

## Taxonomic insights and geographic distribution of Gryllidae (Gryllinae: Orthoptera) in Sindh Pakistan

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### Abstract

In the agricultural expanse of Sindh, Pakistan, this study explores Gryllidae species' taxonomic composition and geographic distribution, focusing on the Gryllinae subfamily within the Orthoptera order. Investigating nine distinct species – including *Acheta domesticus* (Linnaeus, 1758), *Gryllus bimaculatus* De-Geer, 1773, *Gryllus campestris* Linnaeus, 1758, *Gryllodes sigillatus* Walker, 1869, *Gryllodes supplicans* (Walker, 1859), *Callogryllus ovilongus* Saeed&Yousuf, 2000, *Callogryllus saeedi* (Saeed, 2000), *Teleogryllus occipitalis* (Serville, 1838), and *Modicogryllus sindhensis* Riffat, 2018– across six genera, the research unveils insights into the prevalence and diversity of Gryllidae in this agriculturally significant.

**Keywords:** *Gryllus*, *Gryllodes*, *Teleogryllus*, Gryllidae

### Introduction

Pakistan's agricultural terrain is home to a diverse array of insect species, each intricately linked to specific crops like sugarcane, maize, and cotton across various provinces. Among these, Gryllidae species, renowned for their worldwide distribution, thrive prominently within Pakistan. The dynamic response of these species to changing climatic conditions is influenced by a complex interplay of factors, underscoring the need for comprehensive research (Struck *et al.*, 2018). Utilising correlative techniques rooted in ecological niche theories and spatial dynamics hypotheses, the study of species distribution models provides valuable insights into the effects of climate change. This approach employs well-established methodologies and assumptions to predict changes in distribution patterns over time (Santini *et al.*, 2017).

Crickets, belonging to the superfamily Grylloidea, encompass six families, namely Trigonidiidae, Mogoplistidae, Baissogryllidae, Protogryllidae, Phalangopsidae, and Gryllidae (Cigliano *et al.*, 2021). Within Gryllidae, an extensive taxonomic account reveals a roster of 29,060 validated species, supported by 47,500 scientific names and backed by 106,200 specimen records. These terrestrial insects exhibit remarkable adaptability to diverse habitats, ranging from subterranean environments to towering trees, including arid landscapes, dense vegetation, leaf litter, and concealed spaces beneath stones and rocks (Riffat *et al.*, 2021). The egg-laying habits of female crickets involve both plants and soil, contributing to their ecological role (Alexander, 1962).

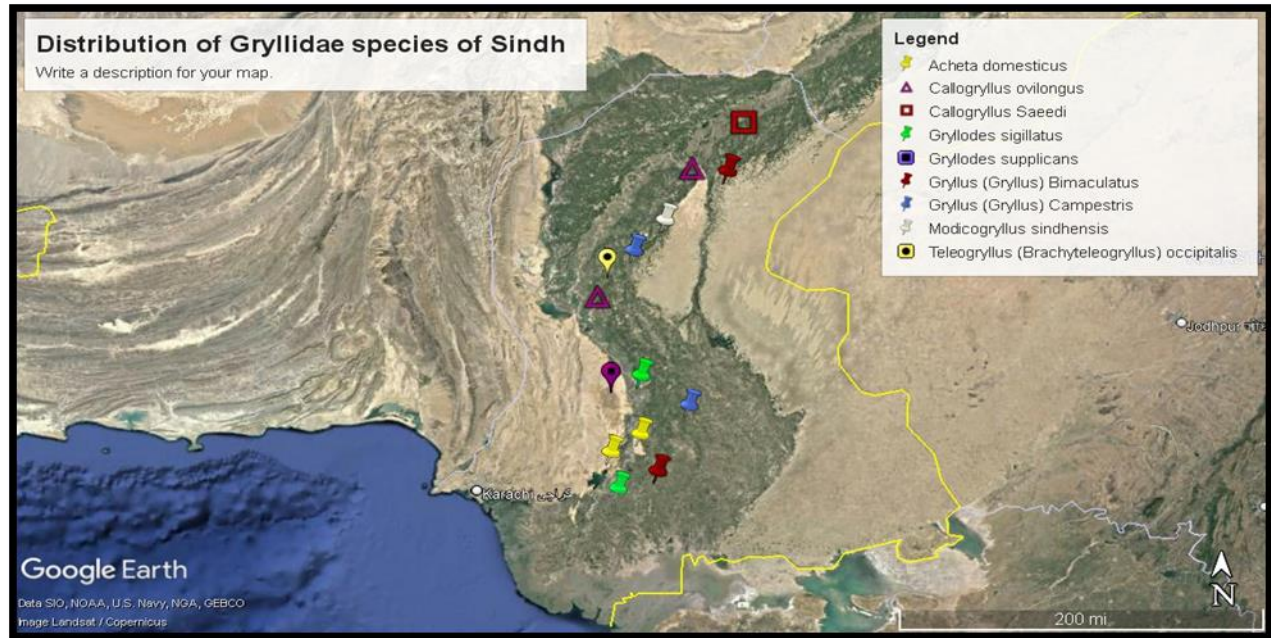
The comprehension of species distribution and composition holds pivotal significance, offering insights for ecosystem understanding, biodiversity documentation, hotspot identification, and the formulation of effective conservation strategies (Mirzaei *et al.*, 2017). In the broader realm of Orthoptera, including phytophagous and hemimetabolous insects like katydids, grasshoppers, crickets, and locusts, distinct suborders Caelifera and Ensifera house a variety of families, each contributing to the ecological fabric. These encompass Pyrgomorphidae, Tetrigidae, Acrididae, Gryllidae, Gryllotalpidae, Tettigoniidae, and Haglidae (Suganya & Manimegalai, 2022). The global expanse of Order Orthoptera extends to 27,260 species (Eades *et al.*, 2016).

Within the agriculturally prominent province of Sindh, Pakistan, Gryllidae species proliferate significantly, with mole crickets, field crickets, and ground crickets exerting notable influence on crop health (Mirzaei *et al.*, 2017). Nonetheless, the understanding of Gryllidae's presence in Sindh remains limited, necessitating dedicated research efforts to illuminate the intricacies of this family's dynamics within the region.

## **Material and methods**

### ***Study area***

Sindh is an agricultural region that grows a variety of crops, including maize, rice, wheat, and sugarcane. Numerous diverse cricket species, including those from plants, grasses, and bushes, have been discovered in Sindh. Sindh is well-known for its developed landscape and Sindhi culture. Sindh is home to Kirthar Mountains and open fields. Deserts can be found in the southeast. South of us is where the Arabian Sea is. Summers are hot and winters are pleasant. The highest temperature recorded in Sindh is 35–38 °C (95–100 °F), (Figure, 1) shows the species' distribution in Sindh.



**Figure 1.** Map was shown the distribution of Gryllidae species from Sindh; colorful legends indicate the species names.

### *Collection of samples*

Specimens of numerous species were gathered from diverse habitats across Sindh, Pakistan, to observe and document their biodiversity. The collection process involved the use of nets and hand-picking techniques. Given that many of these insects exhibit nocturnal behavior and are drawn to light sources, the majority of collections were conducted during nighttime. Subsequently, the collected crickets were transported to the laboratory for comprehensive examination and further analysis.

### *Killing of specimens*

Following the collection of specimens from various crops, the gathered samples were transported to the Entomology and Bio-control Research Laboratory (EBCRL) within the Department of Zoology at the University of Sindh, Jamshoro, Pakistan. To facilitate further study, the crickets were euthanized using a measured quantity of potassium cyanide (KCN), employing specialized entomological containers. To maintain the accurate coloration of the crickets, they were placed within these containers for a period of 5 to 10 minutes before proceeding with the examination.

### *Pinning of samples*

Following the euthanization of the specimens, the crickets were removed from the containers and carefully positioned on a stretching board to prepare them for pinning. Insect pins were inserted into the posterior section of the pronotum, slightly to the right of the median carina and directed

towards the transverse sulcus. This strategic pinning ensured that the head of the cricket was free to move downward with ease.

### ***Specimen Preservation, Identification, and Morphometry***

In the preservation process, crickets underwent pinning, after which they were allowed to air-dry on a stretching board for one hour. Any residual dirt present on the specimens was gently removed using a camel brush, following which the crickets were securely stored in insect cabinets. To ensure proper record-keeping, the specimens were meticulously labelled with essential information such as the collector's name, time, date, and the location of the collection. Naphthalene balls were introduced to the cabinets as a preventive measure against potential insect and parasite infestations.

For identification, Stereoscopic dissecting binocular microscopes were employed, with cricket specimens placed under the microscope using images obtained from the Orthoptera Species File (OSF) (Cigliano *et al.*, 2020). Additional identification efforts were supported by consulting various relevant articles. The morphometric analysis involves the measurement of diverse body parts, including the head, pronotum, femur, tibia, cerci, ovipositor, tegmina, and total body length. These measurements, recorded in millimetres, were facilitated using scales, compasses, and the ocular graph of a microscope. Detailed measurements are elaborated in (Table 1).

**Table 1.** Showing measurement of several body parts of 9 species of subfamily Gryllinae and measurement of body parts such as head, pronotum, femur, tibia, tegmina, cerci, ovipositor and body length were taking place in (mm).

Species	M/F	Head	Pronotum	Femur	Tibia	Tegmina	Cerci	Ovipositor	Body length
<i>Acheta domesticus</i>	M	2-2.1	2.2-2.8	7-9	5-7	10-12	3-3.5	-----	12-15
	F	2-2.1	3.2-3.5	9-11	5-8	-----	6-6.3	9---11	18-20
<i>Gryllus (Gryllus) bimaculatus</i>	M	4-4.2	4.1-4.2	11-13	9-11	15-16	2-2.1	-----	18-24
	F	3-3.5	4-4.2	11-14	10-11	-----	3-4	14-16	19-22
<i>Gryllus (Gryllus) campestris</i>	F	3.1-3.3	6.3-6.4	13-14	11-13	-----	2-3	12-13	23-26
<i>Gryllodes sigillatus</i>	M	2.5-2.9	3.20-3.25	10-11	7-8	-----	1-2	-----	11-15
<i>Gryllodes supplicans</i>	F	3.14-3.15	3.15-3.16	11-14	10-11	-----	2.5	15-16	20-21
<i>Callogryllus ovilongus</i>	F	3.5-3.8	3.2-3.5	10-11	9-10	-----	1-2.6	14-16	15-17
<i>Callogryllus saeedi</i>	F	2.1-2.2	2.6-2.8	11-12	9-10	-----	3.3	13-14	17-18
<i>Teleogryllus (Brachyteleogryllus) occipitalis</i>	F	2-2.2	3.5-3.8	7-10	6-9	-----	2.4	10-12	18-20
<i>Modicogryllus sindhensis</i>	F	2-2.2	3-3.4	7-9	9-11	-----	3.3	12-13	13-16

## Results

### 1. *Acheta domesticus* (Linnaeus, 1758)

*Gryllus (Acheta) domesticus* Linnaeus. 1758. Systema Naturae per Regna tria naturae (10th ed.) 1:428.

*Gryllus domesticus* Linnaeus. 1761. Fauna Sueciae sistens animalia Sueciae (Ed. 2):236.

*Acheta domestica* Fabricius. 1775. Systema entomologiae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus 280.

*Gryllulus domesticus* Uvarov. 1935. Ann. Mag. nat. Hist. 10 15:320.

## Description

♂: Are characterized by their medium-sized, pubescent, and convex bodies, displaying a distinctive testaceous and bright fulvous coloration. Two variably extending testaceous bands adorn their head, contrasting against the overall brown hue. Pronotum boasts two prominent large brown spots. Elytra extend beyond the abdomen's apex, with wings surpassing the elytra. Yellowish legs exhibit occasional brown spots. Notably, the femur features several lines on its upper side, and the tibia is equipped with 6-7 spines. Cerci, positioned at the rear, remain diminutive in size.

♀: Exhibit a larger physique compared to males. Their coloration leans towards light brown. The posterior portion of the head slightly protrudes, and bulging eyes accentuate the outward appearance. Pronotum's interior part curves inwards. Elytra veins in females are notably slanting. The tibia bears 5 or 6 spines, while the posterior side of the femur appears narrower. Cerci are narrower from the anterior perspective. The ovipositor is elongated, acute, and presents a regular structure.

## Phenology

The common cricket, *Acheta domesticus*, exhibits a wide distribution across fields. Its life cycle spans approximately two to three months, lacking any distinct winter-specific stage. Crops impacted by this species include *Tritium aestivum* (Wheat), *Oryza sativa* (Rice), *Sacharum officinarum* (Sugarcane), and *Dactyloctenium aegyptium* (Common lawn grass). This species has been observed in various habitats.

## Remarks

The distribution of this species is cosmopolitan in nature. Reports of its presence span across diverse locations, including the Himalayas, Srinagar, and Kashmir, where it has been observed at an altitude of 6000 ft. (Chopard, 1969). In the course of my ongoing study, I have documented the presence of this species within the Sindh region. In a prior literature review, researchers have

highlighted that *Acheta domesticus*, along with other related species, acts as a significant pest affecting numerous crops in both Pakistan and India (Ghouri, 1961).

## 2. *Gryllus (Gryllus) bimaculatus* De Geer, 1773

*Gryllus (Gryllus) bimaculatus*, De Geer. 1773. Mémoires pour servir à l'histoire des insectes 3:521.

*Acheta bimaculatus*, Herbst. 1786. Archiv der Insectengeschichte. Herausgegeben von Johan Caspar Fuessly 7-8:192.

*Acheta bimaculata*, Afzelius & Brannius. 1804. Achetae Guineenses 18.

*Gryllus bimaculatus*, Gerstaecker. 1869. Arch. f. Naturgesch. 35(1):212.

*Liogryllus bimaculatus*, Saussure. 1877. Mem. Soc. Phys. Hist. Nat. Geneve 25(1).

### Description

♂: Are characterized by body size, medium-sized, color entirely black, including the body and head. Pronotum is shiny, concave at its anterior margin, and piriform (pear-shaped). Impression on disk, strong, which could refer to some form of indentation or pattern on the dorsal surface of the insect. Hind wings, small, long. This indicates that the insect is capable of flight. Tegmina is black in color with two pale spots at the base where they attach to the pronotum. Legs are black, and the anterior tibia is punctured with a smoothed internal and elongated external tympanum. This tympanum could be a sound-producing or detecting structure, common in some insects, hind femur Small. Cerci elongated, cerci are sensory appendages found at the posterior end of many crickets.

♀: The Female is relatively large in size and has a black coloration, the anterior part of the head is described as straight, the pronotum is plate like the dorsal plate covering the thorax, and has outwardly flaring edges. Tegmina are the hardened front wings in crickets. The description of two pale areas attached through the pronotum could be distinctive for certain species. The legs of Orthopterans are adapted for jumping and can be strong and spiny. The female has an ovipositor that is slightly larger than the posterior femur. It has apical valves and is described as acute and lanceolate, which is a feature used to lay eggs in the soil or other suitable substrates. The length of the cerci “paired appendages at the tip of the abdomen” is similar to that of the male.

### Phenology

It seems like you're describing the species *Gryllus bimaculatus*, which is commonly known as the two-spotted field cricket. This species is known to be a pest in agriculture, as it can affect crops like *Triticum aestivum* (Wheat), *Oryza sativa* (Rice), and *Sacharum officinarum* (Sugarcane). *Gryllus bimaculatus* goes through a hemimetabolous life cycle, which means that when they hatch from eggs, they start as nymphs or larvae and undergo several molts (instars) before reaching the adult stage. This development process typically involves 8 to 11 molts. Field crickets like *Gryllus bimaculatus* are often found in grassy areas, herbs, and shrubs and are known for their distinctive chirping sounds, particularly from the males, as a form of communication and mating behavior.



## Remarks

*Gryllus (Gryllus) bimaculatus*, commonly known as the Two-spotted Cricket, is found in various regions, including Europe, Africa, and Tropical Asia, which includes India. The author has also observed this species in Khanedesh and noted that they cause injuries to potato plants. The author mentions the diversity in the spread of this cricket species, with records from different areas: Europe Africa Tropical Asia (including India) Khanedesh (possibly Bangladesh). The author has documented the presence of *Gryllus bimaculatus* in various specific locations: Kashmir (Gandharal), Gilgit in West Pakistan Lyallpur (now Faisalabad) in Pakistan, Rawalpindi Dadia in Pakistan West Bengal (Kolkata) Darjeeling United Provinces Uttar Pradesh Mumbai (Younus *et al.*, 1980). In present study, I have collected specimens of *Gryllus bimaculatus* from various habitats in Sindh during March, April, and September. It appears that this information is part of a study detailing the distribution and ecological impact of these crickets in different regions.

### 3. *Gryllus (Gryllus) campestris* Linnaeus, 1758

*Gryllus (Acheta) campestris* Linnaeus. 1758. Systema Naturae per Regna tria naturae (10th ed.) 1:428.

*Acheta campestris* Fabricius. 1775. Systema entomologiae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus 281

*Gryllus campestris* Olivier, G.A. 1791. Encyclopédie méthodique. Histoire naturelle. Entomologie, ou histoire naturelle des crustacés, des arachnides et des insectes 6:636.

*Liogryllus campestris* Saussure. 1877. Mem. Soc. Phys. Hist. Nat. Geneve 25(1):305.

## Description

♀: Large body size (17-26 mm), black and shiny body, a rounded head, and well-developed pronotum, the presence of short forewings in females indicates that this could be a description of a flightless, the description of the legs having reddish or orange color, with tibia containing 5 to 6 spines on each margin and the femur being thicker than the tibia, an ovipositor being straight and larger than the cerci. The cerci are sensory appendages typically found at the posterior end of the abdomen.

## Phenology

Field crickets, *Gryllus campestris*, are typically found in specific habitats, including dunes, short grass areas, chalk soil, light sandy soil, and porous soil. They prefer open, sunny areas with these soil types. After mating, female field crickets lay their eggs and then disappear for about a week. This is a common behavior among crickets. The eggs are individually placed in the soil, typically from May to July. Hatching occurs about 3-4 weeks later, starting from June onward. In the autumn, nymphs of *Gryllus campestris* go through their second-to-last instar stage, typically the 10th instar. After this stage, they hibernate to survive the winter months. Unlike *Gryllus bimaculatus*, which is more widespread, *Gryllus campestris* is not found everywhere but is restricted to specific habitats, such as shrubs and grasses.



## Remarks

*Gryllus campestris*, is flightless and found in various regions across Europe, Africa, and Asia. In some European countries like Germany, the UK, Netherlands, Switzerland, and Denmark, this species is sporadic and is listed on Red Lists, which likely means it is of conservation concern in those regions (Hochkirch, *et al.*, 2007). During a field survey in Sindh, collected *Gryllus campestris* from different habitat regions in July. I have observed that this species is closely related to *Gryllus (Gryllus) bimaculatus* but has some differences, such as short wings and a large head. It's interesting to note that both *Gryllus campestris* and *Gryllus (Gryllus) bimaculatus* are sibling species, suggesting that they share a close evolutionary relationship.

## 4. *Gryllodes sigillatus* Walker, 1869

*Gryllus sigillatus*, Walker, F. 1869. Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum 1:108.

*Gryllodes supplicans*, Gorochoy. 1983. In Bodrova, Soboleva & Meshcheryakov [Ed.]. Systematics and ecological-faunistic review of the various orders of Insecta of the Far East 43.

## Description

♂: Size is elongated, indicating a relatively long and narrow body shape. The body coloration is light brown, suggesting a brownish or tan color, the head has a wide yellow transverse stripe that curls in between the ocelli. The pronotum, the shield-like structure covering the thorax, has rare brown spots and a feebly concave anterior margin. In males, the elytra extend to the third segment of the abdomen. They are shortened and meagerly smoothed at the top. The femur is brown and yellowish with patches of brown color, the tibia, the segment of the leg nearest to the body, has 6 spines on each margin, paired appendages at the rear of the abdomen “cerci” contains small hairs.

## Phenology

House crickets are found in various parts of the world and are well-adapted to living in human habitats. They are known for inhabiting areas such as below bricks, debris, and kitchens, where they can find food and shelter. Female house crickets typically breed more actively in spring and summer than in winter and autumn. They prefer a humid substrate for breeding, often choosing locations like leaf litter or soil to deposit their eggs directly into the substrate. As mentioned, they are commonly known as house crickets because they are frequently encountered in and around houses. These crickets can be a nuisance in homes and are known for their distinctive chirping sounds, which are often heard at night. They are omnivorous and can feed on a variety of organic materials, including plant matter and even other insects.

## Remarks

This species is commonly referred to as the "cosmopolitan species" because it is dispersed in various parts of the world, including Europe, the USA, India (specifically Ajmer and Rajasthan), Malaysia (Kuala Lumpur), and West Bengal. This species is often called "tropical house crickets" or "Indian house crickets" because they are typically found in and around human dwellings and are associated with specific small habitats like shrubs, herbs, and grasses grown within houses. They are commonly encountered in tropical countries. This species can be considered a pest, as it has been known to cause significant damage to textile mills in India. This suggests that they can be problematic for households and industries (Khan, 1954).

## 5. *Gryllodes supplicans* (Walker, 1859)

*Acheta supplicans* Walker, F. 1859. Ann. Mag. nat. Hist. 3 4:221.

*Gryllus supplicans* Walker, F. 1869. Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum 1:36.

*Gryllodes sigillatus* Chopard. 1967. In Beier [Ed.]. Orthopterorum Catalogus 10:109.

## Description

♀: Elongate-oval body shape, it is light brownish in color, protrusion or structure on the head, pronotum is the upper plate-like structure of the insect's thorax, and its shape can be an important characteristic for identification. This description suggests a specific shape of the pronotum. Reduced four vein wings are present. A strong femur might indicate an insect with powerful leg structures, possibly adapted for jumping or grasping. Tibia contains pointed spines: This is a characteristic feature in various groups of insects, including grasshoppers. These spines can be used for defence or catching prey. Ovipositor is bifurcated from the anterior side, a bifurcated ovipositor means it has two parts or prongs, and this can be a distinguishing feature in certain crickets. Cerci are slightly elongated.

## Phenology

*Gryllodes supplicans* which is commonly known as the "fall field cricket." *Gryllodes supplicans* is a species of cricket that is widely distributed around the world. They are known for feeding on various plants, including *Tritium aestivum* (wheat) and *Oryza sativa* (rice), but they typically do not have significant negative effects on these plants, as they are not considered major agricultural pest. These crickets are both nocturnal and diurnal, meaning they can be active during both day and night. Male *Gryllodes supplicans* produce songs as a part of their mating process. The songs are used to attract females and establish territory. *Gryllodes supplicans* may share similar habitats with other cricket species like *Gryllodes sigillatus*, as they often occupy grassy areas and fields.

They are generally considered a common and adaptable cricket species found in a wide range of environments.

### Remarks

*Gryllodes supplicans* is a species that appears to be closely related to *G. sigillatus*, sharing many morphological characteristics. However, there are notable differences between them, including the fact that *G. supplicans* is macropterous (has long wings) and is elongated in size. This variation is particularly significant since female *G. sigillatus* have experienced a great reduction in the size of their elytra (wing covers). The observation of these differences raises questions about the possibility of a reversion to a completely winged form in *G. sigillatus*. It's challenging to determine whether such a reversion could occur. To investigate this further, I have mentioned that a revision of the genitalia of *G. supplicans* is currently underway. Once this investigation is completed, it is hoped that it will provide more reliable information to verify the status and characteristics of *G. supplicans*.

## 6. *Callogryllus ovilongus* Saeed & Yousuf, 2000

### Description

♀: The female size is slightly large, the body color is described as "testaceous," which typically refers to a reddish-brown or brownish color, and "whitish," which suggests a white or pale color. The head is described as black and shiny. The pronotum is broad, the pronotum is a plate-like structure that covers the top part of the insect's thorax. The wings are described as "micropetrious," which could indicate that the wings are reduced in size or non-functional. The femur is slightly yellow in color, the posterior tibia has both exterior and interior spines. This suggests that the insect may be adapted for climbing or gripping surfaces. The ovipositor is described as short, very elongated, and acute, this is a specific feature of the ovipositor, suggesting it has a slim and pointed structure at the apex. The cerci are described as narrow from one side.

### Phenology

*Callogryllus ovilongus* appears to be a specialist insect that feeds on *Dactyloctenium aegyptium*, which is a common lawn grass. This specific host plant preference can be an important characteristic in identifying and understanding the ecology of the species.

### Remarks

Only one female specimen of this recently discovered species was gathered in Peshawar (Saeed *et al.*, 2000). Six females of this species were collected from Hyderabad, proving its existence (Malik *et al.*, 2013). I have also gathered this species from many Sindhi environments throughout my current research.

## 7. *Callogryllus saeedi*, (Saeed, 2000)

♀: Body size small, color of body is yellowish. Smooth head means the head lacks prominent features or texture. The pronotum is concave at its anterior margin, meaning it has a curved or indented shape at the front. The wings are reduced. In some cases, female crickets have reduced wings and are often unable to fly. The anterior part of the femur, the thigh segment of the leg, is slightly curved from the middle side. The posterior tibiae, the lower part of the hind leg, contain 5-6 external spines. This feature can be important for identifying specific species. The ovipositor is slim and acute at the apical valves. The cerci are small compared to the ovipositor.

### Phenology

*Callogryllus saeedi*, is a species of cricket that is found primarily in Pakistan. It feeds on two main plant species: *Saccharum officinarum*, which is sugarcane, and *Dactyloctenium aegyptium*, also known as common lawn grass. This cricket species can be found in various agricultural fields, herbs, shrubs, and different plants and crops in the regions of Pakistan where it is native. It is a remarkable example of the biodiversity found in various ecosystems, including agricultural areas.

### Remarks

*Callogryllus saeedi* is found in Pakistan, specifically in Peshawar (Malik *et al.*, 2013), and it has been recorded in Sindh. The two species, *Callogryllus saeedi* and *Callogryllus ovilongus*, are closely related. However, there are some observable differences. There is some variance in the presence of a dark slanting gang amongst the compound eyes. The size of the ovipositor in *Callogryllus saeedi* is minor compared to *Callogryllus ovilongus*.

### 8. *Teleogryllus (Brachyteleogryllus) occipitalis* (Serville, 1838)

*Gryllus occipitalis*, Serville. 1838[1839]. Histoire naturelle des insectes. Orthoptères 339.

### Description

♀: Medium to large, which is common for many crickets. Coloration, yellow and brown for the body, with a blackish-brown head. This coloration is typical for many crickets. The posterior part of the pronotum being wider than the anterior. Fully developed wings in females suggest that they are capable of flight. The femur being larger than the tibia and the presence of piercing spines on the tibia are common adaptations for jumping in crickets, Cerci are the paired appendages at the posterior end of the abdomen.

### Phenology

This species, which is nocturnal, inhabits Asia, including India. It consumes *Dactyloctenium aegyptium* (common lawn grass), *Oryza sativa* (rice), and *Tritium aestivum* (wheat). An earlier collection of this female species was made from *Lolium perenne* grass (Malik *et al.*, 2013). Another name for this plant is *perennial ryegrass pasture*. Additionally, I discovered from *Lolium perenne* grasses.

## Remarks

This species is widely dispersed over the globe and may be found in India, namely in the states of Assam, Manipur, Tamil Nadu, Gujarat, and Sri Lanka. This species' nearest report is from Valparai in the Tamil Nadu district of Coimbatore (Riffat *et al.*, 2021). I have discovered that this species is native to Sindh throughout my current research.

## 9. *Modicogryllus sindhensis* Riffat, 2018

### Description

♀: The medium-sized body has a black and light brownish tone, while the shining black head stands out. The pronotum has a few little hairs as well. The femur is 10 mm long and has completely formed elytra. Seven little and big pointed spines make up the tibiae. The cerci are short and have a pointed ovipositor

### Phenology

This species is nocturnal and mostly found in *Oryza sativa* and *Tritium aestivum*. This species has already been recognized as new from Umerkot (Riffat *et al.*, 2021). Additionally, I have discovered this female species among the grasses, herbs, and bushes.

### Remarks

Pakistan was also home to the *Modicogryllus blennus* species. Recent records from Sindh indicate the existence of a new *Modicogryllus species*, *Modicogryllus sindhensis*. Despite having some differences, such as these variations can be the result of adaptations to different ecological niches, geographical isolation, or other factors. This species is closely related to *Modicogryllus signipes*. In certain parts of Asia, *Modicogryllus signipes* is found.

### Conclusion

It's interesting to note that Gryllidae species, which include crickets, are distributed worldwide except for Antarctica. Pakistan, indeed, has a significant agricultural sector, and Sindh is one of its major crop regions. The presence and distribution of Gryllidae species in Sindh are likely related to the prevailing climatic conditions within this region, which is a common pattern for many insect species. It appears that a study has been conducted to investigate the presence and dynamics of these cricket species in Sindh, Pakistan. This study likely examines systematic records to understand the presence, phenology, and distribution of these species. Such research can provide valuable insights into how these insects adapt to the local climate and environmental conditions.

Phenology studies can help researchers understand the timing of various life events in these species, such as when they reproduce, moult, or engage in other behaviors. This, in turn, can shed light on how these insects are affected by climate patterns and how they adapt to changing conditions. Overall, studying the distribution and dynamics of Gryllidae species in Sindh, Pakistan, is not only important for ecological research but can also have practical implications for agriculture and pest management in the region. It can contribute to a better understanding of the interactions between local ecosystems and the insects that inhabit them.

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