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Taxonomy and distribution of *Calliptamus barbarus barbarus* (Costa, 1836) (Orthoptera: Calliptaminae)

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Abstract

Grasshoppers are generally phytophagous insects and regarded as major pests of agricultural crops in the world including Pakistan. At the present extensive survey was carried out to collect the grasshoppers from Hazara Division. A total of 421 samples were collected and identified into Family Acrididae, Subfamily Calliptaminae, genus *Calliptamus* and species *Calliptamus barbarus barbarus* (Costa, 1836). Moreover, the distribution and incidence data will be used for a Red List assessment. Optimistically, finding of present study will be helpful for the future researchers in near future. Besides this, the ecological account of species has been given to determine the pest status of the species.

Keywords: *Calliptamus*, Phytophagous, Ecology, Distribution, Pakistan

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1. INTRODUCTION

Grasshoppers are phytophagous insects and are found all over the world in all type of ecological systems. They are considered as major pests of nearly all type of vegetation. Order Orthoptera is one of the largest orders in class insecta with over 20,000 species[1]. Super family Acridoidae comprises short-horned grasshoppers and locusts, placed in sub-order Caelifera. Grasshopper sometimes form large groups and changes their color and behavior with respect to population densities and termed as locusts.

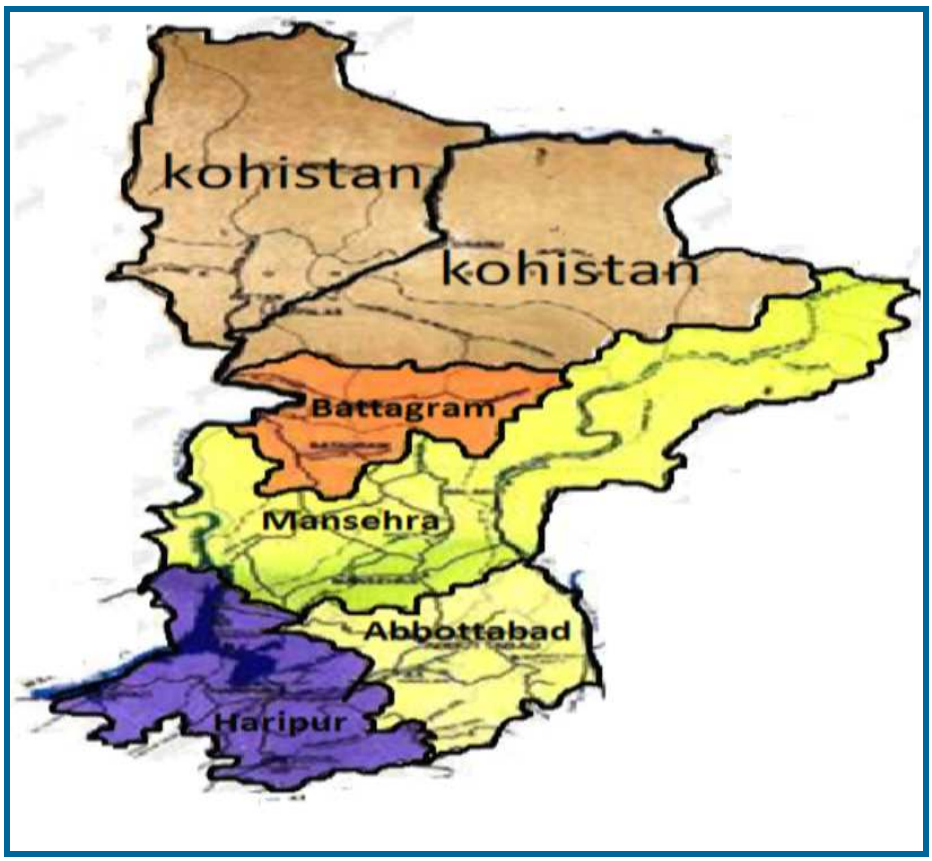
They cause massive destruction to crops in gregarious phases [2].Genus*Calliptamus*was established by Servile in 1831 with type species *Gryllusitalicus* Linnaeus (*Calliptamu sitalicusitalicus*). Currently genus *Calliptamus* includesa total of 15 species and 9 sub-species[3]. It is the genus of grasshoppers which are well known as major pests of pastures and variety of crops in both irrigated and rain-fed areas of Pakistan.

Pakistan provides best geographical conditions and suitable environment for their breeding[4]. *Calliptamusbarbarusbarbarus* shows very distinguishable colorpolymorphism[5].

As the members of subfamily Calliptaminae are considered as the major pests of the range lands as well as economically important crops. So, it is essential to identify them accurately so that diagnosis of economic problem could be properly made. A noteworthy effort on the Orthoptera was carried out by[6,7,8,9,10,11,12,13,14,15] which shows that subfamily Calliptaminae is unsuccessful in getting attention of researchers for many years. It is, therefore, essential to make a critical study on taxonomy and distribution of the species and subspecies in order to bring the knowledge of subfamily Calliptaminae of Pakistan up to date.

2. MATERIALS AND METHODS

The specimens were collected from Hazara division Pakistan, during the year 2016 (Map.1). The terminology of morphological characters used here is adopted from[16,17]. Morphological features were measured with an ocular micrometre and line drawing with aid of a camera lucida attached to a Hund Wetzlar SM33 stereomicroscope. Photographs of the species were taken by a Canon IXY430F digital camera. The measurements are in millimetres.



Map.1 Showing surveyed areas of Hazara Division

3. RESULTS AND DISCUSSIONS

3.1 Taxonomy

Family Acrididae MacLeay, 1821
Subfamily Calliptaminae Jacobson, 1905
Genus *Calliptamus* Serville, 1831
Synonym *Calliptenus* Stål, 1873

Synonym *Caloptenus* Burmeister, 1838
Synonym *Metromerus* Uvarov, 1938
Type species: *Gryllusitalicus* Linnaeus (*Calliptamusitalicusitalicus*)

3.2 Diagnosis

Members of genus *Calliptamus* are medium sized grasshoppers primarily with gray color, having red colored undercuts. Fastigium is rounded, protruding forwards between the probe bases. The pronotumbears a clear center keel. The surface is transversely raised in three beads (sulci). The pronotum has an almost rectangular cross-section with vertically descending sides and flat top. The forebrain (prosternum) bears a distinct, conical cusp. The forewings (tegmina) are always well trained, the animals are airworthy. Depending on the species, they reach over the tip of the hind knee or are slightly shorter, and their shape also varies somewhat according to the species. The wings are transparent (hyaline) or with a broad basal, light red or pink cross binding. The bony legs are large with very strong femora, which on the inner side usually have a drawing of three dark spots, but these can be fused or partially reduced, or reddish brightened. The genus is certainly distinguishable from related genera only in the male sex, even within the genus the females are often not determinable to the species. In the male, the tip of the abdomen is slightly thickened, the ninth and tenth of the tergites are fused. The essential feature of the definition of the genus is the detail of the Aedeagus and its valvets. The Cerci are bent tweezer-like inwardly in supervision; they are three-lobed at the top, the top flap wide and lamellar.

3.3 List of species and sub-species of Genus *Calliptamus* Serville, 1831

S. No	Genus	Species	Sub-species	Author
1		*Abbreviates*		Ikonnikov, 1913
2		*Balucha*		Uvatov, 1938
3		*Balucha*	*balucha*	Uvarov, 1938
4		*Balucha*	*brachypterus*	Drish, 1957
5		*Barbarus*		Costa, 1836
6		*Barbarus*	*barbarus*	Costa, 1836
7		*barbarus*	*cephalotes*	Fischer von Waldheim, 1846
8		*barbarus*	*palaestinensis*	Ramme, 1930
9		*cicatricosus*		Bolívar, 1889
10		*coelesyriensis*		Giglio-Tos, 1893
11		*cyrenaicus*		Jago, 1963
12		*italicus*		Linnaeus, 1758
13	*Calliptamus*	*italicus*	*albotibialis*	Nedelkov, 1907
14		*italicus*	*italicus*	Linnaeus, 1758
15		*madeirae*		Uvarov, 1937
16		*plebeius*		Walker, 1870

17	*plebeius*	*bifasciata*	Krauss, 1892
18	*plebeius*	*plebeius*	Walker, 1870
19	*siciliae*		Ramme, 1927
20	*†strausi*		Harz, 1973
21	*tenuicercis*		Tarbinsky, 1930
22	*testaceus*		Walker, 1870
23	*turanicus*		Tarbinsky, 1930
24	*wattenwylianus*		Pantel, 1896

3.4 Material examined

A total of 421 specimens were collected from 4 districts of Hazara division, KPK, Pakistan. Both male and females specimens were collected. Detail of number of collected specimens with respect to area of collection is shown in Fig. 1.

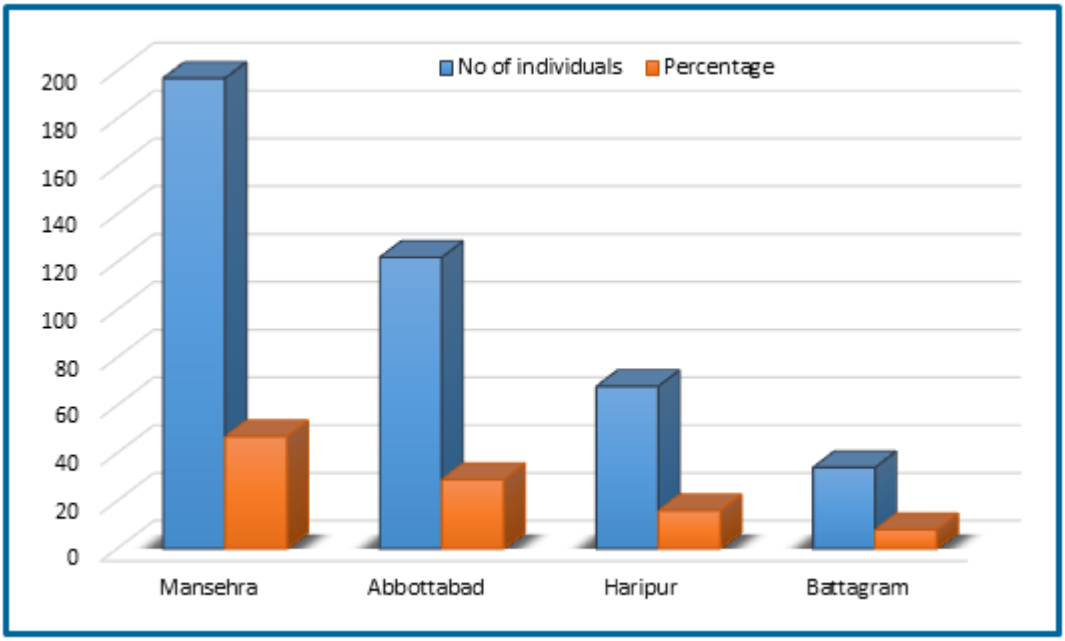


Fig.1. Showing the No. of Individual and Percentage of samples collected from Hazara Division

3.5 Description of Calliptamus barbarus barbarus (Costa, 1836)

Body medium sized to large (17-30 mm) with graycolor, having red colored undercuts. Fastigium is rounded, protruding forwards between the probe bases. The pronotum bears a clear center keel. The surface is transversely raised in three beads (sulci). The pronotum has an almost rectangular cross-section with vertically descending sides and flat top. The forebrain (prosternum) bears a distinct, conical cusp. The forewings (tegmina) are always well trained, the animals are airworthy. Depending on the species, they

reach over the tip of the hind knee or are slightly shorter, and their shape also varies somewhat according to the species. The wings are transparent (hyaline) or with a broad basal, light red or pink cross binding. The bony legs are large with very strong femora, which on the inner side usually have a drawing of three dark spots, but these can be fused or partially reduced, or reddish brightened. Posterior femur possesses inner stripes extending downwards. Males have very long cerci and round-shaped penis. Hind femur on inner surface has most of part in black painted red, with 3 incomplete light bands. Hind tibia is orange red on inner aspect (Fig. 2).

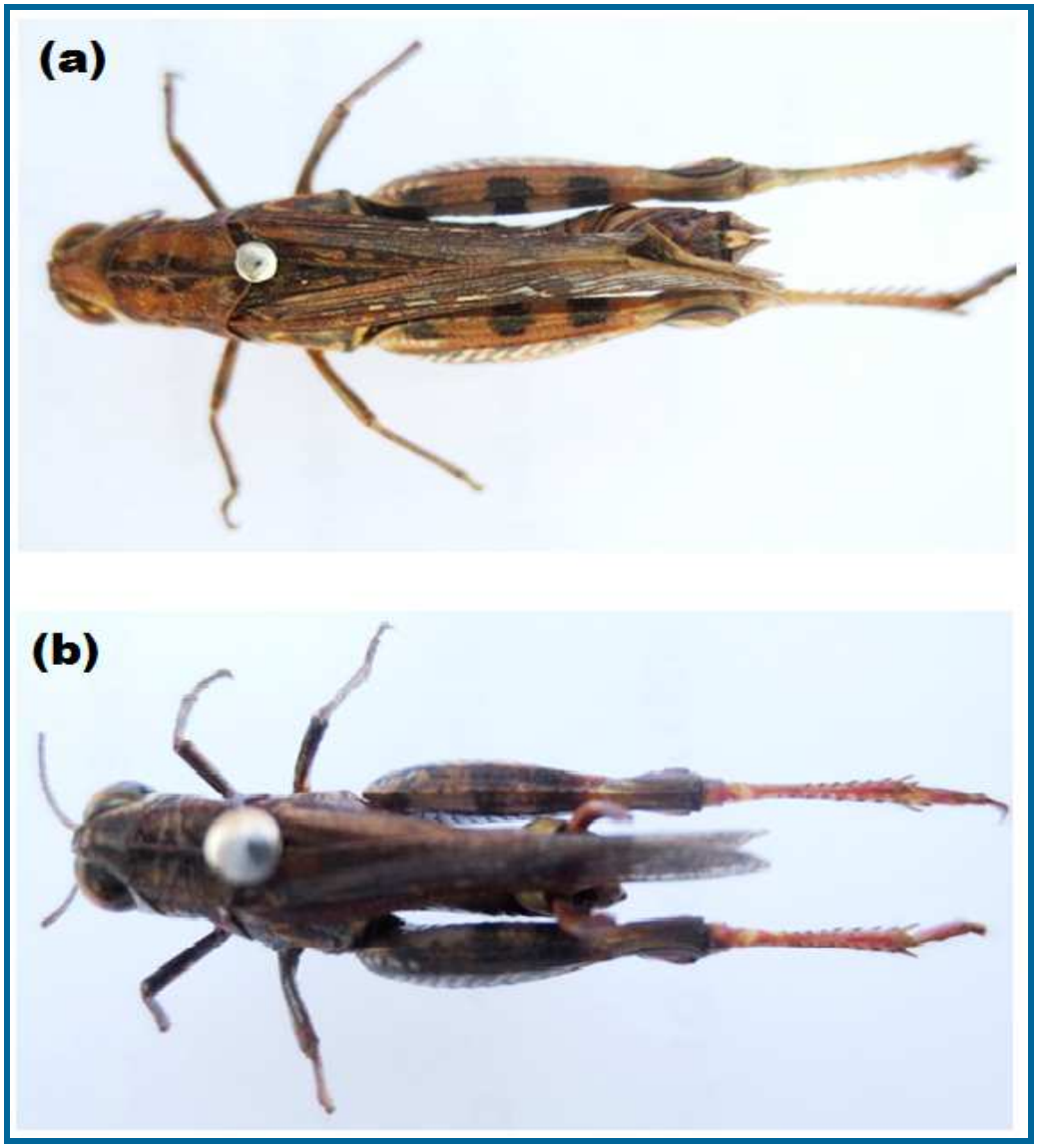


Fig. 2. (a) Habitus Dorsalview Female, (b) Same but Dorsal view Male

3.6 Remarks

This species shows very noticeable colour polymorphism, particularly in South and South East of geographical distribution[15]. This species was recorded by Jago1963 from Baluchistan, whereas from N.W.F.P Yousuf in 1996 recorded same species.Yousuf in 1996 misidentify *C. barbarusmanus*and *C. cephalotes* as a distinct species but according to Jago (1963) defined species are synonymy of *C. barbarous barbarus*. In 2005, Soomro and Wagan described this species from Sindh. During present survey specimens were collected from shrubs, rocky Mountains, steppes, grasses and vegetation of different localities of Hazara division, KP, Pakistan.

3.7 Ecology

C. barbaru sbarbarus inhabits stony areas. Steeps or steep-like slopes. Hazara division is located at north of Pakistan which have unique biodiversity due to the existence of Himalayas. During present investigation several specimens were collected from variety of plantation i.e: *Cynadondactylon*, *Helianthus annus*, *Oryzasativa* (L), *Penicumtergidum* and cultivated lands.

3.8 Worldwide distribution

*C. barbarous barbarus*is globally found in Pakistan, Europe, Italy, Salentina peninsula, Catalonia, Southern Europe, North Africa and Asia.

3.9 Regional distribution

The highest number of samples were collected from district Mansehra i.e. 47% followed by district Abbottabad 29%, Haripur with 16% of collected samples and least number of samples were collected from District Battagram which is 8% of total collected samples.

4. CONCLUSIONS

Present study concludes that the insects belonging to genus *Calliptamus are* important pests of agricultural lands. The present study area is diverse with biodiversity of Orthopteroid insects. Thus, more studies should be conducted in nearer future to record new species.

CONFLICT OF INTEREST

All the authors claim that there is no conflict of interest regarding the publication of this paper.

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