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Study on taxonomy of Hexacentrinae Karny, 1925 (Orthoptera: Tettigoniidae) from Pakistan

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Abstract

The present study was based on collections containing members of the little studied subfamily Hexacentrinae Karny, 1925. A single genus *Hexacentrus* Serville, 1831 with 2 species i.e. *Hexacentrus unicolor* Serville, 1931 and *Hexacentrus pusillus* Redtenbacher, 1891 were came in collection during the year 2014. Hexacentrinae may be a sister group of Conocephalinae due to reason that majority of representatives of subfamilies Hexacentrinae and Conocephalinae having significant similarities in their hind wings venation. Beside this, its predatory mode of life makes the association with other subfamilies such as Tympanophorinae, Listrosclidinae, and Saginae. It was found that all the species of *Hexacentrus* live in the thick vegetation at the present we have reported single male and female. Our further study with more material will confirm this real status.

Keywords: Hexacentrinae, taxonomy, ecology

1. Introduction

The katydid family Tettigoniidae consists of more than 6500 species in 19 existing subfamilies, 74 tribes and 1193 genera^[1]. The katydids belonging to subfamily Hexacentrinae are commonly recognized as fierce katydids and occur in the Asia, Pacific and Central Africa. Karny^[2] incorporated some genera considered now within Hexacentrini in the subfamily Listrosclidinae because of analogous predatory adaptations of these taxa. Subsequently he put these genera in a special subfamily Hexacentrinae (Karny, 1925)^[3]. However, in the subsequent publications^[4, 5], the name Hexacentrinae was omitted (these authors actually incorporated these genera in Listrosclidinae). Gorochov^[6] observed that the venation of hind wings in the genus *Hexacentrus* A.-Serv. is nearly identical to that of 5 tribes of Conocephalinae: Conocephalini, Agraeciini, Copiphorini, Salomonini, and Coniungopterini. This resemblance sustained by the fusion of short parts of veins i.e. MA and CuA at the base of hind wings. The true Listrosclidinae with well-developed wings (*Listrosclis* A.-Serv., *Monocerophora* Walk.) have a much more primitive type of the hind wing venation. These characters led Gorochov^[7] to the belief about possible belonging of *Hexacentrus* to a separate tribe of Conocephalinae. These remarkable differences in the hind wing venation of Hexacentrini and Listrosclidinae were overlooked in the book by Rentz^[8]. He incorporated Hexacentrini jointly with the tribes Terpandrini, Phisidini, Requenini, and Conocephalomimini in Listrosclidinae. The structure of hind wings and tarsi in Terpandrini is very similar to that of Saginae (not in Listrosclidinae), so that Terpandrini as well as Sagini and Austrosaginae sensu Rentz^[9] probably fit in to the same subfamily (Saginae). The structure of body and stridulatory apparatus in Phisidini is analogous to that of Meconematinae. There is also a certain relationship of Phisidini and some of Meconematinae in the mode of life and structure of tympana^[6]. This similarity suggests that the Phisidini is a tribe of Meconematinae or a separate subfamily most linked to Meconematinae. The systematic location of Requenini and Conocephalomimini is not clear; these groups are in requiring of additional study. Gorochov^[10] illustrated *Ecuaneduba*, a new Neotropical genus with indistinct systematic position. He evaluated it with the most similar subfamilies and found that this genus has some similarity to *Hexacentrus* "in the shape of pronotal disc and presence of finger-like processes on male paraprocts". But he stated that "addition of the new genus in Hexacentrini is problematic, as the absence of upper spines on fore tibiae is characteristic of Hexacentrini as well as of the majority of Conocephalinae, and one must suppose parallel loss of these spines in different branches of Conocephalinae or autonomous restoration of them in *Ecuaneduba* (absence of close association between Conocephalinae and Hexacentrini)".

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Additional revision proved that the latter belief is probably correct, as all considered genera of Hexacentrini are characterized by the presence of processes or lobules on the male paraprocts, and most of them have a flat and rather wide hind lobe of pronotum analogous to that of *Ecuaneduba*. It is fascinating that the structure of this lobe in imagines and nymphs of *Ecuaneduba*, *Hexacentrus*, and perhaps some other genera of Hexacentrini is special. Therefore, *Ecuaneduba* probably belongs to Hexacentrini, which must be regarded as a separate subfamily (it may be a sister group of Conocephalinae, as the majority of representatives of Hexacentrinae and Conocephalinae have analogous venation of hind wings, but with independent both the forming of "costal lobe" and fusion of parts of MA and CuA). Their predatory mode of life and some connected characters might be conserved from predatory ancestors, which also gave established to many primitive predatory subfamilies (Listrosclidinae, Tympanophorinae, and Saginae) from the stem of the group of subfamilies related to Tettigoniinae [6]. This subfamily consists of the genera *Hexacentrus* Audinet-Serville, 1831, *Parateuthras* Bolivar, 1905, *Teuthroides* Bolivar, 1905, *Parahexacentrus* Karny, 1912, *Euhexacentrus* Hebard, 1923, *Glenophisis* Karny, 1926, *Aerotegmina* Hemp, 2001, *Alison* Rentz, 2001, *Ecuaneduba* Gorochov, 2006, and possibly *Poecilomerus* Karny, 1907 [26]. The present study was aimed to explore the Hexacentrinae fauna of this region.

2. Material and Methods

2.1 Collection, killing & preservation

The adult *Hexacentrus* were collected from meadow grass with mixed vegetation in the immediate surroundings with the help of insect hand-nets and for killing and preservation of specimens, the standard entomological methods described by [11-19] is adopted for all collected species. The samples were collected during the year 2014 from Mansehra and Quetta Pakistan.

2.2 Identification

Identification of specimens was carried out under a stereoscopic dissecting binocular microscope (OLYMPUS SZX7, SZ2-ILST) with the help of keys and descriptions available in the scientific literature. For identification was carried out by adopting method of Gorochov [26].

3. Result and Discussion

3.1 Tribe Hexacentrini

Head narrow, mandibles simple, moderately long and without distinct sexual morphism. Generally green in color with a special dark or light brown coloured bands covers the pro, meso and meta thorax including tegmina. Fastigium of vertex narrow, conical, apex acute. fully developed surpassing the hind knees. Hind wings caudate. Anterior coxa without spine, anterior femur slightly compressed. Knee lobes of pro and meso femur smooth without spines. Cerci conical, apex pointing. Subgenital plate triangular with a slight medial furrow apex obtuse.

3.2 *Hexacentrus* Serville, 1831

Hexacentrus piura Walker, 1869

Hexacentrus tedla Walker, 1869

Type species: *Hexacentrus unicolor* Serville, by subsequent designation (Fig.1-2)

Diagnosis: Head narrow, mandibles simple, moderately long and without distinct sexual morphism. Generally green in

color with a special dark or light brown coloured bands covers the pro, meso and meta thorax including tegmina. Fastigium of vertex narrow, conical and apex acute. Wings fully developed surpassing the hind knees. Genital plate with elongate or short, comparatively narrow distal part sometimes widened at apex. Cerci conical, apex pointing.

3.3 *Hexacentrus unicolor* Serville, 1931

Hexacentrus plantaris Burmeister, 1838

Hexacentrus sellata (Walker, 1869)

(Fig.1 a-e)

Diagnostic features: General coloration green with a special dark or light brown colored bands covers the pro, meso and meta thorax including tegmina (Fig.1 a,c). Fastigium of vertex narrow, conical, apex acute. Pronotum longer than broad, disconcave in anterior and posterior part (Fig.1 b, d). Anterior margin of paranota rounded and posterior margin angulated, three sulci present on the disc, upper "U" shaped, middle transverse, straight and lower inverted "U" shaped (Fig.1 e). Pro, meso and meta sternum provided with a pair of spike like processes. Tegmina fully developed surpassing the hind knees, radius sector branching at hind portion of tegmina, forked, stem of RS with 03 branches (Fig.1 a). Hind wings caudate. Anterior coxa without spine, anterior femur slightly compressed. Knee lobes of pro and meso femur smooth without spines. Legs with following number of spines opposing on ventral margins; pro and meso femur smooth without spines, left pro tibia with six long external and five long internal spines, right protibia with five long external and six long internal spines, meso tibia with six long external and five long internal spines, hind knee lobes with a spine on each side, hind femora with widely spaced big spines and between them lie small spine, hind tibia with small spines on dorsal and ventral face externally and internally. Epiproct triangular, apex obtuse. Cerci conical, apex pointing. Subgenital plate triangular with a slight medial furrow apex obtuse.

Table 1: Showing the measurement of various body parts of *Hexacentrus unicolor*

Body Parameters	Male (n=01)
Length of pronotum	9mm
Length of tegmina	35mm
Length of femur	22mm
Length of tibia	23mm
Total body length	25mm

Material Examined: Mansehra 9.iv.2014 1 ♂ 34.333°N 73.200°E (Riffat. S. & Waheed A.P)

3.4 Remarks: The specimen at hand agrees with the revision given by Redtenbacher [20] and Heller [21]. Further, Ingrisch and Shishodia [22] reported 1 male and 1 female from India. While Tan [23] reported 1 male 1 female of this species from Bedok South, Singapore. More recent Tan *et al.* [24] while studying the Tettigoniodea population of Parks in Singapore stated that the Parks were with thick vegetation and having maximum population of *Hexacentrus* species. At the present single male of this species has been reported from Pakistan.

3.5 Ecology: This species is a typical species of extensive, fine pastures with a variety of elevated growing and stumpy growing plantation. It is found above sea level among dunes (valleys) in mountainous environments. The surrounding plantations were roofed by *Desmostachya-Brachiaria cynodon* was found leading over this habitat. Additionally,

these valleys were surrounded of diverse plant communities i.e. *Achyranthus aspera*, *Alhagi maurorum*, *Dactyloctenium aegypticum*, *Cenchrus ciliaris* and *Cynodon dactylon* species.

3.6 *Hexacentrus pusillus* Redtenbacher, 1891

Salomona sigma Redtenbacher, 1891

(Fig.2 a-e)

Diagnostic features: Generally green in color with dark brown bands covers the pro, meso and meta thorax including tegmina (Fig.2 a,c). Size moderate; head dorsoventrally elongated, weakly slanting (Fig.2 e). Fastigium of vertex narrow, triangular, dorsal surface with sulcus indicated only by light brown color. Pronotum with disk not expanded dorsally, lateral lobes of pronotum well developed, surface irregular somewhat rugose (Fig.2 b, d). Tegmina longer than the total body length. Tibia with minute spurs. Cerci conical somewhat decurved at apex. Subgenital plate narrow apically, ventral surface with broad, longitudinal apical sulcus.

Table 2: Showing the measurement of various body parts of *Hexacentrus pusillus*

Body Parameters	male (n=01)
Length of pronotum	8mm
Length of tegmina	34mm
Length of femur	25mm
Length of tibia	24mm
Length of ovipositor	--
Total body length	22mm

Material Examined: Quetta 6.v.2014 1 ♂ 30°11'N 67°00'E (Riffat. S. & Waheed A.P)

3.7 Remarks: Hollier ^[25] reported 2 males and 1 female from Java. The species of *Hexacentrus* studied generally agrees with description of Redtenbacher ^[20]. At the present a single male is recorded for the first from this region.

3.8 Ecology

During the field analysis it has been monitored that *Hexacentrus pusillus* entirely feed in cultivated field. These fields were led by the *Cynodon dactylon*, *Dactyloctenium aegypticum*, *Cenchrus ciliaris* and *Demostachya-Brachiaria* species. Present study proposed that these grasses might be having superior level of moisture that attracts these species.

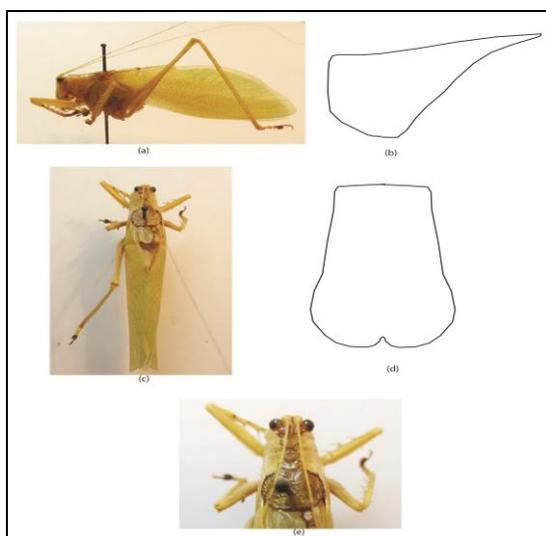


Fig 1: *Hexacentrus unicolor* a-e male; a adult LV, b Pronotum LV, c adult DV, d Pronotum DV, e Head & Pronotum DV (Key: LV=lateral view, DV=dorsal view)

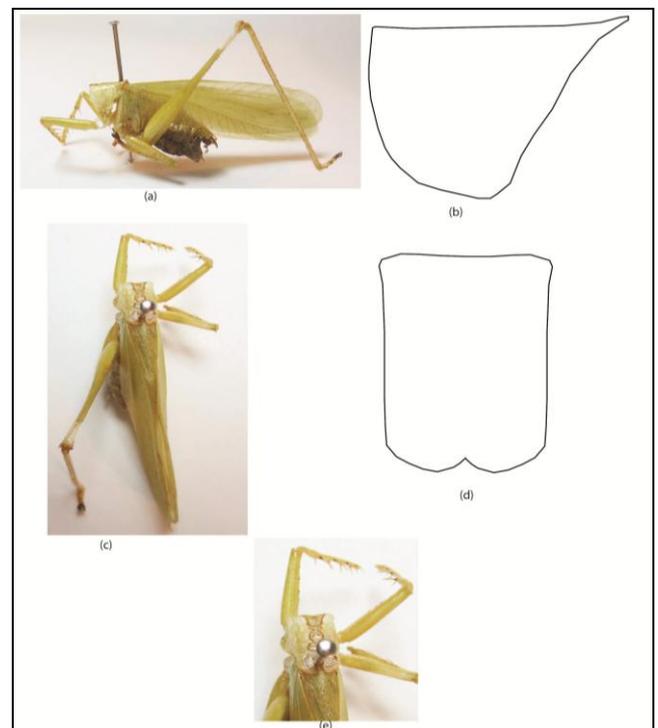


Fig 2: *Hexacentrus pusillus* a-e male; a adult LV, b Pronotum LV, c adult DV, d Pronotum DV, e Head & Pronotum DV

4. Conclusion

The present study concludes that Katydid belonging to genus *Hexacentrus* needs more attention worldwide including Pakistan and very less is known about this beautiful creature if more surveys of the region carried out in nearer future may result in finding of more species of this subfamily from this region.

5. Acknowledgment

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6. References

1. Cigliano MM, Braun H, Eades DC, Otte D. Orthoptera Species File Online. Version 5.0/5.0., 2017.
2. Karny HH. Orthoptera. Fam. Locustidae. Subfam. Listroscolidinae. *Genera Insectorum*. 1912; 131:1-20, Taf.1-3.
3. Karny HH. List of some katydid (Tettigoniidae) in the Sarawak Museum. *Sarawak Mus. J.* 1925; 8:35-53
4. Rentz DCF. Comments on the classification of the Orthopteran family Tettigoniidae, with a key to subfamilies and description of two new subfamilies. *Aust. J. Zool.* 1979; 27:991-1013.
5. Kevan DK, McE. Orthoptera. In: Parker, S.P. (ed.). *Synopsis and classification of living organisms*. pls 109-116. McGraw-Hill Book Comp., New York. 1982; 2:352-379.
6. Gorochov AV. System and evolution of the suborder Ensifera (Orthoptera). Part 1. *Trudy Zool. Inst. Ross. Akad. Nauk*, (In Russian), 1995a; 260:1-224.
7. Gorochov AV. On the systematic position of the genera *Arachnoscelis*, *Poecilomerus*, and *Parateuthras* (Orthoptera: Tettigoniidae). *Zoosyst. Ross.*, 1994, 1995b; 3(2):202.
8. Rentz DCF. Tettigoniidae of Australia. The

- Listroscolidinae, Tympanophorinae, Meconematinae and Microtettigoniinae. CSIRO, Collingwood, 2001; 3:524.
9. Rentz DCF. Tettigoniidae of Australia, The Austrosaginae, Zaprochilinae and Phasmodinae. CSIRO, East Melbourne, 1993; 2:386.
 10. Gorochov AV. A new katydid genus of unclear systematic position from Ecuador (Orthoptera: Tettigoniidae). Zoosyst. Ross. 2006; 15(1):47-50.
 11. Vickery VR, Mce Kevan DK. A monograph of the Orthopteroid insects of Canada and adjacent regions. Mem. Lyman ent. Mus. Res. Lab. 1983; 13(I):i-xxii, 1-679.
 12. Panhwar WA, Sultana R, Wagan MS, Khatari I, Kumar S. Systematic study on the various Tribes of Phaneropterinae (Tettigonioidae: Orthoptera) occurring in Pakistan. Pakistan Journal of Zoology. 2014; 46(1):203-13.
 13. Panhwar WA, Sultana R, Wagan MS, Kumar S. On the distribution and taxonomy of Conocephalus species (Orthoptera: Tettigonioidae: Conocephalinae) from Pakistan. Journal of Biodiversity and Environmental Sciences. 2013; 3(11):171-6.
 14. Panhwar WA, Sultana R, Wagan MS, Wagan YS, Kumar S, Solangi FH. Taxonomy and Ecology of Genus Euconocephalus Karny, 1907 (Orthoptera: Tettigonioidae: Conocephalinae) from Pakistan. International Journal. 2014; 2(2):268-77.
 15. Sultana RI, Wagan MS, Panhwar WA. Distribution and incidence of Tettigonioidae (Ensifera) Orthoptera from Sindh Pakistan. Pakistan Journal of Entomology. 2012; 27:117-22.
 16. Sultana R, Panhwar WA, Wagan MS. Description of New Species of Tettigonia (Tettigoniinae: Orthoptera) from Pakistan. Pakistan Journal of Zoology. 2015; 47(5).
 17. Sultana R, Panhwar WA, Wagan MS. Key to the Tribes and Genera of Tettigonioidae (Orthoptera) of Pakistan. Pakistan Journal of Zoology. 2017; 49(3):1127-30.
 18. Panhwar WA, Sultana R, Wagan MS. Taxonomy of genus Decticus Serville, 1831 (Decticinae: Tettigoniidae: Orthoptera). Journal of Entomology and Zoology Studies. 2017; 5(2):1100-1104.
 19. Sultana R, Panhwar WA, Wagan MS, Khatri I. Systematic status of true katydids Sathrophyllia (Orthoptera, Tettigonioidae, Pseudophyllinae) from Pakistan, with description of two new species. Zoo Keys. 2014; (466):1.
 20. Retdenbacher J. Monographie der Conocephaliden. Verh. zool. bot. Ges. Wien. 1891; 41:315-362, 1.3-4
 21. Heller KG. Warm-up and stridulation in the bush cricket, *Hexacentrus unicolor* Serville (Orthoptera: Conocephalidae: Listroscolidinae).- J. exp. Biol. 1986; 726:97-109
 22. Ingrisich S, Shishodia MS. New species and records of Tettigoniidae from India (Ensifera). Bull. De-La. Soc. Ent. SUISSE. 1998; 71:355-373
 23. Tan MK. The Copiphorini (Orthoptera: Tettigoniidae: Conocephalinae) in Singapore. Nat. Sing. 2011; 4:31-42.
 24. Tan MK, Ngiam RWJ, Ismail MRB. A Checklist of Orthoptera in Singapore Parks. Nat. Sing. 2012; 5:61-67.
 25. Hollier J. An annotated list of the Orthoptera (Insecta) species described by Henri de Saussure, with an account of the primary type material housed in the Muséum d'histoire naturelle de Genève, Part 1: Tridactyloidea. Revue suisse de Zoology. 2012; 119:149-160.
 26. Gorochov AV. Notes on taxonomy of the subfamily