ARPHA Preprints

PENSOFT

PREPRINT

Author-formatted, not peer-reviewed document posted on 30/08/2021

DOI: https://doi.org/10.3897/arphapreprints.e73693

A review of Gryllidae (Grylloidea) with the description of one new species and four new records from the Sindh Pakistan

Riffat Sultana, Suriya Sanam, Santosh Kumar, Sheik Shamsudeen, Fakhra Soomro

ARPHA Preprints *Author-formatted, not peer-reviewed document posted on 30/08/2021* DOI: https://doi.org/10.3897/arphapreprints.e73693

A review of Gryllidae (Grylloidea) with the description of one new species and four new records from the Sindh Province, Pakistan

Riffat Sultana[1], Surriya Sanam[1], Santosh Kumar[2], Sheik Mohammad Shamsuddin[3], Fakhra Soomro[4]

1 Department of Zoology, University of Sindh, Jamshoro, Sindh- Pakistan
2 Department of Zoology, Cholistan University of Veterinary and Animal Sciences, Bahawalpur, Punjab, Pakistan
3 Department of Zoology, Sir Syed college, Kannur University, Kerala, India
4 Department of Zoology, Shah Abdul Latif University, Khairpur, Sindh, Pakistan

Corresponding author: *Riffat Sultana* (riffat.sultana@usindh.edu.pk)

Abstract

The family Gryllidae is reviewed, resulting in the recognition of seventeen species, of which one is *Modicogryllus*? described herein as new. Four species, namely *Acheta hispanicus* Rambur, 1838, *Gryllus septentrionalis* F. Walker, 1869, *Callogryllus saeedi* Saeed, 2000 and *Miogryllus itaquiensis* Orsini and Zefa, 2017 are recorded as new country and state records. Differences from similar species and a taxonomic key to species of Sindh are provided.

Key words

Gryllidae, new record, review, taxonomic key

Introduction

Crickets are representative of superfamily Grylloidea with four families: Myrmecophilidae, Gryllotalpidae, Mogoplistidae, and Gryllidae. The group dates from

the Triassic Period and today includes 3726 known living species and 43 extinct ones, 22 extant subfamilies and 7 extinct ones, and 528 extant genera and 27 extinct ones. Most extant subfamilies are distributed worldwide Resh and Carde (2009). Crickets live in virtually all terrestrial habitats from treetops to a meter or more beneath the ground. Members of several subfamilies live in or near treetops and in bushes, grasses, and other herbaceous plants on the soil surface (Nemobiinae, Gryllinae), in caves (Phalangopsinae, Pentacentrinae), and in shallow or deep burrows (Gryllotalpinae, Brachytrupinae); some excavate burrows in logs or standing trees (Pteroplistinae); some beach-dwelling species of Trigonidiinae run and jump readily on water. Many crickets are omnivorous and some seem to feed almost entirely on vegetable matter, yet sometimes consume carrion and even ferociously kill and eat other insects. Several species frequent human dwellings and refuse heaps, most notably *A. domesticus* Linnaeus, 1758 and the decorated cricket, *Gryllodes sigillatus*. Subterranean species feed mostly on roots and can be injurious when abundant in crops, gardens, lawns, golf courses, and newly reseeded forests. Copulation takes place with the intervention of a rather small spermatophore and, according to the groups, the eggs are laid in the ground or in the stems of herbaceous plants.

The classification of the Gryllidae has been established by Henri de Saussure in a remarkable monograph published in Geneva in the years 1877 and 1878. In this thorough work, the author points out the most important morphological characters and establishes the larger divisions of the group. Although a great number of species have been described since the publication of Saussure's work, this work remains the basis of the modern classification of the Grylloidea. The Gryllidae are abundant throughout Sindh, the most cultivated region and major crops of Pakistan that are damaged by mole crickets, ground crickets, field crickets, house crickets, etc. The Gryllidae live in different types of habitats such as moist soil, herbs, shrubs, grasses, and vegetation. The fauna of Gryllidae from Sindh is still insufficiently known. Considering the ratio of described species to species unknown to science, it can be assumed with some confidence that the number of unknown species is proportionately smaller in the Gryllidae. It was therefore felt necessary to revise the

family from this region. Description, taxonomic keys, and illustration for all 17 known species are provided; bionomics and ecological accounts are also briefly discussed. In this manuscript we offer one new species and four new records from Pakistan, which helps in filling gaps in our knowledge of the Gryllidae of Pakistan and brings information up to date.

Material and methods

All specimens were collected from the different agricultural crops of various districts of Sindh. Material was brought to Entomology and Bio-control Research Laboratory (EBCRL), Department of Zoology, University of Sindh, Jamshoro. Methodology for euthanasia was adapted from Vickery and Kevan (1983) and Riffat and Wagan (2015) with slight modifications: specimens were killed by using Potassium cyanide or Chloroform in standard entomological killing bottles for 5–10 minutes. Samples were not left longer because their colours could be change.

Pinning of samples was done quickly after killing. An insect pin was inserted on the pronotum posterior to transverse sulcus, slightly to the right of the median carina. The head was directed slightly downwards on the stretching board. The left wings were set with the long axis of the body nearly at a right angle to the pin. The posterior legs were bent beneath the body to minimize the possibility of breakage and to occupy a smaller area. The abdomen was dropped below the wings and not obscured by the hind legs.

Fully dried specimens were preserved in insect cabinets with labels providing collection date, habitat, locality, and collector's name. Naphthalene balls ($C_{10}H_8$) were placed in boxes to prevent the attack of ants and other insects. Specimens were identified through the bibliographies given by Riffat and Wagan (2015), and Orthoptera Species File (OSF) (Cigliano et al. 2020) was consulted.

Photographs of the various species were prepared. Line drawings were made with a camera lucida fitted on a microscope (Ernst Leitz Wetzlar Germany 545187) and

these were improved with the help of the software Adobe illustrator CC-2015. Each figure is of one body part of all included species for comparison.

Measurements of various body parts were calculated in millimetres (mm) through microscope (Oculas) 10x10 graph, compass, divider, and rule. Species distributions were mapped using latitude and longitude information for available sites of species. The material (TN: 802 SEM) has been deposited in Sindh Entomological Museum (SEMJ), Department of Zoology, University of Sindh, Jamshoro. Pakistan 30.3753° N, 69.3451° E.

RESULTS

Family Gryllidae

Subfamily Gryllinae

Tribe Gryllini

Genus *Acheta* Linnaeus, 1758

***Acheta domesticus* (Linnaeus, 1758)**

Figures 1-11, Table 1

Material examined: PAKISTAN**- Sindh Prov**. • 2♂, 8♀; Riffat, Surriya; 28 Aug. 2019; Mithi N 24.7436°, E 69.8061°, 11♂, 17♀; Riffat, Surriya; 30 Aug. 2019; Naushahro feroze N 26.8463°, E 68.1253°, 3♀; Surriya, Riffat; 3 Sep. 2019; Chachro N 25.1156°, E 70.2557°, 5♂, 11♀; Riffat, Surriya; 11 Sep. 2019; Umerkot N 25.3549°, E 69.7376°, 5♂, 16♀; Surriya, Riffat; 12 Sep. 2019; Nara N 34.6851°, E 135.8048°, 12♂, 24♀; Surriya, Riffat; 17 Sep. 2019; Nagarparkar N 24.3572°, E 70.7555°, 1♂, 4♀; 14 Aug. 2019; Tharparkar N 24.8777°, E 70.2408°, 2♂, 9♀; Riffat, Surriya; 16 Aug. 2019; Sanghar N 26.0436°, E 68.9480°, 1♂, 8♀; Riffat, Surriya; 17 Aug. 2019; Islamkot N 24.7014°, E 70.1783°.

Description

Medium size, pubescent, and deep. General coloration light fulvous or testaceous (Fig. 1A). Head brown with two variables extending testaceous bands (Fig. 2A, B). Pronotum adorned with two large brown bands (Fig. 4A, B). Elytra extending to the apex of abdomen. Wings usually larger than the elytra (Fig.8A, B). Legs yellowish with a few brown spots. Posterior tibia armed with eleven spines on the basal side (Fig. 6A, B. Ovipositor large and acute.

Male: LH 2.25 ± 0.15 (mm), LP 3.5 ±1.4 (mm), LT 4.5 ± 1.73 (mm), LF 11.0 ± 2.08 (mm), LT 6.01 ± 1.0 (mm), LT 4.9 (mm), TBL 15.33 ± 4.2 (mm) **Female**: LH 3.26 ± 2.8 (mm), LP 3.83 ± 1.50 (mm), LT 4.7 ± 1.23 (mm), LF 14.0 ± 4.11 (mm), LT 7.33 ± 2.06 (mm), LO 10.66 ± 2.94 (mm), TBL 16 ± 3.05 (mm)

Ecology

Acheta domesticus are broadly distributed in the field. They complete their life cycle within 60 to 70 days. Agricultural crops affected by this species are *Tritium aestivum* (wheat), *Oryza sativa* (rice), *Sacharum officinarium* (sugarcane), and *Dactyloctenium aegyptium* (common lawn grasses).

Global distribution

Czech Republic, Greece, Peloponnes, Patras, Yugoslavia, Serbia, USA, India, Pakistan (Cigliano et al. 2020)

Remarks

Acheta domesticus is generally recognised as house crickets, cosmopolitan in nature. The presence of this species was reported by Chopard (1969) from Himalayas, Srinagar, and Kashmir, at 6000 ft. At present we have described this species from Chachro N 25.1156°, E 70.2557°. Previously, Ghouri (1961) stated that *A. domesticus* and other species were severe pests of many crops in Pakistan, and Malik (2012) also stated it from human habitation. We have collected large numbers of specimens from agricultural fields and confirmed that it is a pest of various crops.

***Acheta hispanicus* Rambur, 1838**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♂; Riffat, Surriya; 23 Aug. 2019; Mithi N 24.7436°, E 69.8061°.

Description

Rather large robust, coloration brownish-yellow (Fig. 1C). Head blackish with shining occiput (Fig. 2C). Pronotum unicolor, concave, very slightly widening anterior and posterior margin almost straight with numerous spots (Fig. 1C). Elytra extending to the apex of abdomen, mirror rather small obliquely transverse (Fig. 8C). Wings long. Legs pale-yellowish with numerous hairs. Tibia with eleven pointed and tapered spines on either side (Fig. 6C). Abdomen yellow pubescent. Cerci well developed, pointed at the terminal.

Male: LH 2.17 (mm), LP 2.66 (mm), LT 13 (mm), LF 11 (mm), LT 08 (mm), LT 4.9 (mm), TBL 28 (mm)

Ecology

Species was recorded from Mithi. Weissman et al. (1980) reported that the adults seemed to appear in August but were abundant mid-August to September with a decline observed in October. Usually, they are found in ditches of soil in rice fields.

Global distribution

Portugal, Spain: Granada, India, Pakistan (Cigliano et al. 2020)

Remarks

This species is a new record from Sindh, Pakistan, and also for Asia. The body is wide and robust in structure compared to the more widely distributed *A. domesticus*. In our collection only a single male was captured, so more extensive collections are needed to establish its complete distribution.

Genus *Gryllus* Linnaeus (1758)

164 ***Gryllus (Gryllus) bimaculatus* De Geer, 1773**

165 Figures 1-11, Table 1

166 **Material examined:** PAKISTAN- **Sindh Prov.** • 5♂, 4♀; Surriya, Riffat; 21 Aug. 2019;
167 Mithi N 24.7436°, E 69.8061°, 2♀; Riffat; Naushahro feroze N 26.8463°, E 68.1253°,
168 3♂, 4♀; Riffat, Surriya; 12 Sep. 2020; Chachro N 25.1156°, E 70.2557°, 4♂, 8♀;
169 Surriya, Riffat; 19 Sep. 2020; Umerkot N 25.3549°, E 69.7376°, 2♀; Riffat; 20 Aug.
170 2020; Nara N 34.6851°, E 135.8048°, 6♂, 16♀; Surriya; 24 Aug. 2020; Nagarparkar
171 N 24.3572°, E 70.7555°, 6♂, 11♀; Riffat, Surriya; 23 Aug. 2020; Tharparkar N
172 24.8777°, E 70.2408°, 1♂, 3♀; Riffat; 26 Aug. 2020; Sanghar N 26.0436°, E
173 68.9480°, 3♂, 8♀; Riffat, Surriya; 27 Aug. 2020; Islamkot N 24.7014°, E 70.1783°.

174 **Description**

175 Large size, stout. Colour blackish. Head curved feebly at anterior; wider at posterior
176 (Fig. 1D, E). Pronotum concave with piriform impression on anterior disk (Fig. 4D,
177 E). Elytra reach to the top of abdomen, wings much long (Fig. 8D, E). Legs dark-
178 brown strongly pubescent (Fig. 1D, E). Posterior femora rather thick, dark brown with
179 rufous base; posterior tibia with eight spines on superior margin (Fig. 6D, E).
180 Ovipositor rather long and slender, feebly curved with apical valves very narrow,
181 smooth, acute (Fig. 1D, E).

182 **Male:** LH 2.25 ± 0.15 (mm), LP 3.45 ± 0.057 (mm), LT 4.1 ± 1.5 (mm), LF 14.5 ± 0.57
183 (mm), LT 11.0 ±1.15 (mm), LT 4.2 (mm), TBL 22.5 ± 0.57 (mm) **Female:** LH 4.76 ±
184 0.74 (mm), LP 4.66 ± 0.35 (mm), LT 4.5 ± 1.63 (mm), LF 15.33 ± 0.57 (mm), LT 11.66
185 ± 0.816 (mm), LO 18.5 ± 0.57 (mm), TBL 16 ± 3.05 (mm)

186 **Ecology**

187 This species frequently occurred in the field. Plants affected by this species are
188 *Tritium aestivum* (wheat), *Oryza sativa* (rice), *Sacharum officinarium* (sugarcane),
189 and *Echinochloa colonum* (jungle rice). This species is hemimetabolous and moults
190 8–11 times to become adult.

Global distribution

Mali, Ukraine, France, Spain, USA, India, West Bengal, Kashmir, Pakistan (Cigliano et al. 2020)

Remarks

It is variable in size with colour variations. Chopard (1969) reported that *G. (Gryllus) bimaculatus* causes severe damage to potato plants. During this study we collected this species from dry parts of Nagarparkar and confirm its presence in dry barren areas.

Gryllus (Gryllus) campestris Linnaeus, 1758

Figure 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov**. • 2♂, 6♀; Riffat; 12 Jul. 2019; Chachro N 25.1156°, E 70.2557°, 10♂, 23♀; Riffat, Surriya; 17 Jul. 2019; Umerkot N 25.3549°, E 69.7376°, 3♀; Riffat; 18 Aug. 2019; Nara N 34.6851°, E 135.8048°, 7♂, 12♀; Surriya, Riffat; 27 Aug. 2019; Nagarparkar N 24.3572°, E 70.7555°, 8♂, 15♀; Riffat, Surriya; 8 Jul. 2019; Tharparkar N 24.8777°, E 70.2408°, 4♂, 7♀; Surriya, Riffat; 3 Sep. 2020; Islamkot N 24.7014°, E 70.1783°.

Description

A large species, rather close to *G. (Gryllus*) *bimaculatus,* but with more slightly rounded and curved (Fig. 1F). Head brown-yellowish with patches and raised veins (Fig. 2F). Pronotum convex above, blackish-brown with fine greyish pubescent; posterior margin sinuated; elytra extending to the apex of the abdomen (Fig. 4F), legs blackish testaceous with brown spots, pubescent. Posterior femora rather short and thick; posterior tibia armed with six spines on each margin (unfortunately broke while capturing photography). Abdomen brown, ovipositor long, slender with narrow very acute apical valves (Fig. 1F).

Female: LH 4.6 (mm), LP 4.9 (mm), LT 18 (mm), LF 15, LT 13, TBL 29 (mm)

Ecology

Tritium aestivum (wheat), *Oryza sativa* (rice), *Sacharum officinarium* (sugarcane), *Echinochloa colona* (cultivated field) are all affected by this pest. It seems rare in numbers, and not widely occurring like other species of Gryllidae. Presently, specimens were collected from rice fields whereas other host plants such as sugarcane and wheat were also present.

Global distribution

Denmark, Germany, Netherlands, Switzerland, UK, Pakistan (Cigliano et al. 2020)

Remarks

Due to its rare status and sporadic nature *G. (G.) campestris* is included in the red lists Hochkirch et al. (2007). It is flightless in its habitat of dune, short grasses, chalk soil, and light sandy porous soils. During our field survey we collected material from different districts. Our examination evidenced that this species has morphological similarity to *G. (Gryllus) bimaculatus* but rather had a few differences in wing pattern and head.

Gryllus septentrionalis F. Walker, 1869

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♀; Riffat, Surriya; 21 Jul. 2019; Mahendrani, Umerkot N 25.3549°, E 69.7376°

Description

Medium size, coloration rufous-brown, rather strongly pubescent (Fig. 1G). Head long, rounded without any ornament. Face brown with yellow horizontal band; ocelli big, brown (Fig. 2G). Pronotum slightly enlarged in front, anterior margin feebly concave, posterior one pointed; disk convex, rufous with two large piriform impression; lateral lobes with yellowish inferior part (Fig. 4G). Elytra brownish

reaching to the apex of abdomen; dorsal field with veins slightly oblique, rather projecting. Wings long (Fig. 9A). Legs pubescent; anterior and medium femora rufous-brown; anterior tibia with a large slender external tympanum; the internal face being only depressed. Posterior femora rather long and swollen. Tibia shorter than the femora armed with nine basal spines, four on joint of meta-tarsus (Fig. 6F). Abdomen brown; ovipositor moderately long, rather slender with apical valves very acute (Fig. 1G).

Female: LH 3.9 (mm), LP 4.2 (mm), LT 18 (mm), LF 12.5 (mm), LT 08 (mm), LT 05 (mm), TBL 26 (mm)

Ecology

Gryllus septentrionalis was collected from the village of Mahendrani, Umerkot in August. However, it was noted that this field is surrounded by *Citrus* (lemon) crops and other wild vegetation. The resent study suggests that extensive surveys are needed.

Global distribution

Argentina, Paraguay, Caribbean, Jamaica, Pakistan (Cigliano et al. 2020)

Remarks

This is the first record from desert Thar, Sindh, Pakistan. According to Saeed (2000), this species of cricket occurs in terrestrial habitats throughout the world, and they mostly damage the cotton, rice, millets, and sugarcane crops. Due to their predatory nature, they are also helpful in biological control, but more detailed investigations are needed to identify this strategy in future.

Genus *Gryllodes* Saussure, 1874

***Gryllodes sigillatus* Walker, 1869**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 2♀; Riffat; 14 Jul. 2020; Mithi N 24.7436°, E 69.8061°, 1♂, 8♀; Surriya, Riffat; 19 Jul. 2020; Naushahro feroze N 26.8463°, E 68.1253°, 3♂, 15♀; Riffat; 2 Sep. 2019; Chachro N 25.1156°, E 70.2557°, 9♂, 12♀; Riffat, Surriya; 13 Aug. 2020; Umerkot N 25.3549°, E 69.7376°, 6♂, 7♀; Surriya, Riffat; 16 Aug. 2020; Nagarparkar N 24.3572°, E 70.7555°, 5♀; Riffat, Surriya; 4 Sep. 2020; Tharparkar N 24.8777°, E 70.2408°

Description

Medium size, depressed rather strongly pubescent (Fig. 1H). Head brown with wider, transverse yellowish bands on dorsal field; anterior narrow one, curved between ocelli; face short, yellow; clypeus spotted with brown, front with feeble suture (Fig. 2H). Pronotum transverse with concave anterior margin; disk almost straight; yellowish with a wide brown band along the posterior margin and a more or less important spot of the same colour on the impresses (Fig. 4H). Elytra extending to the third abdominal tergite, truncated and rounded at apex; mirror quite apical a little wider than long rounded posteriorly; wings reduced (Fig. 9B). Abdomen brown presenting in a male sex (Fig. 1H).

(Female unknown)

Male: LH 2.8 ± 0.72 (mm), LP 3.25 ± 0.62 (mm), LT 4.1 ± 5.2 (mm), LF 11.5 ±1.0 (mm), LT 8.0 ± 0.57 (mm), TBL 14.5 ± 1.0 (mm) **Female:** LH 2.10 ± 0.8 (mm), LP 3.32 ± 0.72 (mm), LT 4.3 ± 5.7 (mm), LF 12.5 ± 1.2 (mm), LT 8.2 ± 0.62 (mm), TBL 18.6 ± 2.1 (mm)

Ecology

It commonly found everywhere but surprisingly single ♂ was reported during present survey**.** Mostly this species is found in homes and lives under bricks and debris, and also in kitchen.

Global distribution

Australasia, Perth, Malaysia, West Bengal, U.S.A, India, Pakistan (Cigliano et al. 2020)

Remarks

It is cosmopolitan in nature. This species is generally known as tropical house crickets or Indian house crickets because they are found everywhere and it is domestic in all tropical countries include all of Central America, Mexico and the top half of South America viz; Ecuador, Bolivia, Venezuela, Guyana, Peru, Colombia, French Guiana and all the northern areas. Khan (1954) reported that it caused huge damage to textiles mills in India. During our field survey we observed that this species moves at dusk from the holes of a termite mound. However, this species is not termitophilous in nature like other insects; this cricket does not live with the termites.

***Gryllodes supplicans* (Walker, 1859)**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 2♀; Riffat; 3 Jul. 2019; Nara N 34.6851°, E 135.8048°, 1♀; Surriya; 4 Jul. 2019; Umerkot N 25.3549°, E 69.7376°

Description

Medium size, yellowish-brown (Fig. 1I). Head small, narrow at the anterior, slightly curved at posterior. Face short, yellow with spotted clypeus. Frontal suture feebly arched (Fig. 2I). Pronotum transverse; with feebly concave at anterior (Fig. 4I). Female elytra equilateral reduced, extending to the extremity of abdomen, wings caudate (Fig. 9C). Legs pubescent, yellowish and with a few brown spots. Anterior tibia perforated on the external face with a rather long, oval tympanum (Fig. 6H). Abdomen brown with median line on the dorsal field triangular. Ovipositor long, straight with narrow valves lanceolate apical (Fig. 1I).

Female: LH 3.15 (mm), LP 3.15 (mm), LT 4.2 (mm), LF 14 (mm), LT 10 (mm), LO 15 (mm), TBL 20 (mm)

Ecology

Annandale (1924) reported that this species lives in crevices mostly occurring in wood material and frequently in the holes of bungalows. During the present study, we collected this from a stack of wood from Umerkot. Khan (1954) noticed that all females of Gryllidae deposit more than 150 eggs when temperatures are favourable, between 20-25 ^{0}C with the relative humidity of 80-82 %. At present, only females were captured and seem longer in total body length (20 mm) and ovipositor ca. 15 mm compared to Chopards' (1969) report of total body length 12-15 mm and ovipositor from 12-12.5 mm. This may be a geographical variation of the region; however, when more material will be collected, a detailed and comprehensive analysis of the taxa will be undertaken.

Global Distribution

America, Singapore, Berlin, Ceylon, India, Malaysia, China, Sri-Lanka, and Pakistan (Cigliano et al. 2020)

Remarks

Earlier, this species was collected by Chopard (1969) from various localities of India but his specimens were smaller in size. The elytra of this species are longer than those of *Sigillatus,* leading to the question of whether this species could be a macropterus form of the proceeding one or not. Considering the extreme reduction of the elytra of the female of *Sigillatus*, it seems difficult to admit the possibility of a return to fully winged form. However, future studies with more samples should resolve this problem.

Genus *Teleogryllus* Chopard, 1961

Teleogryllus (Brachyteleogryllus) occipitalis (Serville, 1838)

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♀; Riffat; 5 Sep. 2019; Mithi N 24.7436°, E 69.8061°

Description

Medium to large size. Body light brown (Fig. 1J). Head brown to dark with horizontal band at posterior margin. Ocelli dark brown (broken off while capturing photos). Pronotum dark brown, enlarged in front, its surface is rather strongly punctuated with numerous testaeco-rufous spots (Fig. 4J). Female elytra extending to the apex of abdomen; elytra veins oblique, regular distant. Wings well-developed with geometrical designs (Fig. 9D). Legs of the same colour the body; posterior femora moderately swollen, straited on the external face; posterior tibiae armed with seven spines on each margin (Fig. 6I). Abdomen light brown, yellowish beneath. Ovipositor long, slender, narrow (Fig. 1J).

Female: LH 2.1 (mm), LP 3.85 (mm), LT 08 (mm), LF 9 (mm), TBL 20 (mm)

Ecology

Teleogryllus is commonly known as black field cricket. The species of this genus are reported as a serious pasture pest in Australia and the warmer northern regions of New Zealand (Banfield and Cottier 1948, Reynolds and Langton 1973, Mill 1978). They reported that each year black field crickets cause considerable losses in pasture production over the dry summer period when stock feed is short. In seasons when cricket populations are high, cause severe pasture damage to the crops. The resulting bare areas in the pasture are then open to weed invasion because the black field crickets consume only pasture seed.

During the present study we captured only a single female from *Lolium perenne* grasses which is considered as perennial ryegrass pastures, the main feed for dairy cows in temperate regions. This study suggests that preference of crickets for perennial ryegrass may lead high risk of damage to cultivated areas of Pakistan.

Global distribution

Sumatra, Java, Borneo, Philippines, Vietnam, Australia, Celebes, India, Bangladesh, Sri-Lanka, Nepal, China, Burma, Malaysia, Singapore, Thailand, Pakistan (Cigliano et al. 2020)

Remarks

Until now 52 species of *Teleogryllus* were recorded by Cigliano et al. (2018). Gorochov (1985) reviewed the *Teleogryllus* species from Asia and established two subgenera. He moved *T. occipitalis*, *T. emma, T. infernalis, T. commomdus* and *T. oceanicus* into the subgenus *Brachyteleo gryllus* with *T. occipitalis* as the type species and moved *T. mitratus* and *T. derelictus* into the subgenus *Macroteleo gryllus* with the first as type species. He again in 1988 established another subgenus, *Afroteleogryllus,* with *T. clarus* as its type species from Africa, and added two new species in 1990. Otte (2006) downgraded genus *Cryncoides* as a subgenus under *Teleogryllus*. The remaining species are still in the pool of the subgenus *Teleogryllus* without having being studied. In China, these crickets are often confused, and different species names have been used, until Ma et al. (2015) distinguished these species by their genitalia. However, these changes are mainly based on morphological studies without molecular evidence.

***Teleogryllus* (*Brachyteleogryllus*) *commodus* (Walker, 1869)**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♂, 1♀; Riffat, Surriya; 19 Aug. 2019; Nagarparkar N 24.3572°, E 70.7555°

Description

Very close in size to the proceeding (Fig. 1K, L). Head short with vertical light dark bands at posterior margin. Ocelli dorsal field with dark horizontal band (Fig. 2J), (Fig. 3A). Pronotum dark brown more or less varied with fulvous with black inferior margin (Fig. 5A, B). Elytra extending to the second last segment of abdominal tergite, a little rounded at apex; dorsal field shinning brown with a narrow yellowish band along the external and apical margins; mirror reduced and somewhat broad. Wing long

399 extending to the apex of abdomen (Fig. 9E, F). Legs rather short, widened, yellowish,
400 mottled with brown and covered with an abundant brown pubescence in which are
401 mixed long bristles. Tibia rather thin longer than femora armed with seven internal
402 spines (Fig. 6J, K). Abdomen light brown with dark vase-shaped. Ovipositor long,
403 straight with apical valves, feebly flattened, acute (Fig. 1K, L).

404 **Male:** LH 4.34 (mm), LP 4.06 (mm), LT 14 (mm), LF 12.6 (mm), LT 7.7 (mm), LT 07
405 (mm), TBL 21 (mm), **Female:** LH 2.5 (mm), LP 3.1 (mm), LT 11 (mm), LF 08 (mm),
406 LT 7.4 (mm), LT 04 (mm), TBL 17 (mm)

407 **Ecology**

408 This species was reported from Nagarparkar. This area is surrounded by rock and
409 fine sand. This species has been reported from the *Cymbopogon commutatus* which
410 are perennial grasses and mostly used for medicinal purposes in the locality. It was
411 observed that due to burrowing habits this species uprooted many valued plants.

412 **Global Distribution**

413 Australia, New Zealand, India, Pakistan (Cigliano et al. 2020)

414 **Remarks**

415 This species is commonly known as black field cricket. Its powerful legs are used for
416 jumping. This species has numerous white strips on the abdomen which make it differ
417 from the other species. Zalitschek et al., 2012 reported that these are omnivores in
418 nature. However, dietary requirements are similar but perform different functions
419 depending upon sex of the species: females take a protein rich diet for production of
420 eggs while, male requires it for producing mating calls to attract females.

421 **Genus *Modicogryllus* Chopard, 1961**

422 ***Modicogryllus* sp.**

423 Figures 1-11, Table 1

Material examined: PAKISTAN- Sindh Prov. • 1♀; Riffat, Mohan leg.; 23 July 2019; Umerkot N 25.3549°, E 69.7376°.

Description

Small size, pubescence. Colour light brown (Fig. 1M). Head short, yellow, adorned with rufous spots, ocelli dorsal field with pubescent horizontal dark bands (Fig. 3B). Pronotum depressed above with straight yellowish posterior margin on dorsal field is coarse (Fig. 5C). Elytra extending to the apex of abdomen; veins of the dorsal field rather irregular and condensed (Fig. 9G). Legs brownish. Pubescent rather thick, compressed. Anterior tibia bearing a small oval, external tympanum. Posterior tibia armed with ten external, 1 medio-internal spines (Fig. 6L). Abdomen brown. Ovipositor short, straight, slender with apical valves very small lanceolate, acute (Fig. 1M).

Female: LH 2.1 (mm), LP 2.45 (mm), LF 10 (mm), LT 11(mm), LO 10 (mm), TBL 15 (mm)

Habitat

The specimen was collected from *Sorghum vulgare* near Desert Thar (Umerkot) 25.3549° N, 69.7376° E.

Remarks

The genus *Modicogryllus* was erected by Chopard (1961), he described four species from north-east part of India viz: *M.semiobscurus* (Chopard*), M. ehsani* (Chopard), *M. rehni* (Chopard), and *M. minimus* (Chopard). Our collected species has bright coloured body along with shiny pronotum. Tegmina and wing show different patches on their entire surface. However, the shape, length and other characteristics of ovipositor make it different from the rest of the species described by us. We presume that collection of the male in the future will offer important characters which will resolve the problem of identity.

Genus *Svercus* Gorochov, 1988

Svercus palmetorum (Krauss, 1902)

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 2♀; Surriya, Riffat; 22 Aug. 2020; Dahli, Tharparkar N 24.8777°, E 70.2408°

Description

Medium size. Coloration rufous brown, shinning (Fig. 1N). Head a little wider than pronotum in front; occiput convex with frontal rostrum narrow, ocelli united by a small oblique keel (Fig. 3C). Pronotum dark-brown, little broader than long with anterior margin concave, posterior one feebly convex (Fig. 5D). Elytra extending to the apex of abdomen, narrow posteriorly. Wing well-developed (Fig. 10A). Legs testaceous brown, pubescent. Anterior tibia perforated on external face only. Posterior tibia armed with nine internal, 11 external, 1 medio-internal spines (Fig. 7A). Abdomen brown. Ovipositor rather long, straight with apical valves lanceolate (Fig. 1N).

Female: LH 1.8 (mm), LP 2.7 (mm), LT 9.6 (mm), LF 09 (mm), LT 6.6 (mm), LT 03 (mm), TBL 16 (mm)

Ecology

This species was collected from the village Dahli Taluka Tharparkar Sindh, Pakistan. This species was reported from *Larrea tridentate* locally called the creosote bush. It is a medium-sized evergreen shrub with pointed leaves and a waxy coating. This plant has great medicinal value, mostly it is recommended to cure fever, colds, stomach, pains, arthritis, and as general pain killer; it is also used for cuts, and bacterial and fungal infections.

Global Distribution

Libya, Algeria, Pakistan (Cigliano et al. 2020)

Remarks

Reitmeier et al. (2012) reported this species from Corsica in humid places (except those that were recorded from Bonifacio and Filitosa in September 2010. They further identified the status of this species, distribution, and life parameters. During the field survey we also noticed that this species occurs in humid places, but we were not able to study its life parameters.

Genus *Miogryllus* Saussure, 1877

***Miogryllus itaquiensis* Orsini & Zefa, 2017**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♀; Riffat; 5 Sep. 2019; Chachro, Nagarparkar N 24.3572°, E 70.7555°

Description

Medium size. Coloration brown (Fig. 1O). Head black bright and globous; whitish spot containing posteriorly the scape and following the inner margin of the eyes, becoming punctuated with brown with a white strip before reaching occiput (Fig. 3D). Pronotum black-pubescent, dorsal disc wider than long, bristles on the anterior and posterior margins; lateral lobes marked with antero-ventral whitish spot which becomes light brown posteriorly (Fig. 5E). Elytra extending two third of the abdomen, apical field well-developed. Wings surpassing the abdomen tip (Fig. 10B). Legs dark brown dorsally, whitish ventrally. Tibia armed with nine internal, four medio-internal spines (Fig. 7B). Abdomen black, sternites whitish. Cerci light brown, short. Ovipositor long, slender, straight with apical valves lanceolate (Fig. 1O).

Female: LH 03 (mm), LP 3.1 (mm), LT 09 (mm), LF 10 (mm), LT 0.8 (mm), LT 4.2 (mm), TBL 12 (mm)

Ecology

This species was reported from Chachro, Nagarparkar on *Encelia farinose* roots. This plant is commonly known as Brittle bush. It is a medium-sized, rounded shrub with long, oval, silver grey leaves. The resin collected from this plant used as glue

(Hogan and Michael, 2013); they also stated that Brittle bush treats toothaches. Some animals like desert bighorn sheep and Kangaroo rats eat its seeds.

Global distribution

Argentina, Brazil South, Rio Grande do Sul, Itaqui, Sindh, Pakistan (Cigliano et al. 2020)

Remarks

Pronotum of *M. itaquiensis* bears a whitish lateral lobe, while *M. tucumanensis* has the pronotum with uniform colouration. We collected a single female for the first time from Chachro, Sindh, Pakistan. However, more extensive surveys are needed to explore its diversity in the desert region.

Genus *Callogryllus* Sjöstedt, 1910

***Callogryllus saeedi* (Saeed, 2000)**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 5♀; Surriya, Riffat; 23 Aug. 2020; Sanghar N 26.0436°, E 68.9480°

Description

Medium size. Coloration yellow (Fig. 1P). Head short, narrow, yellowish shinning, adorned on each side with a dark brown line extending from the occiput, along the eye (Fig. 3E). Pronotum as long as wide, feebly widening in front with two dark spots on dorsal field (Fig. 5F). Elytra reduced. No wings (Fig. 10C). Legs yellowish, strongly pubescent. Anterior tibia perforated with an oval tympanum on the external face. Posterior femora rather thick, brown with rufous base, posterior tibia armed with six long external, four varied medio-internal spines (Fig. 7C). Abdomen yellow with dark spots on each tergite. Ovipositor long, straight, slender (Fig. 1P).

Female: LH 2.1 (mm), LP 2.8 (mm), LT 03 (mm), LF 12 (mm), LT 10 (mm), LO 14 (mm), TBL 17 (mm)

Ecology

This species was earlier reported by Saeed (2000) from *Triticum aestivum*. At the present we have reported its female from *Dactyloctenium aegyptium* grasses.

Global distribution

India, Pakistan (Saeed et al. 2000)

Remarks

During this study, we have reported its five females from Sanghar District which also constructed a new record for Sindh province. Our thorough examination shows that this species is similar to *C. ovilongus* with exception of dark slanting gang between compound eyes and size of ovipositor. *C. saeedi* has a smaller ovipositor which is ca. 14 mm while the *Ovilongus* has a greater ovipositor which is ca. 18- 20 mm in size. Beside this, elytra of this female are quite different from those of *Ovilongus*. Spines of the posterior tibiae are little movable. This fine little species differs from the *Ovilongus* ones in the colouration of the head.

***Callogryllus ovilongus* Saeed & Yousuf, 2000**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 4♀; Riffat, Surriya; 16 Sep. 2020; Nagarparkar N 24.3572°, E 70.7555°

Description

Medium size. Coloration yellow (Fig. 1Q). Head short, narrow, very neat. Eyes rounded, moderately projecting; ocelli small (Fig. 3F). Pronotum one and half times as wide as long, slightly concave at anterior margin, straight posterior one side rather strongly convex (Fig. 5G). Elytra yellow reduced (Fig. 10D). No wings. Legs (broken

off at base). Abdomen dark yellowish above, pubescent light yellow beneath. Ovipositor rather long, very slender with apical valves extremely narrow, acute (Fig. 1Q).

Female: LH 3.85 (mm), LP 3.5 (mm), LT 5.2 (mm), LF 4.1 (mm), LO 15 (mm), TBL 16 (mm)

Ecology

During the present study, females of this species are reported from Nagarparkar, Desert Thar from xerophytic plants which were surrounded by sagebrush and saltbush trees.

Global distribution

China, India, Bangladesh, Nepal, Pakistan (Cigliano et al. 2020)

Remarks

This species was erected by Saeed (2000) from Peshawar, KPK with single female specimen; subsequently Malik et al. (2013) reported its male from the Hyderabad - Sindh. At the present, we have a single female from the rocky area of Nagarparkar and confirmed its presence in the desert area.

***Callogryllus bilineatus* (Bolívar, 1900)**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 2♀; Riffat; 25 Aug. 2019; Islamkot N 24.7014°, E 70.1783°

Description

Medium size. Coloration brown to yellowish (Fig. 1R). Head brown, short, dome-shaped with four yellowish vertical sutures (Fig. 3G). Pronotum brown, concave anteriorly while pubescence convex posteriorly with longitudinal rufous bands at

dorsal field (Fig. 5H). Elytra scarcely extending to the apex of first abdominal tergite, slightly crossing in the median line with internal margin oblique, apex rounded; dorsal field presenting plain and straight veins at regular intervals; transverse veinlets very scarce; lateral field with four curved veins (Fig. 10E). Legs yellow, brownish at base, strongly pubescent, irregular bands on dorsal field. Posterior tibiae armed with eleven external, three medio-internal spines (Fig. 7D). Abdomen yellow to dark brown longitudinal rufous bands on each side. Ovipositor very long, straight, apical valves with dark base (Fig. 1R).

Female: LH 3.6(mm), LP 04(mm), LT 05(mm), LF 13.5(mm), LT 10(mm), LT 03(mm), TBL 18(mm)

Ecology

This species is recorded from wheat crops cultivated at Islamkot, Sindh. Weissman et al. (1980) observed that the hoppers emerged in the early days of June and continue to grow till the mid of July. From the mid of July to September period was recorded for adults' presence. Peak period of species' occurrence was noted as mid of August to end of September. After there was no individual in the field. High risk was reported to *Triticum* (wheat) crops from different areas of Islamkot, Sindh.

Global distribution

India, Sindh, Pakistan (Cigliano et al. 2020)

Remarks

Chopard (1969) compiled a detailed account on this species such as his collection shows that body appearance is smaller than the preceding. Head had the same pattern presented before. Abdomen showed the longitudinal bands on both lateral sides. Elytra apparently showed its length from the apex of the abdominal tergite. He calculated length of body 12 mm, pronotum. 2·5 mm, elytra 2 mm, ovipositor 9 mm. The collected specimens show variation in size as well as in other parameters, possibly due to geographical and feeding habitats. This species has unique

characteristics and one of them is the presence of black band that runs from the pronotum where it makes a raised bulging cup-like structure, and this black band covers the whole length of tegmen at the makes the colour of the tegmen black then it makes a narrow and straight line on the abdominal segments till the end of last segment.

Tribe Modicogryllini

Genus *Lepidogryllus* Otte & Alexander, 1983

***Lepidogryllus siamensis* Chopard, 1961**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♀; Surriya; 27 Jul. 2019; Ramalani, Umerkot N 25.3549°, E 69.7376°

Description

Medium size. Coloration dark brown (Fig. 1S). Head shinning brown, short, narrow, ocelli black, horizontal dark band amid of this (Fig. 3H). Pronotum as long as head, two times wider than long on dorsal field, anterior and posterior margin pilose, truncated, dorsal surface brownish, mottled; lateral lobe of pronotum a little deeper than pronotal length (Fig. 5I). Elytra hardly reaching abdominal end. Wings well-developed, condensed veins (Fig. 10F). Legs brown, hind femora much longer than middle femora. Posterior tibia armed with seven external, three medio-internal spines, much widened at anterior, numerous patches on dorsal surface (Fig. 7E). Abdomen brown. Cerci long tapered. Ovipositor long, straight with yellowish base (Fig. 1S).

Female: LH 1.96(mm), LP 2.03(mm), LT 9.5(mm), LF 5.6(mm), LT 07(mm), LT 04(mm), TBL 11(mm)

Ecology

This species was recorded for the first time from the village Ramalani, Umerkot, on the roots of *Acacia nilotia* locally known as Babul. This is a medium-sized, thorny, nearly evergreen tree found in the desert area. Mostly it grows up to 20-25 mm but may remain on shrubby in poor conditions. Our specimen was reported from a shrub. However, this tree provides limber, fuel, shade, food, dye, and gum. it also impacts the environment positively through soil reclamation.

Global distribution

Korea, Japan, Taiwan, Thailand, India, Hawaii, China, Pakistan (Cigliano et al. 2020)

Remarks

Lepidogryllus has a very close morphological resemblance with *Velarifictorus*: male has enlarged round head with swollen frons (Randell, 1964). Kim (2013) also reported the many similarities in these two genera. The species of these genera also has very significant variation in their morphometric parameters. Kim (2013) reported body length size 14-15.2 mm in *L. siamensis*. At the present we have reported a body length 11 mm.

Oecanthinae

Oecanthini

Genus *Oecanthus* Serville, 1831

***Oecanthus fultoni* Walker, 1962**

Figures 1-11, Table 1

Material examined: PAKISTAN- **Sindh Prov.** • 1♀; Riffat; 16 Aug. 2020; Umerkot N 25.3549°, E 69.7376°

Description

Large size. Coloration light pale green to yellowish (Fig. 1T). Head short, narrow with dark brown ocelli (Fig. 3I). Pronotum flat, concave posteriorly (Fig. 5J). Elytra snowy transparent extending to 2/3 at tip of abdomen. Wings rounded, broad with condensed irregular veins (Fig. 10G). Legs same colour of the body. Femora long, thin, slightly widened at anterior and compressed at posterior. Posterior tibia thin, slender armed with twenty-one external, three medio-internal spines (Fig. 7F). Abdomen light pale-yellowish. Ovipositor short. Cerci long with pointed ends (Fig. 1T).

Female: LH 1.96(mm), LP 2.73(mm), LT 14(mm), LF 3.57(mm), LT 3.85(mm), TBL 22(mm)

Ecology

Oecanthus fultoni is a new record from Umerkot, Desert Thar, Pakistan. This species was reported from *Cynadon dactylon* (common lawn grasses) surrounded by wild plants.

Global distribution

Ohio, Franklin, New Jersey, Washington, Pakistan (Cigliano et al. 2020)

Remarks

Walker and Gurney (1967) observed the difference between the coasts of western and eastern populations of this species which showed that *O. fultoni* had a variety of variations in the structure of metanotal gland that showed the great evidence of significant geographical variation between these two groups.

Key to the genera of Gryllidae of Sindh

1	Body medium, pubescent and deepened, with two varied extending testaceous bands on head……	*Acheta*
-	Body large and robust, with yellowish bands with vertical lines on head……	*Gryllus*
2	With variation in growths of elytra, elytra small disjointed, adjacent field have 3 veins, tegmina and wings smaller ……	*Gryllodes*
-	Without variation in growth of elytra, elytra large jointed, field of elytra with numerous small and large veins, wings large……	*Teleogryllus*
3	Hind tibiae with 7 small and large pointed spines, abdomen with brownish black and pale yellow in colour ……..	*Modicogryllus*
-	Hind tibiae with 12 equal-sized spines, abdomen dark brownish……	*Svercus*
4	Fastigium of vertex shiny black, oval shaped with four vertical lines on posterior of head……	*Miogryllus*
-	Fastigium of vertex yellowish black with numerous but vertical lines on almost whole length of head except vertex……	*Callogryllus*
5	Femur wide and small with very thick horizontal lines along one vertical line, tegmen pale yellow, body blackish brown…….. .	*Lepidogryllus*
-	Femur narrow and large but without thick horizontal and vertical line, tegmen transparent, body pale green……..	*Oecanthus*

ARPHA Preprints Author-formatted, not peer-reviewed document posted on 30/08/2021. DOI: https://doi.org/10.3897/arphapreprints.e73693

675

676 **Key to the species of Gryllidae of Sindh**

1	Pronotum with two large brown spots, elytra reach over the apex of abdomen……..	*Acheta domesticus*
-	Pronotum without large brown spots, double line anteriorly and posteriorly, elytra run over the length of abdomen …….	*A. hispanicus*
2	Body size is large, elytra reach to the apex of abdomen, black with two pale area spotted basally……	*Gryllus (Gryllus)bimaculatus*
-	Body size is medium to large, elytra run beyond length of body, elytra with yellow patches on base.....	*G. campestris*
3	Fastigium of vertex black shiny, flat, and slightly curved at lateral side, large body size, elytra large and with thick venation system along total body length…….	*G. septentrionalis*
-	Fastigium of vertex yellowish brown, curved at the anterior side their body size is elongated, elytra small, disjointed……	*Gryllodes sigillatus*
4	Head small, brown, with narrow frontal rostrum, pronotum transverse, with feebly concave anterior margin; elytra of female are moderately diverse……	*G. supplicans*
-	Head wide at back and narrow from the front, pronotum straight, concave and slightly broad, Face is blackish brown, right wing overlapped on anterior wing……	*Teleogryllus* (*Brachyteleogryllus*) *occipitalis*

5	Femur thick and small with bands with vertical lines. Tibia thin with pointed spines with black base, tegmina dorsal field with several veins……..	*T.* (*Brachyteleogryllus*) *commodus*
-	Femur wide with numerous patches and immovable spines, tibia has several spines on one side, tegmina dorsal field with 3 or 4 oblique veins…….	*Modicogryllus* Sp. nov?
6	The tegmen is small compared to wing, with thick lines of venation system…….	*Svercus palmetorum*
-	Tegmen is of equal size to wing, slightly curved at the anterior side and pointed at the posterior side, well developed with good venation system…….	*Miogryllus itaquiensis*
7	Ovipositor slim and acute, face yellow, pronotum concave at its anterior margin having hairs……	*Callogryllus saeedi*
-	Ovipositor small, very elongated, acute slim apical valve, face brownish yellow, pronotum wider than elongated …….	*C. ovilongus*
8	Fastigium of vertex shiny black, pronotum and tegmen with yellowish band, tibia with 7 spines …	8
-	Fastigium of vertex circular and brownish, shiny, pronotum covered with thick hairs, tegmen pointed at one end and curved at the other end, tibia with 10 spines…….	*Lepidogryllus siamensis*
9	Eyes black, antennae large, pronotum elongated, narrow and flat, abdominal part is much larger, wings large, total body colour green……	*Oecanthus fultoni*
-	Eyes oval and brown, pronotum serrated overall and wide, abdominal part smaller than tegmen, wings large, body brownish yellow…….	*C. bilineatus*

677

678 **Acknowledgments**

679 The first author gratefully acknowledges HEC (Higher Education Commission
680 Islamabad) for granting Research Project No. 6737 SINDH/NRPU/R&D/HEC as
681 well as Dr. Mohan Lal Entomologist/ Health officer for helping in field survey in
682 Thar desert.

683

684 **References**

685 Annandale N (1924) Observations on the habits and natural surroundings of insects
686 made during the Skeat expedition to the Malay Peninsula 1899-1900. Proceedings of
687 the Zoological Society of London, December 4, 1900. 55: 835-869.

688 Banfield GL, Cottier W (1948) Success of poison baits in eradicating crickets. New
689 Zealand Journal of Agricultural 77: 569-571.
690 https://doi.org/10.1080/00288233.1981.10420899

691 Chopard L (1961) Orthopteres Gryllidae et Gryllacrididae l'Angola. Companhia de
692 Diamantes de Angola. Publicacoes Culturais 56: 15-69.

693 Chopard L (1969) The fauna of India and adjacent countries like Orthoptera: Gryllidae.
694 The Zoological Survey of India, Calcutta 2: 1-421.

695 Cigliano MM, Braun H, Eades DC, Otte D (2018) Orthoptera Species File. Version
696 5.0/5.0. [Accessed October, 17, 2018]. http://Orthoptera.SpeciesFile.org.

697 Cigliano MM, Braun H, Eades DC, Otte D (2020) Orthoptera species file online, version
698 5.0/5.0. Available at http://Orthoptera.SpeciesFile.org

699 Ghouri ASK (1961) Home and distribution of the House cricket *Acheta domesticus* L.
700 Nature 192: 1000. https://doi.org/10.1038/1921000a0

Gorochov AV (1985) On the Orthoptera subfamily of Gryllinae (Orthoptera, Gryllidae) from eastern Indochina. In: Medvedev LN (Ed.). Insects of Vietnam. Nauka, Moscow, 9-17.

Gorochov AV (1988) New and little known tropical Grylloidea (Orthoptera). Trudy Zoologicheskogo instituta Rossiĭskoĭ akademii nauk. SSSR 178: 3-31.

Hochkirch A, Witzenberger KA, Teerling A, Niemeyer F (2007) Translocation of an endangered insect species, the field cricket (*Gryllus campestris* Linnaeus 1758) in northern Germany. Biodiversity Conservation 12: 3597-3607. DOI: 10.1007/s10531-006-9123-9

Hogan C, Michael (2013) (ed.) Brittlebush – *Encelia farinosa.* at the Encyclopedia of Life, Wikipedia. Retrieved 1 April 2013.

Khan NH (1954) Ecological observations on the eggs of *Gryllodes sigillatus* (Walker). Indian Journal of Entomology 16: 24-26.

Kim TW (2013) A Taxonomic Study on the Burrowing Cricket Genus *Velarifictorus* with morphologically resembled Genus *Lepidogryllus* (Orthoptera: Gryllidae: Gryllinae) in Korea. Animal Systematics Evolution and Diversity 29(4): 294-307. DOI:10.5635/ASED.2013.29.4.294

Ma LB, Gorochov AV, Zhang YL (2015) A new species of the genus *Duolandrevus* (Orthoptera: Gryllidae: Landrevinae) from China. Zootaxa 3963(3): 443-449. DOI: https://doi.org/10.11646/zootaxa.3963.3.8

Malik S (2012) Taxonomy of crickets (Orthoptera: Gryllidae) from Hyderabad and its adjoining areas. M.Phil Thesis. University of Sindh Jamshoro, Pakistan, 85 pp.

Malik S, Soomro NM, Baloach TJN, Wagan MS (2013) A New Species of Genus *Callogryllus* Sjostedt (Gryllidae: Orthoptera) from Sindh, Pakistan. Sindh University Research Journal (Science Series) 45(2): 289-290.

726 Mill G (1978) Crickets cause as much damage as drought. The Journal of the
727 Department of Agriculture of Victoria 76: 268.

728 Otte D (2006) Eighty-Four New Cricket Species (Orthoptera: Grylloidea) from La Selva,
729 Costa Rica. Transactions of the American Entomological Society 132(3/4): 299-418.

730 Randell RL (1964) The male genitalia in Gryllinae (Orthoptera: Gryllidae) and a tribal
731 revision. Canadian Entomologist 96(12): 1565-1607.

732 Reitmeier W, Desutter-Grandcolas L, Sardet E (2012) First confirmed record
733 of *Svercus palmetorum* (Krauss, 1902) in Corsica, France. Articulata 27: 13-15.

734 Resh VH, Carde RT (Eds.) (2009) Encyclopedia of insects. Retrieved from
735 http://ebookcentral.proquest.com published on 17 June 2009. 1-1171.

736 Reynolds DG, Langton ACF (1973) Black beetle and crickets in Northland. Proceedings
737 of the 26th New Zealand weed and pest control conference, 182-183.

738 Riffat S, Wagan MS (2015) Grasshoppers and locusts of Pakistan, Higher
739 Education Commission, Pakistan, 180 pp. ISBN: 978-969-417-180-7

740 Saeed A (2000) New species and Records of some Crickets (Gryllinae: Gryllidae:
741 Orthoptera) from Pakistan. International Journal of Agriculture and Biology 2(3):
742 175-182.

743 Vickery VR, Kevan DKM (1983) A monograph of the Orthopteroid insects of the
744 Canada and adjacent region. Memoirs of the Lyman Entomological Museum
745 and Research Laboratory 1 and 2, 2(13): 681-1462.

746 Walker TJ, Gurney AB (1967) The metanotal gland as a taxomonic character in
747 *Oecanthus* of the United States. Proceedings of the Entomological Society
748 of Washington 69: 157-161.

749 Weissman DB, Rentz DFC, Alexander RD, Loher W (1980) Field crickets (*Gryllus*
750 and *Acheta*) of California and Baja California (Orthoptera: Gryllidae: Gryllinae).
751 Transactions of the American Entomological Society 106: 327-356.

752 Zajitschek F, Lailvaux SP, Dessmann J, Brooks R (2012) Diet, sex, and death in
753 field crickets. Ecology and Evolution 2: 1627-1636. doi: 10.1002/ece3.288

754

755

756

757

758

759

760

761

762

763

764

765

766

767

768

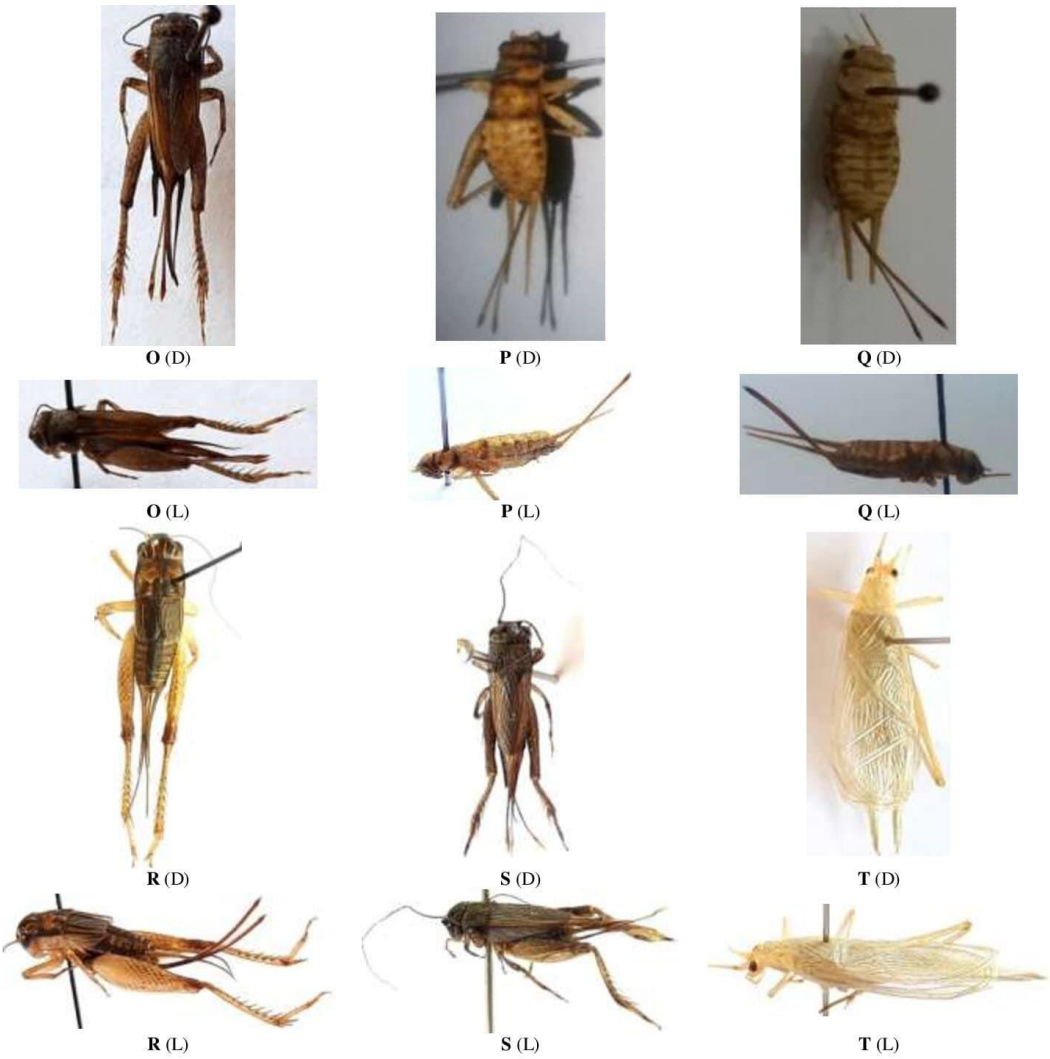

Figure 1. Male and female dorsal and lateral view of Gryllidae species, (D-Dorsal, L-Lateral), (Scale= 2 mm). Subfamily Gryllinae: **A, B** *Acheta domesticus* ♂♀, **C** *A. hispanicus* ♂, **D, E** *Gryllus (Gryllus) bimaculatus* ♀♂, **F** *G. (Gryllus) campestris* ♀, **G** *G. septentrionalis* ♀, **H** *Gryllodes sigillatus* ♂, **I** *Gryllodes supplicans* ♀, **J** *Teleogryllus (Brachyteleogryllus) occipitalis* ♀, **K, L** *T. (Brachyteleogryllus) commodus* ♂♀, **M** *Modicogryllus* sp. nov? ♀, **N** *Svercus palmetorum* ♀, **O** *Miogryllus itaquiensis* ♀, **P** *Callogryllus saeedi* ♀, **Q** *C. ovilongus* ♀, **R** *C. bilineatus* ♀, **S** *Lepidogryllus siamensis* ♀, Subfamily Oecanthinae: **T** *Oecanthus fultoni* ♀

769

770

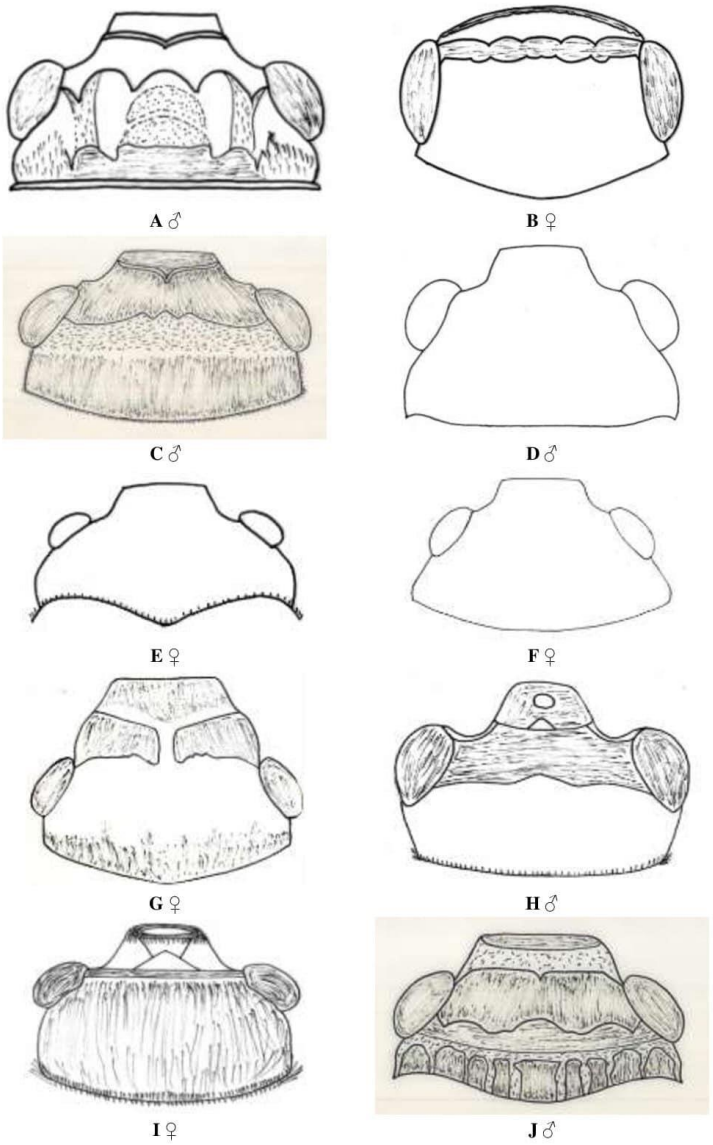

Figure 2. Male and female head dorsal view of Gryllidae species, (D-Dorsal), (Scale= 2 mm). Subfamily Gryllinae: **A, B** *Acheta domesticus* ♂♀, **C** *A. hispanicus* ♂, **D, E** *Gryllus (Gryllus) bimaculatus* ♂♀, **F** *G. (Gryllus) campestris* ♀, **G** *G. septentrionalis* ♀, **H** *Gryllodes sigillatus* ♂, **I** *Gryllodes supplicans* ♀, **J** *T. (Brachyteleogryllus) commodus* ♂

771

772

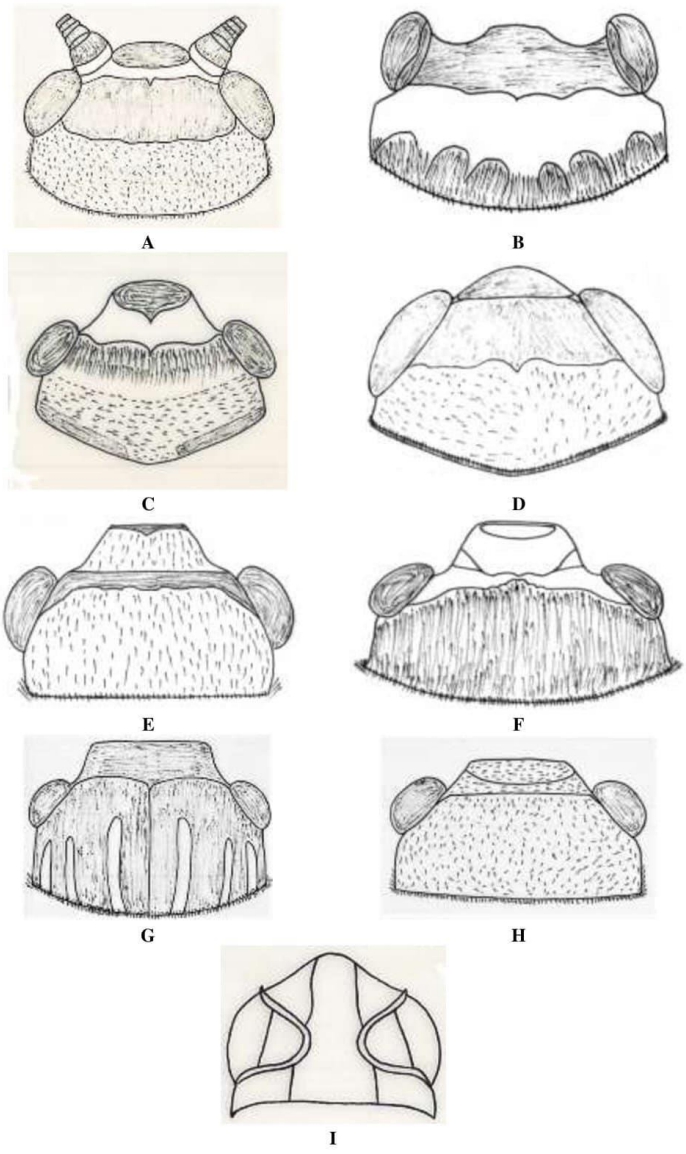

Figure 3. Male and female head dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A** *T. (Brachyteleogryllus) commodus* ♀, **B** *Modicogryllus* sp. nov? ♀, **C** *Svercus palmetorum* ♀, **D** *Miogryllus itaquiensis* ♀, **E** *Callogryllus saeedi* ♀, **F** *C. ovilongus* ♀, **G** *C. bilineatus* ♀, **H** *Lepidogryllus siamensis* ♀, Subfamily Oecanthinae: **I** *Oecanthus fultoni* ♀

773

774

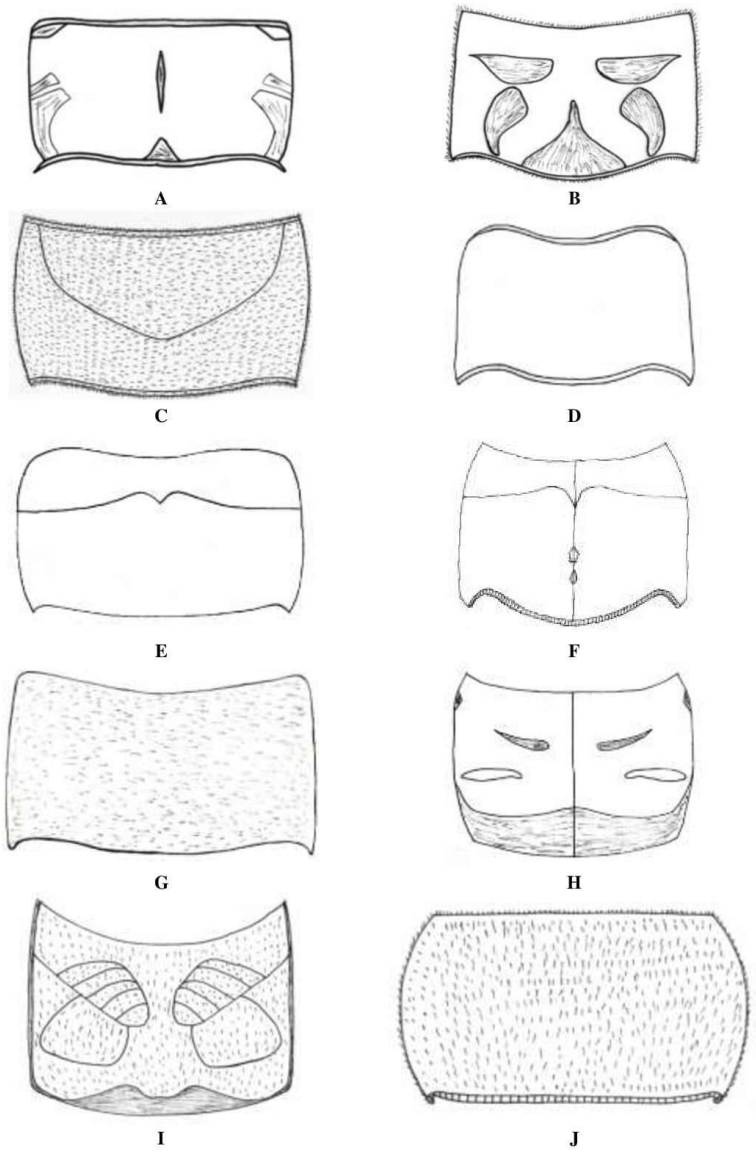

Figure 4. Male and female pronotum dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A, B** *Acheta domesticus* ♂♀, **C** *A. hispanicus* ♂, **D, E** *Gryllus (Gryllus) bimaculatus* ♂♀, **F** *G. (Gryllus) campestris* ♀, **G** *G. septentrionalis* ♀, **H** *Gryllodes sigillatus* ♂, **I** *Gryllodes supplicans* ♀, **J** *Teleogryllus (Brachyteleogryllus) occipitalis* ♀

775

776

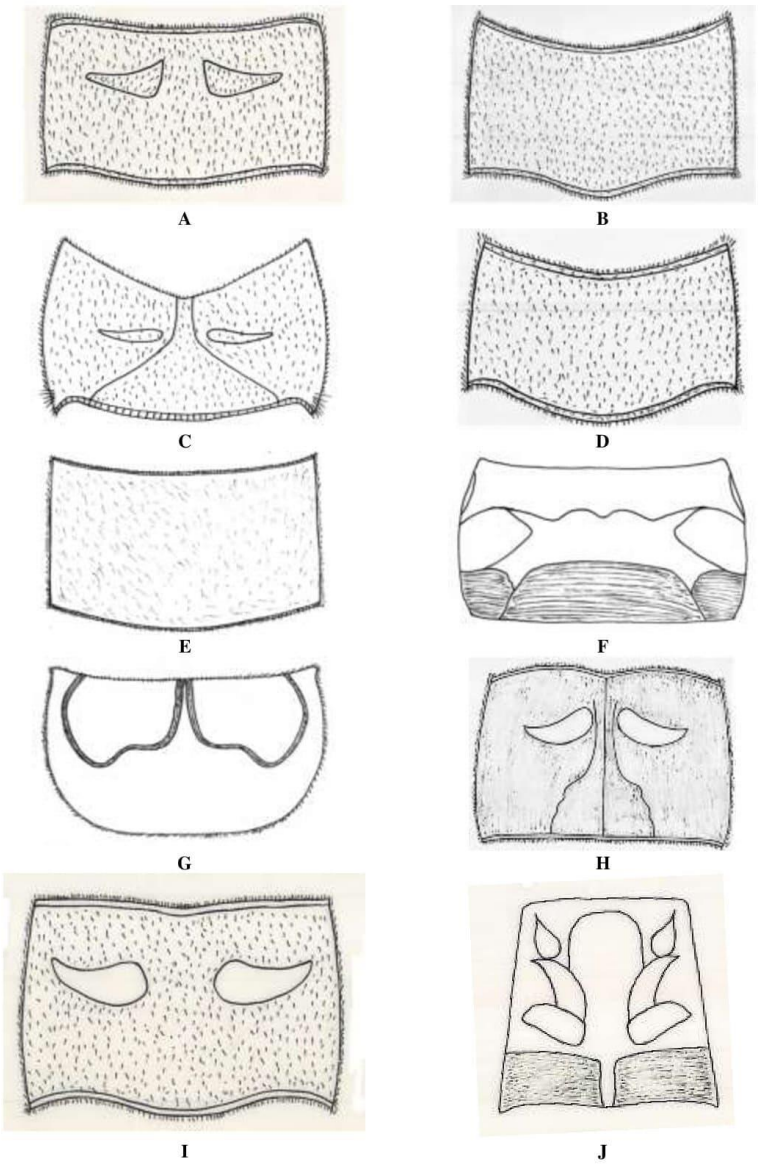

Figure 5. Male and female pronotum dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A, B** *T. (Brachyteleogryllus) commodus* ♂♀, **C** *Modicogryllus* sp. nov? ♀, **D** *Svercus palmetorum* ♀, **E** *Miogryllus itaquiensis* ♀, **F** *Callogryllus saeedi* ♀, **G** *C. ovilongus* ♀, **H** *C. bilineatus* ♀, **I** *Lepidogryllus siamensis* ♀, Subfamily Oecanthinae: **J** *Oecanthus fultoni* ♀

777

778

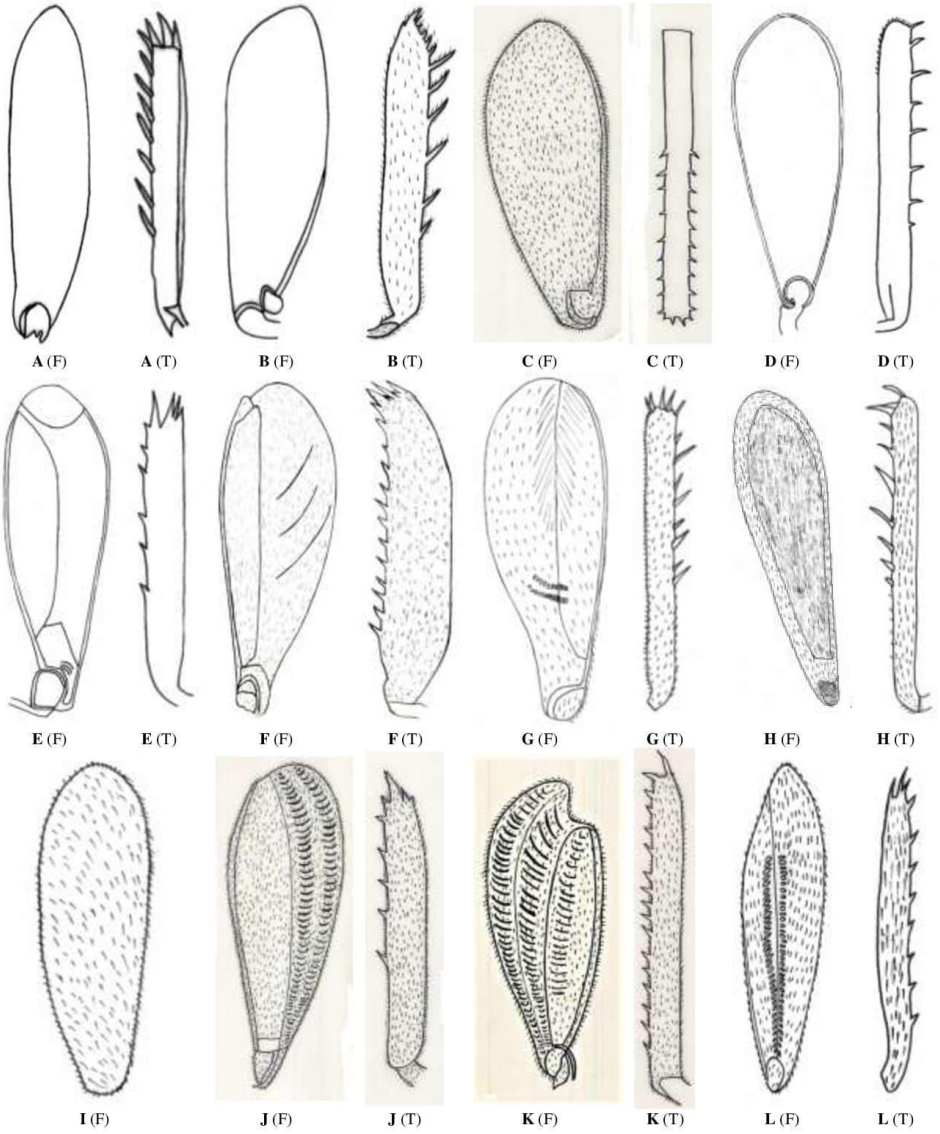

Figure 6. Femur and Tibia dorsal view of Gryllidae species, (F-Femur, T-Tibia), (Scale= 2 mm). Subfamily Gryllinae: **A, B** *Acheta domesticus* ♂♀, **C** *A. hispanicus* ♂, **D, E** *Gryllus (Gryllus) bimaculatus* ♂♀, **F** *G. septentrionalis* ♀, **G** *Gryllodes sigillatus* ♂, **H** *G. supplicans* ♀, **I** *Teleogryllus (Brachyteleogryllus) occipitalis* ♀, **J, K** *T. (Brachyteleogryllus) commodus* ♂♀, **L** *Modicogryllus* sp. nov? ♀

779

780

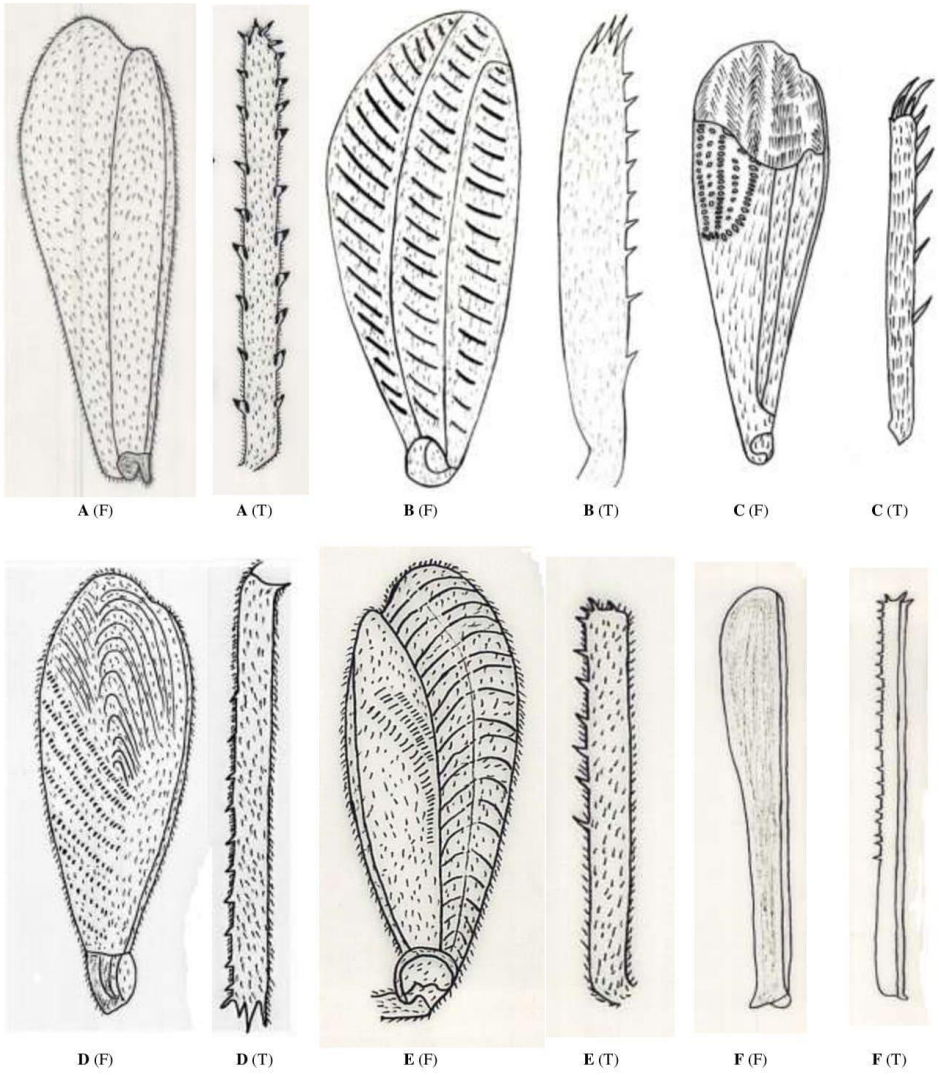

Figure 7. Femur and Tibia dorsal view of Gryllidae species, (F-Femur, T-Tibia), (Scale= 2 mm). Subfamily Gryllinae: **A** *Svercus palmetorum* ♀, **B** *Miogryllus itaquiensis* ♀, **C** *Callogryllus saeedi* ♀, **D** *C. bilineatus* ♀, **E** *Lepidogryllus siamensis* ♀, Subfamily Oecanthinae: **F** *Oecanthus fultoni* ♀

781

782

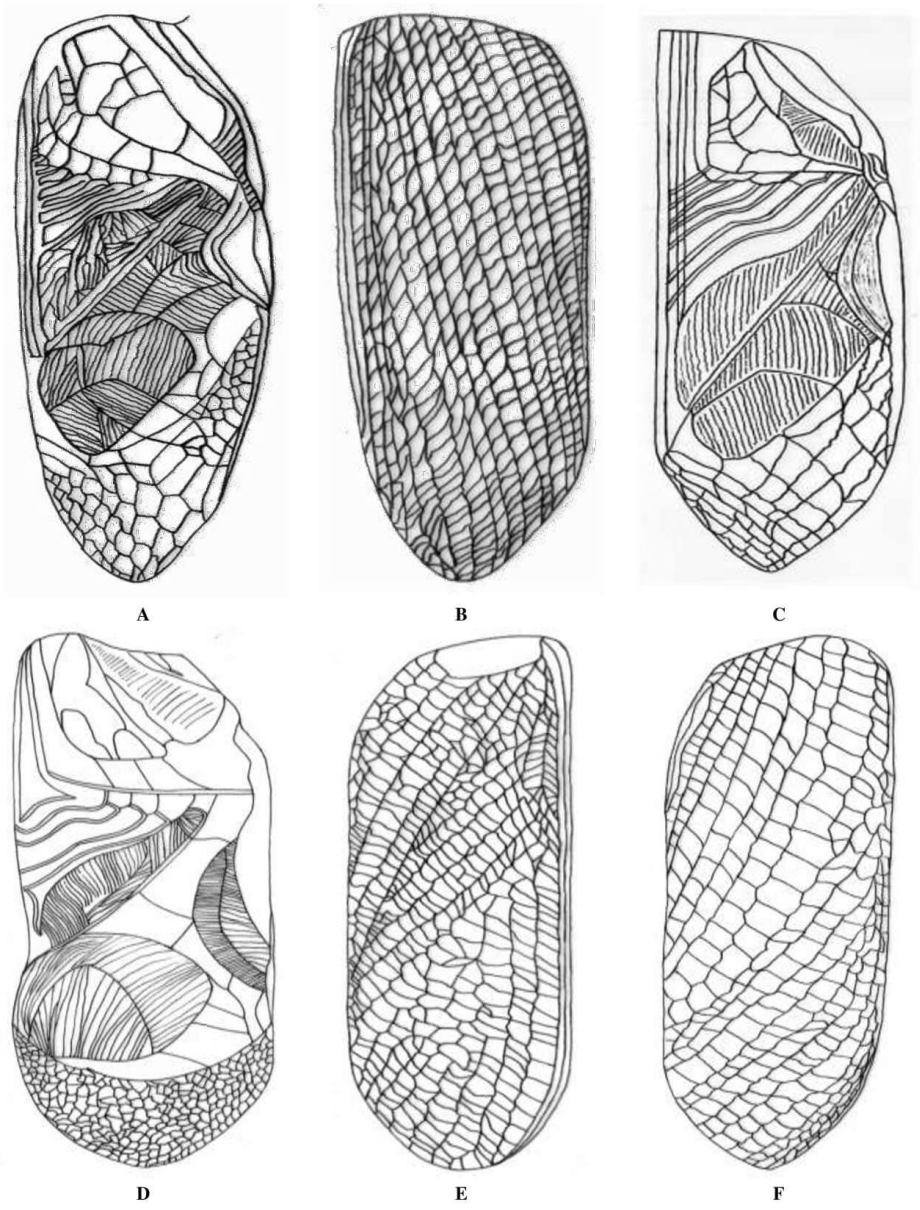

Figure 8. Male and female tegmen dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A, B** *Acheta domesticus* ♂♀, **C** *A. hispanicus* ♂, **D, E** *Gryllus (Gryllus) bimaculatus* ♂♀, **F** *G. (Gryllus) campestris* ♀

783

784

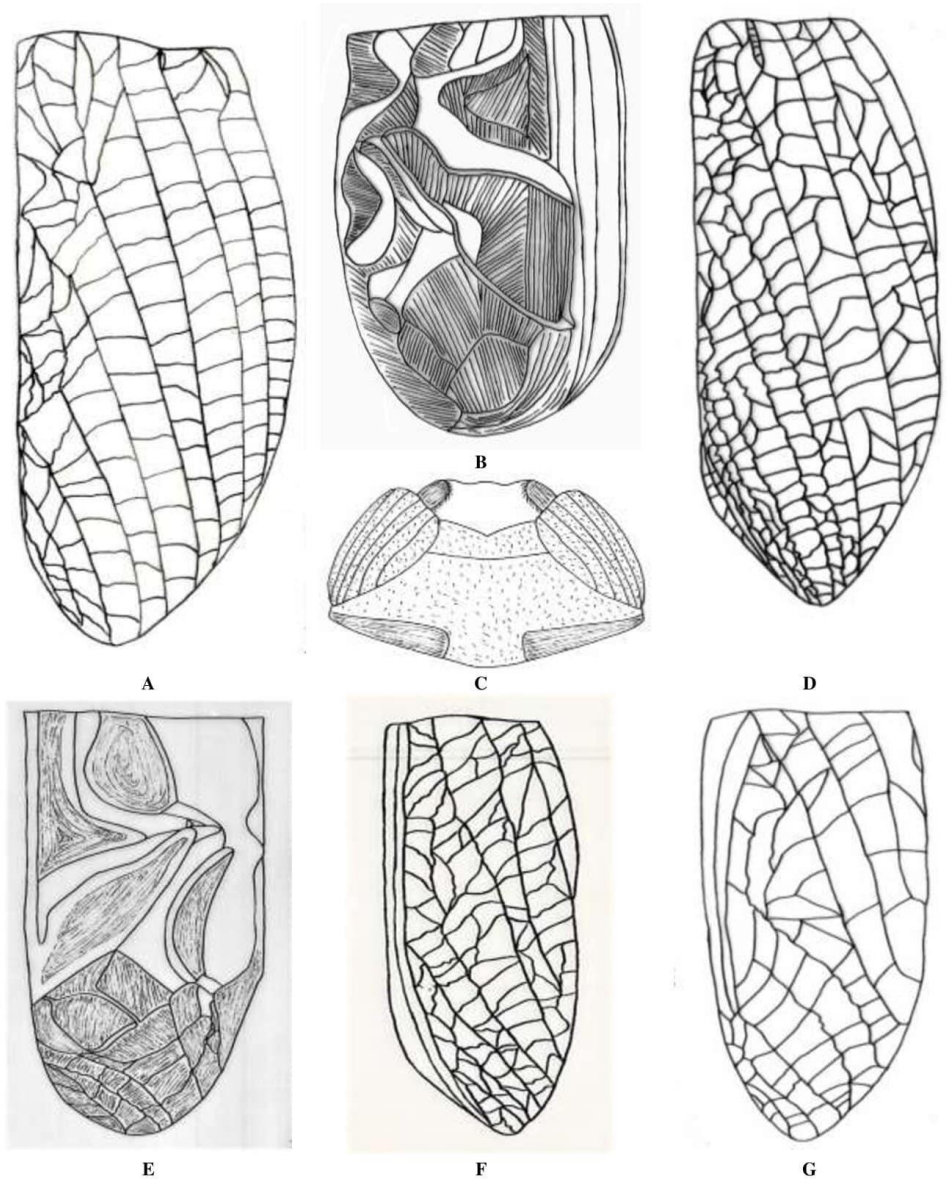

Figure 9. Male and female tegmen dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A** *G. septentrionalis* ♀, **B** *Gryllodes sigillatus* ♂, **C** *Gryllodes Supplicans* ♀, **D** *Teleogryllus (Brachyteleogryllus) occipitalis* ♀, **E, F** *T. (Brachyteleogryllus) commodus* ♂♀, **G** *Modicogryllus* sp. nov? ♀

785

786

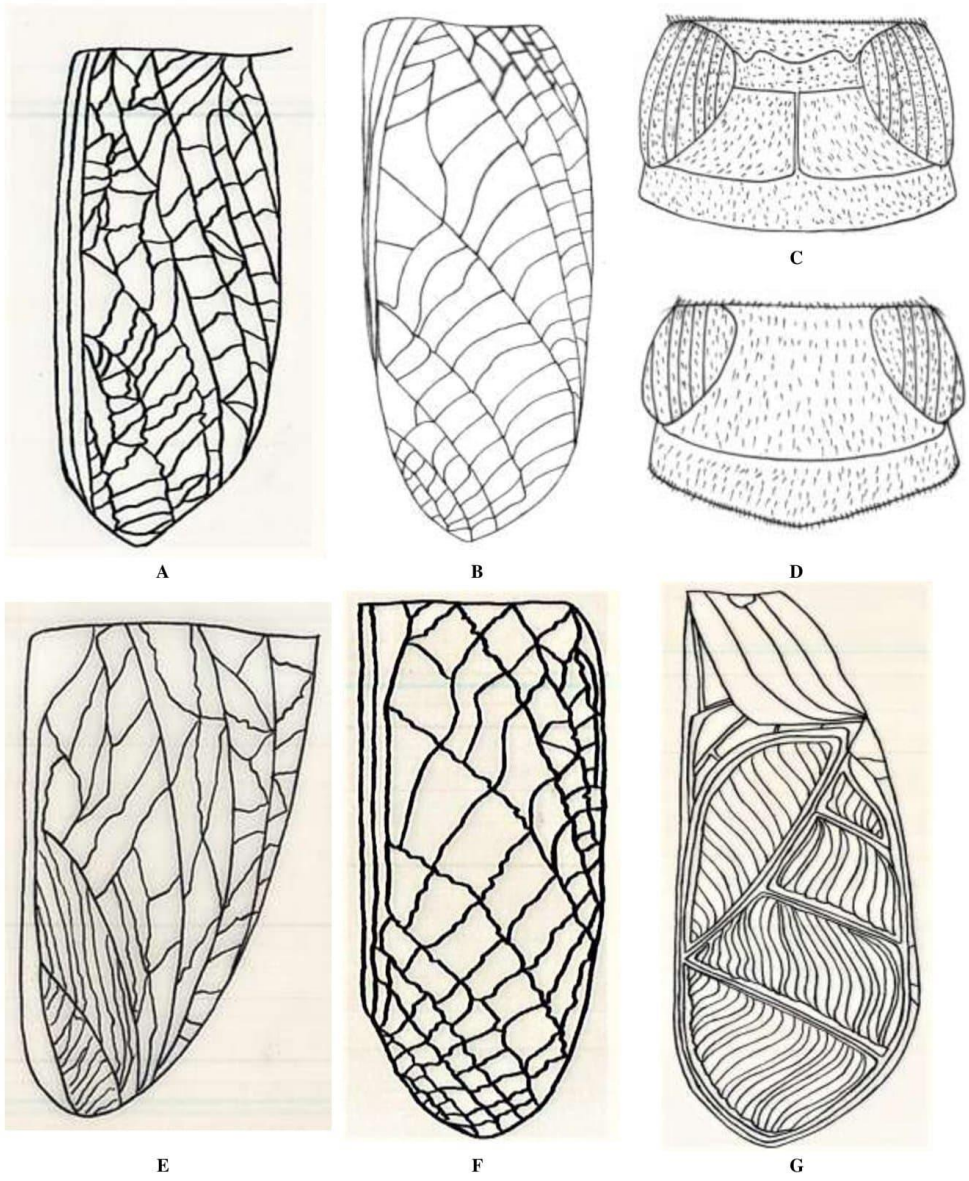

Figure 10. Male and female tegmen dorsal view of Gryllidae species, (Scale= 2 mm). Subfamily Gryllinae: **A** *Svercus palmetorum* ♀, **B** *Miogryllus itaquiensis* ♀, **C** *Callogryllus saeedi* ♀, **D** *C. ovilongus* ♀, **E** *C. bilineatus* ♀, **F** *Lepidogryllus siamensis* ♀, Subfamily Oecanthinae: **G** *Oecanthus fultoni* ♀

787

788

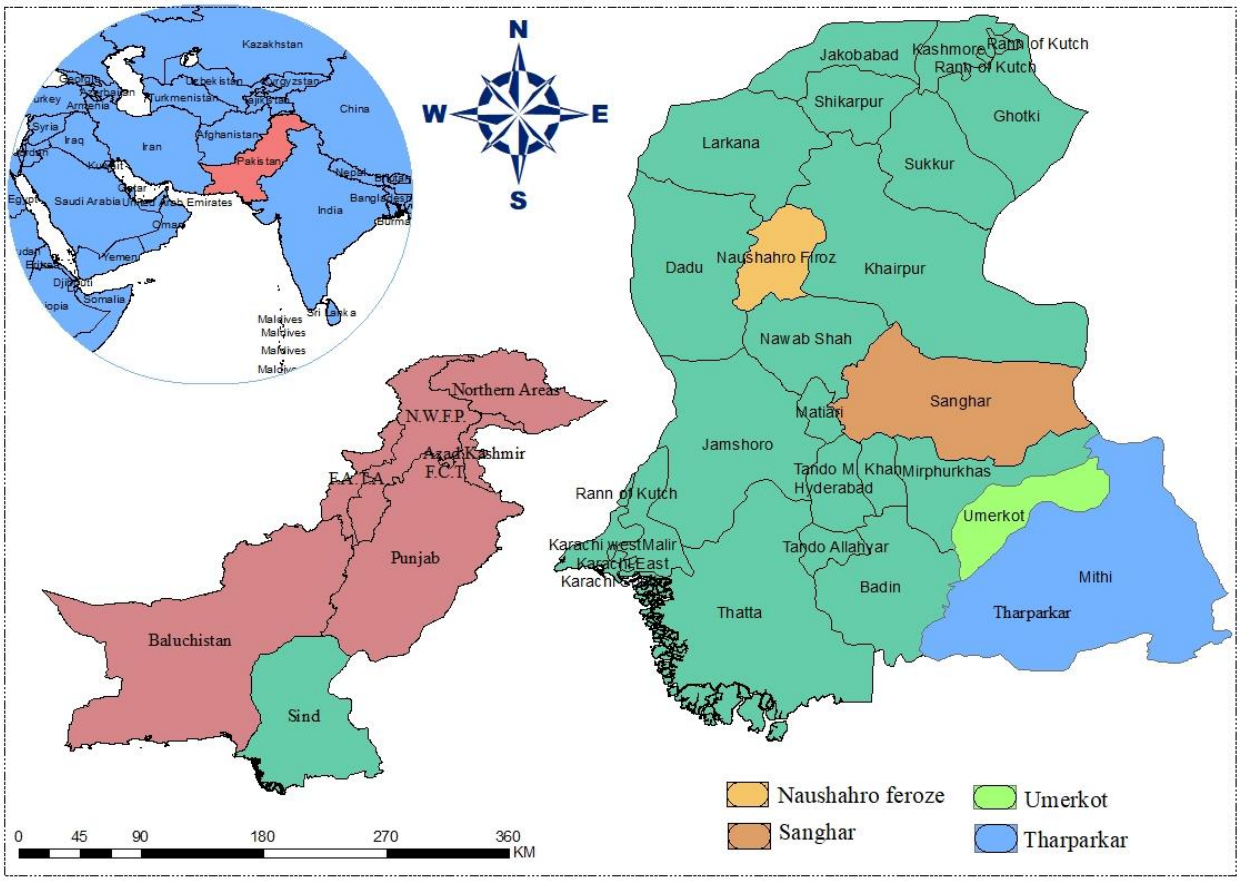

Figure 11 showing the different survey areas

ARPHA Preprints Author-formatted, not peer-reviewed document posted on 30/08/2021 DOI: https://doi.org/10.3897/arphapreprints.e73693

Table 1. Distribution of Gryllidae species in different areas of Sindh

Species	Mithi	Naushahro feroze	Chachro	Umerkot	Nara	Nagarkarkar	Tharparkar	Sanghar	Islamkot
Acheta domesticus	10	28	03	16	21	36	05	11	09
Acheta hispanicus	01	--	--	--	--	--	--	--	--
Gryllus (Gryllus) bimaculatus	09	02	07	12	02	22	17	04	15
Gryllus (G.) campestris	--	--	08	33	03	19	23	--	11
Gryllus septentrionalis	--	--	--	01	--	--	--	--	--
Gryllodes sigillatus	02	09	18	24	--	13	05	--	--
Gryllodes supplicans	--	--	--	01	02	--	--	--	--
Callogryllus saeedi	--	--	--	--	--	--	--	05	--
Callogryllus ovilongus	--	--	--	--	--	04	--	--	--
Callogryllus bilineatus	--	--	--	--	--	--	--	--	02
Modicogryllus (Modicogryllus) sp.	--	--	--	01	--	--	--	--	--
Teleogryllus (Brachyteleogryllus) occipitalis	01	--	--	--	--	--	--	--	--
T. (Brachyteleogryllus) commodus	--	--	--	--	--	02	--	--	--

Lepidogryllus siamensis	--	--	--	01	--	--	--	--	--
Svercus palmetorum	--	--	--	--	--	--	02	--	--
Miogryllus itaquiensis	--	--	01	--	--	--	--	--	--
Oecanthus fultoni	--	--	--	01	--	--	--	--	--