



Studies on the genus *Ergatettix* Kirby 1914 (Tetrigidae: Orthoptera) from Sindh Pakistan

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SUMMARY

Pygmy grasshoppers are a more diversified group of Orthopterans because of their small size and distinctive look, which set them apart from other Orthopterans from a morphological perspective. These little grasshoppers often live on the ground and are found on forest floors among leaf litter. These hoppers were gathered from several locations in the Sindh region of Pakistan, including aquatic habitats, wet spots, and surrounding vegetation between January 2021 and January 2023 using both a traditional insect net and a hand-picking method. Pygmy grasshopper specimens number 913, of which 57 belonged to the genus *Ergatettix* Kirby 1914 and were recognised as belonging to the two species *Ergatettix dorsiferus* and *Ergatettix interruptus*.

Keywords: Orthopterans, Pygmy grasshopper, Habitat, *Ergatettix dorsiferus*, *Ergatettix interruptus*

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INTRODUCTION

Orthoptera is the most diversified order of Polyneoptera, with approximately 27,000 species (Cigialno et al., 2017). This group is distinguished by traits including saltatorial hind legs, stringy forewings, larger and membrane-covered hind wings with a large anal region, and thread-like antennae. Females have a well-developed ovipositor and small, unsegmented Cerci. Both stridulatory (for making noise) and auditory (for picking up sound) organs have been developed (Grimldi and Egel 2005). Ander (1939) proposed the suborders Ensifera and Caelifera to categorise the Orthoptera. Tympana, when present, are positioned anterior to the tibiae and generally enlarged antennae with segments more than 100 are characteristics of the suborder Ensifera. Small, segmented antennae; first abdominal segment contains the tympmana; Caelifera suborder (Song et al., 2015).

The superfamily-rich suborder Ensifera Bush crickets and camel crickets belong to the superfamilies Grylloidea, which has 5000 species, Gryllotalpoidea, which has 600 species, and Tettigoniidea. These superfamilies include Schizodactyloidea, which has 15 species, Tettigonioida, which has 7300 species, Rhaphidophoroidea, which has 650 species, Stenopelmatoidea, which has 900 species, (Song et al., 2015).

These ancient grasshoppers have been determined to be very similar to other grasshoppers in the Orthoptera order. Some pygmy hoppers prefer to live in certain microhabitats, and they have specific association with their habitats. Due to their rarity and ecological significance, pygmy grasshoppers are widely studied throughout Southeast Asia. They also prefer wet and swampy areas (Tan et al., 2017). Tetrigidae has a larger number of species than the rest of Orthopterans due to their diminutive size and distinctive appearance. These types of soil-dwelling insects are frequently observed moving diagonally across the forest floor or in other wet areas close to a body of flowing water, such as a waterway, river, or swamps. With an estimated 250 genera and 1700 species, pygmy hoppers make up the second largest family of Caelifera (Pérez-Gelabert et al., 1998).

Wagan and Kevan (1992) erected 5 genera and reported 7 species of Pygmy hoppers (Tetrigidae) from India, Pakistan, and Sri Lanka. These include, *Deltonotus* (Hancock, 1904), *Epitettix* (Hancock, 1907), *Potua* (Bolivar, 1887), *Bolivaritettix* (Gunther, 1939) and *Lamellitettix* (Hancock, 1915). Two more species *Bolivaritettix nathani n. sp.* and *Potua aptera n. sp.* were also identified. Additionally, the first descriptions of females of the species *Lamellitettix fletcheri* (Hancock, 1915) and *Criotettix latirons* (Hebard, 1929) were made, as was the male of *Epitettix tamilus* (Gunter, 1939). The names *Hedotettix cristatus* Karny 1915 and *Hedotettix punctatus* Hancock 1909 have been made synonymous, and the names *Thoradonta pruthii* Gunther 1938 and *Thoradonta hsinuata* Hancock 1915 have been made synonymous. It was also decided that *Loxibolus parvispinus* Hancock 1912 was really only a subspecies of *Loxibolus acutus* Hancock 1904, and that *Coptotettix rugosus* (Hancock 1904) should replace *Coptotettix hancocki* (Kirby, 1910).

Suhail *et al.*, (2000) collected tetrigid grasshoppers from different parts of Rawalpindi Division and classified them into five different genera in the subfamilies, Metrodorinae and Scelimeninae. Majeed *et al.* (2001) documented six species of pygmy grasshoppers from Thal Punjab. *Bolivaritettix ghumtianus* (Hancock), *Coptotettix annandalei* Hancock, *Thoradonata nodulosa spiculoba* (Hancock), *Tetrix mundus* Walker, and *Oxyphyllum pennantum* Hancock were all discovered by Mahmood *et al.*, (2004) while studying Tetrigidae species from Azad Jammu and Kashmir. These species were discovered first time from Pakistan. Sultana *et al.* (2017) while studying the genus *Hedotettix* Boivar 1887 and recorded 03 species: *Hedotettix lineifera* (Walker, 1871), *Hedotettix attenuates*, Hancock, 1904 and *Hedotettix gracilis* (Haan, 1843) of this genus from Sindh Pakistan.

Saeed *et al.* (2000) described 11 species of pygmy hoppers, each of which belonged to four genera: *Euparatettix*, *Ergatettix*, *Paratettix* and *Hedotettix* from various localities of Rawalpindi. Among these, *Ergatettix dorsiferus* was recorded for the first time from the Punjab, while *Ergatettix guentheri* is a first record from Pakistan no any record of genus *Ergatettix* from Sindh Pakistan.

MATERIALS AND METHODS

PYGMY GRASSHOPPER SPECIMEN COLLECTION

Pygmy grasshopper samples were typically collected using an insect net from wet, streamside habitats, water canals, sides of rivers, leaf litter, forests, small grasses,

muddy shores, grasslands, open ecosystems, ground, agricultural fields, dense vegetation, and wetland, Gorakh Hill Station, semi-aquatic habitats, and Kirthar Mountain of districts in the province of Sindh. Although specimens were gathered over the entire year, the majority were taken in the months of July, August, September, and October. Digital cameras were used to capture the images of the insects. The entire collection are stored at the Shah Abdul Latif University at Khairpur's Insect Systematic Postgraduate Laboratory, Department of Zoology (Skejo et al., 2023).

KILLING, PRESERVATION AND IDENTIFICATION

Chloroform was used to kill the Pygmy grasshoppers (Tetrigidae) in the collected samples. Then, in accordance with usual procedure, entomological pins were maintained on the pronotum and conserved in wooden bug boxes for use in killing (Skejo et al., 2017). The wooden cases were filled with naphthalene balls to keep predatory fungi and ants away from the specimens. Species were identified on the basis of keys and Orthoptera species file online.

DISTRIBUTION, PHOTOGRAPHY AND ANALYSIS OF DATA

The distributions of species from various districts was made and are presented in tables. The images of morphological features were done with microscope fitted with the Computer (Ali and Panhwar, 2017). Mean and Standard deviations were analyzed with MS Excel.

RESULTS

TAXONOMY

Genus *Ergatettix* Kirby, 1914 (urn: lsid: Orthoptera.speciesfile.org:TaxonName:70183)

Ergatettix dorsifera (Walker, 1871)

(urn: lsid:Orthoptera.speciesfile.org:TaxonName:70211)

MATERIAL EXAMINED

Hyderabad: 11.xi.2021 1♂ (Hafeeza GL & Waheed AP). Jamshoro 5.viii.2021, 2♂ (Hafeeza GL & Waheed AP). Sukkur: 18.viii.2022 2♂ (Hafeeza GL & Shaikh AM). same but, 10.vi.2021, 1♀ (Hafeeza GL & Waheed AP), same but, 9.vii.2021, 1♀ (Hafeeza GL & Waheed AP). Shaheed benazir Abad, 14.viii.2022 3♂ (Hafeeza GL & Shaikh AM), same but 10.vi.2022 1♀ (Hafeeza GL & Shaikh AM). Sujawal: 10.vi.2022 1♂ (Hafeeza GL & Shaikh AM). Jacobabad: 12.xi.2021, 2♀ (Hafeeza GL & Shaikh AM). Larkana: 8.xi.2022 4♂ (Hafeeza GL & Waheed AP). Dadu: 15.vi.2022 5♂ (Hafeeza GL & Shaikh AM). Khairpur: 9.xi.2022 3♂ (Hafeeza GL & Waheed AP) same but 20.x.2021, 3♀ (Hafeeza GL & Shaikh AM) Same but 28.xii.2021, 2♀ (Hafeeza GL & Shaikh AM).

DESCRIPTION

Smooth and medium-sized slender is the body. Filiform antennae are inserted almost above the eyes. Small head; emaciated fastigium at the vertex; ambiguous, non-permanent median carina. Round eyes with significant protrusions above the level of

the skull. The dorsal portion of the pronotum has white dots towards the level of the thorax. The medial carina is jagged and depressed in the back of the pronotum. Confluent triangular dark patches can be found in the lateral carina, which project straight onto the dorsal region of the thorax. Tegmina has a broad, rounded tip. much-developed wings reach much over the pronotum level. Serrated carina on the smaller, thicker, and smaller hind femur. The black spots on the hind tibia's whitish skin are home to 8–9 spines. The subgenital plate has a rounded apex and is bent. The ovipositor's valves resemble leaves and have serrated borders and acute apices.

Ecology

This species can also be observed in areas with exposed mud and sparse vegetation, typically in moist and unshaded locations. These areas are often characterised by base-rich or calcareous soil, such as dune slacks. Limestone is a type of sedimentary rock that is commonly found in flood plains, where it is deposited either directly onto the ground or on top of low-lying plants. Skejo (2014) discovered this species from dunes, near rocky habitats.

Table 1: Morphometrics measurements of *Ergatettix dorsiferus*.

Body parameters	Female (n=5) (Mean ± SD)	Male (n=5) (Mean ± SD)
LH	1.5±0.021	1.2±0.013
WH	2.1±0.022	1.9±0.03
LP	1.9±0.04	1.7±0.04
WP	3.8±0.011	3.2±0.012
LT	2.9±0.03	2.6±0.05
WT	3.9±0.011	3.7±0.015
LTB	5.8±0.031	5.5±0.045

Note: LH= Length of Head, WH=Width of head, LP=Length of Pronotum, WP=Length of Pronotum, LT= Length of Tegmen, WT=Width of Tegmen, LTB=Length of Total body

Ergatettix interruptus (Brunner, 1893)

(urn:lsid:Orthoptera.speciesfile.org:TaxonName:70206)

MATERIAL EXAMINED

Hyderabad: 18.xi.2021 1 ♂ (Hafeeza GL & Waheed AP). Sukkur 15.viii.2021, 2♂ (Hafeeza GL & Waheed AP), same but 20.x.2021, 1♀ (Hafeeza GL & Shaikh AM) Same but 28.xii.2021, 1♀ (Hafeeza GL & Shaikh AM). Mitari: 18.viii.2022 1♂ (Hafeeza GL & Shaikh AM). Shaheed benazir Abad, 14.viii.2022 2♂ (Hafeeza GL & Shaikh AM), same but 10.vi.2022 1♀ (Hafeeza GL & Shaikh AM) same but, 10.vi.2021, 2♀ (Hafeeza GL & Waheed AP), same but, 9.vii.2021, 3♀ (Hafeeza GL & Waheed AP). Sujawal: 19.vi.2022 1♂ (Hafeeza GL & Shaikh AM). Shikarpur: 18.xi.2021, 2♀ (Hafeeza GL & Shaikh AM). Sanghar: 20.xi.2022 2♂ (Hafeeza GL & Waheed AP). Khairpur: 8.x.2022 3♂ (Hafeeza GL & Waheed AP) same but 10.x.2021, 2♀ (Hafeeza & Shaikh AM) same but 20.xii.2021, 3♀ (Hafeeza GL & Shaikh AM)

DESCRIPTION

Body is small and cylindrical, and it is golden brown in colour with clear black spots. A filiform antenna. Small head, huge brown eyes projected over the head. Pronotum stiff with noticeable grains and dark spots. Permanent middle carina. Pronotum is smaller than wings. Tiny cylindrical tagmina. Fore femur rough granular with areas of darkness. Small and rough in the middle.

Ecology

This species can be found in its natural environment in places with base rich or calcareous soil, such as dune slacks, where the flora is sparse and the mud is thin, calcareous stone. Skejo (2014) identified this species among denser and taller vegetation as well as close to the border of ditches in wet meadows.

Table 2: Morphometrics measurements of *Ergatettix interruptus*

Body parameters	Female (n=5) (Mean ± SD)	Male (n=5) (Mean ± SD)
LH	1.5±0.011	1.3±0.013
WH	2±0.05	1.7±0.05
LP	2.3±0.03	1.9±0.03
WP	3.5±0.06	3.6±0.04
LT	3±0.06	2.5±0.06
WT	4.3±0.011	3.9±0.012
LTB	6±0.011	5.7±0.051

Note. LH= Length of Head, WH=Width of head, LP=Length of Pronotum, WP=Length of Pronotum, LT= Length of Tegmen, WT=Width of Tegmen, LTB=Length of Total body.

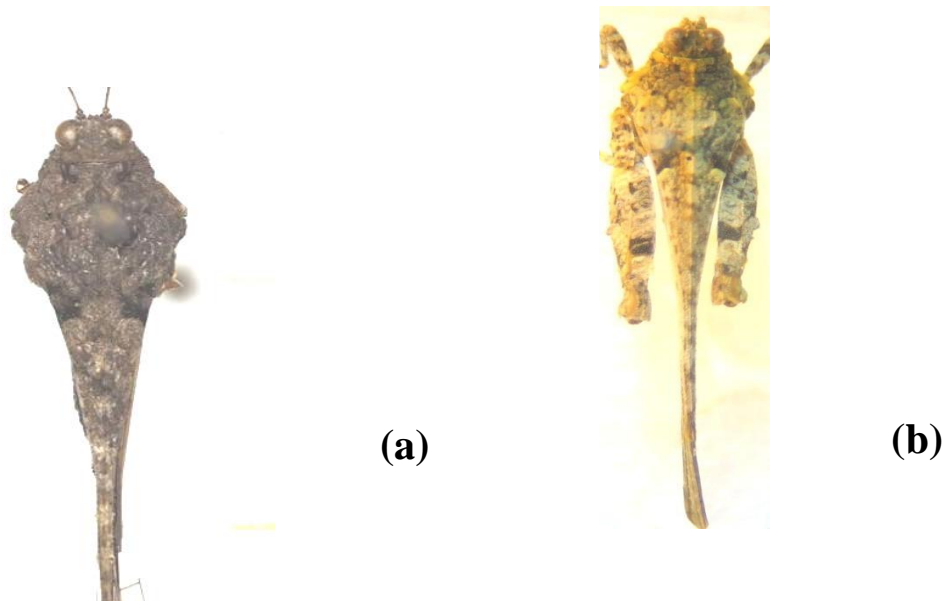


Figure 1 a) Dorsal view of *Ergatettix dorsifera* (Walker, 1871); b) Dorsal view of *Ergatettix interruptus*

DISCUSSION

The family Tetrigidae, which contains the families of crickets, grasshoppers, and their associates, is a long-established member of the order Orthoptera. The Tetrigidae family includes many species that go by the names pygmy grasshoppers, groundhoppers, pygmy devils, and grouse locusts (Panhwar *et al.*, 2023). Tetrigidae are distinguished by a long pronotum and are frequently less than 20 mm in length. This pronotum has a pointy end and spans the entire length of the abdomen, sometimes even reaching the tips of the wings. The pronotum of other Orthoptera is short and does not extend past the back or wings. Tetrigidae typically have cryptic colouring. Some species' expanded pronota resemble twigs, stones, or leaves (Panhwar, 2018; Maitlo & Panhwar, 2021).

The ground hoppers have short, short horns and an extended, tapering tectiform pronotum that encircles the hind wings and abdominal segments. Pygmy grasshoppers, grouse locusts, and groundhoppers belong to the Tetrigidae family and can be identified by their extended pronotum and the absence of the arolium within their tarsal claws. Tetrigids are incredibly diverse, and they can be found almost anywhere in tropical areas (Kocarek *et al.*, 2005). According to Tumbrinck (2014), all lengths and widths were calculated for Tetrigidae species and measured from the frontal crest to the distal portions of the Subgenital region. Tetrigidae species that possess wings are excellent flyers, while others who lacked wings were not. According to Kerpestam and Forsman (2013), the quality of food resources and dietary diversification among Tetrigidae species are to blame for the differences in flight patterns. During the pygmy hoppers were gathered from several locations in Sindh region, Pakistan, including aquatic habitats, wet spots, and surrounding vegetation between January 2021 and January 2023 using both a traditional insect net and a hand-picking method. Pygmy grasshopper specimens number 913, of which 57 belonged to the genus *Ergatettix* Kirby 1914 and were recognized as belonging to the two species *Ergatettix dorsiferus* and *Ergatettix interruptus*. Besides, morphological description, digital photographs and morphometry of species are given.

CONCLUSION

During studies on Genus *Ergatettix* Kirby 1914 (Tetrigidae: Orthoptera) from Sindh Pakistan at total of 57 specimens of Genus *Ergatettix* Kirby 1914 were collected among them two species *Ergatettix dorsifera* (Walker, 1871) and *Ergatettix interruptus* (Brunner, 1893) were identified.

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