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Diversity, species richness and evenness of geometrid fauna of different conifer forests of Seraj valley of Himachal Pradesh

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A B S T R A C T

Moths are collected from different part of Seraj valley of Himachal Pradesh during May 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. Subfamilies Geometridae, Ennominae, Larentiinae and Sterniinae were presented in the collection sample. The diversity index, species richness and evenness of geometrid moths' fauna of Seraj valley were 2.54, 4.39 and 1.26 respectively.

Introduction

Insect are the most dominant creature on this earth. They occur every from the frozen Antarctica to scorching sun of the tropics, in water, land, air dry desert and mountains. Biodiversity is the biological capital of mother planet earth and is the essence of life. The United Nations General Assembly declared 2010 as "International Year of Biodiversity, IYB" on 11th January, 2010 in Berlin, Germany with the slogan "Biodiversity in Life. Biodiversity is our Life". The richness in biodiversity is due to immense variety of climatic habitats in our beautiful country. As many as 1,26,656 species of various organisms are known from India (MoEF, 1998), which is one of the twelve mega biodiversity countries of the world.

Insects are ancient, ecologically significant and beautiful components of the living World. Insects are most numerous and their numerical abundance is amazing. Term biodiversity is commonly used to describe number, variety and variability of living organism. It is defined in term of gene, species and ecosystem, corresponding to their fundamental and hierarchy related level of biological organisation. The 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', 'inchworm' and 'spanworm'. The true species richness for the taxonomic group in the study site, and what extra effort is required to bring the survey to some specified level of completeness. By applying diversity index species richness, species abundance and the seasonal distribution will be evaluated and diversity index with progressive sampling is worth for investigating to determine after what period diversity stabilizes (Robinson and Tuck, 1993).

Lepidoptera is probably one of the most suitable group for most quantities comparison between insect faunas to be valid, for the many reason elaborated by Holloway (1980,1984 and 1985), especially their abundance species richness, response to vegetation and climate, their ease of sampling using light traps and relatively advance taxonomy. A recent review by Holloway (1987) of the many light trap sample of macrolepidoptera throughout the Indo-Australian gave a very useful summery of the existing information.

The main objective of this research study was to collect, identify and calculate diversity, species richness and evenness of Geometrid fauna of Seraj valley of Himachal Pradesh.

Material and Methods

Seraj valley in Mandi district of Himachal Pradesh is located at the altitude ranges from 1200 to 3000 msl was surveyed during May to September, 2010–2012 every year for the collection of geometrid fauna in different locality of different conifer forests. A light lure system comprising of a 3×3m white sheet tied between a pair of vertical poles

and sheet nicely illuminated by two mercury lamps of 160W each was used to attract the moths. Collection of geometrid fauna was done throughout the night as plenty of specimens of different species keep arriving. To collect the geometrid moths, 3–4 killing jars were simultaneously used to enhance the output and quality of work. Each killing jar in fact was a wide mouthed bottle on the inner side of whose lid was pasted a cotton plug with the help of feviquick. About 10 minutes prior to beginning collection of moths, 8-10 drops of ethyl acetate were poured on the cotton plug of each lid and closed the jar for thorough fumigation of the killing jars. Usually single moth was captured in each jar and then placed horizontally on a flat surface so as to avoid folding of wings by dying specimen in undesirable way. Moths caught in the trap were carried to laboratory and were identified with the help of available literature (Hampson, 1984). In seraj valley the main vegetation are *Pinus roxburghii*, *Pinus wallichiana*, *Cedrus deodara*, *Abies Pindraw*, *Picea smithiana*, *Pyrus pashia*, *Rubus ellipticus*, *Myrica esculanta* and *Urtica dioica*, etc. Which constitute the major habitats of the insects' fauna particularly moths.

Measurement of diversity

The type of diversity used here is α -Diversity which is the diversity of species with in a community or habitat. The diversity index was calculated by using the Shannon-Wiener diversity index (Shannon and Wiener, 1949).

$$\text{Diversity index} = H = -\sum P_i \ln P_i$$

Where $P_i = S/N$

S= Number of individual of one species

N= Total number of all individual in the sample

ln= logarithm to base e

Measurement of species richness

Margaef's Index was used as a simple measure of species richness (Margalef, 1958)

Marglef's Index = $(S-1)/\ln N$

S= Total no of species

N = Total no of individual in the sample

Ln= natural logarithm

Measurement of evenness

For calculating the evenness of species, The Pielou's Evenness Index (e) was used (Pielou, 1966)

$E = H/\ln S$

H= Shannon-wiener index

S= total number of species in the sample

Result and Discussion

During the study a total of 1376 specimen of moth belonging to 4 subfamilies were collected in Seraj valley by using light trap. Figure 1 shows the number of individual belonging to each subfamily. The highest number of moth specimen belongs to subfamilies, collected in chirpine forest. While the subfamilies Sterniidae, with a total of 12 moth specimen, represent the minimum number. Figure 2 represents the diversity index of geometrid moths in each forest. Figure 3 represents subfamilies with diversity index.

The biodiversity (Diversity index, species richness and evenness) of geometrid fauna in seraj valley is mainly due to rich vegetation in this area as vegetation plays an

important role for existence of insect fauna in a community as it provide the main source of food etc. for insects. The conservation of natural habitat is very essential for the existence of many species of Lepidoptera. The survival of the large number of endemic species in a community or habitat warrants frequent monitoring of the ecological process beside adoption of appropriate conservation strategy in order to safe guard its rich genetic diversity (Mathew and Rahmatullah, 1993).

The total number of individual 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 (Figure 4) (Barlow and Woiwod, 1989).

This work was an attempt to describe some aspect of diversity of geometrid fauna of Seraj valley in Himachal Pradesh. A lot of further work is necessary in this regard and further collections are essential for getting a detailed periodic estimate of the faunal diversity in this area. Ultimately it is hoped that such work may lead to the development of standard monitoring procedure which could be of value in assessing the environmental stability of areas under cultivation for different crops and the prediction of the effect on the structure of moths' population of tropical forest destruction (Barlow and Woiwod, 1989).

Figure.1 Diversity index in each conifer forest

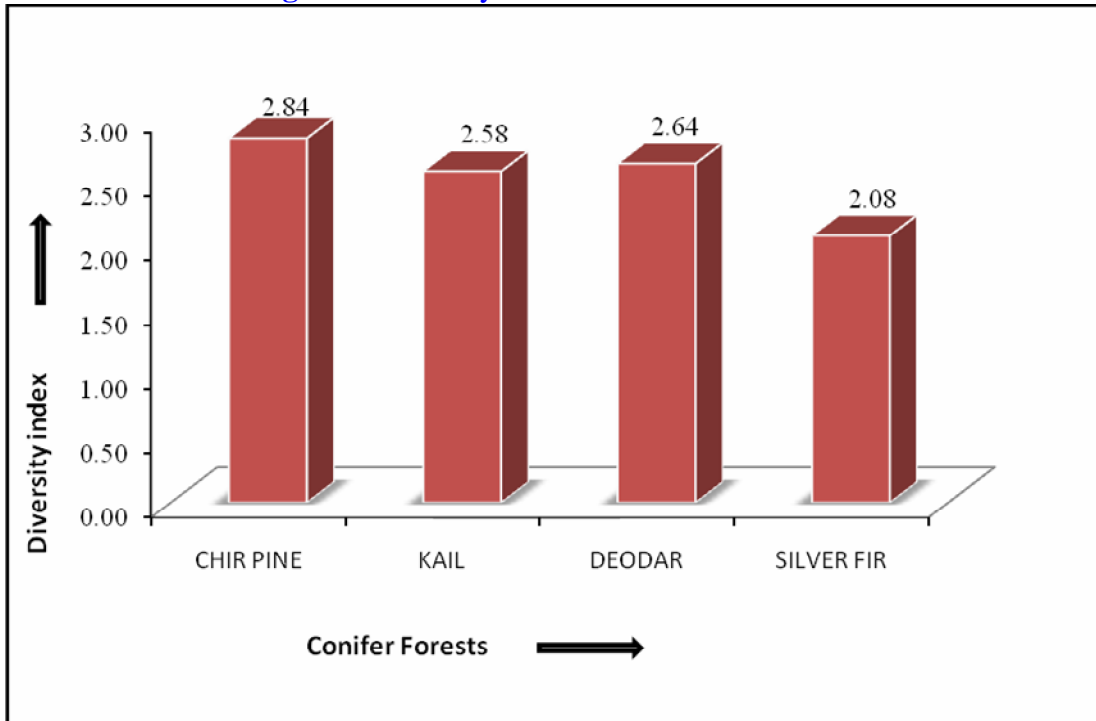


Figure.2 Number of individuals of moths in each forest caught by light trap

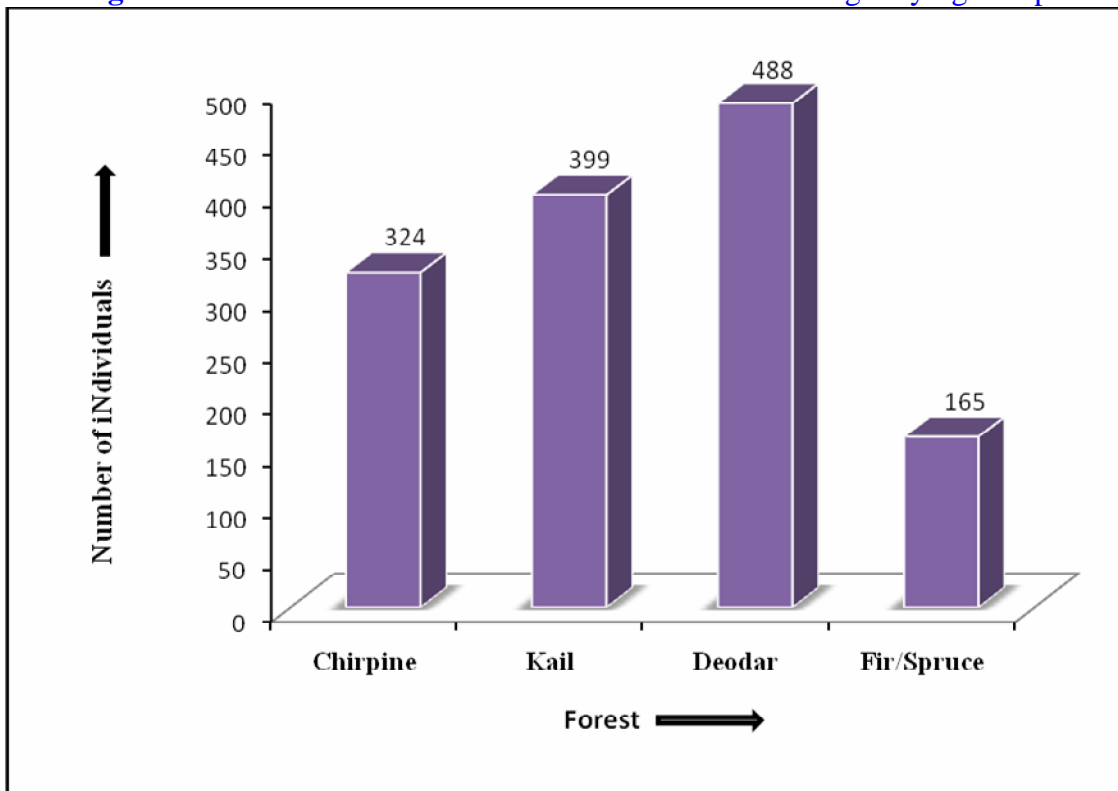


Figure.3 Number of individuals of each subfamily of geometrid moth caught by light trap

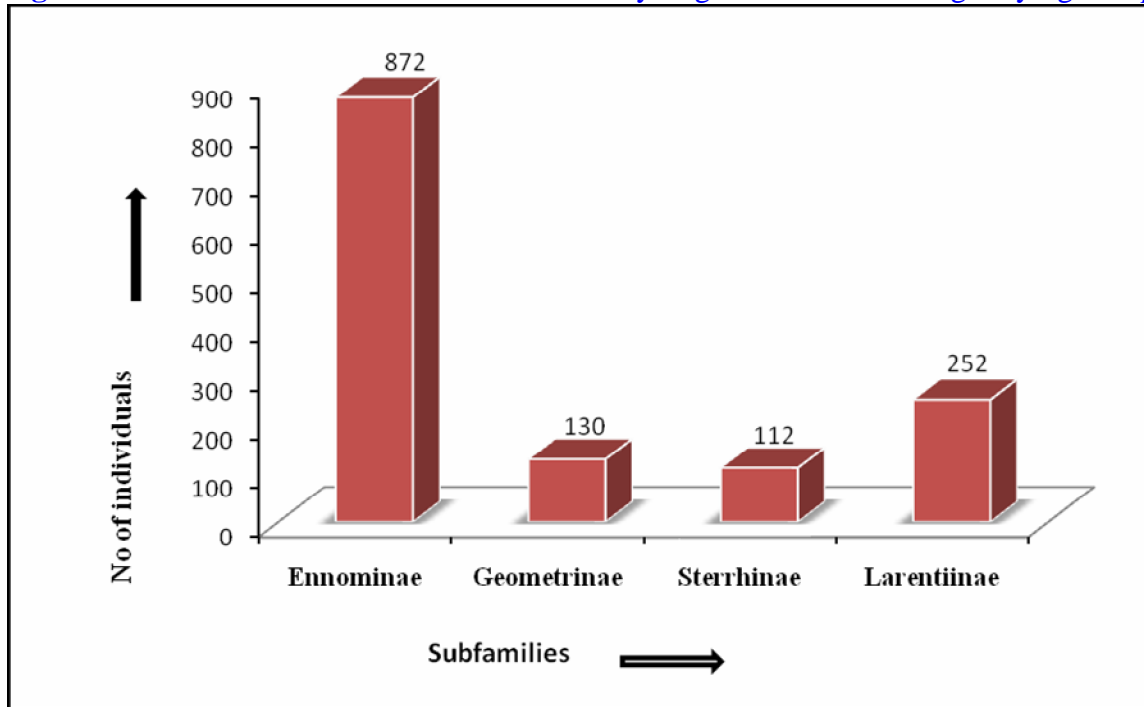
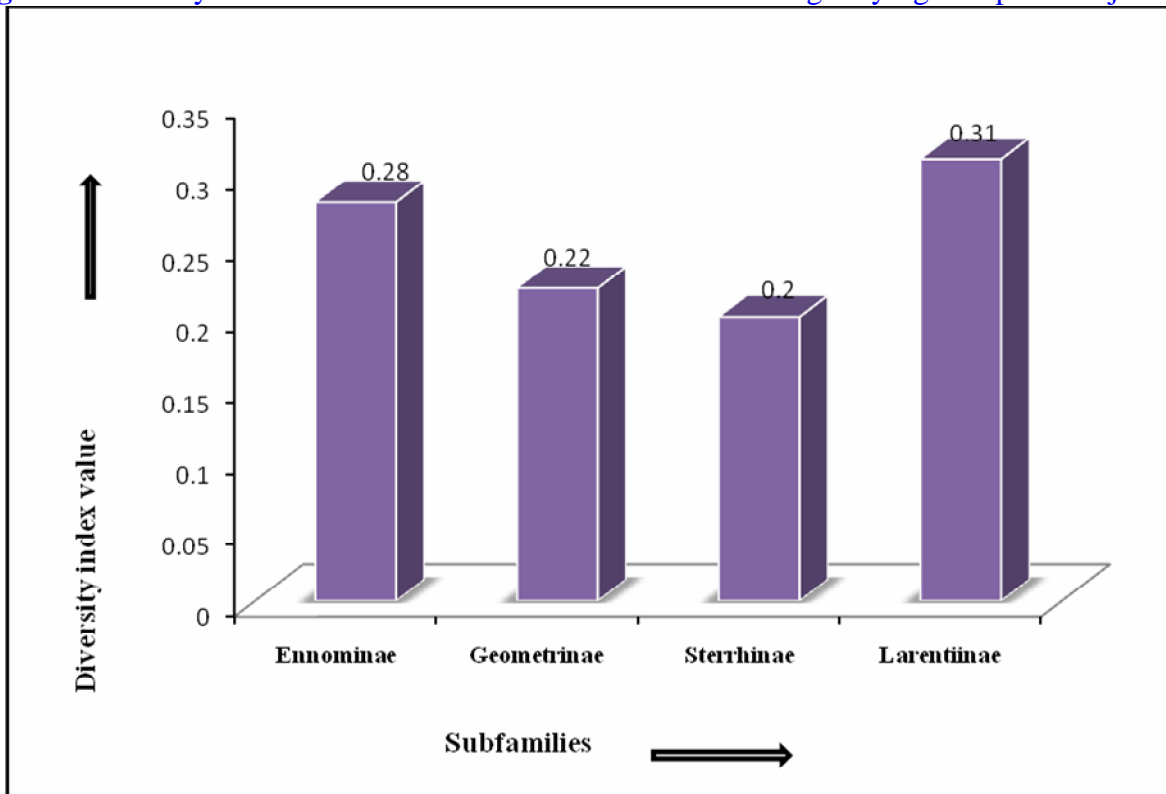


Figure.4 Diversity index of each families of Geometrid moth caught by light trap in Saraj Valley



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