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POPULATION DENSITY, DIVERSITY AND DISTRIBUTIONAL PATTERN OF GRASSHOPPER FAUNA (ACRIDIDAE: ACRIDOIDEA: ORTHOPTERA) IN CENTRAL AND EASTERN UTTAR PRADESH, INDIA

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INTRODUCTION

Uttar Pradesh is bounded by Nepal on the North, Uttarakhand on the north-east, Himachal Pradesh on the north-west, Haryana on the west, Rajasthan on the south-west, Madhya Pradesh on the south and south-west,Chhattisgarh and Jharkhand on south and Bihar on the east. Situated between 23°52'N and 31°28'N latitudes and 77°3' and 84°39'E longitudes, it is the fifth largest state in the country in terms of area, and the first in terms of populationand can be divided into three regions, Eastern, Central and Western Uttar Pradesh. The eastern Uttar Pradesh having twenty-five districts, located between 24.0 to 27.340 N latitudes and 81.130 to84.110 E longitudes, has been divided into three agro-climatic zones namely, North Eastern Plain Zone, Eastern Plain Zone and Vindhyan Zone. Although, the average annual rainfall ineastern U.P. is around 1100 mm, it is quite erratic and confined to July-September (85-90%). The watertable varies from 1 to 14.5 m during pre-monsoon and 0.5 to 7.5 m during post monsoon. Central Uttar Pradesh having twenty-one districts including Lucknow and Kanpur situated on 26.30 & 27.10 North latitude and 80.30 & 81.13 East longitude. Climate is warm humid subtropical with cool, dry winters from December to February and dry, hot summers from April to June. The rainy season is from mid-June to mid-September. In winter the maximum temperature is around 25°C and the minimum is 7-9°C. Fog is quite common from late December to late January. Summers are extremely hot with temperatures rising to the 40 to 45°C.

Orthoptera is one of the largest Orders of insects having suborder Caelifera (short horned grasshoppers and Ensifera (long horned grasshoppers). Caelifera comprises eight super families and out of them Acridoidea and Pyrgomorphoidea are commonly found in India. Out of eleven families of Acridoidea, Acrididae, Pamphagidae, Romaleidae and Tristidae commonly distributed in India, known as grasshoppers and locust. Acrididae are the predominant family of grasshoppers and shows maximum diversity, comprising about 10,000 of the entire 11,000 species of suborder Caelifera all over the world (http://en.wikipedia.org/wiki/Acrididae). Shishodia *et. al.* (2010) reported about 285 species belonging to 135 genera from India. Grasshoppers are of great economic importance, they constitute an important group of pests and pose a constant threat to cereal crops, pulses, vegetables, orchards, grasslands and forest plantations all over the world. Grasshoppers cause significant damage to tree seedlings and agricultural crops (Joshi *et al.*, 1999), hence considered as oligophagous and according to host preferences classified as graminivorous, forbivorous and ambivorous or mixed feeders (Mulkern, 1967). Various

studies have been done on different aspects of grasshoppers across India, *viz*. Mondal and Shishodia (1982), Julka *et al.* (1982), Tandon & Khera (1978) studied their ecological aspects; Dey & Hazra (2003) studied both Taxonomyas well as ecology of grasshopper fauna of Greater Kolkata. Information on population of particular species of *Acrida exaltata* and *Oedaleusabruptus* was added by Susanta & Halder (1998) and Khan & Aziz (1973) respectively whereas Azim *et al.* (2010) added the information regarding seasonal variation of three grasshopper species of Kashmir.

METHODOLOGY

Surveys were carried out during 2010-2012f rom fourty five districts of Central and Eastern Uttar Pradesh during post monsoon season to collect the grasshoppers. Sampling was done randomly during morning hours (6.00 AM to 11.00 AM) and evening hours (3.00 PM to 6.00 PM). Specimens were collected through net sweeping and hand picking method, and then transferred in bottles containing cotton soaked with ethyl acetate covered with paperfor killing. Then specimens were first relaxed, pinned, labeled, stretched on stretching boardand left for 72 hours to prevent decomposition. Grasshoppers were identified by using their morphological as well as genitalic characters. For the purpose of correct identification, the grasshoppers were examined under stereo microscope (Nikon SMZ1500). For a detailed study of the various components of genitalia, the permanent slides were prepared and examined under the microscope. Drawings were made with the help of a camera lucida. Diversity of grasshoppers were calculated by using formula provided by Shannon & Wiener (1963) with the help of SPECDIV software.

RESULTS

During the present study, two thousand four hundred sixty five specimens of grasshoppers belonging to the family Acrididae were collected from 45 districts of Central and Eastern Uttar Pradesh having 48 species of grasshoppers

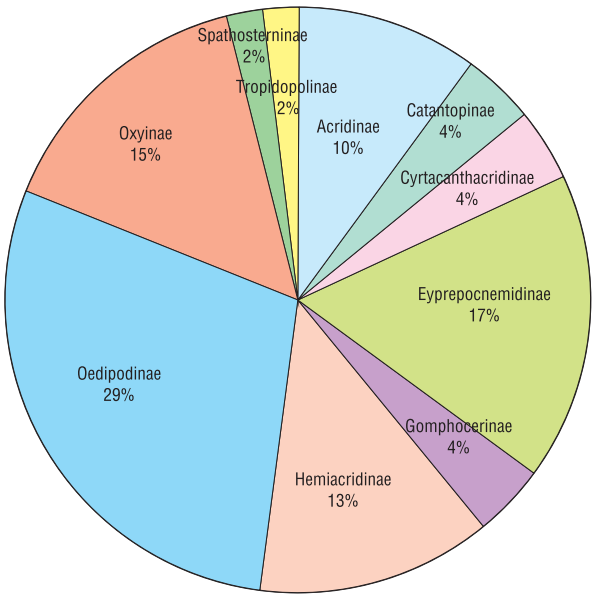

Fig. 1: Species accumulation chart of grasshoppers with reference to their subfamilies in Central and Eastern Uttar Pradesh

representing 28 genera, 16 tribesand 10 subfamilies (Table 1 &2). Maximum diversity of species have been recorded from district Mau (17 species) followed by Ambedkar Nagar and Azamgarh (16 species), Lucknow, Raebarelli and Varanasi (15 species) while a minimum from district Faizabad(4 Species) (Table 1&3). Maximum abundance of grasshoppers population was recorded from district

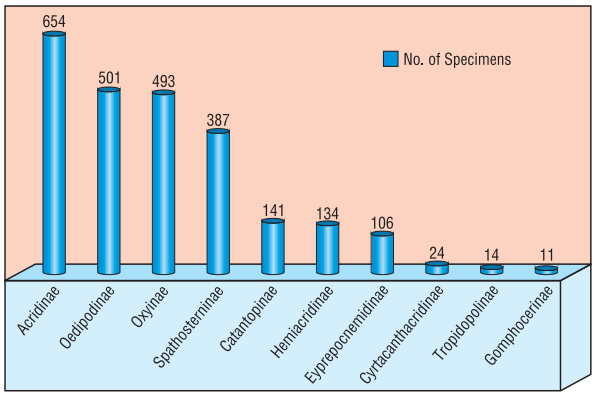

Fig. 2: Abundance of Acridid pests in Central and Eastern U. P.

Faizabad (116) followed by Deoria (101) and Raebareilly (90) and minimum from Pilibhit (15). Subfamily Oedipodinaeimparts 29% of the total species and were followed by Eyprepocnemidinae 17%, Oxyinae15%, Hemiacridinae 13%, Acridinae 10%, Catantopinae, Cyrtacanthacridinae and

Gomphocerinae 4%, while least by Spathosterninae and Tropidopolinae 2% respectively (Figure 1). As per the number of specimens concern edmaximum shown by subfamily Acridinae with least in case of Gomphocerinae (Figure 2). This result is par with the result of Akhtar *et al.* (2012), who reported 26 species of grasshoppers from rice ecosystem of Uttar Pradesh and Usmani *et al.* (2012) who reported 34 species of grasshoppers from pulses and paddy of Bihar and Jharkhand, India but is in conformity with Nayeem and Usmani (2012) who described 41 species of grasshoppers from Jharkhand and 37 species from Bihar respectively. The value of the Shannon Diversity index (2.88 bits) shows that the grasshopper population is moderately diverse in this region.

DISCUSSION

Grasshoppers are polyphagus insect since they damage the agricultural crops, non-agricultural areas and grasslands, hence considered as pest and its distribution depends upon abiotic factors mainly temperature, humidity and rainfall as well as biotic factors such as predators and parasites. During early showers of rain, egg hatches and nymph emerges and starts feeding. However, no detailed work on the distribution of grasshoppersin Central and Eastern Uttar Pradeshhas been done till date; keeping in view this fact, here an attempt has been made to explore the grasshopper fauna of the area. Earlier Usmani *et al*. (2010) have explored 33 species of locusts and grasshoppers from Western Uttar Pradesh. 14 species from pulses and 26 species from Aligarh Fort of Uttar Pradesh were recorded by Usmani *et al*. (2012), whereas ecological study of grasshopper fauna of Aligarh Fort has been done by Akhtar *et al.* (2012).

During the survey it was observed thatspecies richness is highest in district Mau while lowest in Faizabad but on the other hand highest abundance of grasshopper population was recorded from district Faizabad and lowest from Pilibhit (as shown in Table 3). Acridinae, Oedipodinae and Spathosterninae are dominating subfamilies in this area collected from almost all habitats of districts of Central and Eastern U.P. Among species *Spathosternum prasiniferum prasiniferum* is dominating over all other species followed by *Acrida exaltata, Oxyahylahyla* and *Acrida gigantea* in all habitats. Species of subfamily Oxyinae and Hieroglyphinae were reported as major pests of paddy crop. The large sized grasshoppers such as *Hieroglyphus* sp. *Choreodocus* sp., *Locusta migratoria, Gastrimargus africanus* are usually found in large grasses or in bushes near agricultural and non-agricultural areas which were less interfered by humans. Therefore, it is desirable to take up a detailed study on the succession of insect pest complexes under the agroclimatic conditions prevailing in this area. The investigations have a great importance from the point of view of both applied and fundamental knowledge to forecast the pest incidence and suggest measure for its control.

SUMMARY

Locusts and grasshoppers constitute an important group of pests and pose a constant threat to agriculture all over the world. An attempt was made to study the population density, diversity and distribution of these pest in Central and Eastern U.P. Fourty eight species of grasshoppers representing twenty eight genera,sixteen tribes and tensubfamilies have been recorded for the first timefrom fourty five districts of Central and Eastern Uttar Pradeshduring the survey of 2010-2012. Maximum diversity of species was recorded from Mau district (seventeen species) while a least (four species) from Faizabad, whereas maximum numbers of specimens were collected from the same district. Subfamily Oedipodinae constitutes a maximum (fourteen) species followed by Eyprepocnemidinae (eight species), Oxyinae (seven species), Hemiacridinae (six species), Acridinae (five species), Catantopinae, Cyrtacanthacridinae and Gomphocerinae (two species each) while the least of only one by Spathosterninae and Tropidopolinae. Species diversity index was also calculated by using Shannon Diversity index.

Table 1(a). Distribution of grasshoppers in some districts of eastern and central Uttar Pradesh during the year 2010-11.

Sl. No	Acridid Species	1. Balrampur	2. Basti	3. Deoria	4. Barabanki	5. gorakhpur	6. Faizabad	7. Gonda	8. Hamirpur	9. Kanpur (rural)	10. Kannauj	11. Unnao	12. Hardoi	13. Lalitpur	14. Sultanpur	15. Jhansi	16. Jalaun	17. Lucknow	18. Kushinagar	19. Mahoba	20. Sitapur	21. Santkabirnagar	22. Siddhartnagar
	1. Subfamily: **Acridinae**																						
1.	*Acrida exaltata*	+	+	+	+	+	-	+	-	+	+	+	+	+	+	-	+	+	+	-	+	+	+
2.	*Acrida gigenteaa*	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+
3.	*Phlaeoba infumata*	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
4.	*Phlaeoba pantali*	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-
	2. Subfamily: **Catantopinae**																						
5.	*Xenocatantops karnyi*	-	-	+	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	+	-	-	-
6.	*Diabolocatantops pinguis innotabilis*	-	-	-	-	-	-	-	+	+	-	+	-	+	-	+	-	-	-	-	-	-	-
	3. Subfamily: **Cyrtacanthacridinae**																						
7	*Cyrtacanthacris tatarica*	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	+	-	-	-	-	-	-
8	*Schistocerca gregaria*	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4. Subfamily: **Eyprepocnemidinae**																						
9	*Eyprepocnemis alacris*	+	-	-	+	-	-	-	+	-	-	+	-	+	+	-	+	-	+	-	+	-	+
10	*Eyprepocnemis bhaduri*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
11	*Eyprepocnemis rosae*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
12	*Heteracris nobilis*	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-
13	*Choroedocus illustris*	-	-	+	-	+	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-
14	*Choroedocus robustus*	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	+
15	*Tylotropidius varicornis*	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
16	*Cataloipus indicus*	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-
	5. Subfamily: **Gomphocerinae**																						
17.	*Aulacobothrus luteipes lutieps*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
18.	*Leva indica*	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6. Subfamily: **Hemiacridinae**																						
19.	*Hieroglyphus banian*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	+	-	-	-
20.	*Hieroglyphus niegrorepletus*	-	-	-	+	-	-	-	+	+	+	+	+	+	-	+	-	-	-	-	-	-	-

Table 1(a) contd.

Sl. No	Acridid Species	1. Balrampur	2. Basti	3. Deoria	4. Barabanki	5. gorakhpur	6. Faizabad	7. Gonda	8. Hamirpur	9. Kanpur (rural)	10. Kannauj	11. Unnao	12. Hardoi	13. Lalitpur	14. Sultanpur	15. Jhansi	16. Jalaun	17. Lucknow	18. Kushinagar	19. Mahoba	20. Sitapur	21. Santkabirnagar	22. Siddhartnagar
21.	*Hieroglyphus oryzivorus*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22.	*Hieroglyphu indicus*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
	7. Subfamily: **Oedipodinae**																						
23.	*Trilophidia annulata*	-	+	-	-	+	-	-	-	+	-	-	-	-	+	-	+	+	-	-	+	+	-
24.	*Acrotylus humbertianus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
25.	*Aiolopus simulatrix*	-	+	+	+	+	-	+	-	+	+	-	-	+	-	+	+	+	+	+	+	+	+
26.	*Aiolopus t. thalassinus*	-	-	+	+	-	-	-	-	+	+	+	-	-	+	+	-	-	-	-	-	-	+
27.	*Aiolopus t. tamulus*	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	+	+
28.	*Oedaleus abruptus*	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	-
29.	*Oedipoda miniata*	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
30.	*Locusta migratoria*	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	+	-	-
31.	*Chloebora marshalli*	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32.	*Dittopternis venusta*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
33.	*Gastrimargus africanus*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
	8. Subfamily: **Oxyinae**																						
34.	*Oxyafusco vittata*	+	-	+	-	+	+	+	-	-	-	-	+	-	+	-	-	+	+	-	+	-	+
35.	*Oxya hylahyla*	+	+	+	+	+	+	+	-	+	+	-	+	+	+	+	-	+	+	-	+	+	+
36.	*Oxya hylaintricata*	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
37.	*Oxya japonica japonica*	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	+
38.	*Oxya velox*	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-
39.	*Oxya grandis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
	9. Subfamily: **Spathosterninae**																						
40.	*Spathosternum prasiniferum*	+	+	+	+	+	-	+	-	-	+	-	-	+	+	+	-	+	-	-	+	-	-

Table 1(b). Distribution of grasshoppers in some districts of Eastern and central Uttar Pradesh during 2011-12.

SL. No.	Acridid Species	1. Allahabad	2. Ambedkar Nagar	3. Auraiya	4. Azamgarh	5. Ballia	6. Banda	7. Behraich	8. Chandauli	9. Fatehpur	10. Ghazipur	11. Jaunpur	12. Kaushambi	13. Lakhimpur kheri	14. Maharajganj	15. Mau	16. Mirzapur	17. Pilibhit	18. Pratapgarh	19. Rae Barelli	20. Sant ravidas nagar	21. Shravasti	22. Sonbhadra	23. Varanasi
	1. Subfamily: **Acridinae**																							
1.	*Acrida exaltata*	+	+	+	+	+	+	+	+	+	-	+	+	+	+	-	-	-	+	+	-	+	+	-
2.	*Acrida gigenteaa*	+	+	+	+	-	+	+	-	+	-	-	+	-	+	+	-	-	+	+	-	-	+	-
3.	*Phlaeoba infumata*	-	+	-	+	-	-	+	+	-	+	+	-	+	-	+	+	-	+	+	+	-	-	+
4.	*Phlaeoba pentali*	+	+	-	+	-	-	-	+	-	+	-	-	-	-	+	-	-	+	-	-	-	-	+
5.	*Orthoctha indica*	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2. Subfamily: **Catantopinae**																							
6.	*Diabolocatantops pinguis innotabilis*	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+	-	+	-	-	-	+	-	+
7.	*Xenocatantops karnyi*	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
	3. Subfamily: **Cyrtacanthacridinae**																							
8.	*Cyrtacanthacris tatarica*	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-
	4. Subfamily: **Eyprepocnemidinae**																							
9.	*Choroedocus illustris*	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
10.	*Choroedocus robustus*	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
11.	*Eyprepocnemis alacris*	-	-	-	+	-	-	+	-	-	-	-	-	-	+	+	-	+	-	+	+	-	+	+
12.	*Heteracris nobilis*	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+
	5. Subfamily: **Gomphocerinae**																							
13.	*Aulacobothrus luteipes luteipes*	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+
	6. Subfamily: **Hemiacridinae**																							
14.	*Hieroglyphus annulicornis*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	*Hieroglyphus banian*	-	+	+	+	-	-	+	+	-	+	-	-	-	-	+	+	-	-	+	-	-	-	+

Table 1(b) contd.

16.	*Hieroglyphus concolor*	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17.	*Hieroglyphus niegrorepletus*	-	+	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
18.	*Hieroglyphus oryzivorus*	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
	7. Subfamily: **Oedipodinae**																							
19.	*Aiolopus simulatrix simulatrix*	-	-	+	+	-	+	+	+	-	+	+	+	-	+	+	+	+	+	+	-	-	-	+
20.	*Aiolopus thalassinus thalassinus*	+	+	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-	+	+	-	-	-	-
21.	*Aiolopus thalassinus tamulus*	-	+	+	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-
22.	*Gastrimargus africanus*	-	+	-	+	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	+	-
23.	*Locusta migratoria migratoria*	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	+	+	-	-	-
24.	*Oedaleus abruptus*	-	-	-	-	+	+	+	-	+	-	+	-	-	-	+	-	+	+	+	-	+	+	+
25.	*Oedaleus senegalensis*	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
26.	*Oedipoda miniata*	-	+	-	-	+	-	+	-	+	-	+	-	-	-	+	-	-	+	+	+	-	-	+
27.	*Ceracris nigricornis*	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
28.	*Trilophidia annulata*	-	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+
29.	*Trilophidia replete*	+	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8. Subfamily: **Oxiynae**																							
30.	*Oxya chinensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
31.	*Oxya fuscovittata*	-	-	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-
32.	*Oxya hyla hyla*	-	-	-	+	-	+	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	+	+
33.	*Oxya japonica japonica*	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	+
	9. Subfamily: **Spathosterninae**																							
34.	*Spathosternum prasiniferum*	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+
	10. Subfamily: **Tropidopolinae**																							
35.	*Tristria pulvinata*	+	-	-	-	-	-	-	-	+	-	+	-	+	-	+	+	-	-	-	+	-	-	+

35 species, 21 genera, 15 tribes, 10 subfamilies.

Rest of the districts of Eastern U.P. had been covered in previous report.

Table 2. Grasshoppers recorded from Central and Eastern Uttar Pradesh during 2011 & 2012

Sl. No.	Acridid Species	Total	Subfamily	Tribe
1.	*Acrida gigantea*	239	Acridinae	Acridini
2.	*Acrida exaltata*	334	Acridinae	Acridini
3.	*Phlaeoba pantali*	26	Acridinae	Phlaeobini
4.	*Phlaeoba infumata*	54	Acridinae	Phlaeobini
5.	*Orthoctha indica*	1	Acridinae	-
6.	*Diabolocatantops pinguis innotabilis*	100	Catantopinae	Catantopini
7.	*Xenocatantops karnyi*	41	Catantopinae	Catantopini
8.	*Schistocerca gregaria*	1	Cyrtacanthacridinae	Cyrtacanthacridini
9.	*Cyrtacanthacris tatarica*	23	Cyrtacanthacridinae	Cyrtacanthacridini
10.	*Choroedocus illustris*	10	Eyprepocnemidinae	-
11.	*Choroedocus robustus*	15	Eyprepocnemidinae	-
12.	*Eyprepocnemis alacris*	43	Eyprepocnemidinae	Eyprepocnemidini
13.	*Eyprepocnemis bhaduri*	3	Eyprepocnemidinae	Eyprepocnemidini
14.	*Eyprepocnemis rosae*	3	Eyprepocnemidinae	Eyprepocnemidini
15.	*Heteracris nobilis*	22	Eyprepocnemidinae	Eyprepocnemidini
16.	*Tylotropidius varicornis*	2	Eyprepocnemidinae	-
17.	*Cataloipus indicus*	8	Eyprepocnemidinae	-
18.	*Aulacobothrus luteipes*	10	Gomphocerinae	Arcypterini
19.	*Leva indica*	1	Gomphocerinae	-
20.	*Hieroglyphus annulicornis*	1	Hemiacridinae	Hieroglyphini
21.	*Hieroglyphus banian*	63	Hemiacridinae	Hieroglyphini
22.	*Hieroglyphus concolor*	4	Hemiacridinae	Hieroglyphini
23.	*Hieroglyphus niegrorepletus*	62	Hemiacridinae	Hieroglyphini
24.	*Hieroglyphus oryzivorus*	3	Hemiacridinae	Hieroglyphini
25.	*Hieroglyphu indicus*	1	Hemiacridinae	Hieroglyphini
26.	*Aiolopus simulatrix*	133	Oedipodinae	Epacromiini
27.	*Aiolopus thalassinus thalassinus*	55	Oedipodinae	Epacromiini
28.	*Aiolopus t. tamulus*	36	Oedipodinae	Epacromiini
29.	*Acrotylus humbertianus*	1	Oedipodinae	Acrotylini
30.	*Chloebora marshalli*	1	Oedipodinae	-
31.	*Dittopternis venusta*	1	Oedipodinae	-
32.	*Gastrimargus africanus*	9	Oedipodinae	Locustini

Table 2. contd.

Sl. No.	Acridid Species	Total	Subfamily	Tribe
33.	*Locusta migratoria*	14	Oedipodinae	Locustini
34.	*Oedaleus abruptus*	51	Oedipodinae	Locustini
35.	*Oedaleus senegalensis*	4	Oedipodinae	Locustini
36.	*Oedipoda miniata*	30	Oedipodinae	Oedipodini
37.	*Ceracris nigricornis*	1	Oedipodinae	Parapleurini
38.	*Trilophidia annulata*	154	Oedipodinae	Trilophidiini
39.	*Trilophidia repleta*	11	Oedipodinae	Trilophidiini
40.	*Oxya chinensis*	1	Oxyinae	Oxyini
41.	*Oxya fuscovittata*	103	Oxyinae	Oxyini
42.	*Oxya hylahyla*	311	Oxyinae	Oxyini
43.	*Oxya hylaintricata*	10	Oxyinae	Oxyini
44.	*Oxya japonica japonica*	48	Oxyinae	Oxyini
45.	*Oxya velox*	18	Oxyinae	Oxyini
46.	*Oxya grandis*	2	Oxyinae	Oxyini
47.	*Spathosternum prasiniferum*	387	Spathosterninae	Spathosternini
48.	*Tristria pulvinata*	14	Tropidopolinae	Tristriini
	Total	**2465**	**Shanon Diversity Index: 2.88**	

Table 3. Host Plants, Species Richness and Abundance of grasshoppers' fauna in Central and Eastern Uttar Pradesh.

Sl. No.	Districts	Hosts plants	Total no. of specimens	No. of Species	No. of Genera	No. of subfamilies
1.	Balrampur	Grasses	76	7	5	5
2.	Basti	Paddy	69	7	5	4
3.	Deoria	Paddy	101	14	8	6
4.	Barabanki	Paddy	78	9	6	6
5.	Gorakhpur	Paddy	47	9	7	6
6.	Faizabad	Paddy	116	4	1	1
7.	Gonda	Paddy	26	6	4	4
8.	Hamirpur	Grasses	42	9	9	7
9.	Kanpur	Paddy	84	13	11	7
10.	Kannauj	Paddy	46	10	8	7
11.	Unnao	Grasses/Bushes	38	11	10	6
12.	Hardoi	Paddy	35	8	5	5

Table 3. contd.

Sl. No.	Districts	Hosts plants	Total no. of specimens	No. of Specie	No. of Genera	No. of subfamilies
13.	Lalitpur	Paddy	18	11	8	8
14.	Sultanpur	Harvested paddy	38	10	7	5
15.	Jhansi	Grasses/Bushes	84	10	9	7
16.	Jalaun	Oilseeds	27	7	5	5
17.	Lucknow	Grass	79	13	9	6
18.	Kushinagar	Paddy	44	7	5	5
19.	Mahoba	Grasses/Bushes	40	5	5	4
20.	Sitapur	Paddy	66	13	9	5
21.	SantKabir Nagar	Paddy	64	10	4	3
22.	Siddharth Nagar	Paddy	62	11	5	4
23.	Allahabad	Grasses	54	7	6	4
24.	Ambedkarnagar	Grasses	69	16	11	6
25.	Auriya	Grasses	67	13	9	8
26.	Azamgarh	Grasses/Bushes	82	16	11	6
27.	Ballia	Grasses	53	7	7	4
28.	Banda	Grasses	42	10	7	4
29.	Behraich	Grasses/Bushes	48	10	9	5
30.	Chandauli	Paddy field/Grass	56	10	8	5
31.	Fatehpur	Grasses	19	8	7	4
32.	Ghazipur	Grasses/bushes	44	10	7	5
33.	Jaunpur	Grasses	46	11	9	5
34.	Kaushambi	Grasses	23	6	5	3
35.	Lakhimpurkheri	Grasses/Bushes	39	6	6	4
36.	Maharajganj	Paddy /Grasses	56	10	5	4
37.	Mau	Paddy /Grasses	57	17	13	8
38.	Mirzapur	Grasses	68	7	7	5
39.	Pilibhit	Grasses	15	5	5	3
40.	Pratapgarh	Grasses	86	13	8	4
41.	Rae Barelli	Grasses	90	15	13	8
42.	SantRavidas Nagar	Grasses	34	8	8	6
43.	Shravasti	Grasses	28	5	5	4
44.	Sonbhadra	Grasses	54	10	9	7
45.	Varanasi	Paddy /Grasses	55	15	13	9

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REFERENCES

Akhtar, M.H. Usmani, M. K. Nayeem, M.R. and Kumar, H. 2012.Species Diversity and abundance of Grasshopper fauna (Orthoptera) in rice ecosystem. *Ann. of Biol. Res.,* **3**(5): 2190-2193.

Akhtar, M.H. Usmani, M.K. Andnayeem, M.R. 2012. Impact of Abiotic Factors on Population of Acridoid Fauna (Orthoptera) in Aligarh Fort, Uttar Pradesh, India. *Tre. in Biosc.,* **5**(1): 17-19.

Azim, M.N. Reshi, S.A. and Rather, A.H. 2010. Observation on the seasonal variation in population of three species of grasshoppers (Orthoptera : Acrididae) of Kashmir Himalaya. *J. of Ent. Res.,* **34**(4): 259-264.

Dey, A. and Hazra, A.K. 2003. Diversity and distribution of grasshopper fauna of Greater Kolkata with notes on their ecology. *Memoirs,* **19**(3): 1-118.

Joshi, P.C. Lockwood, J.A. Vashishth, N. and Singh, A. 1999. Grasshopper (Orthoptera: Acridoidea) community dynamics in a moist deciduous forest in India. *J. of Orth. Res.,* **8**: 17-23.

Julka, J.M. Tandon, S.K. Halder, P. and Shishodia, M. S. 1982. Ecological observation on grasshoppers (Orthoptera: Acridoidea) at Solan, Himachal Pradesh, India. *Ori. Ins.,* **16**(1): 63-75.

Khan, H.R. and Aziz, S.A. 1973. Observation on seasonal variation in population of hoppers and adults of Oedaleusabruptus (Thunberg) (Orthoptera : Acrididae). *Ind. J. of Ent.,* **35**(4): 300-305.

Mulkern, G.B. 1967. Food selection by grasshoppers. *Ann. Rev. of Ent.,* **12**: 59-78.

Mondal, S.K. and Shishodia, M.S. 1982. Population fluctuation of grasshopper fauna in a field near Culcutta. Pro. Symp. Ecol. *Anim. Popul. Zool. Surv. India,* **3**: 127-132.

Nayeem, M.R. and Usmani, M.K. 2012. Taxonomy and field observations of grasshopper and locust fauna (Orthoptera: Acridoidea) of Jharkhand, India. *Mun. Ento. & Zool,* **7**(1): 391-417.

Shishodia, M.S. Chandra, K. and Gupta, S.K. 2010. An annotated checklist of Orthoptera (Insecta) from India. *Occasional Paper No.* **314**: 366 Zoological survey of India.

Susanta, N. and Halder, P. 1998. Population dynamics of the grasshopper Acrida exaltata (Walker) in the arid zone of West Bengal. *Ind. J. of Inter.,* **2**(1-2): 51-53.

Tandon, S.K. and Khera, P. 1978. Ecology and distribution of grasshoppers (Orthoptera: Acridoidea) in Arunachal Pradesh, India and impact of human activities on their ecology and distribution. *Mem. of the School of Ent. Agra,* **6**: 73-92.

Usmani, M.K. and Nayeem, M.R. 2012. Studies on taxonomy and distribution of Acridoidea (Orthoptera) of Bihar, India. *J. of Threat. Taxa*, **4**(13): 3190–3204

Usmani, M.K. Khan, M.I. and Kumar, H. 2010. Studies on Acridoidea (Orthoptera) of Western Uttar Pradesh. *Biosystematica*, **4**(1): 39-58

Usmani, M.K. Akhtar, M.H. and Nayeem, M.R. 2012. Diversity and taxonomic studies of acridoid pests (Acridoidea: Orthoptera) of pulses from Uttar Pradesh, India. *Mun. Ento. & Zool.,* **7**(2): 837-846

Usmani, M.K. Akhtar, M.H. Andnayeem, M.R. 2012.Diversity, distribution and taxonomic studies of Acridoid fauna (Orthoptera) of Aligarh Fort, Uttar Pradesh, India. *Adv. in Lif. Sci.,* **1**(1): 36-40.

Usmani, M.K. Nayeem, M.R. Andakhtar, M.H. 2012. Field observations on the incidence of Grasshopper fauna (Orthoptera) as a pest of Paddy and pulses. *Eur. J. of Exp. Bio.,* **2**(5):1912-1917.

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