



ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

Species diversity profile of Jute hairy caterpillar (*Spilosoma* spp.) population sampled from Saharsa district urban area North Bihar, India

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Received : 27th November, 2017 ; Revised : 18th January, 2018

Abstract : The paper deals with the preliminary survey and documentation as well as species diversity profile of different varieties of caterpillar species population sampled from 5 different pockets of Northern Saharsa urban area like Sattar Kataiya, Rakia, Shihol, Bijalpur & Menhakhonha. Caterpillar population expected to be well diversified in terms of species richness and abundance has been sampled from northern urban zones of Saharsa situated at latitude and longitude of 88°2'N - 23°3'E & 22°55'S - 88°10'E, having tropical characteristic. The results of application of these species diversity indices as information statistics tools for different caterpillar species sampled have been discussed in this paper which can explain the causes of caterpillar species diversity in this area in relation to other biotic and abiotic factors.

Key words: Species diversity indices, Abundance, Evenness, Similarity index, Dominance, caterpillar population.

INTRODUCTION

Jute hairy caterpillar belonging to the order Lepidoptera constitute one of the important insect community. Hence, unprecedented ecological success and dominance in tropical ecosystems have been achieved by them. In a Brazilian tropical forest caterpillars have been estimated to have a biomass four times that of all vertebrates^{1,2}. Being such dominant and successful components of ecosystems, it is likely that caterpillar would turn out to be good indicators of the well being of ecosystems³. And yet methods reliable for sampling of caterpillar are entirely inadequate⁴. More surprising is the fact that very little information exists regarding the caterpillar fauna, and even less regarding its success and dominance in the tropical forests of Asia^{5,6}.

Starting from agriculture field varieties of caterpillar populations can be easily found thriving on the wide range of both living and non-living materials. Caterpillar have also been taxonomically regarded as belonging to the family Erebidae. Most of the tropical, warm and temperate genera of caterpillar belong to the subfamilies, Arcttinae in which the caterpillar as well as that of Saharsa, Bihar also fall in considerable number. Understanding the vast unexplored field of mapping of jute hairy caterpillar, the present investigation has been carried out as the continued step in a selected areas of Northern Zones of Saharsa.

MATERIALS & METHODS

Selection of sampling sites as follow up schedule of our study was done randomly and the sites were located in the northern zones of Saharsa urban area namely Sattar Kataiya, Rakia, Shihol, Bijalpur & Menhakhonha. The land vegetation of the area had been also recorded for the description of physiography of the sampling sites through quadrature method.

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Sampling Methods :

After detailed survey of Saharsa district of Bihar some of the mulberry fields, cotton fields, jute fields as well as the vegetable field were selected for the collection of defoliator insect pests. The selected fields were from different areas of Saharsa. Different defoliator insect's pests were collected from the field in and around the selected fields of Saharsa, India by insect collection techniques as well as by hand picking method. All Out Search (AOS) method had been overall practiced to collect all the representatives of as any species of caterpillar as possible showing visible morphological variations.

Sampling Schedule:

Two hour morning from 7.00 to 9.00 AM and two hour evening from 4.00 to 6.00 PM. sampling schedule were maintained in order to have the best samples. A full day was devoted to each quadrat and attempt was made to collect individuals of all the representatives in the population.

Preservation and Data Collection:

All the individuals of the sample were preserved in 70% alcohol in different vials bearing appropriate tags. The quadrat wise number of sampled individuals according to their genus and species had been recorded in tabular form. (Table 1)

Statistical Analysis:

Analysis of collected data had also been done by using following statistical indices within the habitat :

a) Alpha (α) diversity Shannon Weiner index: -

$$H = - \sum p_i \log p_i$$

Where,

H = species diversity,

P_i = mean of individual species procured by the formula n_i/N ,

log p_i is the log product of p_i (mean of individual species).

b) Relative abundance = $n_i/N \times 100$

Where,

N_i = number of individuals of a species.

N = number of individuals of total number of species

c) Evenness = $H/\log 2S$

Where,

S = number of species, H= diversity.

d) Simpson's dominance $D = 1/D_s$,

$$D_s = \sum_{i=1}^s \frac{n_i(n_i-1)}{N(N-1)}$$

Where,

s= No. of species present

i= ith no. of species (1 to ∞)

n_i = number of individuals of ith species,

N = Total number of individuals of all the species.

OBSERVATIONS

The intensive "all out search" (AOS) sampling of caterpillar's in different sites and quadrates of the selected Saharsa area locality has given exciting findings as recorded following table.

The table is record of eight different varieties of caterpillar belonging to six different sub families as identified with their respective common names. The largest no.(412) of sampled individuals was of *Spilosoma obliqua*. The lowest no. (20) of *Cydalima perspectalis*, Walker, commonly known as box tree moth belonging to the family Crambidae. Interestingly the population counts of the box tree moth and the oriental army worm was almost same (39 & 40).

The site-specific sampling fetched exciting results as recorded in table. However, the a vegetable field (site IV) was the most populated area giving largest no. of individuals followed by other sites.

DISCUSSIONS

The present investigation has developed a preliminary sampling based checklist of eight different species of caterpillar and computed significant values of diversity and abundance of them from the selected locality of northern zones of Saharsa. The results provide first hand similarities with that of Western Ghats (Karnataka) caterpillar population, assessed by Gadagkar *et.al*. The resemblance of results in these selected areas is due to the prevailing tropical conditions even on such a long stretch from Bihar to Western Ghat.

Although the observation is very restricted to a selected locality which prevents from drawing any firm conclusion regarding the possible causes of variation in caterpillar species diversity from locality to locality of Saharsa, Bihar, yet specific trends are quite evident. The first is that man disturbed sites show lower richness and diversity while the undisturbed sites with rich vegetation encourages better population growth of any species. The

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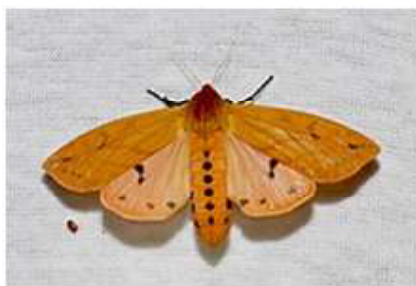
cause of significant reduction in caterpillar species richness and diversity in less vegetational shore of has been due to the use of various pesticides and insecticides. On the other hand, the polyculture vegetational area like orchid and grassy land could not support much population build up of various caterpillar varieties.⁸

Withstanding to previous discussion and also assessed by the values of alpha diversity “Shannon Weiner” index, relative abundance, evenness calculated statistically, the variety of caterpillar species sampled in this project has clearly established the relative abundance of spotted caterpillar.

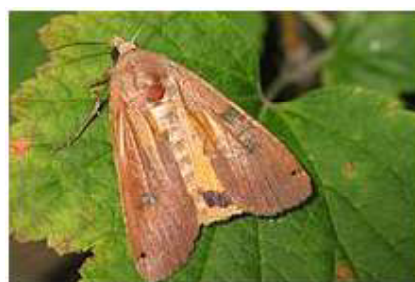
Table I: Check list, taxonomy and S-W species diversity of different caterpillar species sampled during January, 2016 to December, 2016.

Sl. No.	Scientific & common names of the caterpillar species	Sub family	No. of individuals collected	Relative Abundance RA	S-W Diversity \bar{H}	D=1/DS	Evenness
1.	<i>Pyrrharctica isabella</i> (woollybear)	Arctiinae	72	6.4748	0.2791	0.17295	0.006517
2.	<i>Noctua pronuba</i>	Noctuoidea	60	5.3956			0.004715
3.	<i>Spilosoma virginica</i> (yellow bear)	Arctiinae	150	13.4892			0.015751
4.	<i>Cybalinma perspectalis</i> (box tree moth)	Spilomelinae	20	1.7985			0.003212
5.	<i>Trichoplusia ni</i> (cabbage looper)	Plusiinae	39	3.5071			0.004589
6.	<i>Mythimna separate</i> (oriental armyworm)	Hadeninae	40	3.5971			0.006421
7.	<i>Malacosoma americanum</i> (eastern tent caterpillar)	Lasiocampinae	319	28.6870			0.031756
8.	<i>Spilosoma obliqua</i> (jute hairy caterpillar)	Arctiinae	412	37.0503			0.042517
		Total	1112				

Photo plates of caterpillar species sampled from northern Saharsa zone, Bihar



1. *Pyrrharctica isabella* (woollybear)



2. *Noctua pronuba*



3. *Spilosoma virginica* (yellow bear)



4. *Cybalinma perspectalis* (box tree moth)



5. *Trichoplusia ni* (cabbage looper)



6. *Mythimna separata* (oriental armyworm)



7. *Malacosoma americanum* (eastern tent caterpillar)



8. *Spilosoma obliqua* (jute hairy caterpillar)

ACKNOWLEDGEMENT

The authors are extremely thankful to Dr. Arun Kumar, Dept. of Zoology, B.N Mandal University Madhepura for his guidance & Prof. M. Prasad, Department of Zoology, Ranchi University Ranchi, Jharkhand for his academic help in the taxonomy & diversity assessment of the caterpillar properties with respect to the vegetation & environmental factor.

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