



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(4): 803-807
© 2017 JEZS
Received: 11-05-2017
Accepted: 12-06-2017

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First record of subfamily Mecopodinae (Orthoptera: Tettigoniidae) from Bihar along with description of Indian species

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Abstract

The present study was based on the specimens of Mecopodinae during the course of a survey from (01/03/2015 to 30/03/2015) from various agricultural areas of different regions of Bihar. Four male specimens were collected from different localities and identified as a species *Mecopoda elongata elongata* (Linnaeus, 1758) (Orthoptera: Tettigoniidae), was newly recorded from Bihar, India. The description was based on both conventional morphological and genitalic characters. The identifying features of the species were body very large, brown in color, tibial tympana opened on both the sides, stridulatory file having 98 teeth arranged in lamelliform manner under the side of left tegmen, male subgenital plate developed conically from region of bifurcation with short styli and hind femur & tibiae very long and large. A morphological description, as well as detailed illustrations of this species is presented. Distribution and morphometrically data is also provided.

Keywords: Orthoptera, Tettigoniidae, *Mecopoda elongata elongata*, new record, India

1. Introduction

Tettigoniidae is a family of suborder Ensifera under the superfamily Tettigonoidea and members of Tettigoniidae are commonly known as katydids and bush-crickets Srinivasan & Prabakar [1]. They are also known as long horned grasshoppers, although, they are more closely related to crickets than to grasshoppers Srinivasan & Prabakar [1]. Tettigoniidae possess long and cylinder antennae, usually longer than the body, four segmented tarsi and usually sword or sickle like ovipositors Rentz & Weismann [2]. These constitute an economically important group of Orthoptera pests that infest a number of cultivated and non-cultivated crops Usmani *et al.*, [3]. They cause considerable damage to agricultural crops, pasture, and forests and are well reputed for their destructiveness all over the world. There are about 6000 species of Tettigoniidae found in the world belonging to 1070 genera Otte [4], out of which 160 species under 68 genera are reported from India Shishodia *et al.*, [5]. Katydids are widely distributed throughout the world, but the majority of species can be expected in tropical and sub-tropical regions, especially the New World tropics Gwynne [6]. The economic importance of these insects has been recognized all over the world. Tettigonids are the important members of biological communities. They play the role of both herbivores and predators, and they are consumed by many vertebrates and invertebrates as the primary source of animal proteins Naskrecki [7]. The subfamily Mecopodinae is characterized by having widely open tympanum on fore tibia and the prosternum armed with a pair of spines Brunner [8]. The tribe Mecopodini comprises 8 genera in the subfamily Mecopodinae are *Mecopoda* Serville [9], *Afromecopoda* Uvarov [10], *Anoedopoda* Karsch [11], *Arachnacris* Giebel [12], *Austromecopoda* Rentz, Su & Ueshima [13], *Characta* Redtenbacher [14], *Eumecopoda* Hebard [15], and *Euthypoda* Karsch [16] in which only *Mecopoda* Serville [9] is distributed throughout India and comprises a single species *Mecopoda elongata elongata* Linnaeus [17]. Barman & Srivastava [18] reported this species from Kameng and Siang districts of Arunachal Pradesh. The Tettigonid fauna of Bihar is insufficiently known, there are only four species: *Ducetia japonica* Thunberg [19], *Himertula kinneari* Uvarov [20], *Letana megastridula* Ingrisch [21] and *Phaneroptera gracilis* Burmeister [22] belonging to the subfamily Phaneropterinae were reported from this state in the checklist of the Orthoptera from India given by Shishodia *et al.*, [5] but unable to report *Mecopoda elongata elongata* of the subfamily Mecopodinae from this region, In this checklist, the distribution of *Mecopoda elongata elongata* recorded was Andaman & Nicobar Islands,

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Andhra Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal Shishodia *et al.*, [5]. So, the present paper was the first report of subfamily Mecopodinae (Orthoptera: Tettigoniidae) to the Tettigoniid fauna of Bihar with description and detailed illustration of Indian species.

2. Materials and Methods

Four (4) male specimens of adult long-horned grasshoppers were collected during the period (from 01/03/2015 to 30/0/2015) from different localities of Bihar. These localities are Muzaffarpur, Darbhanga and Madhubani. The surveys were done daily from 9: 30 am to 12: 30 pm and from 2:00 pm to 5:00 pm. They were caught in a sweep net. The collected specimens were killed in ethyl acetate fumes. The specimens were prepared, stretched and pinned. The present study followed the Orthoptera Species File in classifying Tettigoniidae [23]. The material is deposited in the Zoological Museum of the Aligarh Muslim University, Aligarh, India.

3. Results

Systematic Account

Order: Orthoptera

Suborder: Ensifera

Superfamily: Tettigoniioidea Krauss, 1910

Family: Tettigoniidae Krauss, 1902

Subfamily: Mecopodinae walker, 1871

Tribe: Mecopodini walker, 1871

Genus: *Mecopoda* serville, 1831

Mecopoda elongata elongata (Linnaeus, 1758)

Gryllus(*Tettigonia*) *elongatus* Linnaeus, 1758: 429

Mecopoda elongata Barman, 2003: 195

Redescription

(Fig. 1–13)

Male. Body (Fig. 1) large, 34.91 mm in size. Antennae filiform, Antennal scorbac strongly rimmed, Fastigium (Fig. 2) of vertex not strongly compressed laterally, apex blunt, not sulcate tapering forward and finely touches the fastigium of frons. Median ocellus well developed. Eyes large and oval. Pronotum (Fig. 3) is strongly rough and divided by two transverse sulci of concave shaped and a “v-shaped” mark is present between two transverse sulci, Median carina distinct, anterior margin slightly concave, posterior margin convex, Lateral lobes (Fig. 4) of pronotum higher than long with black spot and grooved medially, anterior margin slightly concave, posterior margin rounded and lower margin curved, two small finger like projection is present on anterior side just below the lateral lobe of the pronotum. Humeral sinus weak. Sternum; (Fig. 5) Prosternum armed with two cylindrical less separated spines, Mesosternal and metasternal interspace present, mesosternal and metasternal lobes bifurcated posteriorly in the middle. Tegmen (Fig. 6); anterior margin convex, caudal margin obtusely rounded. Stridulatory file (Fig. 7); broad and concave shaped, slightly folded and smoothly narrowing towards proximal end and rounded at distal end, teeth arranged in lamelliform manner, total numbers of teeth are 98 in which 68 large in the centre of file and 30 small teeth arranged towards the both ends. Hind wing longer than tegmen. Legs: Genicular lobes; fore legs poorly armed by spinose on both inner and outer sides, mid legs armed by

spinose on inner side and unarmed on outer side, hind legs armed by spinose on both inner and outer sides. Fore leg: coxa with dorsal forward projecting spine, Femur; dorsally unarmed, ventral surface; 2 small spines present from medially to apically on inner margin, unarmed on outer margin. Tibial tympanum (Fig. 8) widely opened on both sides. Tibia (Fig. 9); dorsal surface; 6 small spines present from the base of tympanum to apically on inner margin, 8 small spines present from the base of tympanum to apically on outer margin, ventral surface: 11 small spines present from the base of tympanum to apically on inner margin, 13 small spines present from the base of tympanum to apically on outer margin. Mid Leg: femur; dorsally and ventrally unarmed, Tibia: dorsal surface; 13 small and thick spines present on entire inner margin, 8 small and thick spines present on entire outer margin, ventral surface: 13 small and thick spines present sub basally to apically on both inner and outer margin. Hind leg: femur; dorsally unarmed, ventral surface: 7 small, thick, more spaced spines arranged medially to apically on inner margin, 4 small and thick, more spaced spines arranged medially to apically on outer margin, Tibia (Fig. 10); dorsal surface: 22 minute to small, thick spines arranged sub basally to apically on inner margin, 25 minute to small, thick spines arranged sub basally to apically on outer margin, Single pair of spur present on the apical region, ventral surface; 16 minute to small thick spines arranged sub basally to apically on inner margin, 16 minute to small thick spines arranged over entire outer margin, Two pairs (inner small and outer large) of spurs present on the apical region. Hind femur and tibia both are very long and large. Abdomen: Thoracic auditory spiracle: large elliptical partially hidden under the lateral lobe of pronotum with a long apical finger like projection and a fine protuberance in the middle on anterior margin of spiracle. Subgenital plate (Fig. 11): Basal part grooved medially or (longitudinal ridges on either side) with bifurcated apex, conical from the region of bifurcation, elongated, curved upwardly with short styli. Supra anal plate (Fig. 12): Epiproct rounded triangular structure. Paraprocts rounded with minute spine at apex. Cerci (Fig. 13) conical, thick, apex armed by two short spines and slightly curved inwardly.

Measurements as shown in Table 1.

Table 1: Body measurements of species of *Mecopoda elongata elongata* (all measurements are lengths in mm.)

S.NO.	Body parts	Male (♂)
1.	Body with wing	60.36
2.	Tegmen	49.82
3.	Hind wing	50.45
4.	Pronotum length	07.50
5.	Pronotum height	05.58
6.	Pronotum length (lateral lobe)	03.81
7.	Fore femur	12.61
8.	Fore tibia	13.65
9.	Hind femur	37.34
10.	Hind tibia	37.21
11.	Body length	34.91

Distribution

India: Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal.

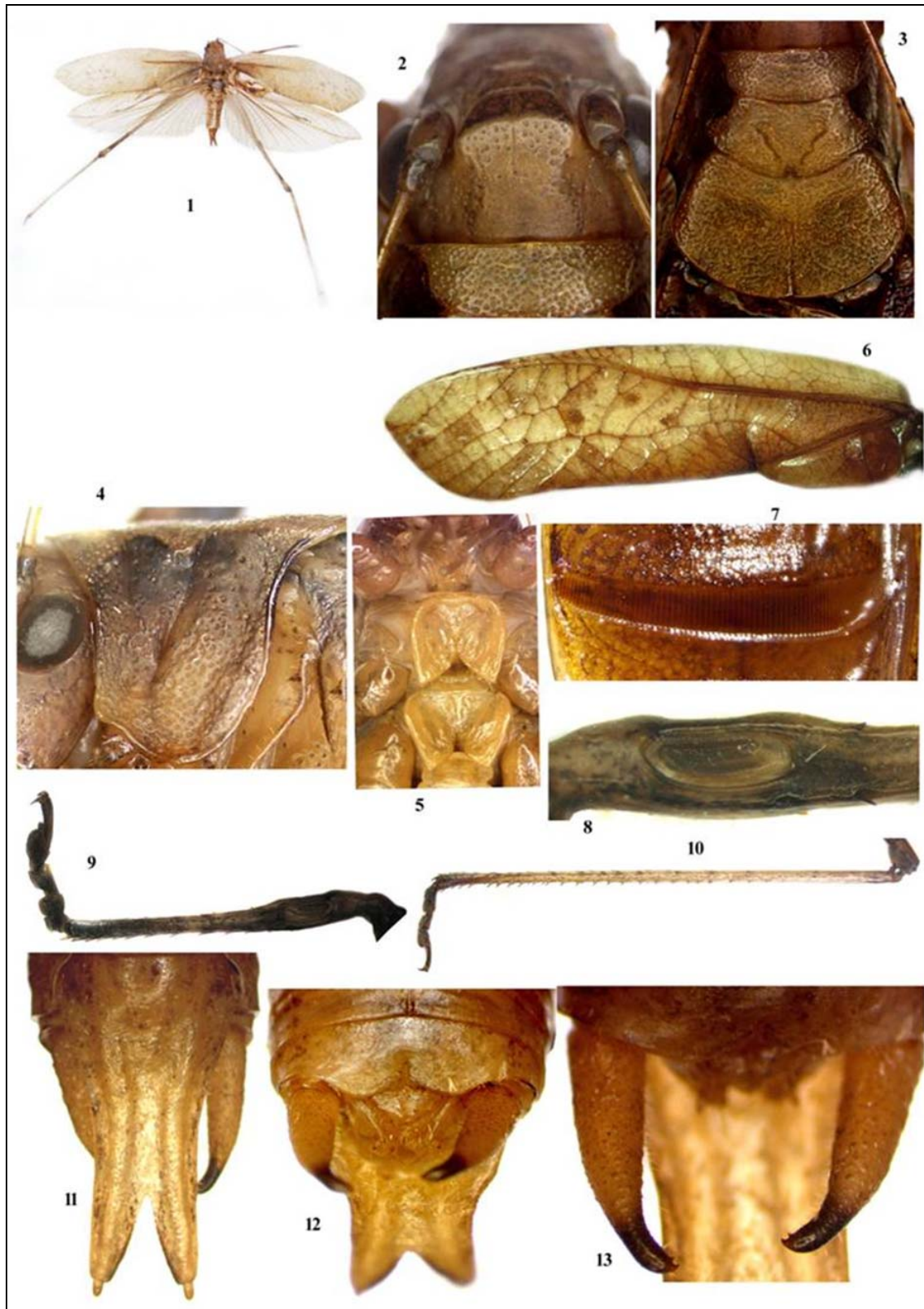


Fig. (1-13): 1, *Mecopoda elongata elongata* (Male); 2, Fastigium of vertex, dorsal view; 3, dorsal surface of pronotum; 4, lateral lobe of pronotum; 5, sternum; 6, left tegmen; 7, stridulatory file of left tegmen; 8, tympanum on fore tibia; 9, fore tibia, lateral view; 10, hind tibia, lateral view; 11, subgenital plate; 12, supra-anal plate; 13, cerci dorsal view.

4. Discussion

The katydid subfamily Mecopodinae was first named by Karsch [16]. The tribe Mecopodini comprises 8 genera in the subfamily Mecopodinae are *Mecopoda* Serville [9], *Afromecopoda* Uvarov [10], *Anoedopoda* Karsch [11],

Arachnacris Giebel [12], *Austromecopoda* Rentz, Su & Ueshima [13], *Characta* Redtenbacher [14], *Eumecopoda* Hebard [15], and *Euthypoda* Karsch [16] in which only *Mecopoda* Serville [9] is distributed throughout India. There are six reported species of the genus *Mecopoda*, all from Asia

Otte *et al.*,^[24] Four of these species have been reported from Indonesia (*M. dilatata*, *M. divergens*, *M. elongata* and *M. macassariensis*), one from Japan (*M. niponensis*) and one from Sri Lanka and recently reported from Pakistan Waheed^[25] (*M. platyphoea*). The only species reported from India is *Mecopoda elongata elongata* Linnaeus^[17]. This species has been previously reported from the Indian subcontinent by Ingrisch^[26]; Ingrisch & Shishodia^[27]; Ingrisch & Garai^[28] and in India, Barman & Srivastava^[18] reported this species from Kameng and Siang districts of Arunachal Pradesh and Srinivasan & Prabakar^[1] reported it from Papumpare and Kameng districts of Arunachal Pradesh. The present study included four specimens of subfamily Mecopodinae (Orthoptera: Tettigoniidae) from different habitats of various cultivated and non-cultivated areas of Bihar. This captured material identified as *Mecopoda elongata elongata*, a lone representative of the subfamily Mecopodinae and also a first record from Bihar. The morphological redescription including detailed illustrations of male with stridulatory file has been provided.

5. Conclusion

The aim of the present paper is to provide knowledge of the subfamily Mecopodinae from this region. *Mecopoda elongata elongata*, a lone representative of the subfamily Mecopodinae and also a first record from Bihar. No survey work so far has been done exclusively for this group from Bihar, insufficiently known for its Tettigoniid fauna. There are very few reports on the taxonomy of Tettigoniidae from this state of India. Except for some sporadic reports there is no systematic study on the katydids and bush-crickets belonging to the family Tettigoniidae from Bihar state of India.

6. Acknowledgements

Authors wish to extend their gratitude to Department of Science and Technology, New Delhi for providing financial assistance during the tenure of a major research project (Ref. No. SB/SO/AS-083/2013) being carried out on "Studies on the Taxonomy and Diversity of Tettigoniidae (Orthoptera : Tettigonoidea) in Ganga Basin States, India". Thanks are also due to Chairman, Department of Zoology, Aligarh Muslim University, for providing facilities.

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