A New Malaysian Myrmecophilous Cricket (Orthoptera: Myrmecophilidae)

by

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ABSTRACT

A new species of myrmecophilous cricket, *Myrmecophilus leei*, is described from Penang, Malaysia from a series which contained both males and females. The crickets are associated with the long-legged ant, *Anoplolepis gracilipes*. A short review of the importance of the long-legged ant and also a short review of the sexual history of some *Myrmecophilus* species is given. The question of why this cricket occurs with this ant in Malaysia while the cricket has never been recorded with the same ants found in almost all moist tropical regions of the world remains open.

Key Words: *Myrmecophilus leei* new species, Malaysia, Penang, males and females recovered, *Anoplolepis gracilipes,* Formicidae, Myrmecophilidae, myrmecophiles.

INTRODUCTION

Myrmecophilous crickets were the earliest myrmecophiles studied (Panzer 1799, Savis 1819) and are still the most studied with active efforts made by almost every myrmecologist [see reviews by Kistner (1982) and [Hölldobler & Wilson (1990)]. Approximately 43 species (now 44) have been described from the Palaearctic, Nearctic, Oriental, Australian, and Pacific faunal areas.

It was of great interest to us that a fine series of what turned out to be a new species of *Myrmecophilus* Latreille was captured on the Minden campus of the Universiti Sains Malaysia with *Anoplolepis gracilipes* (F. Smith) by Kim-Fung Chong together with her professor C.-Y. Lee from some stacked empty flower pots in a greenhouse approximately 0.5m above ground level. The first series, captured in February had but 1 female and 4 males, an unusual situation in a genus known for its preponderance of females to males. A second series had 2

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males and 2 females and an immature male, which could indicate a balanced sex ratio. The purpose of this paper is to describe the new species.

METHODS

In the lab, specimens were photographed under a Meiji stereo microscope with a Olympus Q-Color camera. Multiple exposures were made at different levels of focus. These were amalgamated with the program Automontage to produce the whole mount images. Specimens forming the basis of Figs. 4A and 4C, made by C.-F Chong, were made under an Olympus SZ61 stereo microscope attached to an IC Imaging Standard V2.1 using SIS® Image Processing software on a PC. A few specimens were placed in cold 10% KOH for a day, washed in water for a day, then dissected in ethanol. The appropriate

Fig. 1. *Myrmecophilus leei*. A, Dorsal view of the female. B, Lateral view of the female. In both figures, the metathoracic legs are photographed through the enlarged coxae. Part of the ovipositor is displaced to the side in Fig. 1A. which shows again that the valves of the ovipositor can operate independently as first shown by Henderson & Akre (1986). Scale represents 1 mm. Photos partly by Ryan Mooney.

parts were then mounted on slides in Hoyer's medium and allowed to dry on a slide warmer. The parts were then photographed with a Motic microscope and camera combination and the resulting images were processed with Automontage and cleaned up in Photoshop 9.02.

RESULTS

The preparations permitted us to determine that the specimens were a new species of *Myrmecophilus* belonging to the subgenus *Myrmecophilus*. The only other species known from Malaysia is *Myrmecophilus polyrhachi* Ingrisch which belongs to the subgenus *Paramyrmecophilus* Gorochov

Myrmecophilus leei Kistner & Chong New Species

Figs. 1-4

Most similar to *Myrmecophilus arboreus* Maeyama & Terayama (1975) by overall shape and the presence of striping on the dorsal part of the body. Distinguished therefrom by the pattern of the banding and its much larger size.

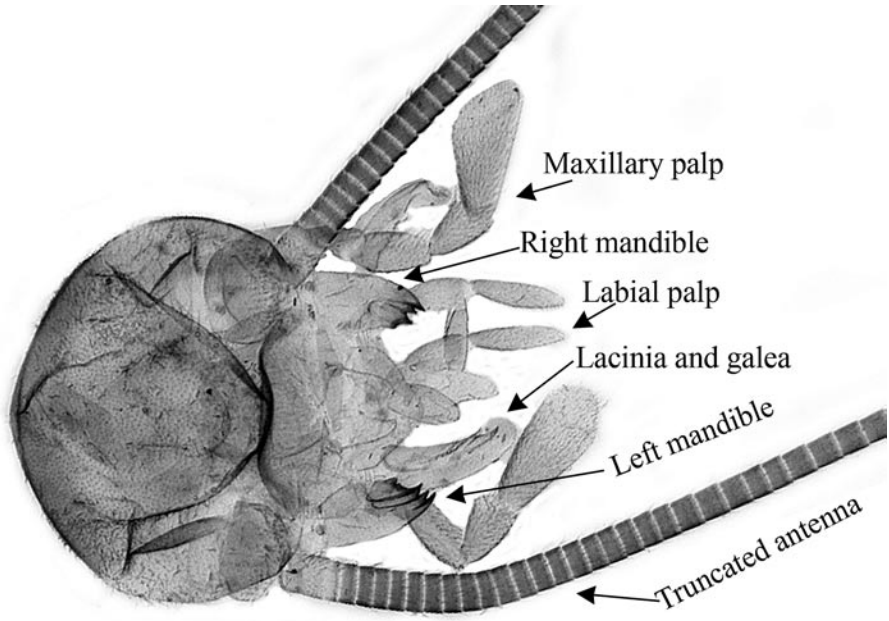

Fig. 2. *Myrmecophilus leei*. Head capsule and mouthparts. Photo by D.H.K.

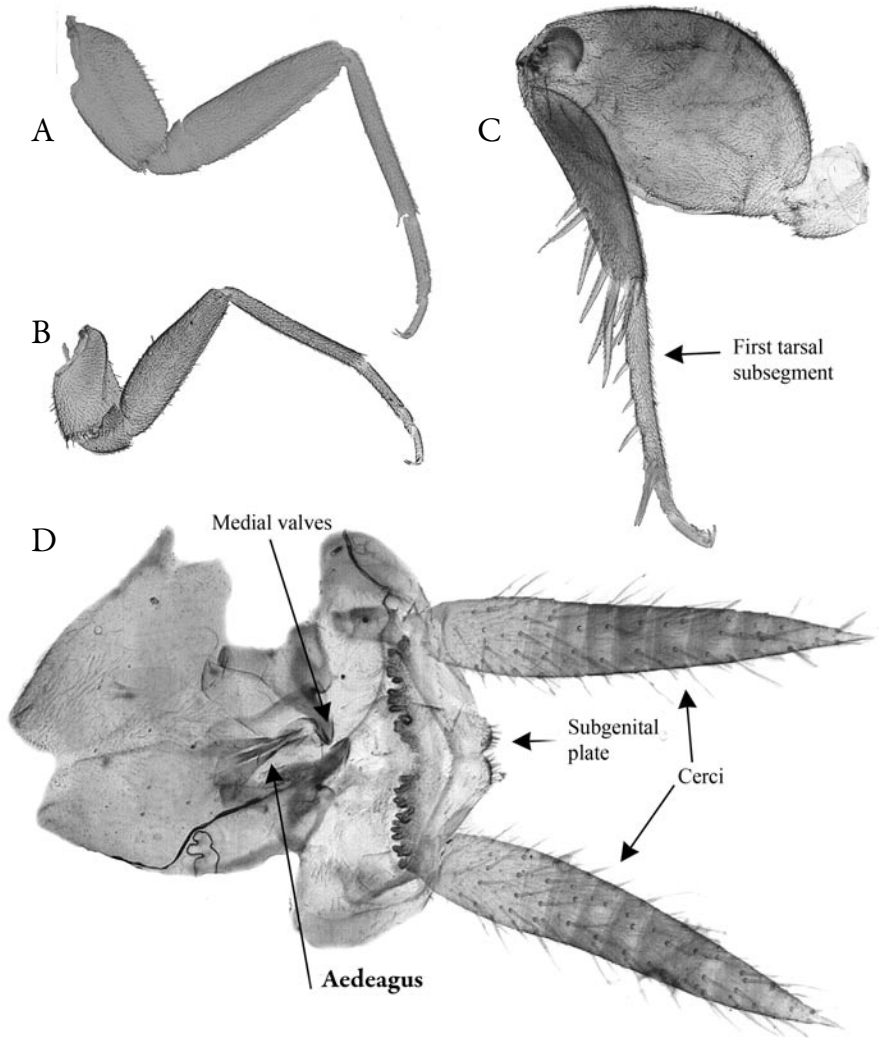

Fig. 3. *Myrmecophilus leei*. A, Prothoracic leg; B, Mesothoracic leg; C, Metathoracic leg. D, Male posterior abdomen. Photos from slides by D.H.K.

Overall shape of the female as in Fig. 1. The male looks almost the same but appears slightly smaller and the antennae are slightly shorter. Ground color is a chestnut brown with the ovipositor, legs, and mouthparts much lighter except for the enlarged metafemora which are dark chestnut brown. Pronotum with a yellow transverse band at the anterior margin, another yellow

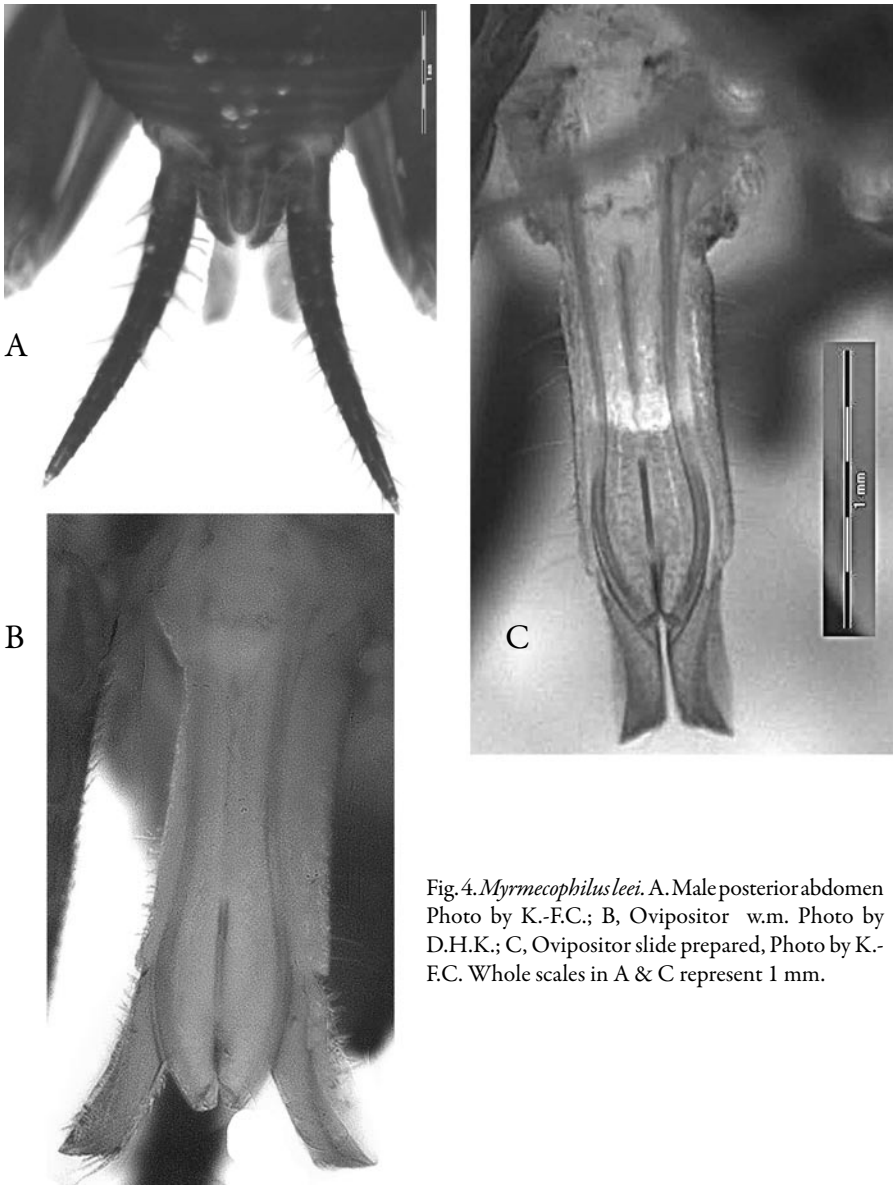

Fig. 4. *Myrmecophilus leei*. A. Male posterior abdomen Photo by K.-F.C.; B, Ovipositor w.m. Photo by D.H.K.; C, Ovipositor slide prepared, Photo by K.-F.C. Whole scales in A & C represent 1 mm.

transverse band at the posterior border and a vague midline band between the two transverse bands. The yellow banding is obscure but detectable on some specimens. Mesonotum with an anterior narrow brown band followed by a transverse yellow band, then a brown and followed by a much narrower

posterior yellow band. Metanotum brown with no bands. Abdomen brown with no banding.

Head capsule oval in shape, with well developed eyes. Antennae as long or slightly longer than the total body length including the cerci. Mouthparts as shown in Fig. 2. Labrum (not shown) subtriangular. Mandibles as shown; the left with 4 acute teeth. Right mandible with 3 acute teeth. Maxillary palpi with 5 segments, 1 and 2 short, 3 longer than 4, segment 5 about twice the length of 4. Labial palpi 3 segmented with the first segment short and the other 2 almost equally long. Lacinia toothed and about as long as the galeae.

Pronotum longer than the meso- and metanotum combined. Smooth and shiny on the surface. Prothoracic and mesothoracic legs (Figs. 3A & B) with even coverings of short fine setae. Metathoracic legs shaped as in Fig. 3C with enormously expanded femora. Tibiae of the metathoracic legs (Fig. 3C) with 3 inner preapical spurs and 2 outer preapical spurs (a principal subgeneric character). First tarsomere longer than all other tarsomeres collectively with 6 spurs with the apical longest.

Abdomen short and somewhat pointed posteriorly in both the males and females. The ovipositor (Figs. 4B & C) measures 2.0-2.2 mm long and it is protected on both sides by the lateral valves. In the slide preparation the very narrow dorsal valve is visible. Cerci of both males and females have 13 pseudo-segments. The male abdomen seen in Fig. 4A possesses a subtriangular supragenital plate, 2 lateral genital plates, and a subgenital plate with 2 lobes. Fig. 3D shows a dissected male with the parts labelled. We do not know the name of the denticle-like structures on the interior of the upper surface of the opened abdomen.

Measurements: (in mm): While males appear slightly smaller than females, the ranges in this short series overlapped completely. Total length (not including the cerci), 2.8-4.0; head width, 0.85-1.04; pronotum length, 0.85-0.95; pronotum width, 1.25-1.60; mesonotum length, 0.35-0.50, metanotum length, 0.30-0.63; antennae length, 3.5-3.6; length of cercus, 1.20-1.30. Number measured, 6.

Holotype: female, **Malaysia**, Minden campus of the Universiti Sains, Malaysia, Penang, 4 October 2006, Coll. by Kim-Fung Chong and C.-Y. Lee In the collection of the Division of Insects, Field Museum of Natural History, Chicago.

Paratypes: **Malaysia**: 1 female, 3 males, 1 immature, same locality, date, and collectors as the Holotype (F.M.N.H.); 2 females, 4 males, same locality and collectors as the holotype but collected 7 February 2006, (F.M.N.H.).

Notes: All specimens were collected with the ant, *Anoplolepis gracilipes,* determined by C.-Y. Lee. The species is named for Chow-Yang Lee.

GENERAL CONSIDERATIONS

Myrmecophilus and sex

Kistner (1982) in his general review of the biology of social insect guests, somehow missed an important paper by K. Hölldobler (1947) who concluded that there were no males in populations of *Myrmecophilus acervorum (*Panzer) [reviewed by Hölldobler, B. & Wilson (1990)]. He further showed that there were two morphs of the species - a larger one and a smaller one. The larger morph he found in nests of ants such as *Camponotus, Myrmica*, or *Formica* which have larger workers. The smaller morphs were found with ants such as *Lasius* and *Tetramorium* which have smaller workers. Using this size criterion, *M. leei* is found with ants which have larger workers.

Not all *Myrmecophilus* lack males. This was shown by Henderson & Akre (1986) in studies of *Myrmecophilus manni* Schimmer. This species reproduces sexually with the males competing for courtship rights to females. They also showed that the males frequently carry a spermatophore on the subgenital plate and make frequent movements to remove it when not in a mating sequence. They described the entire behavioral sequence of mating and provided the most complete description of the general behavior of these crickets but did not give the proportion of males to females. They also introduced the idea of a primary host for *M. manni (Formica obscuripes* Forel) where most of the crickets were captured as opposed to secondary hosts with which few crickets were found. There are males in the series of *M. leei* but the numbers are too low to calculate a sex ratio.

Ant host

Anoplolepis gracilipes (F. Smith) [formerly *Anoplolepis longipes* (Jerdon)]. also known as the long-legged ant or the yellow crazy ant (subfamily Formicinae) has workers with 11-segmented antennae, that are long and slender in size (4-5 mm), and are yellowish brown in color. Colonies usually consist of

27-50 queens (polygynous) and from 2500-5200 workers (Haines & Haines 1978). Nests are constructed outdoors particularly in soil, below rocks, bamboo sections placed on the ground, and beneath accumulated leaf litter on the forest floor (Haines & Haines 1978; Lee & Tan 2004). They are scavengers and predators, preying particularly on isopods, earthworms, insects, crabs, birds, etc. (Lewis *et al.* 1976).

A. gracilipes is recognized by the IUCN and the Global Invasive Species Program as one of the world's 100 worst invaders (ISSD 2001) because they have invaded the urban, agricultural, and native ecosystems. They attack nesting birds and native invertebrates in the Seychelles (Feare 1999, Hill *et al.* 2003) and endemic red land crabs on Christmas Island (O'Dowd *et al.* 2003). They also attack hatchling birds and reptiles (Feare 1999) as well as newborn pigs, dogs, cats, rabbits, etc. (Haines *et al.* 1994). The association among *A. gracilipes* and honey-dew secreting scale insects may lead to canopy dieback because of the growth of sooty molds (O'Dowd *et al.* 2003). *A. gracilipes* also displaced the 'keystone' species as they were able to form multi-queen supercolonies in the rain forest (O'Dowd *et al.* 2003). Lester and Tavite (2004) reported that there was a significant reduction in ant species diversity with increasing *A. gracilipes* densities in newly invaded areas in Tokelau. The importance and world-wide distribution of this species was reviewed by Wetterer (2005).

In view of the wide-spread distribution and the enormous amount of energy spent studying this species of ant, one wonders why it is only now and in Malaysia that the accompanying crickets have been discovered. Have the crickets invaded the *A. gracilipes* colonies from colonies of other ant species or is Malaysia the place of origin of the original *A. gracilipes* colonies and the crickets failed to migrate with their hosts? Or perhaps they are simply so small and cryptic that they have been missed in other localities. Only time and careful study can answer such questions.

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