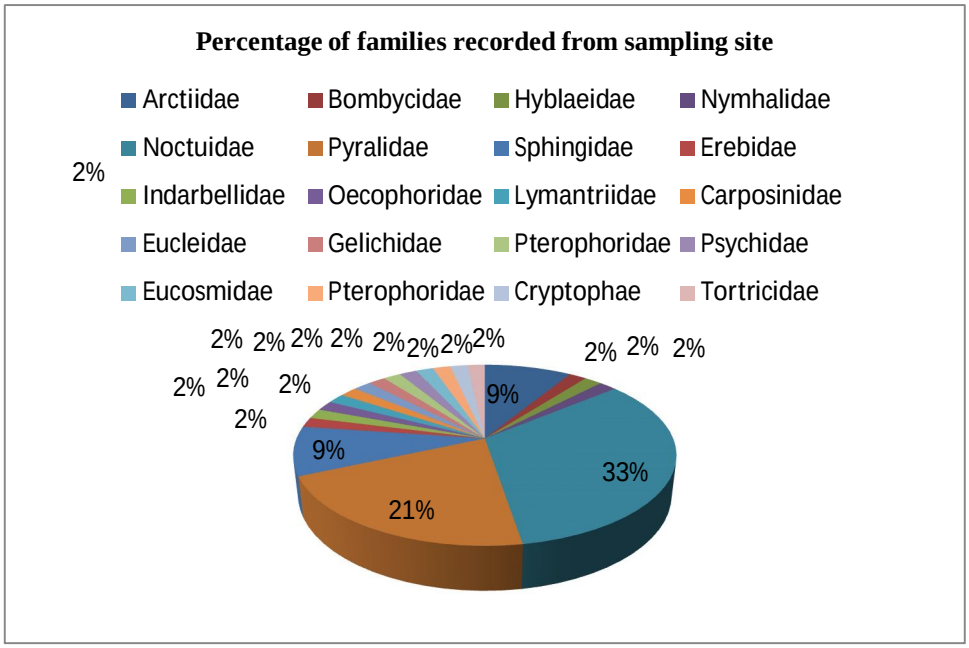

Fig. 2 Percentage of No. of species identified from different families

The moth morphological species richness was similar in both the habitats. The diversity of moths from both the site was 50-50 percentage. The overall structure of the vegetation community explains much moth diversity. Vegetation based communities are the major spatial divers of moth diversity in this landscape. The diversity of moth fauna in agricultural field of Western Maharashtra is mainly due to the rich, vegetation in this area as vegetation plays an important role for existence of lepidopteron fauna in a community as it provides the main source of food etc. for insects. Conservation of natural habitats is very essential for the existence of many species of lepidopteron. The total number of individuals caught in a light 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).

Table No. 2. Common name, scientific name, families and host plant of Identified specimens

Sr. No.	Name of Species	Common Name	Family
1	*Rajendra perrottetii*	-	Erebidae
2	*Syntomoidas imaon*	Handmaiden moth	Arctiidae
3	*Syntomeida epilais*	Oleander moth	Arctiidae
4	*Arctiinae*	Tiger moth	Arctiidae
5	*Hippotion celerio*	Hawk moth	Sphingidae
6	*Daphnis nerii*	Oleander hawk moth	Sphingidae
7	*Acherontia atropos*	African deaths head hawkmoth	Sphingidae
8	*Erebus macrops*	Owl moth	Nymphalidae
9	*Asota caricae*	Tropical tiger moth	Noctuidae
10	*Hyblaea Puera*	Teak defoliator	Hyblaeidae
11	Chrysodeixis includence	Soybean looper	Noctuidae
12	Eudocima follonic	Citrus fruit sucking moth	Noctuidae
13	*Inderbelo quadrinotata*	Bark eating caterpillar	Indarbellidae
14	*Tonia Ziyphi*	Citrus leaf roller	Oecophoridae
15	*Chumetia transverso*	Shoot borer	Noctuidae
16	*Bombtelia jacosatrix*	Leaf eating caterpillar	Noctuidae
17	*Orthago exuvinaea*	Leaf webber	Pyralidae
18	*Sylepta lunalis*	Leaf roller	Pyralidae
19	*Euproctis fraternal*	Hairy caterpillar	Lymantriidae
20	*Conogethes panctiferalis*	Fruit borers	Noctuidae
21	*Achaeca jonata*	Fruit sucking moth	Noctuidae
22	*Aganus ficus*	Leaf eating caterpillar	Arctiidae
23	*Meridarchis scyrode*	Bee fruit borer	Carposinidae
24	*Trymalitis margaritas*	Chickoo seed borer	Tortricidae
25	*Nephopteryx eugraphella*	Chicko moth	Pyralidae
26	*Opisina arenosella*	Black headed caterpillar	Cryptophae
27	*Paras lepida*	Slug caterpillar	Eucleidae
28	*Macalla moncausalis*	Leaf Webber	Pyralidae
29	*Thylocoptila panrosema*	Nut borer	Pyralidae
30	*Helicoverpa armigera*	Bud borer	Noctuidae
31	*Deilephila nerri*	Army green moth	Sphingidae
32	*Leucinodes orbonalis*	Brinjal shoot and fruit borer	Pyralidae
33	*Phthorimaea operculella*	Potato tuber moth	Gelichidae

34	*Agrotis ipsilon*	Potato cut worm	Noctuidae
35	*Herse convolvuli L.*	Convolvulus hawk moth	Sphingidae
36	*Euzophera perticella*	Brinjal stem borer	Pyralidae
37	*Antoba olivacea*	Brinjal leaf roller	Noctuidae
38	*Helicoverpa armigera*	Tomato fruit borer	Noctuidae
39	*Euzophera perticella*	Tomato stem borer	Pyrallidae
40	*Earias virtella*	Bhendi shoot and fruit borer	Noctuidae
41	*Sylepta derogate*	Bhendi leaf roller	Pyralidae
42	*Helicoverpa armgera*	Gram pod borer	Noctuidae
43	*Etiella zinckenella*	Lentil pod borer	Pyralidae
44	Plutella xylostella	Diamond black moth	Plttelidae
45	*Hellula undalis*	Cabbage borer	Pieridae
46	*Thysanopulsia orihalcea*	Cabbage semilooper	Noctuidae
47	*Sphenarches caffer*	Bottle guard plume moth	Pterophoridae
48	*Margaronia indica*	Snake gourd semilooper	Pyralidae
49	*Cydia hemidoxa*	Top shoot borer	Eucosmidae
50	*Dichocrocis punctiferalis*	Shoot, panicle and capsule borer	Pyralidae
51	*Acanthopsyche bipar*	Bag worm	Psychidae
52	*Spodoptera hexigua*	Army worm	Noctuidae
53	*Spodoptera litura*	Cumin Caterpillar	Noctuidae
54	*Amsacta morei*	Red hairy caterpillar	Noctuidae
55	*Spilosoma obliqua*	Bihar hairy caterpillar	Arctidae
56	*Agrotis ipsilon*	Greasy cutworm	Noctuidae
57	*Helicoverpa armigera*	Fruit borer	Noctuidae

IV. ACKNOWLEDGEMENT

We would like to thank Principal Dr. Preeta Nilesh, KET's V.G. Vaze ASC College, Mulund (E), Dr. B.B. Sharma KET's Mumbai and Dr. S.S. Barve, Dy Director SRC, Dr. Ajit Kengar, HOD Botany Department KET's V.G. Vaze College, Mulund East, Mumbai and Principal Dr. Bharat Shinde, Vidya Pratishthan's Art's, Science and Commerce College, Baramati for the encouragement and providing facilities.

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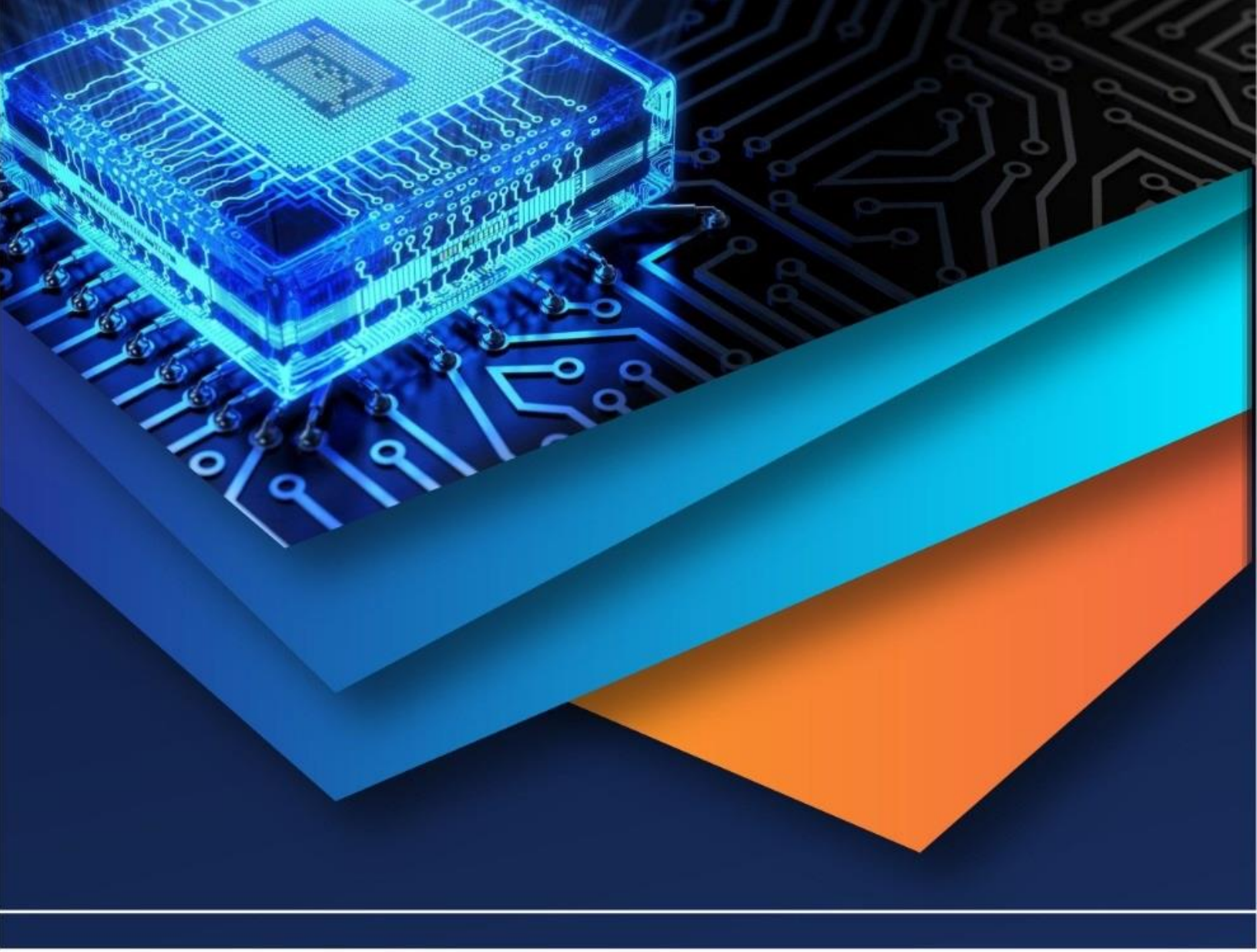

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