



ISSN: 0975-833X

RESEARCH ARTICLE

BIODIVERSITY OF GEOMETRID MOTHS (LEPIDOPTERA) OF CONIFER FORESTS OF SARAJ VALLEY OF HIMACHAL PRADESH, INDIA

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ARTICLE INFO

Article History:

Received 11th October, 2014
Received in revised form
14th November, 2014
Accepted 15th December, 2014
Published online 23rd January, 2015

Key words:

Lepidoptera, Geometrid, Hierarchy.

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ABSTRACT

Moths were collected from different part of Seraj valley of Himachal Pradesh during June 2010 to September 2013. A total of 1376 specimens were collected by using Simple light traps operated from dusk to dawn daily for eighty nights. The moths caught were identified up to the subfamily level. Sub-family Ennominae represents maximum number of species (18) and Sub-family Geometrinae show the minimum number (4).

INTRODUCTION

Family Geometridae of order Lepidoptera is one of the most species rich families of moths. So far, as many as 19,720 species have been described under it from all over the world. The word Geometridae has been derived from two Greek words 'Geo' means 'Earth' and 'Metridae' means to 'Measure'. Its caterpillars seem to measure the earth while moving, therefore, enabling to name the family Geometridae. Caterpillars of this family are popularly known as 'measuring worm', 'looper'. Geometrids are generally slender-bodied, broad winged and rather delicate macrolepidopterans. Family Geometridae is one of the most important groups of moths, being serious defoliators of forest trees. Their caterpillars voraciously feed on tender leaves of large number of plants and denude them completely. Members of this family are associated with human welfare in a number of ways i.e. pests of agriculture crops, fruit plants and forest trees and also as vectors of several diseases.

Extensive faunistic surveys, along with proper identification and documentation, at least to species level, provides the most reliable data for conservation and management of different habitats. This is only second to the maximum recorded under family Noctuidae of Lepidoptera (Scoble, 1999). Majority of geometrid moths are easily recognizable from their characteristic resting posture. While at rest, wings are laid horizontally and appressed tightly against the substratum.

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MATERIALS AND METHODS

Saraj valley in Mandi district of Himachal Pradesh located at the altitude ranges from 1,200 to 3,000 amsl was surveyed every year during June 2010 to September 2013 for the collection of geometrid fauna. Different locality of different conifer forests were chosen as ideal site for setting up of temporary laboratory to execute the entire field work of setting light lure system, collection, stretching, drying, labelling and storage of procured species of family Geometridae of order Lepidoptera. A rapid faunistic survey or assessment was carried out in the study area in the Thunag Forest range including Raindhar, Bhulah, Janjehli and Maghaar and a few localities of the Kandha Forest range viz. Bijhai, Dhrotadhar and Jaach. The geographic coordinate of the collection localities are listed in Table 1.

Table 1. Geographic Coordinate of collection localities of Seraj Valley

Forests	Study Sites	Elevation(m)	Latitude	Longitude
Chirpine	Dhrotadhar	1872	N 31°34'17.72"	E 77°05'35.95"
	Jaach	2075	N 31°29'25.81"	E 77°03'05.95"
Kail	Maghaar	2038	N31°32'10.15"	E 77°12'27.63"
	Janjehli	2344	N 31°31'07.23"	E 77°12'46.32"
Deodar	Raindhar	2267	N 31°33'19.82"	E 77°08'50.86"
	Bijhai	2151	N 31°33'01.77"	E 77°05'08.03"
Fir/Spruce	Bhulah	2832	N 31°28'07.87"	E 77°11'43.66"

Collection Method

The sheet method was used, which allows specimen collection individually without any damage. A white sheet (10'x6') was

hung between two vertical poles in such a way that it touched the surface and extended forward over the ground slightly away from direct source of light placed at such a point that the whole sheet from edge to edge brightly reflected the light. A 160 watt mercury vapour lamp was used as light source through the night. The moths started collecting on the sheet just after sunset between 1800-2300 hr, after that the abundance of moths slowly decline.

Identification

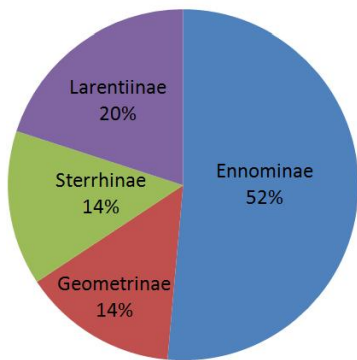
The moths collected from different localities were identified, and classified with the available literature (Hampson 1894-96; Bell & Scott 1937) and their current nomenclature is based on LEPINDEX (Beccaloni *et al.*, 2003). The hierarchy of different moth is given by Van Nieukerken *et al.* (2011).

RESULTS

A total of 1376 specimens were collected by using Simple light traps operated from dusk to dawn daily for eighty nights. The study revealed that the total of 35 species belonging to four subfamily, out of which 18 species belonging to 12 genera of subfamily Ennominae, 5 species to 4 genera of subfamily Geometrinae, 5 species under 3 genera of subfamily Sterrhinae and 7 species pertaining to 7 genera of subfamily Larentiinae (Table 2). In the present study more than 45 species were collected and 35 species belonging to 26 genera under geometridae identified (Annexure-1) The subfamily Ennominae dominated with 52% of the total species recorded, followed by Larentiinae (20%) Geometrinae (14%) and Sterrhinae (14 %)

Table 2. The Diversity of Geometrid moths In Seraj Valley of Himachal Pradesh India as recorded in the present study

S.No	Sub Family	Genus	Species
1.	Ennominae	12	18
2.	Geometrinae	4	5
3.	Sterrhinae	3	5
4.	Larentiinae	7	7



Different subfamilies showing Species abundance

Annexure 1: List of taxa

Ennominae

1. *Opisthograptis luteolata luteolata* (Linnaeus)
2. *Loxaspilates obliquaria* (Moore)
3. *Biston suppressaria* Guenee

4. *Abraxas picaria* Moore
5. *Abraxas leucostola* Hampson
6. *Abraxas sylvata* Scopoli
7. *Plagodis inustaria* (Moore)
8. *Heterolocha phoenicotaeniata* (Kollar)
9. *Heterolocha patalata* Felder and Rogenhofer
10. *Garaeus specularis specularis* Moore
11. *Corymica arnearia* Walker
12. *Chiasmia eleonora* (Cramer)
13. *Chiasmia nora* (Walker)
14. *Hypomecis transscissa* (Walker)
15. *Hypomecis infixaria* (Walker)
16. *Cleora cornaria* (Guenee)
17. *Cleora acaciaria* (Boisduval)
18. *Ourapteryx marginata* Hampson

Geometrinae

19. *Iotaphora admirabilis* (Oberthür)
20. *Agathia hemithearia* Guenee
21. *Agathia hilarata* Guenee
22. *Eucyclodes divapala* (Walker)

Sterrhinae

23. *Rhodostrophia pelliaria pelliaria* (Guenée)
24. *Problepsis vulgaris* Butler
25. *Problepsis deliaria* Guenee
26. *Timandra responsaria* Moore
27. *Timandra correspondens* Hampson

Larentiinae

28. *Thera consimilis* Warren
29. *Rheumaptera nigralbata* (Warren)
30. *Horisme plurilineata* (Moore)
31. *Photoscotia miniosata miniosata* (Walker)
32. *Ecliptopera silaceata silaceata* (Denis & Schiffermuller)
33. *Xanthorhoe curcumata* (Moore)
34. *Euphyia subangulata* (Kollar)
35. *Laciniodes plurilinearia* (Moore)

DISCUSSION

Family Geometridae is one of the most important group of moth being serious defoliators in forest trees. Their caterpillars voraciously feed on tender leaves of large number of plants and denude them completely. Many species of geometrid moths have been found to affect both domestic as well as wild animals. The importance of adequate taxonomic treatment, correct identification, true host plants and the exact dispersal limits of the species is important for both control measures of these pest species and conservation of biodiversity. The proposed investigation on geometrid moth group, which is a very large group, thus warrants fresh taxonomic treatment to all the Indian species, including pest species. Wider benefits of conservation studies on single species include developing and clarifying their role as putative ‘umbrella’ taxa whereby their protection also confers protection on coexisting organisms, which are not as well documented.



Opisthographis luteolata luteolata (Linnaeus)



Loxaspilates obliquaria (Moore)



Biston suppressaria Guenee



Abraxas picaria Moore



Abraxas leucostola Hampson



Abraxas sylvata Scopoli



Plagadis inustaria (Moore)



Heterolocha phoenicotaeniata (Kollar)



Heterolocha patalata Felder & Rogenhofer

Image 1



Garaeus specularis specularis Moore



Corymica arnearia Walker



Chiasmia eleonora (Cramer)



Chiasmia nora (Walker)



Hypomecis transcissa (Walker)



Hypomecis infixaria (Walker)



Cleora cornaria (Guenee)



Cleora acaciaria (Boisduval)



Ourapteryx marginata Hampson

Image 2

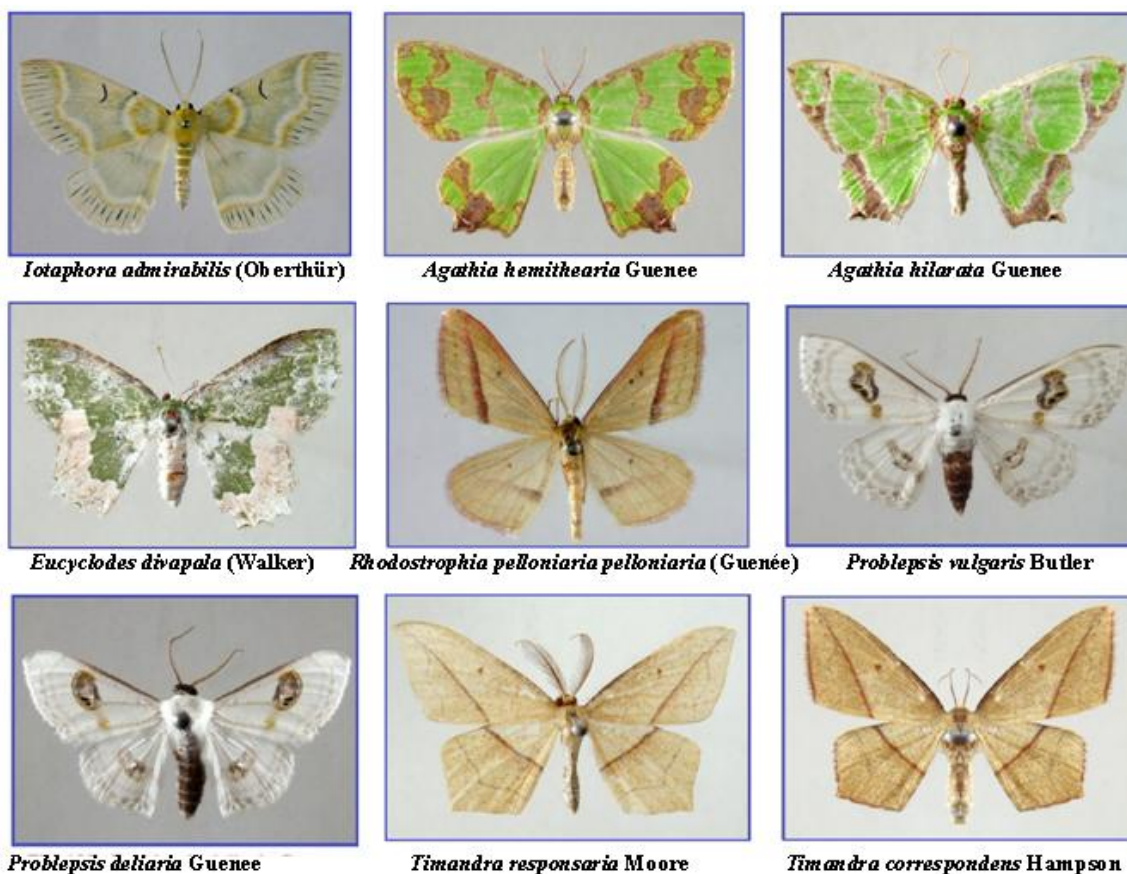


Image 3

Conclusion

Himachal Pradesh having naturally protected flora at different altitudes, not surveyed so far by anyone, shall surely bring to the light plenty of unexplored geometrid fauna comprising of new species, new records from the covered states and even from India. Overall higher species richness and diversity was recorded in the Chirpine Forest of the study areas. The result from this study can be used to make decision on the conservation of natural resources management especially for insect diversity. Hence intensive survey with long term monitoring programmes will help to identify the status of the species with the help of IUCN categories for the conservation and management of biodiversity.

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