

# A Preliminary Study of Grasshoppers (Acrididae: Orthoptera) of Baltistan, Azad Jammu & Kashmir, Pakistan

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**Abstract.-** In the present study we collected and identified the seven species of grasshoppers belonging to subfamily Oedipodinae, Calliptaminae and Acridinae. Six species (86%) were found on loose sandy soil having xerophytic vegetation, whereas only one species (14%) was found on clay-loamy soil with succulent vegetation. Six parameters viz. Length of body, tegmen, hind femur, hind tibia, hind tarsus and number of hind tibial spines of the species *Locusta migratoria migratoris* were compared to know the morphometric variations at various elevations i.e. 2439 m, 3048 m and 3658 m from sea level. In the study of intra-specific variation in *Locusta migratoria migratoris*, it was found that at higher elevation hind femur has significantly increased while hind tarsus has decreased in male. In female, length of body, hind tibia and tarsus have decreased significantly at maximum elevation.

**Key words:** Grasshoppers, intra-specific variation, various elevations, abundant species, rare species, *Locusta migratoria migratoris*.

## INTRODUCTION

Grasshoppers are known to be most important group of Phylum Arthropoda for their contribution to diversity, abundance and biomass (Watts, 1989; Joern and Gaines, 1990; Lockwood, 1997). The grasshoppers are important component of agricultural fields and grasslands and their global pest status has been reviewed in detail (Jago, 1998). It is generally established that the acridid species diversity and abundance depends on the availability of host plant species (Kemp *et al.*, 1990a,b). Some earlier workers (Kirby, 1914; Bei-Bienko and Mischenko, 1951) conducted a good taxonomic work on acridid grasshoppers of Baltistan yet more material was expected from this area.

Baltistan also called as roof of the world is part of Azad Jammu and Kashmir, which lies on the north of Pakistan (36-37°E, 74-75°N). Its elevation ranges from 2000 m to 6000 m above the sea level. All around it is surrounded by world highest mountain ranges. Karakorum Range situated to its north and north-east while, its eastern side is surrounded by ice range Siachin. Its south and west is surrounded by great Himalayas range. This area is

dry, cold alpine desert where the climatic changes occur vertically. The valley remains under snow from mid November to March, while surrounding higher mountainous slopes are always covered with snow. The average annual rainfall is 50-100 mm, while annual temperature ranges between -6°C to 25°C (Khan, 1999). The river Indus flows through its mid line from east to west. The soil of valley is sandy/desert type with sparse herbaceous vegetation. The agricultural fields are irrigated and occupied with potato, wheat and vegetables during summer. The soil of the slopes is clay loam where contour forming is practiced. The slopes of hilly areas remain under alpha alpha crop.

Thus this valley depicts unique geographical and climatic features. Therefore, the present survey was conducted to know about the acridid species on various elevation of Baltistan region. The habitat preference and intra-specific variations due to elevation in *Locusta migratoria migratoris* were also studied during this investigation

## MATERIALS AND METHODS

The acridid grasshoppers were collected during August and September 1999, because during these months maximum population of acridid grasshoppers is found in this area. The localities surveyed during this expedition are: Skardu (2073

m), Chorbut (2439 m), Kaldaq (3048 m) and Hunjore (3658 m).

For collection sweep net was used. For the study of intra-specific variations, six parameters of five male and female taken from each locality were measured using vernier microscope. The parameters studied were body length (P1), tegmen length (P2), hind femur length (P3), hind tibia length (P4), hind tarsus length (P5) and number of hind tibial spines (P6).

The classification system of Bei-Bienko and Mischenko (1951) was used in this manuscript. The collected data was analyzed statistically by multifactorial analysis of variance (ANOVA), using the software package Statgraphics (1992). Confidence values (p) are given in text for the significance among different parameters. All lines bars are least significant differences of a parameter studied at different elevations.

## RESULTS AND DISCUSSION

The present study resulted in the identification of five species of Oedipodinae, one species of Calliptaminae and one species of Acridinae (Table I) from this area. About 86% species (6 species) were restricted in Skardu valley, whereas only 14% species (1 species) was distributed in other localities *i.e.* Hunjore, Kaldaq and Chorbut. The major reason for this difference regarding species distribution pattern can be the effect of habitat. The Skardu valley harbouring maximum number of species, has sandy/desert type soil with xerophytic vegetation. The highest percentage of species accumulation in this valley depicts that species diversity and distribution depends on soil type and vegetation. These findings are in line with those of Bei-Bienko and Mischenko (1951) and Gangwere *et al.* (1998) who have reported most species of Oedipodinae from desert, semi desert and rocky habitat. The qualitative species richness in an area depends upon the topographical and ecological variations. The Baltistan area comes under arid zone, as the annual average rainfall is 50-100 mm. The rainfall plays an important role in habitat formation because floristic species diversity and richness is rainfall dependent. Due to low amount of rainfall this area presents poor floristic species diversity and richness leading

to fewer acridid species.

The species *Locusta migratoria migratoris* was found in all localities except Skardu valley, which shows its wide range of distribution. These localities are side slopes with clay-loam soil. The main crop of these localities is alpha alpha. The *Locusta migratoria migratoris* was caught from alpha alpha and natural grasses of the surrounding areas, which also get the irrigation water from the main crop. The alpha alpha and natural grasses are succulent as compared to the xerophytic vegetation found in Skardu valley. The present study shows this species prefers to feed on succulent vegetation grown on clay-loam soil, which has great influence on its distribution pattern. This study also shows that *Locusta migratoria migratoris* is a strong flier and can reach on maximum elevation wherever the favorite host plants and other suitable climatic conditions are available. Bland *et al.* (1996) reported that elevation and species diversity are significantly correlated but it is an indirect relationship. Because higher elevations provide more vegetational zones and probably more surface area for favourable habitat thereby, leading to greater species diversity. Here the situation is reverse as higher elevation provides less vegetation due to low rainfall. Hence it is concluded that species distribution is directly correlated with habitat rather elevation.

### *Intra-specific variations in Locusta migratoria migratoris in relation to elevation*

Six parameters *viz.* Body length, tegmen length, hind femur length, hind tibia length, hind tarsus length and number of hind tibial spines were studied to know the morphometric variations at different elevations. Measurements of these characteristics, of both male and female and their comparison is given in Figures 1 and 2, respectively. The analysis of data shows that in male, elevation has significant effect only on hind femur length and hind tarsus length at  $P < 0.05$ . At maximum elevation hind femur length has significantly increased while the length of hind tarsus has decreased. These results may show that to reach at maximum elevations strong hind femur is required for jumping and flight activities. Similarly, the reduction in hind tarsus length lessens the overall body weight that is

**Table I.- Species distribution at various localities of Baltistan.**

Species	Localities with numbers of specimens collected			
	Skardu	Chorbut	Kaldaq	Hunjore
<b>Oedipodinae</b>				
1. <i>Locusta migratoria migratoris</i> L.	-	40	30	35
2. <i>Sphingonotus balteatus himalyanus</i> Uv.	1	-	-	-
3. <i>Heliosertus moseri moseri</i> sauss	7	-	-	-
4. <i>Acrotylus humbertianus</i> sauss	12	-	-	-
5. <i>Scintharista</i> sp.	1	-	-	-
<b>Calliptaminae</b>				
6. <i>Calliptamus italicus italicus</i> Rme.	1	-	-	-
<b>Acridinae</b>				
7. <i>Acrida exaltata</i>	4	-	-	-

Fig. 1. Measurements of different parameters of male grasshopper at different elevation (average of 5 individuals). Vertical bars indicate Least significant difference (LSD) at  $P < 0.05$  between body parts at different elevation.

also helpful to reach on higher elevations. The Figure 2 shows that in female on maximum elevation, body length, hind tibia length and hind tarsus length has significantly reduced at  $P < 0.05$  level. These results also indicate that on higher elevation overall lesser body weight is required for easy jumping and flight activities.

Fig. 2. Measurements of different parameters of female grasshopper at different elevation (average of 5 individuals). Vertical bars indicate Least significant difference (LSD) at  $P < 0.05$  between body parts at different elevation.

*Remarks*

## Subfamily Oedipodinae

1. *Locusta migratoria migratoris* L. phase solitaria: The collected specimens agree with the published description (Bei-Bienko and Mishchenko, 1951; Dirsh, 1965) of this species. On the basis of total number of individuals collected, this species proved as most dominant and abundant (80.15%) acridid species in Baltistan except Skardu valley.

2. *Sphingonotus balteatus himalayanus* Uv.: The collected specimens were compared with the published description (Kirby, 1914; Bei-Bienko and Mishchenko, 1951) of this species. This species was found on sparsely grown vegetation along the roadside and barren land having thorny vegetation. Earlier, Mahmood and Yousuf (1999) collected this species from the rocky and stony soil along the riverbank. Only a single female collected indicates its rarity in this area.

3. *Helioscirtus moseri moseri* Sauss: The collected specimens agree with the published description given by Bei-Bienko and Mishchenko, 1951) of this species who recorded it from the low land of middle Asia. This species was collected from the sandy desert having sparsely grown thorny vegetation. On the basis of number of individual collected (5.34%) this is second abundant species in Skardu valley.

This species has been recorded for the first time from this area.

4. *Acrotylus humberianus* Sauss: The collected specimens conform to the published description (Kirby, 1914; Bei-Bienko and Mishchenko, 1951; Wagan, 1990; Mahmood and Yousuf, 1999) of this species. This species was collected from sandy loose soil having sparsely grown vegetation. A total number of 12 individuals of this species were collected from Skardu valley, which shows it as most abundant species (9.16%) of this locality.

5. *Scintharista* sp.: A single female of this genus was collected which could not be identified. The present investigation showed that it is a rare genus of this area. Bei-Bienko and Mishchenko (1951) reported its distribution from North West India and Pakistan to Spain, Morocco and Canary Island.

## Sub-family Calliptaminae

6. *Calliptamus italicus italicus* (L.): The collected specimens agree with the published description (Bei-Bienko and Mishchenko, 1951) of this species. It is a widely distributed species throughout the Asia and Europe with significant pest status. During present expedition only a single male specimen was collected from loose sandy soil, which is the indication of its rarity.

## Sub-family Acridinae

7. *Acrida exaltata* (Walker): The collected specimens conformed to the published description (Kirby, 1914; Jago, 1996) of this species. This species was collected from the loose sandy soil along the roadside and riverbank.

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