

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2023): 5.29
IJABR 2026; SP-7(2): 59-63
www.biochemjournal.com
Received: 10-09-2023
Accepted: 15-10-2023

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Taxonomic studies on *Pyrgomorphidae* (Orthoptera: *Caelifera*: *Pyrgomorphoidea*) from Telangana, India

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DOI: <https://www.doi.org/10.33545/26174693.2023.v7.i2Sa.9212>

Abstract

The family *Pyrgomorphidae* represents an ecologically important group of short-horned grasshoppers distributed throughout tropical and subtropical regions. Despite their diversity and agricultural importance, comprehensive taxonomic information on pyrgomorphid grasshoppers from Telangana remains limited. The present study was undertaken to document the taxonomy, distribution, diagnostic characteristics and morphometric variation of pyrgomorphid species occurring in different agro-climatic zones of Telangana. Extensive field surveys were conducted during 2020–2021 in cultivated fields, grasslands and adjoining natural habitats across northern, central and southern Telangana. Specimens were collected using sweep nets and hand picking, preserved following standard entomological procedures and examined under stereoscopic microscopes. External morphology, morphometric characters and diagnostic features were studied using standard taxonomic keys and available literature. The investigation recorded two subfamilies, four genera and four species of *Pyrgomorphidae*, namely *Atractomorpha crenulata crenulata* (Fabricius, 1793) [14], *Chrotogonus trachypterus trachypterus* (Blanchard, 1836), *Poekilocerus pictus* (Fabricius, 1775) and *Neorthacris acuticeps acuticeps* (Bolívar, 1902). Diagnostic descriptions, synonymies, material examined, distributional records, morphometric observations and remarks are provided for each species. *Atractomorpha crenulata crenulata* was found to be the most widely distributed species across all three agro-climatic zones, whereas *Neorthacris acuticeps acuticeps* showed a comparatively restricted distribution. Detailed measurements revealed considerable sexual dimorphism in body size and appendage length among the recorded taxa. The present investigation contributes updated distributional records and diagnostic information for *Pyrgomorphidae* from Telangana and provides a baseline for future taxonomic, ecological and biodiversity studies on grasshoppers in peninsular India.

Keywords: Acridoidea, *Pyrgomorphidae*, taxonomy, morphology, grasshopper, Telangana, distribution, orthoptera

Introduction

Grasshoppers belonging to the order Orthoptera constitute one of the largest and most diverse groups of phytophagous insects occurring in natural and agricultural ecosystems. Orthopterans play significant ecological roles as herbivores, prey for numerous vertebrate and invertebrate predators and bioindicators of habitat quality. Several species are economically important because they cause considerable damage to cereals, pulses, oilseeds, vegetables and forage crops, whereas others contribute to ecosystem functioning by participating in nutrient cycling and energy transfer (Uvarov, 1966; Dirsh, 1975) [12, 4].

The superfamily Pyrgomorphoidea comprises a distinct lineage of short-horned grasshoppers characterized by conical heads, robust bodies, well-developed prosternal processes and considerable variation in wing development. Among its constituent families, *Pyrgomorphidae* Brunner von Wattenwyl, 1874 is one of the most recognizable groups because of its striking colouration, morphological diversity and host-plant associations. Approximately 500 species distributed among nearly 170 genera have been reported worldwide, with maximum diversity occurring in tropical Africa and Asia (Kevan & Akbar, 1964) [6]. (Akwanjoh, 2018; Blackith & Kevan, 1967; Mao & Li, 2015; Sm & Swaminathan, 2012; Soomro, 2020; Zahid *et al.*, 2021) [1, 2, 8, 10, 11, 13]

India possesses a rich pyrgomorphid fauna owing to its diverse climatic conditions and vegetation types. Classical taxonomic studies by Kirby (1914) [7], Dirsh (1961) [3], Kevan and

Akbar (1964) ^[4], Shishodia *et al.* (2010) ^[9] have considerably improved the knowledge of Indian *Pyrgomorphidae*. Nevertheless, information from the Deccan Plateau, particularly Telangana, remains fragmentary and scattered in regional faunal surveys.

Telangana encompasses diverse agro-climatic zones, including dry deciduous forests, scrublands, grasslands and intensively cultivated agricultural landscapes. These habitats support a rich assemblage of grasshopper species, many of which are associated with economically important crops such as maize, paddy, sorghum, pearl millet and pulses. Accurate identification of pyrgomorphid species is essential not only for biodiversity assessment but also for pest management and ecological investigations.

Taxonomic studies based on external morphology, morphometric measurements and genital characters continue to provide reliable criteria for species identification despite recent advances in molecular systematics. Comprehensive taxonomic documentation also facilitates biodiversity conservation, faunal inventories and future phylogenetic studies.

Materials and Methods

Field surveys were conducted from October 2020 to January 2021 across the Northern, Central and Southern Telangana Zones, covering agricultural fields of maize, paddy, pearl millet and redgram as well as natural grasslands. Grasshoppers were collected by sweep netting, hand collection and visual searching during morning and evening hours, then transferred to killing jars charged with ethyl acetate and preserved by standard entomological procedures. Specimens were identified under a stereoscopic microscope using the classifications and keys of Kirby (1914) ^[7], Dirsh (1961, 1975) ^[3, 4], Kevan and Akbar (1964) ^[1], Shishodia *et al.* (2010) ^[9] and the Orthoptera Species File. Morphometric data were recorded in millimetres using digital Vernier calipers for body length, antennal length, head length, pronotum length, tegmen length, hind femur length and hind tibia length with measurements taken separately for males and females whenever both sexes were available. Species descriptions were prepared based on external morphology, coloration, diagnostic structures and morphometric observations. Distributional information was compiled from the present collections together with published Indian records. Each species account includes synonymy, diagnosis, material examined, distribution and remarks following current taxonomic conventions.

Family: *Pyrgomorphidae* Brunner von Wattenwyl, 1874

Family diagnosis

Members of *Pyrgomorphidae* are medium to large-sized grasshoppers characterized by a conical head, oblique frons, filiform antennae, distinct prosternal process, robust hind femora and well-developed or reduced tegmina and wings. They are predominantly phytophagous and inhabit grasslands as well as cultivated ecosystems.

Subfamily: *Pyrgomorphinae* Brunner von Wattenwyl, 1874

Subfamily diagnosis

Body small to medium-sized with a conical head, projecting fastigium, filiform antennae, open mesosternal interspace and slender hind femora. Tegmina and wings may be fully developed or reduced.

Genus *Atractomorpha* Saussure, 1862

Genus diagnosis

Body slender and green with an elongated conical head, elliptical eyes, narrow pronotum and elongated tegmina. Antennae are shorter than the combined length of the head and pronotum.

Atractomorpha crenulata crenulata (Fabricius, 1793) ^[14]

Material examined: Palem, Jagitial, Rajendranagar, Sircilla and Aswaraopeta collected from maize, paddy, bajra, grasses and redgram during October 2020–January 2021.

Diagnosis: Slender bright-green grasshopper with elongated conical head, narrow frontal ridge, elongated pronotum and well-developed tegmina (Plate 1). Females are larger than males.

Morphometrics: Female body length ranged from 23.55–27.93 mm (mean 26.02 mm), whereas males measured 17.20–19.33 mm (mean 18.26 mm). Mean antennal length was 5.30 mm in females and 4.95 mm in males. Mean head length measured 4.30 mm (female) and 4.27 mm (male); pronotum length 3.39 and 2.88 mm; tegmina length 18.59 and 15.31 mm; hind femur length 9.24 and 8.43 mm; and hind tibia length 9.08 and 7.46 mm, respectively.

Distribution: Widely distributed throughout India including Telangana, Andhra Pradesh, Maharashtra, Karnataka and Tamil Nadu.

Remarks: The most abundant pyrgomorphid species recorded and widely distributed throughout all agro-climatic zones of Telangana.

Genus *Chrotogonus* Serville, 1838

Genus diagnosis

Body short, stout and brown with black markings; frons tuberculate; hind femora robust and hind tibiae with short spines. Species are mainly ground-dwelling.

Chrotogonus trachypterus trachypterus (Blanchard, 1836)

Material examined: Palem, Jagitial, Rajendranagar and Sircilla collected from paddy, maize and grasses.

Diagnosis: Pale-brown grasshopper with black spots on thorax, narrow head, rugose pronotum, filiform antennae and robust hind femora (Plate 2). Tegmina exceed the abdomen but are shorter than hind wings.

Morphometrics: Only females were collected. Body length ranged from 19.59–22.26 mm (mean 21.07 mm). Mean antennal length was 7.45 mm, head length 4.80 mm, pronotum length 3.30 mm, tegmina length 11.05 mm, hind femur length 11.94 mm and hind tibia length 10.49 mm.

Distribution: Telangana, Andhra Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and several other Indian states.

Remarks: Male specimens were not encountered during the survey; therefore, morphometric observations are based only on females.

Genus *Poecilocerus* Serville, 1831

Genus diagnosis

Large, robust and brightly coloured grasshoppers with

projecting fastigium, broad pronotum, fully developed wings and strong hind legs.

***Poeciloceris pictus* (Fabricius, 1775)**

Material examined: Adult specimens collected from Northern and Southern Telangana on *Calotropis* and associated vegetation.

Diagnosis: Large grasshopper with characteristic blue-black and yellow bands on the body, green tegmina, reddish hind wings and yellow hind tibiae (Plate 3).

Morphometrics: Female body length ranged from 38.48–44.81 mm (mean 42.18 mm) and male body length from 38.28–47.91 mm (mean 42.36 mm). Mean head length was 5.97 mm in females and 6.33 mm in males. Mean pronotum length measured 7.15 mm (female) and 5.62 mm (male). Mean hind femur length was 25.38 mm in females and 23.61 mm in males, while mean hind tibia length measured 25.19 mm and 23.30 mm, respectively.

Distribution: Widely distributed in India including Telangana, Andhra Pradesh, Maharashtra, Karnataka, Rajasthan and Tamil Nadu.

Remarks: The species is readily recognized by its striking aposematic colouration and frequent association with *Calotropis* species.

Subfamily: Orthacridinae Bolívar, 1905

Subfamily diagnosis

Body elongate, cylindrical and green with a projecting fastigium and reduced or absent wings. Species are generally associated with grasses and shrubs.

Genus *Neorthacris* Kevan & Singh, 1964

Genus diagnosis

Body cylindrical with projecting fastigium, robust antennae, whip-like male genitalia and green body marked with black longitudinal bands. Wings absent or highly reduced.

***Neorthacris acuticeps acuticeps* (Bolívar, 1902)**

Material examined: Adult specimens collected from Northern and Southern Telangana during 2020–2021.

Diagnosis: Bright green species with elongated head, black longitudinal stripe extending from the eye to abdomen, wingless body and long curved male cerci (Plate 4).

Morphometrics: Detailed morphometric observations showed that females were generally larger than males. Measurements included body length, head length, pronotum length, hind femur and hind tibia, confirming moderate sexual dimorphism within the species.

Distribution: Telangana, Andhra Pradesh and Tamil Nadu.

Remarks: This species exhibited a comparatively restricted distribution and was mainly encountered in natural grassland habitats.

Discussion

The present investigation documented four pyrgomorphid species belonging to three genera of Pyrgomorphinae and one genus of Orthacridinae from Telangana. Morphometric comparisons revealed clear sexual dimorphism, with females generally larger than males in all species. Diagnostic characters such as body colour, head morphology, pronotal configuration, tegmina and hind leg measurements proved useful for species delimitation. *Atractomorpha crenulata crenulata* was the most abundant and widely distributed species, whereas *Neorthacris acuticeps acuticeps* exhibited a restricted distribution. These observations agree with previous taxonomic accounts of Indian Pyrgomorphidae.

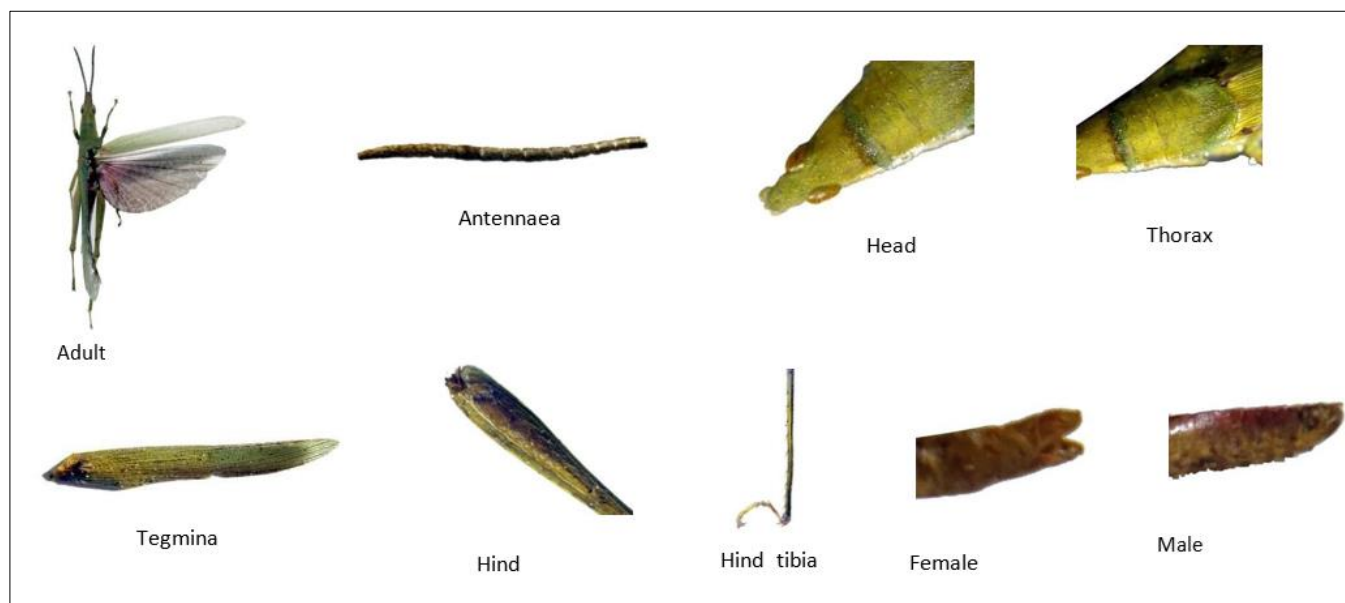


Plate 1: Illustrations of external body parts of *Atractomorpha crenulata crenulata* (Fabricius, 1793) ^[14].

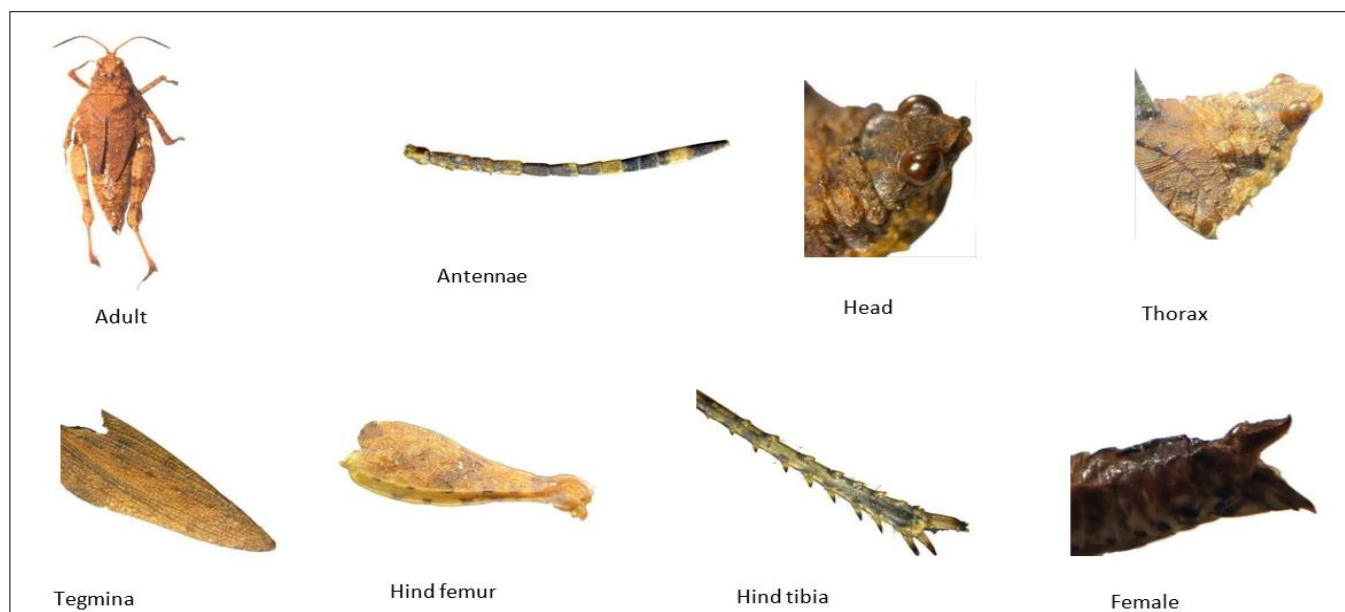


Plate 2: Illustrations of external body parts of *Chrotogonus trachypterus trachypterus* (Blanchard, 1836).

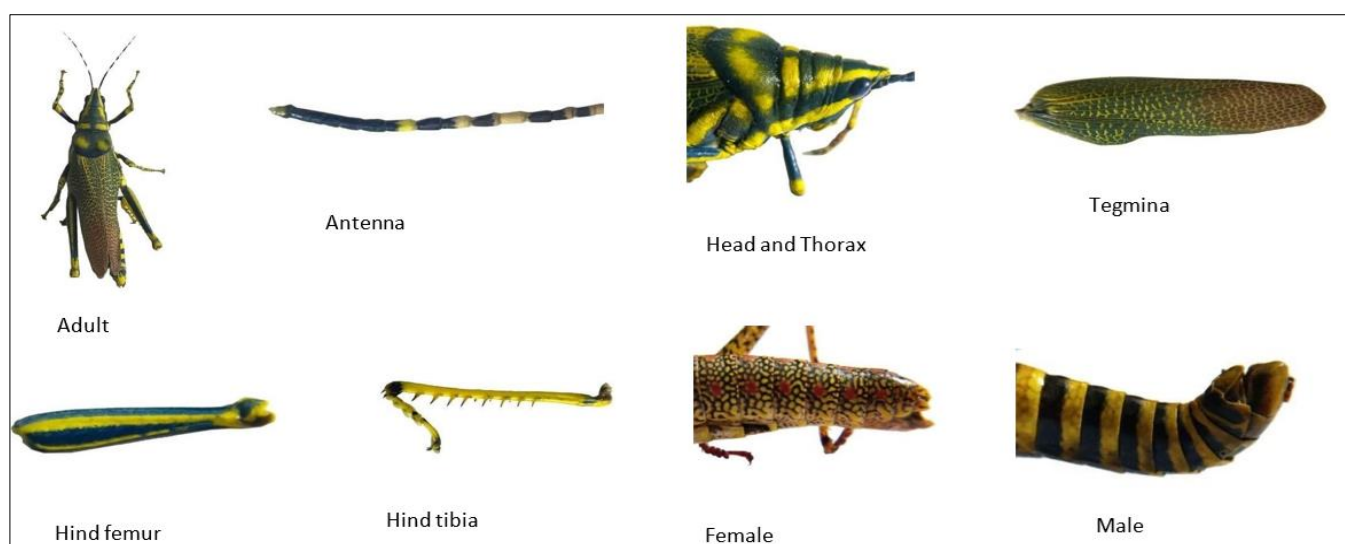


Plate 3: Illustrations of external body parts of *Poecilocerus pictus* (Fabricius, 1775).



Plate 4: Illustrations of external body parts of *Neorthacris acuticeps acuticeps* (Bolívar, 1902).

Conclusion

The present study provides an updated taxonomic account of *Pyrgomorphidae* from Telangana, including diagnoses, morphometric observations and distributional records of four species. The information generated contributes to the documentation of Orthopteran biodiversity and provides a useful reference for future taxonomic, ecological and conservation studies on grasshoppers in India.

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