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## Study on the incidences of phaneropterinae from district Jamshoro

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### Abstract

A total of 72 specimens were collected from different localities of Jamshoro during the year 2016-2017, the sites from where I have collected the specimens are: fruit orchards, berry shrubs, grasses, rice fields and trees. The collected material was sorted out into 2 species i.e. *Trigonocorypha unicolor* Stal 1873, *T. angustata* Uvarov 1922 from Jamshoro. Phaneropterinae are also called leaf crickets because they look like leaf and have green color and their wings green color conceal their presence on the leaf. After collecting the material it was preserved at laboratory and lab methods were applied for further process. These findings provide important data regarding Phaneropterinae biodiversity conservation and grassland restoration in Sindh. Present study will also be very useful for the behavioral distribution of this species.

**Keywords:** Phnaeropterinae, distribution, biodiversity, conservation, Leaf crickets, Jamshoro

### Introduction

The Phaneropterinae are the largest winged katydids <sup>[1]</sup>. The grasshopper insect fauna generally are grouped as short-horned grasshopper (Caelifera) and long-horned grasshopper (Ensifera) <sup>[2, 3]</sup>. The phaneropterinae insect fauna of Jamshoro is very insufficiently known. It is thus not surprising that intensifying the research on the Phaneropterinae fauna of Jamshoro reveals many new taxa. The name phaneropterinae is derived from the old world genus phanoptera meaning 'visible wings' refer to the exposed tip of the inner wings <sup>[4, 5]</sup>. The phaneropterinae are leaf crickets whose head is rounded, face is short but not flattened and slanted. The Phaneropterinae differentiate in their legs in every genus, but they have similarity in front and middle ones, but the hind legs are much larger than front and middle legs. The ovipositor and male genitalia differ from each other depending on genus <sup>[6]</sup>. The katydids live their lives in shrubs and trees and are arboreal in habitat. The Phaneropterinae are phytophagous, they feed on the leaves. The Phaneropterinae cause much danger when they are in large number particularly tender wings is much nocuous. The Phaneropterinae have camouflage behavior that's why they are noticed seldom. They live solitary life and are nocturnal. The Phaneropterinae have mimicry behavior of defense mechanism in which they camouflage of the surrounding environment and objects present in their habitat <sup>[7, 8]</sup>. Sometimes they adopt the color morphs to protect themselves from the aerial and ground predators and they go deep inside the thick vegetation above from the ground and below from the height of the host plant to defense themselves from the aerial predators. Many authors carried work on Caelifera of Sindh e.g. <sup>[9, 10]</sup> but no attention has been paid to long-horned grasshopper Ensifera. As some of the species belonging to phaneropterinae are important pests of agricultural crops <sup>[6, 11]</sup>.

### Material and Methods

#### Sampling

The specimens of the grasshopper were collected from the different localities of Jamshoro, the material were collected from rice, sugarcane field, fruit orchards, berry, herb, sherb and grasses. All the specimens were captured by insect net and hand picking. All the specimens were collected during the year 2016 – 2017 from August to December. Collected specimens were brought to the laboratory for further analyzed.

#### Killing and Preservation

All the collected material of sub family Phaneropterinae was killed and sorted by the methods of killing and preservation of specimens given by <sup>[12, 13]</sup>.

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The collected material was brought to the laboratory with care and then potassium cyanide (KCN) was used for just 15-20 minutes this usage of potassium cyanide may retain the original color of the specimens. The original color would also be helpful for the identification of the specimen during the further observation after preservation. These specimens were analyzed by Stereoscopic Dissecting Binocular Microscope (SDBM) KYOWA TOKYO NO.884443 (JAPAN) by the identification process of the specimens we easily classified them into different generic groups i-e; subfamilies, tribes, genera and species.

After analyses of the specimens, the adult specimens were pinned on stretching board and their different body parts i-e wings and tegmina whether stretched or not on the stretching board for 24 hours. These body parameters helped out in displaying taxonomic characters and variations in each specimen. The examination of the specimens was followed according to the given entomological methods. The stretched wings and tegmina were covered by the hard sheet by pinning 2-3 insect pins on the edges of the hard sheet. This whole process was carried out with full care and attention. If there were some sorts of dirt and extra material on the specimens were cleaned by using the camel brush (No. Zero). After full drying of the specimens left for 24 hours were moved to the into the insect cabinets and these specimens were labeled using the name of collector, place from where it was collected, date, day, time and host plant. For any risk of damaging to the specimens from the predators, naphthalene balls were kept inside the insect box.

#### Identification of the samples

All the specimens preserved in the insect boxes were examined thoroughly under the stereoscope dissecting

binocular microscope (OLYMPUS, SZX7, SZ2-ILST). All the entomological methods were applied for the identification including keys description mentioned in different books, papers, articles by different scientist, photographs and synonymy. The Orthoptera Species File (<http://www.orthoptera.org>) version 5.0/ 5.0 was also used for the examination of the specimens.

The further procedure consists of drawing line and measurement of the different body parameters of the specimens. Drawing of the different body parameters were drawn on "Ocular Square Reticule" (mostly in 2X magnification) which is in one eyepiece of binocular microscope. Body parameters were measured in millimeters (mm), scales, divider and ocular square reticules.

#### Depository

All the collected material was positioned at Sindh Entomological Museum (SEM) Department of Zoology, University of Sindh, Jamshoro, Pakistan.

#### Statistical analysis

The collected data was analyzed by software (SPSS) version 16.0. These tests were carried out to compare the mean of different body parameters of the specimens.

#### Results

During the present study a total of 72 specimens were collected and sorted out into 2 species namely *Trigonocorypha unicolor* and *T. angustata* for which identification keys are given below

#### Key to the tribes of Phaneropterinae occurring in Sindh

1	Pronotum with lateral carinae serrate like straight & saw like tegmen broad.....	<i>Trigonocoryphini</i>
-	Not as above.....	2
2	Male cerci long & curved.....	<i>Phaneropterini</i>
-	Male cerci short & curved.....	3
3	Ovipositor shorter than pronotum.....	<i>Holochlorini</i>
-	Ovipositor longer than pronotum.....	4
4	Fastigium of vertex widened anteriorly.....	<i>Isopserini</i>
-	Fastigium of vertex conical, narrow than scapus.....	<i>Himertulini</i>

#### A. *Trigonocorypha unicolor* Stal, 1873

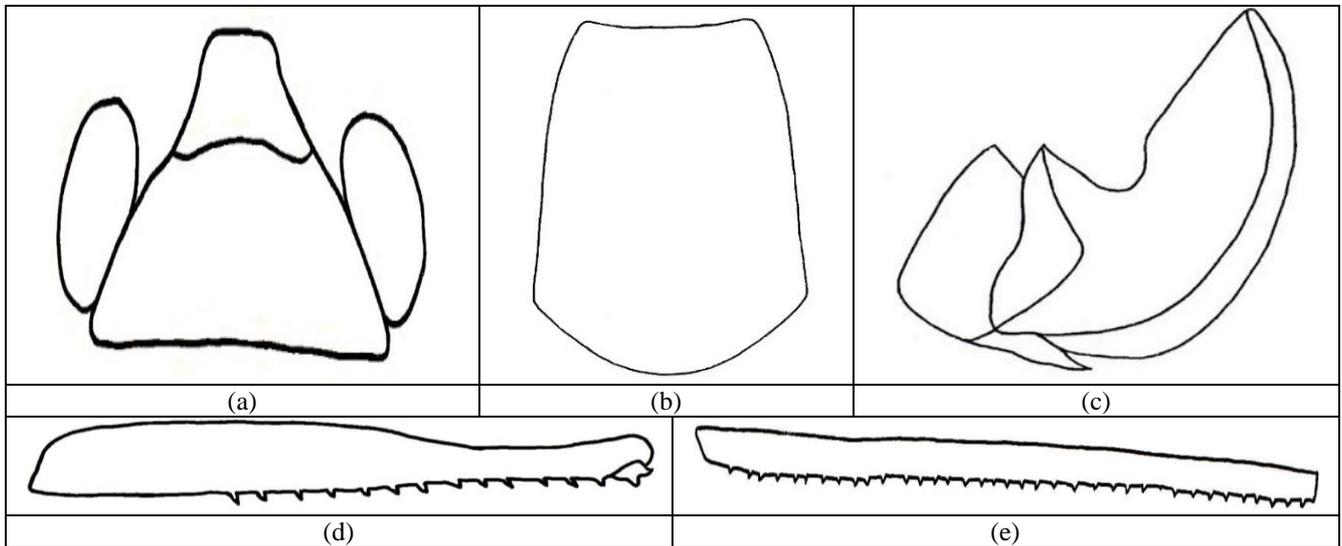
##### General characters

Body was large and green in color. Fastigium inverted below, triangular and wide posteriorly than antennal pedicel and pointed anteriorly near the frontal apex, upper side has grooves. Eyes were broad, oval and slightly bulging outward. Pronotum was flat and has slightly concave disc, rounded posteriorly, lateral lobes were flat and vertical, form distinct angle with disc, humeral notch was slightly deep and sharp. Tegmina was densely compact, leathery and wide at the

middle anteriorly. Wings were larger than the tegmina and had transparent veins. All femora were almost flat at the lower side and had inconspicuous groove. Fore-coxae had small spinules, both tympanal openings were oval, membranous and outward. Mid-tibiae had spinules on inner margin. Hind femora contained spinules on lower side of both margins. Cerci in male was elongated and curved, whereas cerci in female was small with tiny hair, ovipositor was short, much flattened and had fine serration on entire upper and lower apical margin.

**Table 1:** Showing measurement of various body parts *T. unicolor*

Parameters	Male (n=5)	Female (n=5)
	Mean ± SD	Mean ± SD
Length of Head	1.83 ± 0.34	1.70 ± 0.28
Length of Pronotum	6.06 ± 1.84	6.70 ± 0.64
Difference between eyes	1.99 ± 0.14	2.27 ± 0.29
Length of Tegmen	42.33 ± 1.75	48.16 ± 2.71
Length of Wing	47.16 ± 2.78	51.5 ± 1.64
Length of Femur	17.5 ± 9.79	24 ± 7.87
Length of Tibia	19.33 ± 10.32	27.16 ± 8.97
Length of Ovipositor	-----	5.48 ± 0.68
Total body Length	25.83 ± 3.31	30.16 ± 1.47



**Fig 1:** *T. unicolor* Female: Adult, a, head, b, Pronotum, c, ovipositor, d, femur, e, tibia (Bar line = 4mm)



**Fig 2:** *Trigonocorypha unicolor* (♂) (a), (♀) (b) Dorsal view (♂) (c) (♀) (d) Lateral view

**Remarks**

*Trigonocorypha unicolor* was first time reported from the different localities of Jamshoro. It was entirely seen different from other species on the basis of its typical structure of pronotum. It spent a long time of day at thick vegetation of trees and shrub leaves, its favorable time for reproduction and other activities at night time. *Trigonocorypha unicolor* specie were fully active at night time. Earlier Riffat *et al.*,<sup>[14]</sup> collected 7 male and 9 female from Jamshoro. At present fair number of the species was collected from this region.

**B. *Trigonocorypha angustata* Uvarov, 1922**

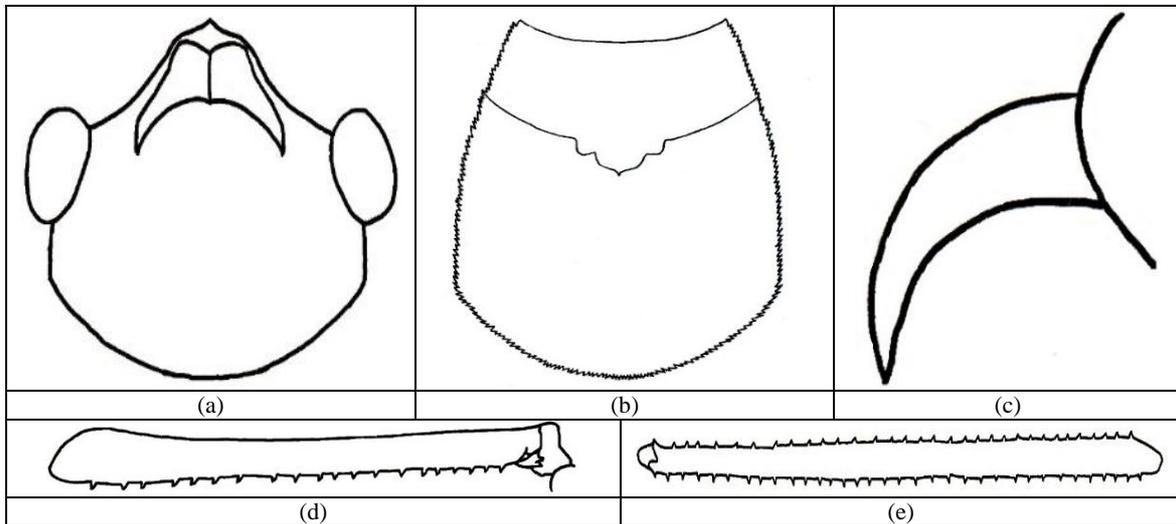
**General characters**

Body color green and yellowish green. Fastigium had triangular shape and middle sulcus was deep and wide and anterior margin was slightly sinuate. Pronotum was flat anteriorly and concave posteriorly. Tegmen was much larger than hind knees of hind femora and had pale band at basal part and wide posteriorly, maximum width slightly exceeded than pronotal length. Wings were larger than tegmen. Outer margin of fore tibiae had only apical spines and usually spines were adjacent to the tympanal organs. On the contrary, there

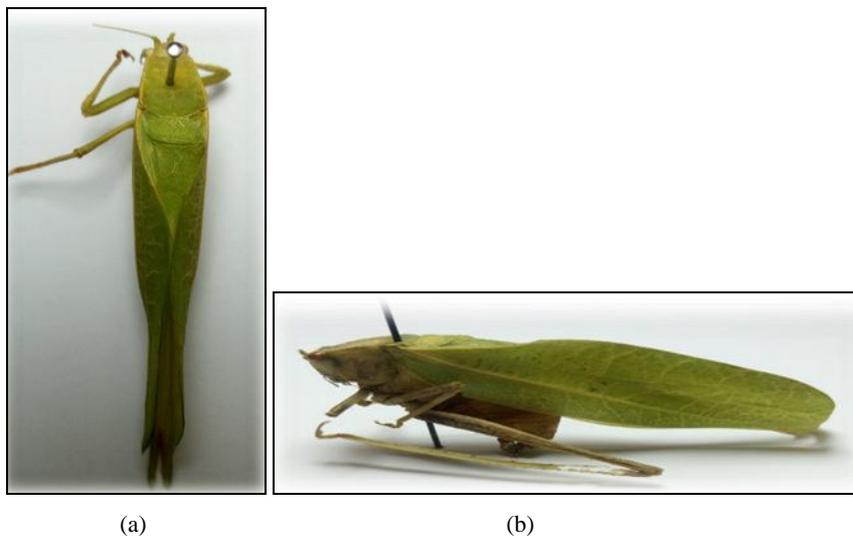
were several small spines at inner margin on lower side. Male last abdominal tergite had small nick at outer side. Male cerci is slightly curved, curved and narrow at apical part. It reached to the apex of sub-genital plate. Female cerci had bend, conical posteriorly and narrow slightly at inner side.

**Table 2:** Showing measurement of various body parts *T. angustata*

Parameters	Male (n=5)
	Mean ± SD
Length of Head	1.63 ± 0.40
Length of Pronotum	5.48 ± 1.32
Difference between eyes	1.75 ± 0.35
Length of Tegmen	37.33 ± 5.85
Length of Wing	42.33 ± 6.80
Length of Femur	16 ± 6.92
Length of Tibia	19 ± 8.71
Total body Length	23.66 ± 3.05



**Fig 3:** *Trigonocorypha angustata* male: Adult, a, head, b, Pronotum, c, femur, d, tibia, cerci (male) (Bar line = 4mm)



**Fig 4:** *Trigonocorypha angustata* (♂) (a) Dorsal view (b) Lateral view

**Remarks**

*Trigonocorypha angustata* was smaller in size, it was quite possible that the collected specimens might be the subspecies, but at this stage little bit confused was noticed that the holotype was not seen. Therefore this specie was not separated as sub-specie or specie. This specie was first time

described by Uvarov and he found a single female from Persian Gulf, while Bei-Bienko found 2 males and 1 female from Southern Iran. Furthermore [15] described that *T. angustata* had much narrow tegmina along with a slight notch beyond the middle of anterior margin, after my study I'm also agreed with these observations.

**Table 3:** Distribution of specimens in different localities of District Jamshoro

Species	Jamshoro	Manjhand	Kotri	Sehwan	T. B. Khan	Total
<i>Trigonocorypha unicolor</i>	08	05	04	07	06	30
<i>T. angustata</i>	04	03	02	02	05	16

**Table 4:** Showing the comparative diagnostic features of species occurring in Sindh

Parameters	<i>Trigonocorypha</i>
Fastigium	Fastigium was wide, triangular and wide at basal part
Pronotum	Pronotum was conspicuous straight with flat disc and deep humeral notch.
Wings	Wings were shorter or larger than the tegmen,
Tegmen	Tegmen were wider or fully narrowed at the apex.
Femur	Femur almost flat on lower side with transparent veins
Tibia	Tibia was un-cylindrical and had flat and oval openings of the tympanal organs
Body Length	<i>Trigonocorypha</i> body was large

**Discussion**

Phaneropterinae are phytophagous and they are the agricultural pest of different crops [16, 17, 18, 19, 20]. Phaneropterinae species have ecological association with forest, sugarcane, rice herb, grasses and biocenoses and they are much nocuous to the shrub and herbs. Many species have same characters like shape and color and their color resembles to the color of leaf. Phaneropterinae species have mimicry behavior of defense mechanism i-e: *Trigonocorypha unicolor*, Stal, 1873, *T. angustata*, Uvarov, 1922, *Hexacentus pusillus* Redtenbacher, 1891 and *H. unicolor* Serville, 1831. Keen study was carried out by [21] his findings suggests that the species *Phaneroptera roseata* Walker. Phaneropterinae are commonly called katydids and they are cosmopolitan in

habitat <sup>[22]</sup>. The more extensive study on Phaneropterinae may suggest new species and data <sup>[23]</sup>. During the present study my findings about the Phaneropterinae have the resemblance of the characters that are mentioned above by the different scientist which helps to identify their abundance in district Jamshoro for the first time and their impact on the agricultural crops i.e rice, sugarcane fields, fruit orchards, berry and grasses.

### Conclusion

The Phaneropterinae are the phytophagous insect. They are widely distributed in the different fields of district Jamshoro. Phaneropterinae belongs to the family Tettigoniidae. Every genus have their own characters, and every species have their own distinguishable characters. Some characters are somehow similar to each other. Each species have different body size. Phaneropterinae species usually feed on fresh leaves. Phaneropterinae are nocturnal they do their activities at night time especially their reproduction time is at night. The agricultural crops where they are abundantly found are: rice fields, sugarcane fields, wheat, fruit orchards, berries, herbs, shrubs and bushes.

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