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Distribution and diversity of pentatomidae (Hemiptera: Heteroptera) in Ranchi, Jharkhand

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Abstract : Biodiversity conservation and management are worldwide concern. They play a vital role as prey and predator to maintain the balance of tropic levels for food chain. Pentatomids are potential biocontrol agents but being sapsuckers they play an important role to attain the pest status and damage the host plants. In the present study an attempt has been taken to know about the diversity and distribution of Pentatomids in Ranchi at different locations. All together eleven species were recorded from various study sites and diversity richness has been determined by using Shannon Weiner index in different study zones.

Keywords : Pentatomids, Diversity, Shanon- Weiner Index, Ranchi.

INTRODUCTION

Hemiptera are true bugs, belong to the infraclass Neoptera, Division Exopterygota, their wings develop externally and can be folded over the dorsum.[1] Majority of the Hemiptera are terrestrial, but there are aquatic or semiaquatic species also. They are distributed throughout the world, living in diverse habitats that even include oceans. In India 77 families having 6500 species of Hemiptera are found from total of about 80,000 present worldwide. Out of these, 2421 species are endemic to India.[2] About 63 families are terrestrial and other 14 families are aquatic and semiaquatic.[3] Biodiversity of Pentatomidae family was studied by Kumar and Naidu (2010)[4] in Vadodra (Gujrat), Chandra (2008[5], 2009[6], 2012[7], 2013[8,9]) in Madhya Pradesh, T. Selvi and Dayana (2015) in Tamilnadu[10], Chandra and Kushwaha (2014)[11] in Arunachal Pradesh.The first studies of Heteroptera were exclusively faunistic in character, followed much later by studies of pest species and their increasing importance in medicine, agriculture and forestry management. Since the time when irrational use of pesticides and environmental pollution were first mentioned in public, awareness of the presence of predators such as the zoophagous Heteroptera species is increasing. Studies of the predatory Heteroptera are important due to the increasing impact of this species on maintaining the biological equilibrium in natural ecosystems and maintaining lower population numbers of various pest insects on cultivated plants. However, the best studied Heteroptera are presently phytophagous species, pests in agriculture and forestry management.

Study area

Ranchi, the capital of Jharkhand is located at $23^0 23'$ latitude and $82^0 23'$ longitude. The study zone has been conveniently divided into four zones –East, North, West and South. These zones are further sub-divided into sectors for sight specific survey and sampling.

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Climate

Climatic condition of Ranchi is moderate. Overall climatic condition of Ranchi varies from extreme cold during November to mid- February, then the Spring is followed by hot to very hot Summer from May to July, the Rainy season is from mid-July to about September.

Temperature

The climate of this area is moderate. It fluctuates between 31.5^0 to 39.6^0 in summer and in winter it drops down to a minimum of 4.5^0 to 18^0.

Relative Humidity and Rainfall

The average rainfall in July-August is 251.4mm with proportional rise in relative humidity from 69.9 to 84.4 in August.

METHODOLOGY

Study Design

Study has been carried out from January 2016 to December 2016. For convenient of data collection the study area has been divided into four distinct zone based on different locations and directions etc.

Zone-1 : East –South Area- Bariatu , Booty Area consists of Agricultural fields, pond area.

Zone-II:South-WestArea- Doranda, Hatia Area consists of Shrubs, large trees,Ponds.grasslands.

Zone-III:West-NorthArea- Pandra,Ratu Area consists of Wetlands, Ponds, Smallriver, Shrubs, Trees.

Zone-IV : North-East Area- Kanke, Pithoria consists of River, Pond, Agricultural area, Sal Forest

Data Collection and Analysis

Data was collected from four selected study zone with the help of butterfly net and by hand picking. The data were randomly collected in selected area as per methods used by Pollard et al.(1977) and Pollard (1975). After collection the species were stretched in a stretching box and pinning with the help of entomological pin. Naphthalene and Benzoic acid were used for the preservation. The species were identified at Forest Research Institute, Dehradun and Zoological Survey of India , Kolkata. Data are analyzed only with the help of Shannon Weiner Diversity index in different study zones.

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

$\bar{H} = - \sum pi.logpi$

Where,

$\bar{H}$= species diversity,

Pi = mean of individual species procured by the formula n/N,

logpi is the log product of pi (mean of individual species).

b) Relative abundance = ni/N x 100

Where,

Ni = number of individuals of a species.

N = number of individuals of total number of species

RESULTS & DISCUSSION

In the present investigation 11 species of pentatomids were identified. The checklist of Pentatomids, their habitats is given in Table-1. In present study diversity of Pentatomids of four different areas were recorded. The percentage of different species recorded in the study area is given in Figure- I

Table-1: Checklist of Pentatomidae family and their habitats from the study area.

Sl.No	Family	Genus/sps.	Habitat Sites			
			I	II	III	IV
1	PENTATOMIDAE	*Halys dentatus* Fabr.	+	+	+	+
2		*Nezara viridula* Linn.	+	-	-	+
3		*Degonetus serratus* Dist.	-	-	+	-
4		*Aspongo pusjanus*	-	+	+	+
5		*Bagrada cruciferum*	+	+	-	-
6		*Dalpada versicolor* Hem-Sch	+	+	-	-
7		*Dalpada jugatoria* Coth	+	+	+	-
8		*Tessaratoma javanica Thumb.*	+	+	+	+
9		*Carpocoris pallidus* Dall.	-	+	+	+
10		*Syncanus collaris* Fabr.	+	+	+	-
11		*Litchi bug*	+	+	+	+

Z-1 : East –South Area **Z-II**: South-West Area.
Z-III:West-North Area **Z-IV** : North –East Area

Table-2 : Checklist of Pentatomidae family and their habitats from the study area.

S.No	Family	Genus/sps.	Habitat Sites				Total
			I	II	III	IV	
1	PENTATOMIDAE	*Halys dentatus* Fabr.	15	19	16	10	60
2		*Nezara viridula* Linn.	05	-	-	03	08
3		*Degonetus serratus* Dist.	-	-	04	-	04
4		*Aspongopus janus*	-	08	08	06	22
5		*Bagrada cruciferum*	09	06	-	-	15
6		*Dalpada vesicolor* Hem-Sch	4	6	-	-	10
7		*Dalpada jugatoria* Coth	4	5	6	-	15
8		*Tessaratoma javanica Thumb.*	5	3	7	8	23
9		*Corpocoris pallidus* Dall.	-	5	4	7	16
10		*Syncanus collaris* Fabr.	8	3	4	-	15
11		*Litchi bug*	6	8	7	8	29

Table -3 :Shanon Biodiversity Index of different species of Pentatomidae family

Pentatomidae	pi	Pi(ln(pi))
Halys dentatus Fabr.	-0.1535	-0.0954
Nezara viridula Linn.	-0.0456	-0.04308
Degonetus serratus Dist.	-0.0400	-0.0013
Aspongopus janus	-0.100	-0.0233
Bagrada cruciferum	-0.0733	-0.0127
Dalpada versicolor Hem-Sch	-0.0559	-0.0139
Dalpada jugatoria Coth	-0.0733	-0.0127
Tessaratoma javanica Thumb	-0.100	-0.0248
Corpocoris pallidus Dall.	-0.0733	-0.0139
Syncanus collaris Fabr	-0.0733	-0.0127
Litchi bug	-0.1151	-0.0359
Total	-0.9836	-0.2822

1. Corpocoris pallidus

2. Litchi bug

3. Tessaratoma javanica

4. Dalpada versicolor

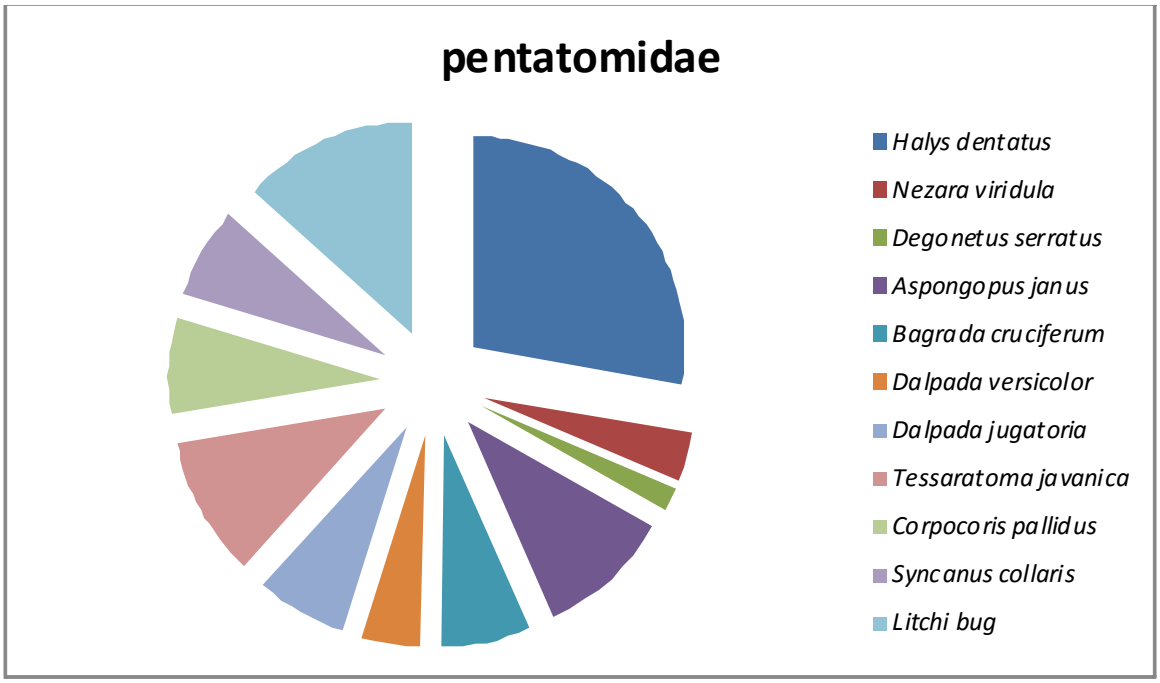
5. Aspongopus janus

6. Bagrada cruciferum

7. Nezara viridula

8. Halys dentatus

9. Degonetus serratus



Species Diversity Indices

Analysis of Shannon Winner Index of diversity shows that the species diversity was highest in Zone II and lowest in Zone IV. The value of Dominance is highest in Zone II and lowest in Zone IV.

Distribution and Abundance of Pentatomid family

Analysis of proportional abundance of different species of Pentatomidae family shows that 11 species are collected highest in Zone-II and lowest in Zone IV. *Halys dentatus* Fabr. , *Tessaratoma javanica* Thumb. and Litchi Bug is most commonly found in all the four zones.

DISCUSSION

From the study it has been seen that distribution of different species are different in the 4 distinct zones. Their numbers vary in different zones. It has been seen that zone two has the maximumbiodiversity. The zone I of Booty area consisted the agricultural area and ponds have maximum varieties of trees, grass fields and wetlands etc..

It has been found that maximum individuals of *Halys dentatus* Fabr.(60) , *Tessaratoma javanica* Thumb.(23) and Litchi Bug (29) is most commonly found in all the four zones . *Halys dentatus* Fabr. are most common in Zone II, while *Bagrada cruciferarum* is most common in Zone I and *Nezara viridula* Linn. is found least in Zone IV.

Aspongopus janus (22) and *Corpocoris pallidus* Dall. (16) are absent in site I and present in other three sites. *Dalpada jugatoria* Coth (15) and *Syncanus collaris* Fabr (15) are absent in zone IV and present in other three zones. *Nezara viridula* Linn. (8) is was collected from Zone I and IV. *Bagrada cruciferarum* (15) and *Dalpada versicolor* Hem-Sch (10) collected maximum from Zone I and II and absent in zone III and IV *Degonetus serratus* Dist. was collected only from zone III.

Out of 11 species, 9 species are found in Zone II. 8 species were found in Zone I and Zone III. Minimum 6 species are found in Zone IV.

Overall percentage composition of insects has been found to be less. Fragmented habitat represented the maximum species richness 11 species of Pentatomidae. The results of this study points towards the threat to biodiversity due to growing anthropogenic activities. Species diversity and richness varied all along the study sites

Variation in distribution is due to different environmental conditions. It depends upon the presence of wetland, grassland, shrubs, water bodies, trees etc.

CONCLUSION

The present study highlights the presence of 11 species of Pentatomidae family which can be considered to be an important finding. Rapid urbanization and other factors like shrinking of marshy land, vegetation cover etc. may have contributed to biodiversity sinking of Heteroptera.

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