



G- Journal of Environmental Science and Technology

(An International Peer Reviewed Research Journal)

Available online at <http://www.gjestenv.com>

Diversity of *Elasmus* species in rural and urban areas of district Bareilly, Uttar Pradesh India (Hymenoptera: Chalcidoidea)

Ved Prakash* and Mahesh Verma

Department of Zoology, Bareilly College, Bareilly-243001, Uttar Pradesh, INDIA

ARTICLE INFO

Received: 21 Apr 2015

Revised : 12 May 2015

Accepted: 15 May 2015

Key words:

Diversity, *Elasmus*,
Temperature

ABSTRACT

The present study is based on the diversity of *Elasmus* Westwood. The genus is cosmopolitan in distribution containing about 254 species described from various parts of the world out of which 47 species are recognized from India. Attempts have not been made to explore the species of genus *Elasmus* in District Bareilly and its surrounding areas. During the course of study, 15 specimens of genus *Elasmus* have been collected by sweeping method over grasses trees and bushes in urban and rural areas of Bareilly district. All the collected specimens have been identified and compared with the type material obtained from ZSI Jodhpur and the Department of Zoology, Aligarh Muslim University, Aligarh. The morphological features of collected specimens have been compared with the type material obtained from above said Institutions, which clearly indicate that these changes are due to demographic variations as a result of changes in the environmental conditions especially due to impact of temperature of this temperate zone of Northern India.

1) INTRODUCTION

Biodiversity is the degree of variation of life forms within a given species, ecosystem, biome, or entire planet. No work has been done on the biodiversity of Elasmids till now. This area of Uttar Pradesh is unexplored as regards the morphology of genus *Elasmus* and its relative ecological variations in urban & rural areas of Bareilly. Present author has explored above areas and has successfully collected large number of chalcids from the proposed area including the species of family Eulophidae and Elasmidae. Literature reveals that members of sub family Elasmidae; Eulophidae are mainly primary parasitoids on the larvae and pre pupae of various Lepidoptera. Few species of the *Elasmus* are however hyperparasitoids of cocooned prepupae of Braconidae and Ichneumonidae [1, 2, 3]. Temperature plays an important role in the morphological features, coloration & Sculpture pattern of species as they are cold blooded parasitoid insects [4]. With the range of ambient temperatures to which Elasmids are exposed the morphological features are affected directly with temperature in urban & rural area of Bareilly district.

Most of the species of the *Elasmus* survive somewhere between 10°C and 40°C. The temperature greatly affects the distribution of an *Elasmus* species both horizontally and vertically under the variation of the body colour, wing, sculpture, setation and morphological features which clearly

show that these changes are due to ecological variation and impact of temperature. The main objective of this research was to collect, identify and calculate diversity, species richness and evenness of Elasmid fauna of urban & rural areas of Bareilly district.

2) MATERIALS AND METHODS

Bareilly is located at 28°10'N, 78°23'E, and lies in northern India. It borders Pilibhit and Shahjahanpur on East and Rampur on West, Udham Singh Nagar (Uttarakhand) in North and Badaun in South. Bareilly has a humid subtropical climate with high variation between summer and winter temperatures. Summers are long, from early April to October, with the monsoon season in between. Winter starts in October and peaks in January and is notorious for its heavy fog. Extreme temperatures range from 4°C to 44°C. The annual mean temperature is 25°C (77°F), monthly mean temperatures range from 14°C to 33°C (58°F to 92°F). The average annual rainfall is approximately 1714 mm (28.1 inches), most of which is during the monsoons in July and August Bareilly has a moderate climate. The city lies entirely in the Ganges plains. The low-lying Ganges plains provide fertile alluvial soil

* Corresponding Author: Mr. Ved Prakash

Email address: vedprakash.bcb@gmail.com

Table 1. Chick list of Elasmus Genus in the study area

S.No	Family	Locality	Genus/species	No Of specimens	% of Occurrence
1	Elasminae	Urban	<i>Elasmus nigricoxa</i> sp. nov.	2	13.33
2	Elasminae	Rural	<i>Elasmus anticles</i> (walker)	3	20.00
3	Elasminae	Urban	<i>Elasmus Punensis</i> (Mani and Saraswat)	3	20.00
4	Elasminae	Rural	<i>Elasmus alami</i> (Verma et al.)	1	6.67
5	Elasminae	Rural	<i>Elasmus lutens</i> crawford	1	6.67
6	Elasminae	Urban	<i>Elasmus</i> sp.nov	4	26.67
7	Elasminae	Rural	<i>Elasmus lutescens</i> sp nov.	1	6.66

Table.2 Species wise distribution in Urban areas.

S.No	Genus /species	Number of specimens	n/N	Pi	pi	Inpi	PiInPi
1	<i>Elasmus nigricoxa</i> sp nov.	2	2/9	0.222	0.049	-1.505	-0.334
2	<i>Elasmus punensis</i> (Mani and Saraswat)	3	3/9	0.333	0.110	-1.099	-0.365
3	<i>Elasmus</i> sp nov	4	4/9	0.444	0.197	-0.812	-0.360

S=(number of species) =3

N =total number of individuals =9

\sum (Sum) of Pi (n/N)=0.356

\sum (Sum) of Pi InPi= -1.372

H= $-(0.334+0.365+0.360) = 1.372$

D = $1/(0.049+0.110+0.197) = 2.80$

Table.3 Species wise distribution in urban area.

S.No	Genus /species	Number of specimens	n/N	Pi	pi	Inpi	PiInPi
1	<i>Elasmus antictles</i> (Walker)	3	3/6	0.500	0.25	-0.693	-0.346
2	<i>Elasmus alami</i> Verma et al.	1	1/6	0.166	0.027	-1.795	-0.297
3	<i>Elasmus lutens</i> Crawford	1	1/6	0.166	0.027	-1.795	-0.297
4	<i>Elasmus lutescens</i> sp .nov	1	1/6	0.166	0.027	-1.795	-0.297

S=(number of species)= 4

N total number of individuals =6

\sum (sum) of pi (n/N) = 0.331

\sum (sum) of pi In Pi = -1.237

Shannon index = $-(0.346+0.297+0.297+0.297) = -1.237$

Simpson Index D = $1/(0.25+0.027+0.027+0.027) = 1/0.331=3.021$

Table: 4 Temperature variations during the study period.

Months	Maximum Temp. (°C)	Minimum Temp. (°C)	Humidity (mm)
June 2012	41.9	28.3	38.00
July 2012	34.9	26.2	78.3
August 2012	32.6	24.8	82.5
Sept 2013	33.5	34.0	77.00
Oct 2012	32.9	19.2	53.8
Nov 2012	28.4	13.2	55.3
Dec. 2012	22.9	8.7	65.3
Jan. 2013	18.2	6.1	80.1
Feb. 2013	24.6	11.2	70.3
Mar. 2013	31.5	16.2	61.6
Apr. 2013	36.7	20.8	42.8
May 2013	40.8	24.9	40.3

suitable for Agriculture. They are prone to recurrent floods. Bareilly lies on the bank of river Rāmgangā, and there are seven rivers passing through this district. The lower Himalayan range is 40 km north.

Collection of Elasmids: For studying the diversity of species of Elasmus, collection was mainly done by net sweeping

method over grasses from selected localities from urban & rural areas of Bareilly_district. The specimens were sorted out & brought to laboratory & were kept in 80% alcohol in small vials. Collected specimens were mounted in DPX & some specimens were card mounted for the purpose of studying

coloration and sculpture variations in different species for the techniques of Noyes [5] have been used. Diversity index =the diversity index was calculated by using the Shannon diversity index & Simpson index.

$$\text{Shannon Index}(H) = - \sum_{i=1}^s p_i \ln p_i$$

$$\text{Simpson Index}(D) = \frac{1}{\sum_{i=1}^s p_i^2}$$

The Shannon index is an information statistic index, which means it assumes all species are represented in a sample and that they are randomly sampled.

In the Shannon index, **p** is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), **ln** is the natural log, Σ is the sum of the calculations, and **s** is the number of species.

The Simpson index is a dominance index because it gives more weight to common or dominant species. In this case, a few rare species with only a few representatives will not affect the diversity. In the Simpson index, **p** is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), Σ is still the sum of the calculations, and **s** is the number of species.

Diversity index H=1.775, Diversity index D =5.58
Urban area H=1.372, D = 2.80 Rural area H =1.237, D = 3.021

3) RESULTS AND DISCUSSION

During the course of study, a total of 15 species of Elasmus were collected in urban and rural areas of Bareilly district by using net sweeping methods. The check list of Elasmus is given in **table.1**. In the present investigations the % of different species have been recorded in fig 1

The study indicates that the diversity index of captured species in urban and rural areas of Bareilly were 1.372, 2.80, 1.237 and 3.021 respectively. Table 2, 3 and fig 2, 3

Temperature variations during the study period of different twelve month are given in Table 4 and fig 4.

The highest number of Elasmus species was collected during the months March and April 2013. (**Table 2 and fig 2**)

Fig.1 : Species wise distribution in the study area

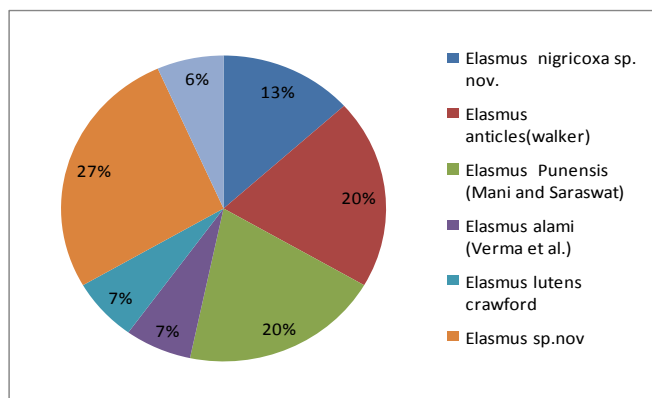


Fig.2 : Species wise distribution in Urban areas.

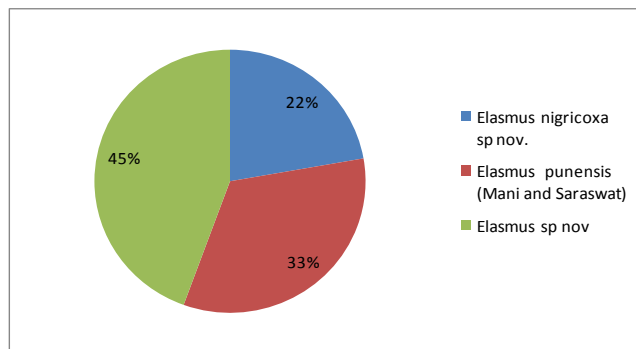
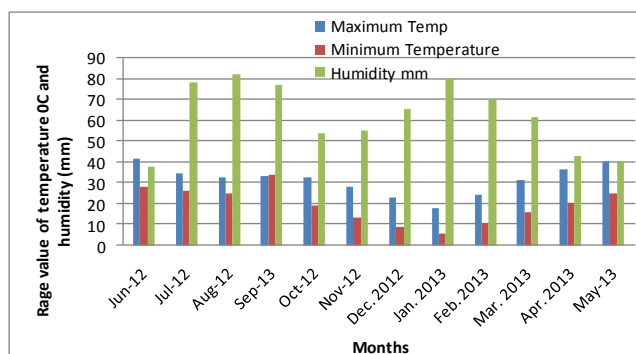


Fig.4 : Temperature variation during the study period.



Acknowledgement

I am deeply grateful to Dr. M. Verma, Associate Professor, Department of Zoology, Bareilly College, Bareilly who has provided me guidance and also helped in improving the identification ability. I am also thankful to Associate Professor Dr. D.K Gupta, Head of Department Zoology, Bareilly College Bareilly and thanks are also due to U.G.C, New Delhi for the financial assistance under the Rajeev Gandhi National Fellowship Scheme.

REFERENCES

- 1) Verma, M and Hayat, M. 1985. 'Family Elasmidae': pp. 233-234. In B.R. Subba Rao & m. Hayat (eds): The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. Part I. Oriental Ins., 19. 163-310.
- 2) Verma, M and Hayat, M. 1986. 'Family Elasmidae': pp. 173-178. In B.R. Subba Rao & M. Hayat (eds): The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. Part II. Oriental Ins., 20: 1-430.
- 3) Coote, L.D. 1997. Chapter 7. Elasmidae': pp. 165-169. In G.A.P. GIBSON, J.T.HUBER & J.B. WOOLLEY (eds): Annotated Keys to the Genera of Nearctic Chalcidoidea (Hymenoptera). NRC Research Press Ottawa, Ontario, Canada. 794pp.
- 4) Mohan, K. and Padmanaban, M. 2013. Diversity and abundance of Coleopteran Insects in Bhavani Taluk Erode District, Tamil Nadu India. IJIBS, 3(2), 57-63.
- 5) Noyes, J.S. 1982. Collecting and preserving Chalcid wasps (Hymenoptera:Chalcidoidea). J. Nat. Hist. 16: 315-334.

- 6) Satarupa paul, et al., 2013. Anopheline diversity; Morphology and Molecular variation of *An subpictus* in Rural urban Areas of West Bengal. I. J.Z S Vol.1
- 7) Chandra, K. 2012. New Records to species Diversity of family Scarabaidae and Hybosoridae (Coleoptera: Scarabaeoidea) of Jabalpur, Madhya Pradesh India, *acd. J.Ento* 5(1); 28-36.
- 8) Hamid, S.A. 2011. Stone flies (Insecta;Plaeoptera) in Malayasian tropical rivers ; diversity : facts, fiction and speculation. *Biological Journal of the linnean Society* 35: 321-337.