



DIVERSITY OF GRASSHOPPER (INSECT: ORTHOPTERA) FAUNA OF UREGI AND DOBHA VILLAGES IN PAURI GARHWAL, UTTARAKHAND, INDIA

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Abstract: This paper presents the distributional record of the of grasshopper fauna of Uregi and Dobha villages in Pauri Garhwal, Uttarakhand, India. A total of 18 species of grasshoppers belonging to 3 families and 17 genera were recorded during this study. Acrididae was the dominant family with 15 species and the other minor families were Tettigoniidae with 2 species and pyrgomorphidae with 1 species. This habitat was studied for the first time and a maximum number of the grasshoppers were recorded in Uregi village as compared to the Dobha village.

Keywords: Grasshopper, Diversity, Uregi, Dobha Villages

Introduction

Order Orthoptera includes short and long-horned grasshoppers, pygmy grasshoppers, grouse locusts, crickets, mole crickets, katydids, raspy cricket, and cave crickets. At least 10 families of grasshoppers are recognized worldwide, depending on the classification system, in which the family Acrididae show maximum diversity comprises of around 8,100 species worldwide. The largest subfamily Acridoidea is recorded globally with 12000 species. 290 species representing 138 genera are reported from India (Shishodia, 2010). The acridids, commonly known as short grasshoppers, are recognized at a glance by short antennae and three articulated tarsus.

Grasshoppers are one of the largest and most diverse insect groups. They are functionally important, being the dominant aerial invertebrates in natural grasslands when judged by biomass (Scott et al. 1979; Risser et al. 1981). Some grasshoppers cause significant damage to tree seedlings (Joshi et al. 1999) and agricultural crops. They are also important components of the food chain of many birds and mammals (Capinera et al. 1997; Mayya et al. 2005), and thus resource

management practices that alter the dynamics of the grasshopper population will affect various trophic levels in the food chain (Capinera et al. 1997). Most grasshoppers are oligophagous and show defined host preferences (Mulkern 1967). Grasshoppers are classified as herbivore (graminivore), forb-feeders (forbivore), or a mixture of the two (ambivorous or mixed) (Isely, 1944). In recent years, farmers have changed farming patterns and agronomic practices due to urbanization, job problems and the desire for higher profits. The changing landscape of agriculture is affecting primary consumers such as grasshoppers and thus creating impacts for the entire food web, making it necessary to study the distribution of grasshoppers in relation to their habitats and host plants. Previous studies by Shrinivasan and Muralirangan (1992), Muralirangan et al. (1992), Sanjayan et al. (1995), Joshi et al. (1999), Kandibane et al. (2004) and Mayya et al. (2005) added information on grasshopper fauna from different regions of India. Grasshoppers sometimes show complex and camouflage types of behaviors (Latchininsky et



al., 2011) which help them in mating, flying, and feeding. Order Orthoptera is common in the terrestrial ecosystem and is found in different ecosystems (Bhowmik and Rui, 1982). Some species of grasshoppers are projected as an ecological indicator of the ecosystem and ecological networks (Bazelet, 2011).

In view of literature analysis it is observed that the studies on grasshopper fauna in Garhwal region is meagre. Hence the present work was undertaken as M. Sc dissertation.

Material and methods

Study area: The present study was carried out in the Pauri Garhwal, district of Uttarakhand, which encompasses an area of 5,230 sq. km and situated between 29°45' to 30°15' N and 78°24' to 79°23' E in the Northern part of India from October 2019 to May 2020. Due to pandemic COVID-19 lockdown, it was limited up to two location i.e., Dobha and Uregi villages located about 10-20 km from the main city of Pauri Garhwal, Uttarakhand. The study area comes under temperate to sub-temperate climate, which remains pleasant throughout the year. The maximum temperature recorded in June and minimum in January. The temperature for the region ranges from 25°C to 30°C. The annual average rain fall in the District was 218 cm, mainly during monsoon but occasional rain was also observed in winters. Relative humidity varies between 54 and 63 percent. The study area is located under the sub-temperate forest. This area is covered with mixed forest with Pinus, Deodar and meadows. The dominated tree species are *Rhododendron arboreum*, *Cedrus deodara*, *Pinus roxburghii* and *Myrica esculenta*.

Survey methods during lockdown: In view of COVID-19 pandemic our study was hindered for a short period. But after a few days, we had started our work with a novel investigation procedure with the transition to a fully digital and virtual platform (January-August, 2020). We have started taking photographs of grasshoppers using mobile phone (Vivo v15pro) individuals collected from Uregi and Dobha Village in Pauri Garhwal.

Results and Discussion

A total of 18 species of grasshoppers belonging to 3 families and 17 genera were recorded during this study. Acrididae was the dominant family among the three families with 15 species, Tettigoniidae with 2 species and pyrgomorphidae with 1 species. With the help of diagnostic features, the observed grasshoppers were identified up to species level during the present study are given below:

1) *Tylotropidius varicornis* (Walker, 1870)

This species belongs to family Acrididae and subfamily Eyprepocnemidinae of order orthoptera.

Diagnostic characters: The species recognizable by having fastigium of vertex with two depressions at the base; compressed, truncated and somewhat bi-tuberculated apex of the prosternal tubercle and, in the tegmen, has "a row of triangular whitish points on the radial nervure" and also with the apical half clearly attenuated of the posterior femur. Filiform antenna, females very similar to males, except that they are larger.

Body size (length in mm): Male: 25-26 Female: 36-37

Distribution: This species is found in different districts of Uttarakhand like Pauri Garhwal and Tehri. The genus has also been reported from Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra and Uttarakhand in India and Pakistan, Nepal, Srilanka and Myanmar.

Ecology and Habitat: This group of grasshopper observed throughout the year. It is a minor pest of corn, oats and rice. Maximum population observed in October. This species was found on grasses in Uregi village in Pauri Garhwal Uttarakhand, India at an altitude of 1490 m asl. Species feed on mixed ground grass varieties.

2) *Xenocatantops humilis humilis* (Serville, 1839)

This species belongs to family Acrididae and subfamily Catantopinae of order orthoptera.

Diagnostic characters: The species was unique in the form of a male cercus, dark marks on the outer



surface of the posterior femur, and in having an epiphylous combined with the lophalcavity. Filiform antenna. Body-color brown pale green; finely rough body, gray with a black patch on legs, female very similar to males, except that they are larger.

Body size (length in mm): Male: 21-24 Female: 26-27

Distribution: This species found from several sites of Pauri Garhwal in Dandapani, Kandoliya, Tekka. The genus has also been reported from Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal in India and Borneo, Indo-China, Java, Lombok, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sumatra, Sri Lanka and Thailand.

Ecology and Habitat: This species was generally inhabitant in the forest, a strong infestation of this species has been found on the slopes of the hills adjacent to cultivated fields, the species feed on ground vegetation such as *Urticadioica L.*

3) *Atractomorpha crenulata* (Fabricius, 1793)

This species belongs to family Pyrgomorphae and subfamily Cyrtacanthacridinae of order orthoptera.

Diagnostic characters: Generally the specimens are greenish, with well-developed tegmina and rosy wings. Both individuals of *Atractomorpha crenulata* are medium-size, pubescent, Short and thick antennae, Punctured pronotum and poorly granulated, Head and pronotum with slightly inclined sides, crenulated behind the eyes, often pink crenulation, Prosternum with rounded obtuse tubercle, Tegmina pointed, extending up to a one-fourth of its length beyond the hind femora; wings shorter than the tegmina.

Body size (length in mm): Male: 24-26 Female: 31-35

Distribution: Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Lakshadweep Islands, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh

and West Bengal in India and Nepal, Pakistan, South Vietnam, Sri Lanka, Sumatra and Thailand.

Ecology and Habitat: It causes damage to the seedlings of rice, corn, milk, millet, oats, cowpeas, tobacco. Second and third-generation adults can attack wheat, millet, and oats. This species was mostly seen in the field of *Triticum* and *Pisumsativum*.

4) *Phlaeobapanteli* (Bolivar, 1902)

This species belongs to family Acrididae and subfamily Acridinae of order orthoptera.

Diagnostic characters: The species can be easily distinguished from the irregular striated callosities of the head and pronotum, which was the most unique feature. Besides, the meso and metasternal lobes, the subgenital plate, and the epiphallus are also remarkable. Female similar to males but larger, ensiform antenna.

Body size (length in mm): Male: 19-25 Female: 25-41

Distribution: This species found from several sites of Pauri Garhwal in Dobha and Satyakhal. The genus has also been reported from Himachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Tamil Nadu, Tripura, Uttarakhand, and West Bengal in India and Afghanistan and Bhutan

Ecology and Habitat: Specimens of this species were collected from herbs near the roadside and in the fields of corn, rice, millet, peanuts, alfalfa, and sugar cane. It was a common species of India and occurs in hill regions and plains. This species feeds upon leaves of different shrubs.

5) *Spathosternum prasiniferum prasiniferum* (Walker, 1871)

This species belongs to family Acrididae and subfamily Spathosterninae of order orthoptera.

Diagnostic characters: The subspecies is unique in having a convex and flathead and pronotum. With parallel sides; the usual greenish color and the characteristic post-ocular band on the head and pronotum and its dark central streak on the tegmina are also noted. Besides, the texture of the prosternal spine and epiphallus are also distinctive. Female looks very similar to males but larger.



Body size (length in mm): Male: 14-16.5
Female: 19-22

Distribution: Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal in India and Bangladesh, Myanmar, Nepal, Pakistan, South and East China, Sri Lanka, Thailand, Vietnam and West Malaysia.

Ecology and Habitat: This species is associated with grass. This species feeds upon different vegetation such as *Apludamutica*, *Durva* (Bermuda grass), and *Cynodondactylon*.

6) *Diabolocatantops innotabilis* (Walker, 1870)

This species belongs to family Acrididae and subfamily Catantopinae of order orthoptera.

Diagnostic characters: This species is distinguished by its frontal ridge with parallel sides and its coloring in the wings. However, the species is unique in that it has the expanded tip of male cercus and the same type of genitalia. Body testaceous brown; antenna paler towards the base, darker towards apex; tegmina mottled with the brown, radial area with pale spots. Females were similar to males but slightly larger.

Body size (length in mm): Male: 24-27.5 **Female:** 31-35.5

Distribution: Madhya Pradesh, Maharashtra, Meghalaya, Manipur, Nagaland, Odisha, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal in India and Sri Lanka, Sumatra, Tibet, and Thailand.

Ecology and Habitat: These species were seen in the forest of Uregi village, forest-covered with forest meadows and tall trees of *Pinus roxburghii* and *Rhododendron*. This species feeds upon ground vegetation and seedling of *Pinus roxburghii*.

7) *Oedaleus abruptus* (Thunberg, 1815)

This species belongs to family Acrididae and subfamily Oedipodinae of order orthoptera.

Diagnostic characters: This species differs from all other species of the genus by the shape of its wing band, the front end of which is flattened and exceeds only the second anal vein and the

posterior two-thirds are parallel to the posterior margin of the wing. Females are very similar to males, except slightly larger.

Body size (length in mm): Male: 12.5-17 **Female:** 18.5-21.5

Distribution: Himachal Pradesh, J&K, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Manipur, Odisha, Puducherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal in India and Afghanistan, Bangladesh, China, Indo-China, Myanmar in world.

Ecology and Habitat: Both adults and nymphs are geophilic, generally associated with bare soil, often with cultivation, and both are found throughout the years. Adults can attack sorghum, corn, millet, and rice seedlings.

8) *Phaneroptera gracilis* (Burmeister, 1838)

This species belongs to family Tettigoniidae and subfamily Phaneropterinae of order orthoptera.

Diagnostic characters: Generally body size small, color light brown to light green. Body cylindrical. Antennae are filiform. Head shorter than pronotum. Front and middle legs short, hind legs long and sickle-shaped ovipositor in female.

Body size (length in mm): Male: 28-30 **Female:** 32-34

Distribution: Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, and Uttarakhand in India and Africa, Annam, Australia, Celebes, China, Indo-China, Java .

Ecology and Habitat: This grasshopper is found both in the plains and in mountainous regions. It has been found in the scattered vegetation of herbs and shrubs. Species were seen mostly in the cultivated field and sometimes observed in forest cover with herbs and shrubs and feed on grasses.

9) *Ditto pternis venusta* (Walker, 1870)

This species belongs to family Acrididae and subfamily Oedipodinae of order orthoptera.

Diagnostic characters: The species is separable from its rectangular shape of lateral pronotal lobes at a posterior angle and its male genitalia. Females are very similar to males, except slightly larger.



Small in size with hairy and pronotum granulated body and head, Filiform antenna, head longer than the pronotum.

Body size (length in mm): Male: 18.5-19 Female: 27-29

Distribution: Andhra Pradesh, Chhattisgarh, Karnataka, Uttarakhand, Madhya Pradesh, Manipur, Meghalaya, Odisha, Tamil Nadu, Tripura and West Bengal in India and Sri Lanka.

Ecology and Habitat: This species is associated with bare ground in small grass. It has a six-monthly generation in one year. Nymphs are found from March to November. It is a minor pest of rice and cowpea. These species feed upon mixed grasses.

10) *Aulacobolus luteipes luteipes* (Walker, 1871)

This species belongs to family Acrididae and subfamily Gomphocerinae of order orthoptera.

Diagnostic characters: Small size body, pitted finely, Filiform antenna, longer than the head and the pronotum together, Colour testaceous, vertex rounded in front; the outer angles of the vertex form small black depressions; foveolae oval; visible from above; head with three broad blackish stripes behind the eyes. The central part of the tegmina dusky, the costa and inner margin broadly pale. Females are very similar to males, except slightly larger.

Body size (length in mm): Male: 14-18 Female: 21-23

Distribution: Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Himachal Pradesh, Jammu & Kashmir and Uttarakhand in India and Bangladesh, China, Japan, Europe, Myanmar, Nepal, North America, Pakistan, Sri Lanka, Taiwan and Thailand.

Ecology and Habitat: This species was a minor rice pest around mixed vegetation. In six-monthly generation completed, nymphs and adults seen from March to December. This species found in the forest meadows with some leaf litters in Uregi village of Uttarakhand.

11) *Trilophidia annulata* (Thunberg, 1815)

This species belongs to family Acrididae and subfamily Oedipodinae of order orthoptera.

Diagnostic characters: In India, the genus is represented only by this species. Therefore, their geographical isolation together with the coloring of the internal surface of the posterior femur and the unique shape of the epiphalluslophi easily identify the species. Filiform antenna, females very similar to males except for larger sizes.

Body size (length in mm): Male: 12.5-15.5 Female: 16-22

Distribution: Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal in India and Myanmar, Nepal, Pakistan, Philippines, Sarawak, Singapore, Sri Lanka, Sumatra, Taiwan, Thailand and Vietnam in world.

Ecology and Habitat: This species is mainly found on bare soil near the pond or the roadside along with green herbs. This species can attack Paddy and Cowpea. Adults and nymphs are found throughout the year. The highest population is seen in August and fewer in February. It occurs in almost everyone's type of vegetation. This species feeds upon broadleaf plants when green herbs are not available.

12) *Aiolopus thalassinus* (Fabricius, 1781)

This species belongs to family Acrididae and subfamily Oedipodinae of order orthoptera.

Diagnostic characters: This subspecies is recognizable by the shape of its fastigium, gradually narrowing the frontal crest and the coloring of the post tibia although it has a high transition in terms of size and coloring. Females are longer than males.

Body size (length in mm): Male: 15-21.6 Female: 21-27

Distribution: It is very common in district Pauri Garhwal in India and Andaman Island, Australia, Borneo, Brunei, Burma, China, East Pakistan, Hainan, Japan, Java, Malaya, Mariana, New Guinea, Nicobar Island, Singapore, Sri Lanka, Sumatra, and Taiwan.

Ecology and Habitat: The species is mostly seen on the river banks on barren grounds with grass. This species were seen in the Uregi village at an altitude of 1400m asl. These grasshoppers prefer



open grass habitats and other low plants, some species live in forests or jungles.

13) *Chorthippus biguttulus* (Linnaeus, 1758)

This species belongs to family Acrididae and subfamily Gomphocerinae of order orthoptera.

Diagnostic characters: The species are extremely variable in color from green to black-brown, males often have a red tip to the abdomen while females do not. Presence of precostal lobe, front wings slightly longer than the abdomen. Presence of precostal lobe, front wings slightly longer than the abdomen, wider coastal field, this section of the wings starts small on the side of the head and diverges widely in the backside.

Body size (length in mm): Male: 21-24 Female: 26-27

Distribution: Himachal Pradesh, Uttarakhand in India and Georgia, Kazakhstan, North Africa, European part of the USSR, Siberia, and West Europe in the world.

Ecology and Habitat: *Chorthippus biguttulus* colonizes almost all open and clear forest habitats. But in agricultural meadows, it is rarely found in completely over-fertilized areas, but more in widely managed areas or edges.

14) *Eyprepocnemis alacris alacris* (Serville, 1839)

This species belongs to family Acrididae and subfamily Eyprepocnemidinae of order orthoptera.

Diagnostic characters: This species generally brown and black in color, size medium, hind tibiae bluish-grey with two whitish rings at the base of hind tibiae and reddish tarsus, Filiform antenna, longer than the head and the pronotum together.

Body size (length in mm): Male: 22-24 Female: 35-36

Distribution: This species is found in the Pauri Garhwal district of Uttarakhand. Goa, Haryana, Andhra Pradesh, Arunachal Pradesh, Assam in India and Bangladesh, Iran, Afghanistan, Pakistan, Iraq, and Sri Lanka.

Ecology and Habitat: Nymphs and adults are found in the long, thick grass with bushes. This species causes considerable damage to grass, corn, cucumbers, oats, and cowpea.

15) *Oxya fuscovittata* (Marschall, 1836)

This species belongs to family Acrididae and subfamily Oxyinae of order orthoptera.

Diagnostic characters: This species generally green and brown, generally body size medium, finely pitted integument, black patches present along the side of the abdomen. Antenna longer or slightly longer than the head and pronotum, The species is distinguished by its large, compressed and apically bifid male cercus; and short spines, in the ovipositor valves of female and the absence of lateral longitudinal ridges of the subgenital plate on the ventral side.

Body size (length in mm): Male: 19.5-24 Female: 25-30

Distribution: Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal in India and Afghanistan, Bangladesh, Nepal, Pakistan and USSR.

Ecology and Habitat: It is an important rice pest throughout the year. The maximum population is seen in the swamp from September to October. This is probably two to three generations per year and can cause damage to seedlings of crops such as rice, corn, etc.

16) *Holochlora indica* (Kirby, 1906)

This species belongs to family Tettigoniidae and subfamily Phaneropterinae of order orthoptera.

Diagnostic characters: This species generally light green to dark green, antennae longer than the size of the body, body size medium. Filiform antennae.

Body size (length in mm): Male: 17-22 Female: 20-25

Distribution: Uttarakhand, Andaman and Nicobar Islands, Chhattisgarh, Himachal Pradesh, Karnataka, Manipur, Meghalaya, Mizoram, Orissa, Sikkim, Tamil Nadu, Tripura and West Bengal in India and Java and Sri Lanka.

Ecology and Habitat: These grasshoppers prefer open grass habitats and other low plants; some species live in forests or jungles. This species feed



upon ground vegetation such as *Apludamutica*, *Durva*, and *Cynodon dactylon*.

17) *Chorthippus almoranus* (Uvarov, 1942)

This species belongs to family Acrididae and subfamily Gomphocerinae of order orthoptera.

Diagnostic characters: This species generally green and brown, head conical in shape. Small body, short and filiform antennae, longer than the head and shorter than the pronotum. Subconic head; shorter than pronotum, female larger.

Body size (length in mm): Male: 15-16 Female: 17-19

Distribution: The species has also been reported by Almora, Milam Pithoragarh area, Reni area of Chamoli districts, Uregi area of Pauri district, Uttarakhand in India and Asia and South Asia.

Ecology and Habitat: It lives surrounded by short shrubs and grasses. This species found in the forest meadows cover with different vegetation such as shrubs, herbs, short plants, and tall trees.

18) *Oxyrrhepes obtusa* (Haan, 1842)

This species belongs to family Acrididae and subfamily Catantopinae of order orthoptera.

Diagnostic characters: This species generally yellow or brown in color, antennae short and stout, body generally medium in size. moderately thick body, Head wider as the pronotum in front. The species is distinguished by its approximate mesosternal lobes and the insertion of antennae near the eyes.

Body size (length in mm): Male: 32-35 Female: 40-42

Distribution: Arunachal Pradesh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Odisha, Rajasthan, Sikkim, Tamil Nadu, Uttarakhand and West Bengal in India and China, Indo-China, Indonesia, Java, Lombok, Myanmar and Sri Lanka.

Ecology and Habitat: This species has been seen in forest areas covered with tall grass and leaf litters. This feed upon different vegetation and seedlings of Pinus trees. This species was seen in the bare ground areas during the study.

Conclusion

From this study, it has been concluded that grasshoppers are important bioindicator of environments because of their specific microhabitat preferences, functional importance in ecosystems, and sensitivity to changes in biotic and abiotic factors in their habitats. Grasshoppers live in fields, meadows, and just about anywhere they can find generous amounts of food to eat. These species were mostly seen in the forest meadows covered with leaf litters and in cultivated fields of rice, wheat, and oat. Some species found on bare soil near the pond or the roadside along with green herbs. Conservation continues with a large survey, monitoring, and investigation, and Protect their natural habitat.

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