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Diversity and Status of Acridoids in Radua Watershed of Himachal Pradesh, India

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Abstract: ***Radua watershed is situated at 31°11'45" N to 31°14'52" N latitude and 76°38'43" E to 76°42'37" E longitude between Bilaspur and Solan hills of Himachal Pradesh. This watershed primarily symbolizes one of most fragile ecosystem (sub-tropical zone) of the Shiwalik hills and supports rich and diversified faunal and floral diversity. At present, the left bank of present watershed is in a state of disturbance primarily due to widening of National highway (NH- 21), various types of landslides, soil erosion, pollution etc. Therefore, present studies were conducted in order to know the status and diversity of orthopteran fauna in this watershed. Keeping in view the above, Radua watershed was explored for the presence of orthopteran fauna especially short horned grasshopper in various ecosystems/habitats types like agriculture fields, forests, grasslands, streams, human habitations, industrial area etc. These studies revealed the presence of 30 species of orthopterans belonging to 25 genera and 2 families of super-family acridoidea. It was observed that Acrididae, represented by 26 (87%) species, spread over 22 (88%) genera under 8 subfamilies was the largest family of acridoids, while Pyrgomorphidae represented by 4 (13%) species belonging to 3 (12%) genera was the smallest. Among subfamilies, Oedipodinae (27%) was the largest with 7 species followed by Acridinae (15%) and Hemiacridinae (15%, 4 species each); Gomphocerinae (12%), Eyprepocnemidinae (12%) and Catantopinae (11%, 3 species each) and Oxynae and Truxalinae (4%, 1 species each). Acrida exaltata, Gastrimargus africanus africanus, Spathosternum pr. prasiniferum, Oxya hyla hyla, Atractomorpha cr. crenulata and Chrotogonus (Chr.) tr. Trachypterus were the most abundant, whereas, Gelastrrhinus laticornis, Scintharista blanchardiana, Choroedocus illustris, Hieroglyphus oryzivorus and Xenocatantops karnyi were the least represented species in this watershed. Present biodiversity studies on acridoids shall be of great use in taxonomical practices, formulation of a reliable data base of insects, monitoring changes in an ecosystem, especially in relation to crops and climate change.***

Keywords: Acridoids, Grasshopper, Ecosystem, Pyrgomorphidae, Shiwalik hills, Radua Watershed, Bageri

1. Introduction

Acridoid Fauna study in Radua Watershed (Bageri) of Himachal Pradesh is very rich and diversified with scientific perspectives. Acridoids include some of the most ancient and beautiful insects ever roamed the earth, as well as some of the most economic important invertebrates, because most of them are pest. They occur throughout the world, mainly in open grasslands, where they eat leafy vegetation. They are found in a variety of habitats, with more familiar species of Acridoids found in grasslands and forests, locust live in deserts and semi-deserts. The form of body and shape of head and thorax are diverse. The antennae are filiform, but sometimes ensiform. Tarsi are 2-3 segmented, but 4 segmented are also found; hind femora large, slender and thick towards base and adapting for leaping. Wings either fully developed or reduced or absent; fore-wings, generally in the form of leathery tegmina; hind-wings are fan-like; male external genitalia complex (except in Tetrigidae), symmetrical and concealed when not in use (Shishodia, 2000). They always provided with strong mandibles and are generally vegetable feeders. The most significant feature of this group is its jumping habit with the help of large hind legs and sound production by its auditory organs.

2. Materials and Methods

Radua Watershed (Bageri) area situated at 31°11'45.18"N to 31°14'52.12"N latitude and 76°38'43.15"E to 76°42'37.117"E longitude and at an altitude of 300 to 650 m, in two Districts left bank in Bilaspur District (Mora, Gra, Karmala, Katlan, Ria, Kuthhar, Kanchimode,Khurani, Jangal Jajjar, Dadrana, Nalaian, etc.), while the right bank in Solan District (Sawarghatt, Kaneri, Baan, Baha, Behli, Dabheta Kangrait, Ponaili, Katthimb, Amb da Haar, Tikari, Khatiaal, Shampujan, Bageri etc.) of Himachal Pradesh was explored for the presence of acridoids in various habitat types (Figure:1,2). This watershed primarily symbolizes one of most fragile ecosystem (sub-tropical zone) of the Shiwalik hills and supports rich and diversified faunal and floral diversity. At present, the left bank of present watershed is in a state of disturbance primarily due to widening of National highway (NH- 21), various types of landslides, soil erosion, pollution etc. Therefore, present studies were conducted in order to know the status and diversity of Orthopteran fauna in this watershed.

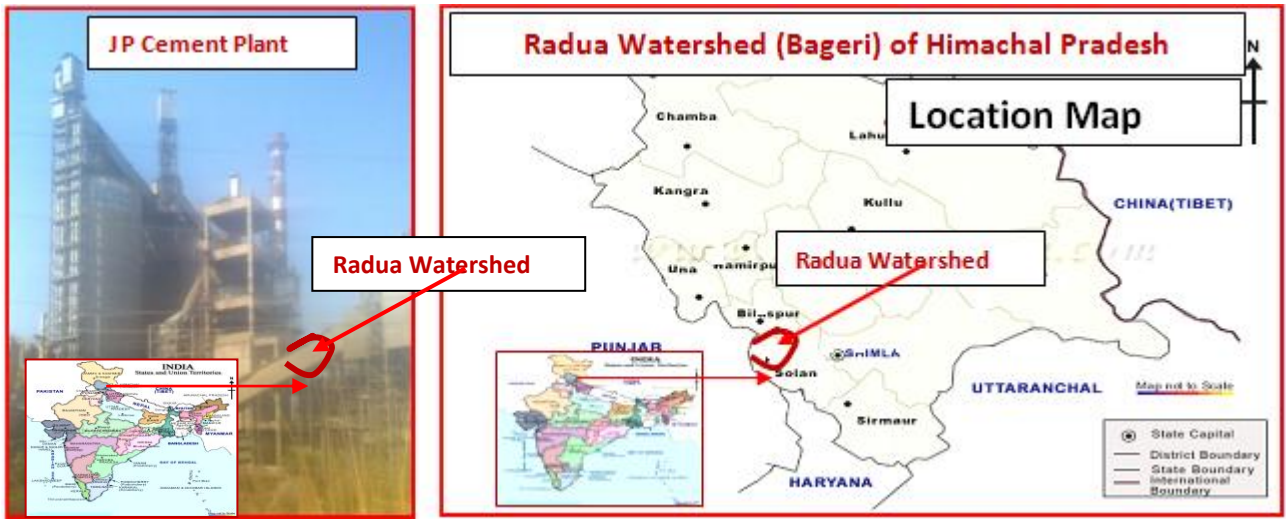
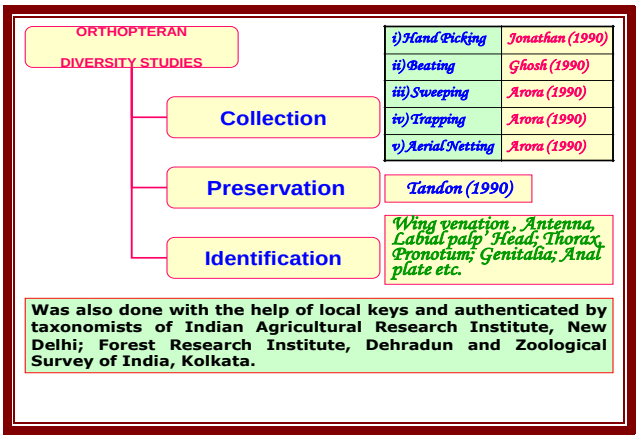


Figure 1: Location map showing Radua Watershed (Bageri) District Solan of Himachal Pradesh

Figure 2: Google earth image of study area Radua Watershed (Bageri) of Himachal Pradesh

The comprehensive bio-ecological studies were conducted on various aspects on Acridoid fauna of Radua Watershed (Bageri) District Solan of Himachal Pradesh. The orthopteran specimens collected by various methods like hand picking, beating, sweeping, trapping, night trap and aerial netting were then killed in a killing bottle (Ghosh,1990; Arora, 1990). After killing, specimens were removed from bottle within half an hour to avoid any damage to colouration and then pinned, identified, preserved and labelled (Tandan, 1990). The identified collections were stored in insect cabinets having good quality drawers. The naphthalene powder was also put in grooves of the drawers. The cotton balls soaked in the mixture of camphor and carbolic acid, in the ratio of 1:3 were put in each corner of the drawers. These investigations mainly aimed at knowing the current status of orthopterans in different habitats of this zone.



3. Results and Discussion

Keeping in view the above, Radua watershed was explored for the presence of orthopteran fauna especially short horned grasshopper in various ecosystems/habitats types

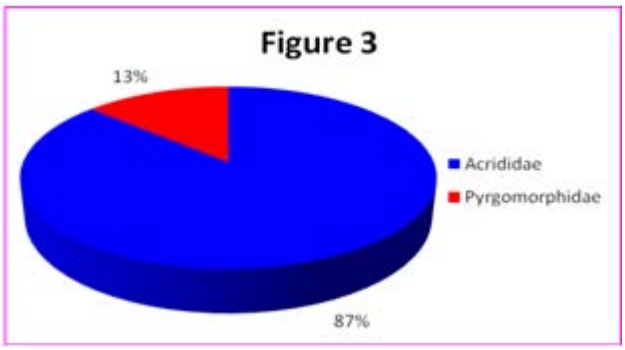


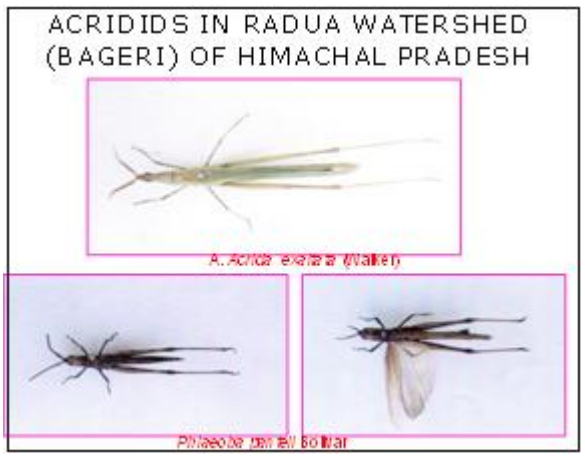
Figure 3: Precent composition of Acridoids fauna (family wise) in Radua watershed (Bageri)

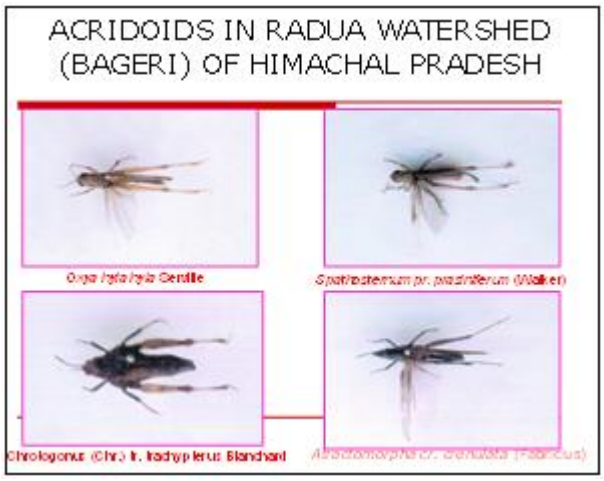
like agriculture fields, forests, grassland, streams, human habitations, industrial area etc. These studies revealed the presence of 30 species of orthopterans belonging to 25 genera and 2 families of super-family acridoidea. It was observed that Acrididae, represented by 26 (87%) species, spread over 22 (88%) genera under 8 subfamilies was the largest family of acridoids, while Pyrgomorphidae represented by 4 (13%) species belonging to 3 (12%) genera was the smallest (Table 1; Figure 3). Among subfamilies, Oedipodinae was the largest with 7 species followed by Acridinae and Hemiacridinae 4 species each; Gomphocerinae Eyprepocnemidinae & Catantopinae 3 species each and Oxynae & Truxalinae 1 species each (Table 1; Figure: 4). Further, the percent composition studies of Acridids fauna show that Oedipodinae represented by 27% species was maximum, followed by Acridinae and Hemiacridinae (15%, species each); Gomphocerinae 11.33%, Eyprepocnemidinae 11.33% and Catantopinae 11.34%, species each and Oxynae and Truxalinae 4% species each (Table 1; Figure: 5).

Table 1: Diversity of Acridoids in Radua Watershed (Bageri) of Himachal Pradesh

S.No	Systematic List	S.No	Systematic List
	Superfamily : Acridoidea		**Subfamily: Hemiacridinae**
	Family: Acrididae	**16**	*Parahieroglyphus bilineatus* (Bolivar)
	Sub-family: Acridinae	**17**	*Hieroglyphus concolor* (Walker)
1	*Acrida exaltata* (Walker)	**18**	*Hieroglyphus oryzivorus* Carl
2	*Ceracris nigricornis nigricornis* (Walker)	**19**	*Spathosternum pr. prasiniferum* (Walker)
3	*Gelastrrhinus laticornis* (Serville)		
4	*Phlaeoba panteli* Bolivar		**Subfamily: Oxyinae**
		20	*Oxya hyla hyla* Serville
	Subfamily: Truxalinae		
5	*Truxalis indica* (Bolivar)		**Subfamily: Eyprepocnemidinae**
		21	*Choroedocus illustris* (Walker)
	Subfamily: Gomphocerinae	**22**	*Choroedocus robustus* (Serville)
6	*Chorthippus (Chorthipus) indus* Uvarov	**23**	*Eyprepocnemis rosea* Uvarov
7	*Dnopherula (Aulacobothrus) decisus* (Walk)		
8	*Dnopherula (Aulacobothrus) luteipes*(Walk)		**Subfamily: Catantopinae**
		24	*Catantops innotabilis* (Walk.)
	Subfamily: Oedipodinae	**25**	*Xenocatantops humilis humilis* (Serville)
9	*Acrotylus humbertianus* Saussure	**26**	*Xenocatantops karnyi* (Kirby)
10	*Aiolopus th. thalassinus* (Fabricus)		
11	*Gastrimargus africanus africanus* (Saussure)		**Family: Pyrgomorphidae**
12	*Pseudosphingonotus savignyi* Saussure	**27**	*Atractomorpha cr. crenulata* (Fabricus)
13	*Scintharista blanchardiana* (Saussure)	**28**	*Aularches miliaris* (Linnaeus)
14	*Oedaleus abruptus (Thunberg)*	**29**	*Aularches punctatus* (Drury)
15	*Trilophidia annulata* (Thunberg)	**30**	*Chrotogonus (Chr.) tr. trachypterus* Blanch

The number of known species of orthopteranfauna from the whole world is 20,000 and out of these 1,750 species nearly 10% of the world is known from India (Tandan and Hazra, 1998). An inventory of the orthopteran species recorded earlier from Nilgiri Biosphere reserve and its environs has been be prepared, mainly through work of Kirby (1914). Moreover, taxonomically significant morphological features like genitalia of orthopteran were used for characterizing the species/subspecies of these insects. Some studies have been carried out on orthoptera fauna by some earlier field biologists, but that too in a fragmented manner. However,





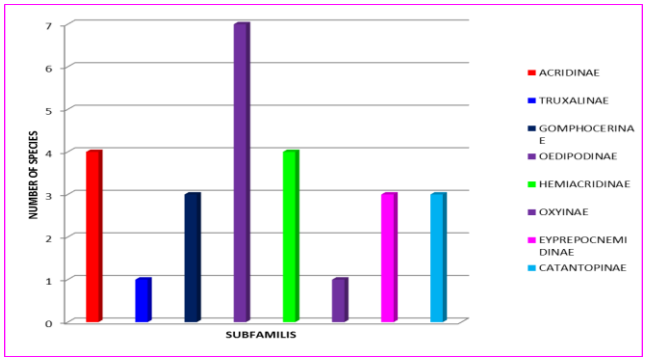


Figure 4: Acridids fauna (sub-family wise) in Radua watershed (Bageri) of Himachal Pradesh

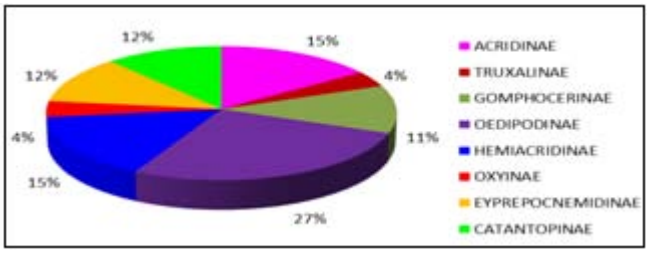


Figure 5: Precent composition of Acridid fauna (sub-family wise) in Radua watershed (Bageri)

a little work has been done on orthopterans of the Himalayan region (Julka *et al*., 1982; Tandon *et al.,* 1995; Shishodia *et al*., 2003, Saini and Mehta, 2007). Sharma and Mattu (2010) have recorded 57 species from Nalagarh valley, the sub-tropical zone of the Shiwalik hills of District Solan, Himachal Pradesh; during different seasons of the years revealed the presence of 57 species of insects belonging to 49 genera, 11 families and 4 superfamilies. Sharma and Mattu (2011) recently revealed the presence of 30 species of grasshoppers belonging 25 genera and 2 families from Pallasi Valley of Himachal Pradesh. They have also revealed the relative abundance showed that the valley is very rich in grasshopper fauna and found maximum were very common (15 species), followed by common (7 species), 6 uncommon (6 species) and least 2 rare species.

4. Conclusion

The tropical insect species provide a good indication of the degree of species richness and is well understood in grasshoppers, butterflies and dragonflies. The global distribution of species richness increases with decreasing latitude, i.e. there are far more species per unit area in the tropics than in temperate regions, and more species in temperate regions than in polar-regions (Gentry, 1988). In tropical forests, diversity may be higher at mid altitudes than in lower areas, but there is no substantiating data. However, this has been noted in desert mountains of Arizona where diversity at lower and higher altitude is believed to be limited by aridity and low temperature respectively (Brown, 1988). Hurd *et al*. (1971) stated that the abundance of one group of insects has little effect on other species in a stable ecosystem. *Acrida exaltata*, *Gastrimargus africanus africanus*, *Spathosternum pr. prasiniferum*, *Oxya hyla hyla*, *Atractomorpha cr. crenulata* and *Chrotogonus (Chr.) tr. Trachypterus* were the most abundant, whereas, *Gelastrrhinus laticornis*, *Scintharista blanchardiana*, *Choroedocus illustris*, *Hieroglyphus oryzivorus* and *Xenocatantops karnyi* were the least represented species in this watershed. There mere presence in any habitat shows the conditions are varied, congenial and healthy, supporting diversified faunal components, which in turns are supported by complex flora. Present biodiversity studies on acridoids shall be of great use in taxonomical practices, formulation of a reliable data base of insects, monitoring changes in an ecosystem, especially in relation to crops, and climate change. Moreover, Needless to say, the Acridoids have their own role in ecobalance. Therefore, the present study makes a modest attempt to explore the existing fauna of Acridoids from the Radua Watershed.

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