

A New Species of the Genus Melanogryllus (Orthoptera : Gryllidae) from Taiwan 【Research report】

台灣產Melanogryllus 屬(直翅目:蟋蟀科)之一新種【研究報告】

Jeng-Tze Yang and Chung-Tu Yang 楊正澤、楊仲圖

*通訊作者E-mail:

Received: Accepted: 1994/05/02 Available online: 1994/09/01

Abstract

A new species, Melanogryllus bilineatus Yang et Yang from Taiwan was described and illustrated for the first time in this study. The description comprises five different character sets. They are coloration, external morp-hology, male genitalia, calling acoustics and habitat. The intraspecific variation of tegmen and male genitalia among the isofemale population are also mentioned.

摘要

本文圖並敘述台灣產新種蟋蟀 Melanogryllus bilineatus Yang et Yang 之各門徑特徵,包括顏色,外部形態,雄性生殖器,呼喚聲音之聲學特徵及棲所。檢查單雌後代之雄性生殖器之種內變異特性也一併加以繪圖及討論。

Key words: Melanogryllus, new species, Gryllidae, bioacoustics, taxonomy. 關鍵詞: 新種、蟋蟀科、生物聲學、台灣、分類。

Full Text: PDF(1.25 MB)

下載其它卷期全文 Browse all articles in archive: http://entsocjournal.yabee.com.tw

中華昆蟲 14: 379-386(1994) Chinese J. Entomol. 14: 379-386(1994)

A New Species of the Genus *Melanogryllus* (Orthoptera: Gryllidae) from Taiwan

Jeng-Tze Yang and Chung-Tu Yang Department of Entomology, National Chung-hsing University, 250 Kuo-Kuan Rd. Taichung, 402, Taiwan, R.O.C.

ABSTRACT

A new species, *Melanogryllus bilineatus* Yang et Yang from Taiwan was described and illustrated for the first time in this study. The description comprises five different character sets. They are coloration, external morphology, male genitalia, calling acoustics and habitat. The intraspecific variation of tegmen and male genitalia among the isofemale population are also mentioned.

Key words: Melanogryllus, new species, Gryllidae, bioacoustics, taxonomy.

台灣產Melanogryllus 屬(直翅目:蟋蟀科)之一新種

楊正澤、楊仲圖 國立中興大學昆蟲學系 台中市國光路 250 號

摘 亜

本文繪圖並敘述台灣產新種蟋蟀 Melanogryllus bilineatus Yang et Yang 之各門 徑特徵,包括顏色,外部形態,雄性生殖器,呼喚聲音之聲學特徵及棲所。檢查單雌後 代之雄性生殖器之種內變異特性也一併加以繪圖及討論。 關鍵詞:新種、蟋蟀科、生物聲學、台灣、分類。

Introduction

The genus *Melanogryllus* was erected by L. Chopard (1961) with type species, *Gryllus desertus* Pallas, 1771 based on the epiphallus of male genitalia which without cornua aside. There are 5 species in the genus before (Chopard, 1967). However, the genus *Melanogryllus* from Taiwan is recorded for the first time in this study.

The morphology of the male genitalia had been well studied by Randell (1964). He mentioned that the spermatophore sac very convoluted into a shape resembled two layers together. He noted that could possibly be the result of over cooking in the potassium hydroxide solution. This assumption was confirmed by authors in this study.

The acoustic character of this genus still remains unknown. The calling sound of the genus is described for the first time in this paper.

Materials and Methods

Two major methods are applied in this paper to gain the structural and the nonstructural characters of the cricket. The structural character include coloration, external morphology and male genitalia made by the classical method as previously done before (Yang and Yang, 1986; Yang, 1993).

The nonstructural character here is the acoustic character of the calling sound. The method of the tape recording and the sound analyzing are provided below.

Tape recording:

The crickets were collected by first author and moved into the laboratory, then reared in plastic cups (7 cm in diameter and 11 cm in height) (Yang, 1993). Eggs were collected from a single female. They were reared separately after the nymph grew up. Once the adult male matured and emitted the calling sound in solitary status, the sounds were immediately recorded in a simple sound-proof chamber (length, 243cm; width, 200cm and height, 200cm) (Yang, 1993).

The sound tape was made with a stereo cassette recorder (SONY TCD 5M), use a super-cardioid electric condenser microphone (Victor, MU-510). The sound-proof chamber was controlled in a condition of 25-28°C and RH 50-60% while the tape recording was undertaken.

Sound analysis:

The sounds were analyzed by Digital Sonagraph, KAY-7800 in the Institute of Marine Biology, Sun Yat-Sen University. The water fall display of the spectra was obtained from the program package of Interactive Laboratory System (ILS V6.0)

Types and sound tapes depositing

the type materials and other specimens deposited in the Insect museum of Department of Entomology, National Chung-hsing University, Taichung, Taiwan, Republic of Chian. The analyzed sound tapes were also deposited in the same place.

Melanogryllus bilineatus Yang et Yang n. sp.

Coloration:

General color black, except occiput, mouth part and hind femur somewhat dark brown. Head reddish brown, marked with two short stripes behind eyes, reddish brown.

External morphology:

Head hemispherical, short, frontoclypeus convex roundly, basal width of vertex about 1.8 times as long as middle length. Eyes divergent posteriorly, distance between eyes slightly narrower at anterior part than at posterior part about 1:1.6, lateral margins of vertex slightly convexed at the level of eyes; in lateral view, vertex gradually rounding into frons, Face rounded, slightly narrower at widest part than middle length, about 1:1. 1, frons about 1.1 times as long as length of clypeus and labrum together. Maxillary palpi with apical segment longer than subapical one about 1.4:1. Labial palpi with apical segment longer than subapical one about 1.4:1, and almost equal to subapical segment of maxillary palpi, but shorter than apical segment of latter about 1:1.4. Eyes large, elliptical, about 1. 7 times longer in longitudinal diameter than in transverse one; 3 ocelli arranged in triangular, lateral ocelli smaller than median one, deposit vertically, median ocellus long, larger than lateral ones, deposit horizontally. Distance between antennae about 2.3 times as long as wide of scape itself, antennal scape short, shorter than wide.

Pronotum very wide, in dorsal view, lateral margins parallel, very slightly convex at middle; anterior wide of pronotal disc almost equal to posterior one, widest part about 1.8 times wider than middle long; anterior margin slightly concave at middle, posterior margin bisinuate, distinctly convexed at middle, caudolateral angle distinct, acute. Fore tibia with outer-tympanum about twice longer than width, and almost 2.5 times longer than inner-tympanum in maximum length; hind femur about 2.5 times longer than wide at widest part; hind-tibia with lateral spines in / out = 6 / 7, apical spines in / out = 3 / 3.

Tegmen exceeding to base of epiprocta, dorsal field of tegmen about 8 times longer than wide (Fig. 1, H) and about 3. 5 times longer than apical area; apical margin acutely round. Wings absent (detached) or present, if present, it exceeding to 7th segment of abdomen.

Genitalia:

Male: Subgenital plate moderately large. Epiphallus simple, only single plate, without cornua, in dorsal view, general features like an escutcheon, but variate in forms, distinct produced, roundly acute at apex (Figs. 2, G, J and 3, B, F,) anterior emargination strongly arched, various in V-shape (Fig. 2, J), in C-shape (Figs. 2, G and 3, B) or U-shape (Fig. 3, F); in lateral view, apical part of epiphallus bearing a dorsal carina.

Ectoparamere relative simple, basal part broad, rounded at apex, each lateral margin shallow indented near apex or strongly convex at middle; each paramere divided into a broad lateral branch and a slender, small mesospur, both branches connected with membrane at basal twothirds. Median lobes in ventral view, slender, directed mesad, contact in apical part, acute at apex. Endoparamere in lateral view, curved as hook-like.

Male:

body length: 11.72–16.13 mm. head length: 1.98–2.95mm. head width: 3.33–4.46 mm. pronotum length: 2.15–2.90 mm. pronotum width: 3.50–4.84 mm. tegmen length: 6.94–8.60 mm. tegmen width: 3.12–5.59 mm. wing length: 13.28–15.27 mm. fore femur length: 2.80–3.98 mm. fore tibia length: 2.58–3.55 mm. hind femur length: 7.36–9.52 mm. hind femur width: 1.94–3.44 mm. hind tibia length: 5.05–7.15 mm.

Female:

body length: 12.36–15.86 mm. head length: 2.39–2.63 mm. head width: 3.60–4.57 mm. pronotum length: 2.61–2.95 pronotum width: 4.08–5.21 mm. tegmen length: 6.94–9.95 mm. tegmen width: 3.44–5.59 mm. wing length: 16.77–17.10 mm. fore femur length: 2.58–3.87 mm. fore tibia length: 2.26–3.33 mm. hind femur length: 7.20–8.60 mm. hind femur width: 2.31–3.33 mm. hind tibia length: 4.35–7.10 mm.



Fig. 1. Melanogryllus bilineatus n. s_N. A, head and pronotum, dorsal view; B, the same, lateral view; C, head anterior view; D, maxillary palpi (mp) and labial palpi (lp); E, fore tibia with tympanum inner (left) and outer (right) side; F, hind femur, lateral view; G, hind tibia, inner (left) and outer (right) sides; H, tegmina left and right. al: length of apical area; dft: dorsal field of tegmen; dl: length of dorsal field; div: dividing vein; tw: width of tegmen. unit=mm.

Calling acoustics:

The species with chirp rate of 2 chirps (per 5.12 sec) based on the sampling rate at 8 KHz (Table 1). It is constant among tested individuals at the same condition. The intervals between chirps vary among tested individuals. The low range of it ranges from 0.720 to 0.992 sec., the high range of it ranging from

0.904 to 1.496 sec.

This species also have a constant character in the pulse ratio of 6 pulses per chirp, and pulse duration of 0.032 sec (Table 2). the front pulse of each chirp is much smaller than subsequently ones (Fig. 4).

Based on the waterfall spectrography (Fig. 5), the relative intensity of a major



Fig. 2. Melanogryllus bilineatus n. sp. A, terminal segments of abdomen, lateral view; B, the same, ventral view; C, male genitalia, lateral view (over soaked); D, the same, terminate, lateral view; E, the same, ventral view; F, the same, caudal view; G, epiphallus dorsal view; H, terminate of pennis; I-L, one of various form, 42-45-2, from isofemale stock, I, tegmina; J, male genitalia, dorsal view; K, the same, ventral view; L, the same, lateral view. aem: anterior emargination; mdl: median lobe; sps: spermatophore sac. unit=mm.



Fig. 3. Melanogryllus bilineatus n. sp. A-D, 42-45-217, E-H, 42-45-214, A & E, tegmina; B & F, male genitalia, dorsal view; C & G, the same, ventral view, D & H, the same, lateral view. unit=mm.

Table 1.	The chirp characteristics of the calling				
hard and a second s	sound of Melanogryllus bilineatus n. sp.				
Code of	Chirp rate	Chirp	Duration	Interval	
specimen	(* / 2.56	(mode)	(sec.)	(sec.)	
	sec.)				
267-1	2	2	0.232	0.720-1.496	
42-45-205	2	2	0.432	0.896-0.904	
42-45-212	2	2	0.432	0.992-1.024	

Table	2.	The	pulse	characteristics	of	the	calling

sound of <i>Melanogryllus bilineatus</i> n. sp.			
Code of	Pulse ratio	Duration	Interval
specimen	(pls/chp)	(sec.)	(sec.)
267-1	6	0.032	0.016
42-45-205	6	0.032	0.024 - 0.028
42-45-212	6	0.032	0.024-0.032



Fig. 4. The calling sound of *Melanogryllus bilineatus* n. sp. time-wave (upper) and sonagraphy (lower).



Fig. 5. The waterfall spectrography of calling sound of *Melanogryllus bilineatus* n. sp. for 5.689 sec.

spectrum gradually increased from low frequency to the peak then suddenly dropped down around the frequency of 4.5 KHz. There are several minor spectra of the frequency about 5.0 KHz in relative low intensity. The frequency range of the species ranges from 3.8 to 5.0 KHz, the band width of the calling sound is 1.2 KHz (Table 3).

Table 3.	The frequency characteristics of the calling
	sound of Melanoarvillus hilineatus n. sp

sound of <i>Wielanogryllus bilineatus</i> n. sp.				
Code of	Low	Middle	High	Width
specimen	(KHz)	(KHz)	(KHz)	(KHz)
267-1	3.8	4.0	5.0	1.2
42-45-205	3.8	4.0	5.0	1.2
42-45-212	3.8	4.0	5.0	1.2

Habitat:

Roadside, On grassland or under stones.

Holotype:

Male (42-45-4, G4a), reared from isofemale stock of 42-45, originary collected from Pingtung Hsien, Nanjen shan, 14-IX-1988, J. T. Yang.

Paratypes:

3 males (42-45-205; 42-45-214; 42-45-217), 1 female (42-45-212), same data as in holotype; 1 male (42-37, # 27), Pingtung Hsien, Nanjen shan, 14-IX-1988, J. T. Yang; 1 male (116-1), missing data, T. Wang; 1 male (267-1 G60), Pingtung Hsien, Fongun, 25-I-1992, J. T. Yang.

Distribution: Taiwan.

Etymology: *bi*: two; *lineatus*: L. adj. *-us*, *-a*, *-um*, the reddish stripes behind eyes.

According to the key of Shiraki (1930), this species should be *Gryllus* (=*Plebeogryllus*) *plebejus* (Saussure, 1877). However, the tegmen with various subcostal ramose is different from the view point of Dr. T. Shiraki. On the other hand, based on the illustration of male genitalia and the description from Chopard (1969) shown this species similar to *Gryllus guttiventris* Chopard. However, the species differs from *guttiventris* by having only 2 short reddish stripes behind eyes and both anterior and posterior ends of pronotum not straight, (*G. guttiventris* with six short but light lines on occiput and both ends of pronotum almost straight)

References

- **Chopard, L**. 1961. Contribution a l'etude de la faune d'Afghanistan 35, Gryllides. Eos. 36: 387-401.
- Chopard, L. 1967. Pars 10. Gryllides In Orthopterum Catalogus (M. Beier, ed.)". W. Junk's Gravengage. 10: 126.
- Chopard, L. 1969. The fauna of India and adjacent countries (R. B. S. Sewell, ed.). Orthoptera, Vol. 2, Grylloidea. Baptist Mission Press, Calcutta. 1969: 1-421.
- Randell, R. L. 1964. The male genitalia in Gryllinae (Orthoptera: Gryllidae) and a tribal revision. Can. Entomol. 96: 1565-1607.
- Shiraki, T. 1930. Orthoptera of the Japanese Empire. Part I. (Gryllotalpidae and Gryllidae). Insecta Matsumurana 4: 181-252.
- Saussure, H. De. 1877. Melanges Orthoptrologiques, fasc. 5. Memoires. Soc. phys. Hist. Natur. Genve 25(1): 1-352.
- Yang, J. T. 1993. Biosystematics of Gryllinae (Orthoptera: Gryllidae) from Taiwan. Doctoral dissertation of National Chung-hsing University. (In Chinese).
- Yang, J. T., and C. T. Yang. 1986. Delphacidae of Taiwan (I) Asiracinae and tribe Tropidocephalini (Homoptera: Fulgoroidea). Taiwan Museum Spec. Publ. 6: 1-79.

Received for publication December 24, 1993; revised manuscript accepted May 2, 1994.