ORTHOPTERA IN THE BUKIT TIMAH AND CENTRAL CATCHMENT NATURE RESERVES (PART 2): SUBORDER ENSIFERA

2nd Edition

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Lee Kong Chian Natural History Museum
National University of Singapore
Singapore
2017
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INTRODUCTION

The Orthoptera is the order of insects consisting of the grasshoppers (suborder Caelifera), as well as crickets and katydids (suborder Ensifera). They are among the most diverse (around 27,000 species worldwide) and common terrestrial macro-invertebrates (Cigliano et al., 2017). In the Tropics, these insects can be found in most terrestrial habitats, from the dipterocarp forests and grassland sites to mangrove and coastal forests, and even highly urbanised areas. Orthopterans also occupy a diverse array of microhabitats, from subterranean and leaf litter to the forest canopy and streams. Although the orthopterans consist of species ranging from herbivores to carnivores (Poo et al., 2016), most orthopterans are primary consumers. They also play important roles as nutrient recyclers (Badenhausser et al., 2015) and pollinators of plants (Micheneau et al., 2010). Owing the sensitivity of orthopterans to their floristic environment, understanding their interactions with plants also paves potential paths to using orthopterans as bio-indicators of forests (Bazelet & Samways, 2011; Fartmann et al., 2012).

The diversity of orthopterans in and around the Bukit Timah Nature Reserve (BTNR) and the Central Catchment Nature Reserve (CCNR) was first published in 2012 (Tan, 2012a; 2012b). It was based on intensive sampling of the nature reserves between 2010–2011 and 150 species of orthopterans were recorded from the BTNR and CCNR including 10 species that have been found to be new to science (see Gorochov & Tan, 2011, 2012; Ingrisch & Tan, 2012; Tan, 2012c, 2012d). However, some species could not be identified to specific level at that time. It was also mentioned that more species could be expected with more comprehensive sampling. Indeed, a subsequent survey in the Mandai Road area by Tan et al. (2015) discovered 14 new records of orthopterans for the CCNR. All these new data called for a second edition of the orthoptera in the BTNR and CCNR. In this latest edition, the names for more species, including those found to be new to science, have been updated. Some of the species previously identified to generic level only are now assigned to species. Moreover, based on new collections between 2012–2015, nine new species records have been added. Lastly, additional information in this edition includes a short remark (on taxonomy and/or natural history) and the national conservation status category for each species.

Classification and nomenclature of species were based on the Orthoptera Species File Online Version 5.0/5.0 (Cigliano et al., 2017). The families, subfamilies, and tribes are arranged alphabetically for ease of reference. In the habitus photographs, the measurement indicated refers to the body length (from the vertex of fastigium to the abdominal apex, exclusive of ovipositor or cercus) of freshly euthanised specimens. The national conservation status categories follow those of Davison (2008): Common, Least Concern, Vulnerable, Endangered and Critically Endangered.

RESULTS AND OBSERVATIONS

Overall, 123 known species representing six families from the suborder Ensifera were collected and examined from the BTNR and CCNR whereas 117 species were recorded previously (Tan, 2012b). The superfamily Grylloidea (64 species from two families) is the most species rich, followed by the Tettigonioida (47 species from one family). At the other extreme, the superfamily Rhaphidophoroidea and Stenopelmatoidea are represented by merely one family each with a small number of species (one and eight species, respectively). Among the families, the species number is significantly higher in the Gryllidae (54 species) and Tettigoniidae (47 species), whereas the Rhaphidophoridae is only represented with a single species. Forty-two species have had their nomenclature updated in this new edition. Nine species were also added to the original checklist:

1. *Odontogryllodes latus* Chopard (Gryllidae)
2. *Sclerogryllus* sp. 2 (Gryllidae)
3. *Pentacentrus* sp. 1 (Gryllidae)
4. *Micrornebius distinctus* Tan (Mogoplistidae)
5. *Micrornebius eclipsus* Tan (Mogoplistidae)
6. *Micrornebius mandai* Tan (Mogoplistidae)
7. *Capnogryllacris fruhstorferi* (Griffini) (Gryllacrididae)
8. *Larnaca* (*Larnaca*) *fasciata dammermani* (Karny) (Gryllacrididae)
9. *Xestophrys horvathi* Bolivar (Tettigoniidae)

The classification of the taxa is as follows:

Order Orthoptera

Suborder Ensifera

Superfamily Grylloidea

Family Gryllidae (54)

Family Mogoplistidae (10)

Superfamily Gryllotalpoidea

Family Gryllotalpidae (3)

Superfamily Rhaphidophoroidea
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Family Rhaphidophoridae (1)
Superfamily Stenopelmatoidea
Family Gryllacrididae (8)
Superfamily Tettigonioidea
Family Tettigoniidae (47)

The lineages of Ensifera found in and around BTNR and CCNR are comparably representative of the overall phylogenetic diversity of Ensifera (see Song et al., 2015). Five of the seven monophyletic clades (or superfamilies) of the Ensifera are represented here in the BTNR and CCNR. The two missing clades (Schizodactyloidea and Hagloidea) do not occur in Singapore and the Malay Peninsula (Cigliano et al., 2017). This is an impressive representation, especially since the two nature reserves comprise of a relatively small area of fragmented forest located in the middle of highly urbanised Singapore. This is in spite of the fact that the species composition can be observed to be dominated by a few large families.

Additionally, based on the material collected from the BTNR and CCNR between 2010–2015, 23 species new to science were also described. They are listed here chronologically:
1. Asiophlugis temasek Gorochov & Tan, 2011 (Tettigoniidae)
2. Glenophisis singapura Tan, 2012 (Tettigoniidae)
3. Jambiliara selita Ingrisch & Tan, 2012 (Tettigoniidae)
4. Nahlakia bidadari Ingrisch & Tan, 2012 (Tettigoniidae)
5. Oxylakis singaporensis Ingrisch & Tan, 2012 (Tettigoniidae)
6. Gryllootalpa nymphicus Tan, 2012 (Gryllotalpidae)
7. Gryllootalpa wallace Tan, 2012 (Gryllotalpidae)
8. Trellius neesoon Gorochov & Tan, 2012 (Gryllidae)
9. Tremellia timah Gorochov & Tan, 2012 (Gryllidae)
10. Phaloria jerelynae Gorochov & Tan, 2012 (Gryllidae)
11. Singapuriola separata Gorochov & Tan, 2012 (Gryllidae)
12. Micrornebius kopisua Tan & Ingrisch, 2013 (Mogoplistidae)
13. Ornebius insculpta Tan & Ingrisch, 2013 (Mogoplistidae)
14. Lebinthus luae Robillard & Tan, 2013 (Gryllidae)
15. Paragraecia temasek Tan & Ingrisch, 2014 (Tettigoniidae)
16. Peracca mirzai Tan & Ingrisch, 2014 (Tettigoniidae)
17. Peracca macrichiensis Tan & Ingrisch, 2014 (Tettigoniidae)
18. Varitrella (Cantotrella) orion Gorochov & Tan, 2014 (Gryllidae)
19. Cesasundana lorniensis Tan, 2014 (Tettigoniidae)
20. Micrornebius distinctus Tan, 2014 (Mogoplistidae)
21. Micrornebius eclipsus Tan, 2014 (Mogoplistidae)
22. Micrornebius mandai Tan, 2014 (Mogoplistidae)
23. Endodrelanva jimini Tan & Kamaruddin, 2016 (Gryllidae)

The national conservation status categories for all 123 species are provided with the hope to aid conservation managers in decision and policy making when the orthopterans are being used as bio-indicators. It should however be noted that it is not easy to obtain population size, area of occupancy, and rates of decline for insects. As such, the status provided here for each species is qualitative and dependent on the author’s experience and observations in the field between 2009 and 2016. Threats to the Ensifera and Orthoptera in general are mostly habitat loss and degradation. A summary of the national conservation status categories for the Ensifera are summarised below:
1. Common: 31
2. Vulnerable: 56
3. Endangered: 23
4. Critically endangered: 13
ENSIFERA RECORDED FROM THE BUKIT TIMAH AND CENTRAL CATCHMENT NATURE RESERVES

FAMILY GRYLLIDAE

So far, 54 species from 13 subfamilies of Gryllidae have been collected. The subfamilies Trigonidiinae and Podoscirtinae are represented with the largest number of species (13 and 10, respectively). On the other hand, five subfamilies are represented with two or less species—Itarinae, Oecanthinae, Pentacentrinae, Pteroplistinae, and Sclerogryllinae.

Subfamily Eneopterinae

The review of the subfamily from Singapore can be found in Robillard & Tan (2013) and a key to species can be found in Tan & Robillard (2014).

Cardiodactylus singapura Robillard

(Fig. 1)


Remarks. — This species was described from Singapore but may also be found in Peninsular Malaysia (Tan & Kamaruddin, 2016a). Another species from the same genus, Cardiodactylus admirabilis Tan & Robillard can be found in Singapore, but is not recorded in the BTNR and CCNR (Tan & Robillard, 2014).

National conservation status. — Common.

Lebinthus luæ Robillard & Tan

(Fig. 2)


Remarks. — Only the generic name was provided in the first edition (Lebinthus sp.). The species was formally described by Robillard & Tan (2013). This species is named after the recently retired curator of the Lee Kong Chian Natural History Museum, Ms. Lua Hui Kheng. This species is restricted to mostly coastal forests (such as those in Labrador Nature Reserve and Pulau Ubin) and parts of the BTNR (Tan et al., 2012; Robillard & Tan, 2013; Tan, 2013).

National conservation status. — Vulnerable.

Nisitrus vittatus (de Haan)

(Fig. 3)


Remarks. — This is among the more common species of crickets found in nature parks and nature reserves in Singapore. In the day, the male can be heard continuously chirping in the vegetation (Robillard & Tan, 2013).

National conservation status. — Common.
Fig. 1. *Cardiodactylus singapura* Robillard: A, female, 19.5 mm; B, ZRC.ORT.133, male, 17.7 mm.
Fig. 2. *Lebinthus luae* Robillard & Tan: ZRC.ORT.294, female, 17.5 mm (A); ZRC.ORT.294, male, 16.4 mm (B).
Subfamily *Euscyrtinae*

These crickets are known as the quiet crickets, because unlike most crickets, the male does not have the stridulatory apparatus on its wings and as such, cannot produce calling songs.

*Beybienkoana trapeza* Liu & Shi

(Fig. 4)


Remarks. — Only the generic name was provided in the first edition (*Beybienkoana* sp.). Examination of the male genitalia and comparison with type specimens allowed the material to be identified to species. This species is so far found only among bamboo clumps. This species was described from China but is also found in Peninsular Malaysia (Tan & Kamaruddin, 2016a).

National conservation status. — Endangered.

*Euscyrtus (Osus) concinnus* (de Haan)

(Fig. 5)


Remarks. — The species inhabits grassy areas.

National conservation status. — Common.
Fig. 4. *Beybienkoana trapeza* Liu & Shi: ZRC.ORT.285, male, 14.7 mm (A); ZRC.ORT.280, female, 19.3 mm (B).

Fig. 5. *Euscyrtus (Osus) concinnus* (de Haan): ZRC.ORT.323, male, 10.3 mm.
Fig. 6. *Euscyrtus* (*Osus*) c.f. *hemelytrus* (de Haan): ZRC.ORT.284, female, 12.5 mm (A); ZRC.ORT.279, male, 12.2 mm (B).

Fig. 7. *Patiscus malayanus* Chopard: ZRC.ORT.336, female, 15.5 mm.
**Euscyrtus (Osus) hemelytrus** (de Haan)
(Fig. 6)


Remarks. — This species tends to be found among tall grasses.

National conservation status. — Common.

**Patiscus malayanus** Chopard
(Fig. 7)


Remarks. — Only the generic name was provided in the first edition. Examination of male genitalia allowed the material to be identified to species. This species tends to be found among tall grasses and can be found coexisting with the two *Euscyrtus* species.

National conservation status. — Common.

Subfamily **Gryllinae**

These crickets are ground-dwelling; many of them form burrows underground.

**Gryllus bimaculatus** De Geer
(Fig. 8)


Remarks. — This ground-dwelling species is very widespread and can be sold in aquarium as live fish food.

National conservation status. — Common.

**Gymnogryllus** c.f. **angustus** (Saussure)
(Fig. 9)


Remarks. — Only the generic name was provided in the first edition (*Gymnogryllus* sp. 1). Further examination allowed the material to be identified tentatively to species. This large ground-dwelling cricket digs burrows in the forest floor and produces high-pitched and resonant buzzes at night, sometimes in large numbers. Upon disturbance, it retreats into its burrow, making it difficult to observe.

National conservation status. — Common.
Fig. 8. *Gryllus bimaculatus* De Geer: ZRC.ORT.134, female, 22.9 mm.

Fig. 9. *Gymnogryllus c.f. angustus* (Saussure): ZRC.ORT.250, male, 30.4 mm.
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*Gymnogryllus malayanus* Desutter-Grandcolas
(Fig. 10)


Remarks. — Only the generic name was provided in the first edition (*Gymnogryllus* sp. 2). Examination of male genitalia allowed the material to be identified to species. This large ground-dwelling cricket digs burrows in the forest floor and produces high-pitched and resonant buzzes at night. The calling song of this species is louder and higher pitched than that of *Gymnogryllus angusta*. Upon disturbance, it retreats into its burrow, making it difficult to observe.

National conservation status. — Vulnerable.

*Loxoblemmus parabolicus* Saussure
(Fig. 11)


Remarks. — This ground-dwelling species can be found among short grasses along forest edge.

National conservation status. — Common.

Fig. 10. *Gymnogryllus malayanus* Desutter-Grandcolas: ZRC.ORT.299, male, 35.2 mm.
Fig. 11. *Loxoblemmus parabolicus* Saussure: ZRC.ORT.169, male, 13.8 mm (A); ZRC.ORT.169, male, 13.7 mm (B); ZRC.ORT.275, male, 13.0 mm (C).
Fig. 12. *Mitius* species: ZRC.ORT.271, male, 11.4 mm (A); ZRC.ORT.329, female, 10.8 mm (B).
**Mitius sp.**  
(Fig. 12)

voluteers.
Remarks. — This ground-dwelling species can be found among short grasses along forest edge.

National conservation status. — Common.

**Teleogryllus sp.**  
(Fig. 13)

Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.1067, Mandai Track 15, 13 June 2014, coll. M.  
K. Tan & H. Yeo.
Remarks. — This ground-dwelling species can be found among short grasses along forest edge.

National conservation status. — Common.

**Velarifictorus (Velarifictorus) aspersus aspersus** (Walker)  
(Fig. 14)

M. R. B. Ismail; ZRC.ORT.221, 1 male, Dairy Farm Loop, 7 February 2011, coll. M. K. Tan;  
ZRC.ORT.366, 1 male, Hindhede Nature Park, 17 January 2012, coll. M. K. Tan; ZRC.ORT.404, 1  
male, Wallace Trail, 8 March 2012, coll. M. K. Tan; ZRC.ORT.1033,1034, 2 males, Mandai Track  
Remarks. — Only the generic name was confirmed in the first edition. Examination of male genitalia  
allowed the species to be identified. This is a very common ground-dwelling cricket found along  
forest edges and grassy areas and even urbanised areas. The male can be heard chirping at night,  
sometimes quite loudly.

National conservation status. — Common.

Fig. 13. *Teleogryllus* species: ZRC.ORT.161, male, 23.6 mm.
Fig. 14. *Velarifictorus (Velarifictorus) aspersus aspersus* (Walker): ZRC.ORT.127, female, 16.1 mm (A); ZRC.ORT.221, male, 14.9 mm (B).

**Subfamily Itarinae**

*Itara johni* Gorochov  
(Fig. 15)


Remarks. — This is a forest-restricted species that tends to inhabit foliage of understorey plants. The male produces loud and high-pitched resonant chirps at night. Species from this subfamily are updated here. A second species in the previous edition comprising of only females has been removed until male specimens are provided to verify the identity of the species.
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National conservation status. — Vulnerable.

Subfamily Landrevinae

Known commonly as the bark crickets, they tend to be found among tree barks and branches. The wings of many species are not developed for flying and some species do not have hind wings.

**Endodrelana jimini** Tan & Kamaruddin
(Fig. 16)


Remarks. — A different generic name (*Duolandrevus* sp. 1) was provided in the first edition. Examination of male genitalia allowed the material to be identified to genus. The species was formally described by Tan & Kamaruddin (2016c). This is a forest-restricted species. This species is hard to observe as it tends to be found among branches and bark. It hides in hollow branches upon disturbance. The wings in the adult are highly reduced and cannot be used for flight.

National conservation status. — Vulnerable.

**Duolandrevus (Bejorama) parvulus** Gorochov
(Fig. 17)


Remarks. — Only the generic name was provided in the first edition (*Duolandrevus* sp. 2). Examination of male genitalia allowed the material to be identified to species (see Tan & Kamaruddin, 2016c). This is a forest-restricted species which is difficult to find as it tends to hide among fallen tree trunks.

National conservation status. — Vulnerable.
Fig. 15. *Itara johni* Gorochov: ZRC.ORT.328, male, 19.5 mm; ZRC.ORT.314, female, 15.9 mm.
Fig. 16. *Endodrelanva jimini* Tan & Kamaruddin: ZRC.ORT.231, female, 18.4 mm (A); ZRC.ORT.247, male, 17.9 mm (B).
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Fig. 17. *Duolandrevus (Bejorama) parvulus* Gorochov: ZRC.ORT.197, male, 13.7 mm.

Fig. 18. *Odontogryllodes latus* Chopard: ZRC.ORT.1039, male, 12.2 mm. Image by Visionary Digital System (LKCNHM).

**Odontogryllodes latus** Chopard

(Fig. 18)


Remarks. — This is a forest-restricted species that is difficult to find as it tends to inhabit branches and tree bark. It will hide in hollow branches when disturbed. The tegmina in the male are highly
reduced and cannot produce sounds. This species is new to this list because material previously collected was initially thought to be a nymph until male genitalia were dissected and examined to confirm the identity (see Tan & Kamaruddin, 2016c).

National conservation status. — Vulnerable.

Subfamily Nemobiinae

Crickets from this subfamily are generally small. They differ from those of another subfamily of small crickets, the Trigonidiinae, by the absence of adhesive pads on their tarsi and tend to inhabit the ground or short grasses (instead among understorey plants or undergrowth) (Otte & Alexander, 1983).

**Polionemobius c.f. taprobanensis** (Walker)
(Fig. 19)


Remarks. — Only the generic name was provided in the first edition (*Pteronemobius* sp. 3). Examination of the male genitalia allowed the material to be identified to species. This species can be found in urbanised parks. The male produces soft chirping sounds at night.

National conservation status. — Common.

**Pteronemobius** (*Pteronemobius*) c.f. *indicus* (Walker)
(Fig. 20)


Remarks. — Only the generic name was provided in the first edition (*Pteronemobius* sp. 2). Examination of the male genitalia allowed the material to be identified to species. It is very similar to other species in the same subfamily but differs by the male genitalia. This species is among the larger species in Singapore.

National conservation status. — Common.

**Pteronemobius** sp. 1
(Fig. 21)


Remarks. — The taxonomy of this group requires further study before the species can be identified. It is found among grassy areas but this is a less widespread and common species, at least in Singapore.

National conservation status. — Vulnerable.
Fig. 19. *Polionemobius* c.f. *taprobanensis* (Walker): ZRC.ORT.310, male, 6.7 mm.

Fig. 20. *Pteronemobius* (Pteronemobius) c.f. *indicus* (Walker): ZRC.ORT.318, male, 7.6 mm.
Fig. 21. *Pteronemobius* species 1: ZRC.ORT.194, female, 5.5 mm (A); ZRC.ORT.252, male, 6.2 mm (B).

*Pteronemobius* sp. 2
(Fig. 22)


Remarks. — More taxonomic studies are required before this species can be identified. It is found in grassy areas but this is a less widespread and common species, at least in Singapore.

National conservation status. — Vulnerable.
Subfamily *Oecanthinae*

Crickets from this subfamily tend to be pale in colour, sometimes green, and appear fragile. The tegmina in the male are enlarged for producing loud calls. The species within each genus are very similar and require dissection of the male genitals for identification to species. Unfortunately, some species lack information on the male genitals, thus making it difficult to identify to species for the material collected in the BTNR and CCNR.

**Oecanthus sp.**

(Fig. 23)


Remarks. — This species is found in grassy areas where the male can be heard producing calls at night. The 19th century American novelist Nathaniel Hawthorne (1833) once said: “If moonlight could be heard, it would sound just like this.” ‘This’ referred to species from this cosmopolitan genus.

National conservation status. — Vulnerable.
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Fig. 24. Xabea species: ZRC.ORT.267, male, 10.9 mm.

Xabea sp.
(Fig. 24)


Remarks. — In contrast to the former species, this is a forest-restricted species. This genus also differs from the former by the cerci being shorter than the mesotibiae (they are longer than the mesotibiae in Oecanthus); the hind tibiae are without subapical spurs or small spines (subapical spurs and spines are present in Oecanthus), and the male tegmina have a bent Cu1 vein (straight in Oecanthus) (Otte & Alexander, 1983). The male can be heard calling at night among the leaves of trees.

National conservation status. — Vulnerable.

Subfamily Phaloriinae

Phaloria jerelynae Gorochov & Tan
(Fig. 25)

Remarks. — An endemic species found only in a small patch of forest within the BTNMR. It is mostly found among foliage of understorey plants but calling songs can also be heard at night from the canopy. The calling song consists of repeated double chirps (Gorochov & Tan, 2012).

National conservation status. — Critically endangered.
**Tremellia timah** Gorochov & Tan  
(Fig. 26)


Remarks. — An endemic forest species. It can be found fairly commonly among shrubs and the understorey vegetation. The male can be heard producing a series of trilling calls at night (Gorochov & Tan, 2012).

National conservation status. — Vulnerable.

**Trellius neesoon** Gorochov & Tan  
(Fig. 27)


Remarks. — An endemic species restricted to swamp forests. It can be found among vegetation near streams. It is a good jumper and can also fly over relatively long distances.

National conservation status. — Critically endangered.

Fig. 27. *Trellius neesoon* Gorochov & Tan: ZRC.ORT.266, male, 15.6 mm.
Subfamily Pentacentrinae

*Pentacentrus* sp. 1
(Fig. 28)


Remarks. — This species is new to the list. It was reported as a new record for the CCNR in Tan et al. (2015). This species has distinctly short black and white antennae. It is not common but can be found along forest edges. It can be attracted to light traps.

National conservation status. — Vulnerable.

Subfamily Podoscirtinae

*Aphonoides* sp. 1
(Fig. 29)


Remarks. — It is a relatively common species in the forest. Many species from this genus are very similar and can only be reliably differentiated by comparing the male genitalia. It is found to inhabit understorey plants, and usually found on leaves or branches.

National conservation status. — Vulnerable.
Fig. 29. *Aphonoides* species 1: ZRC.ORT.120, male, 11.8 mm.

Fig. 30. *Aphonoides* species 2: ZRC.ORT.115, female, 13.1 mm.
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*Aphonoides* sp. 2
(Fig. 30)


Remarks. — This is a less commonly sighted species than the former. Note the difference in the wing patterns between the two species. They are found to inhabit understory plants, usually on leaves or branches.

National conservation status. — Vulnerable.

*Aphonoides* sp. 3
(Fig. 31)


Remarks. — This species was *Aphonoides* sp. 4 in the first edition. This species differs clearly from the previous two species by their colouration. It is also a relatively rarer species than sp. 1 although it can be found along forest edge. They are found to inhabit understory plants, usually on leaves or branches.

National conservation status. — Vulnerable.

*Mistshenkoana* sp.
(Fig. 32)


Remarks. — Only the genus name was available in the first edition (*Aphonoides* sp. 3). A forest-restricted species, this species is also rarely encountered and as such, little is known about them. Further examination allows the material to be identified to a more correct genus name and updated here.

National conservation status. — Vulnerable.

*Mnesibulus* (*Mnesibulus*) c.f. *brunnerianus* (Saussure)
(Fig. 33)


Remarks. — Only the generic name was provided in the first edition (*Mnesibulus* sp.). New male specimen allowed the material to be identified tentatively to species. This is a forest-restricted species. It is found to inhabit understorey plants, usually on leaves or branches.

National conservation status. — Vulnerable.
Fig. 31. *Aphonoides* species 3: ZRC.ORT.233, female, 16.5 mm (A); ZRC.ORT.296, male, 15.5 mm (B).

Fig. 32. *Mistshenkoana* sp.: ZRC.ORT.167, female, 12.2 mm.
Fig. 33. Mnesibulus (Mnesibulus) c.f. brunnerianus (Saussure): ZRC.ORT.290, female, 14.7 mm.

Fig. 34. Idiotrella c.f. karnyi (Chopard): ZRC.ORT.170, male, 25.2 mm.

**Idiotrella c.f. karnyi** (Chopard)
(Fig. 34)


Remarks. — The species was tentatively identified as Varitrella or Idiotrella or Noctitrella sp. 1 in the first edition. Examination of male genitalia allowed the material to be identified to species. This is a forest-restricted species and are found to inhabit foliage on understorey plants. Species from this specious genus can only be reliably identified by comparing male genitalia.

National conservation status. — Vulnerable.
Sonotrella (Calyptotrella) bipunctata (Chopard)
(Fig. 35)


Remarks. — Only the generic name was provided in the first edition (Sonotrella sp.). Examination of male genitalia allowed the material to be identified to species. This is a rare and forest-restricted species and little is known about it.

National conservation status. — Endangered.

Sonotrella (Megatrella) typica Gorochov
(Fig. 36)


Remarks. — The species was tentatively identified as Zvenella sp. in the first edition. Examination of male genitalia allowed the material to be identified to species. This is a rare and forest-restricted species that can be sighted occasionally along forest edges. This species was observed to feed on Dillenia suffruticosa leaves.

National conservation status. — Endangered.
Fig. 36. *Sonotrella (Megatrella) typica* Gorochov: ZRC.ORT.198, female, 32.8 mm.

Fig. 37. *Varitrella (Cantotrella) orion* Tan & Gorochov: ZRC.ORT.200, male, 22.1 mm.

*Varitrella (Cantotrella) orion* Tan & Gorochov
(Fig. 37)


Remarks. — The species was tentatively identified as *Varitrella* or *Idiotrella* or *Noctitrella* sp. 2 in the first edition. The species name is updated here after the species was formally described (Gorochov & Tan, 2014). There is only one record of this endemic species. Little is known about them. The single male collected is also the holotype of this species (Gorochov & Tan, 2014).

National conservation status. — Critically endangered.

Remarks. — The species was tentatively identified as *Varitrella* or *Idiotrella* or *Noctitrella* sp. 3 in the first edition. This is a rare and forest-restricted species. Male specimens are needed for identification as congeners are very similar morphologically and often can only be differentiated by the male genitalia.

National conservation status. — Vulnerable.
Tan Ming Kai

Subfamily **Pteroplistinae**

*Singapuriola separata* Gorochov & Tan  
(Fig. 39)


Remarks. — This is a new genus of cricket first described from Singapore. This genus is so far endemic to Singapore and is restricted to the forest. It hides among dead leaves and hollow branches among shrubs and trees. The male can be heard producing soft chirping songs at night while hiding among leaves and branches.

National conservation status. — Endangered.

Subfamily **Sclerogryllinae**

*Sclerogryllus* sp. 1  
(Fig. 40)


Remarks. — The taxonomy of this small genus require further investigation before species name can be confirmed. This relatively uncommon species tends to be found among forest floor and leaf litter.

National conservation status. — Vulnerable.

*Sclerogryllus* sp. 2  
(Fig. 41)


Remarks. — This species is new to this list. It was reported as a new record for CCNR in Tan et al. (2015). This species differs from the former by the white femora. The males also differ in their genitalia. This relatively uncommon species tends to be found on forest floor and dry leaf litter.

National conservation status. — Vulnerable.
Fig. 40. *Sclerogryllus* sp. 1: ZRC.ORT.222, female, 10.7 mm (A); ZRC.ORT.281, male, 9.6 mm (B).

Fig. 41. *Sclerogryllus* sp. 2: ZRC.ORT.1030, male, 10.0 mm.
Fig. 42. *Amusurgus* species 1: ZRC.ORT.168, female, 6.2 mm.

Fig. 43. *Amusurgus* species 2: ZRC.ORT.218, male, 6.8 mm.

Subfamily *Trigonidiinae*

The *Trigonidiinae*, commonly known as the sword-tailed crickets, is in need of revision. Unfortunately, the genitalia, which are important for diagnosis of the species, of Indo-Malayan species are insufficiently studied. It is thus difficult to identify species until all known species have been examined. In particular, species from the genus *Anaxipha* should be rightfully transferred to other genera. Species and genera are morphologically similar and often require examination of the male genitalia for identification.

*Amusurgus* sp. 1

(Fig. 42)

Remarks. — The taxonomy of this subfamily requires revision for proper identification of the many specious genera. Little is known about these small crickets.

National conservation status. — Vulnerable.

*Amusurgus* sp. 2
(Fig. 43)


Remarks. — This is one of the more common species of the genus. It can be found among the foliage of understorey plants.

National conservation status. — Common.

*Amusurgus* sp. 3
(Fig. 44)


Remarks. — This is a forest-restricted species. Little is known about these small crickets.

National conservation status. — Vulnerable.

*Amusurgus* sp. 4
(Fig. 45)


Remarks. — It is one of the rarer species of its Singapore congeners.

National conservation status. — Endangered.

Fig. 44. *Amusurgus* species 3: ZRC.ORT.239, male, 6.5 mm.
Fig. 45. *Amusurgus* species 4: ZRC.ORT.240, female, 6.0 mm.

Fig. 46. *Amusurgus* species 5: ZRC.ORT.253, male, 6.0 mm.

*Amusurgus* sp. 5  
(Fig. 46)


Remarks. — It can be found among the foliage of understorey plants.

National conservation status. — Vulnerable.
Fig. 47. *Amusurgus* species 6: ZRC.ORT.257, female, 5.9 mm.

Fig. 48. *Anaxipha* species 1: ZRC.ORT.217, male, 6.8 mm (A); ZRC.ORT.258, female, 6.4 mm (B).
Tan Ming Kai

*Amusurgus* sp. 6
(Fig. 47)


Remarks. — It can be found among the foliage of understorey plants.

National conservation status. — Vulnerable.

*Anaxipha* sp. 1
(Fig. 48)


Remarks. — This species is found in forest, among the foliage of understorey vegetation.

National conservation status. — Vulnerable.

*Anaxipha* sp. 2
(Fig. 49)


Remarks. — This species is found in the forest, among the foliage of understorey vegetation.

National conservation status. — Vulnerable.

Fig. 49. *Anaxipha* species 2: ZRC.ORT.260, male, 5.5 mm.
Anaxipha sp. 3  
(Fig. 50)


Remarks. — This species is also found in the forest, among the foliage of understorey vegetation.

National conservation status. — Vulnerable.

Anaxipha sp. 4  
(Fig. 51)


Remarks. — This species can also be found in grassy areas, albeit less commonly than the latter three species (below).

National conservation status. — Vulnerable.

Homoeoxipha lycoides (Walker)  
(Fig. 52)


Remarks. — This species can be found relatively commonly among grasses and other herbaceous plants. The females have much simpler tegminal venation than the males. Some males have hind wings surpassing the tegmina.

National conservation status. — Common.
Fig. 51. *Anaxipha* species 4: ZRC.ORT.282, male, 5.8 mm (A); ZRC.ORT.302, female, 5.0 mm (B).
Fig. 52. *Homoeoxipha lycoides* (Walker): ZRC.ORT.324, male, 5.9 mm.

Fig. 53. *Natula longipennis* (Serville): ZRC.ORT.242, male, 6.5 mm.

*Natula longipennis* (Serville)
(Fig. 53)


Remarks. — This species was tentatively identified as *Anaxipha* sp. 2 in the first edition. Examination of male genitalia allowed the material to be identified to species. This species can be found commonly among grasses and other herbaceous plants. The female has a much simpler tegminal venation than that in the male.

National conservation status. — Common.

Remarks. — This species was tentatively identified as *Anaxipha* sp. 4 in the first edition. Examination of male genitalia allowed the material to be identified to species. Among the most common of the Trigonidiinae members in Singapore, it can be found quite commonly among grasses and other herbaceous plants. The female has a much simpler tegminal venation than that of the male. The male produces soft and continuous chirping calls at night.

National conservation status. — Common.

**FAMILY MOGOPLISTIDAE**

These crickets are known as scaly crickets because of the scales found throughout the body (Ingrisch, 2006). The taxonomic reviews for Singapore species of the family can be found in Tan & Ingrisch (2013), and Tan (2014a). The key to Singaporean species can also be found in Tan & Ingrisch (2013) and key to Singaporean *Micrornebius* can be found in Tan (2014a).

**Subfamily Mogoplistinae**

*Apterornebius* c.f. *chong* Ingrisch

(Fig. 55)

Remarks. — A forest-restricted species, it can be found among the leaves and branches of understorey plants.

National conservation status. — Vulnerable.

Fig. 55. *Apterornebius* c.f. *chong* Ingrisch: ZRC.ORT.110, female, 10.7 mm (A); ZRC.ORT.165, male, 10.2 (B).
Fig. 56. *Cycloptiloides* c.f. *timah* Ingrisch: ZRC.ORT.230, male, 5.8 mm (A); ZRC.ORT.230, female, 7.1 mm (B); ZRC.ORT.300, female, 5.8 mm (C).
Orthoptera in BTNR and CCNR (Part 2): Suborder Ensifera, 2nd Edition

Fig. 56. *Cycloptiloides* c.f. *timah* Ingrisch: ZRC.ORT.230, male, 5.8 mm (A); ZRC.ORT.230, female, 7.1 mm (B); ZRC.ORT.300, female, 5.8 mm (C).

**Cycloptiloides** c.f. *timah* Ingrisch
(Fig. 56)


Remarks. — Although probably among the most abundant of the crickets in Singapore, these tiny crickets are however cryptic, and well-camouflaged in the leaf litter. It probably feeds on detritus and/or decaying matter.

National conservation status. — Common.

**Ectatoderus angusticollis** Chopard
(Fig. 57)


Remarks. — A forest-restricted species, it can be found among the leaves and branches of understorey plants.

National conservation status. — Vulnerable.
Fig. 57. *Ectatoderus angusticollis* Chopard: ZRC.ORT.174, male, 11.0 mm.

**Micronotolopha distinctus** Tan
(Fig. 58)


Remarks. — This species is new to this list. It is a small (poor dispersal ability) species that is endemic to Singapore. It has cryptic behaviour, hiding among crevices on the bark of trees. So far, it is only found in the forest in certain parts of the CCNR. There are four species in this genus recorded in Singapore. They are all morphologically similar but can be identified readily using the male genitalia. The male produces very soft chirping calls at night.

National conservation status. — Endangered.

**Micronebius eclipsus** Tan
(Fig. 59)


Remarks. — This species is new to this list. It is a small (poor dispersal ability) species that is endemic to Singapore. It has cryptic behaviour, hiding among crevices on the bark of trees. So far, it is only found in the forest in certain parts of the CCNR. The male produces very soft chirping calls at night.

National conservation status. — Endangered.
**Fig. 58.** *Micronnebius distinctus* Tan: ZRC.ORT.1945, male 4.4 mm. Image by Visionary Digital System (LKCNMH).

**Fig. 59.** *Micronnebius eclipsus* Tan: ZRC.ORT.1168, male, 4.1 mm. Image by Visionary Digital System (LKCNMH).

*Micronnebius kopisua* Tan & Ingrisch  
(Fig. 60)

Remarks. — Only the generic name was provided in the first edition (*Micronebius* sp.). The species name is updated here after the species was formally described (Tan & Ingrisch, 2013). This forest-restricted species is more common than the other congeners. It can be found among the leaves of understorey plants. The male produces very soft chirping calls at night.

National conservation status. — Vulnerable.

*Micronebius mandai* Tan  
(Fig. 61)


Remarks. — This species is new to this list. It is a small (poor dispersal ability) species that is endemic to Singapore. It has cryptic behaviour, hiding among crevices on the bark of trees. So far, it is only found in the forest in certain parts of the CCNR. The male produces very soft chirping calls at night.

National conservation status. — Endangered.

*Ornebius albipalpus* Ingrisch  
(Fig. 62)


Remarks. — Only the generic name was provided in the first edition (*Ornebius* sp. 2). A forest-restricted species, it can be found among the branches and leaves of understorey plants. The male produces soft chirping calls at night. The female was previously thought to be a separate species (*Ornebius* sp. 2 in the first edition). More materials allowed the reassessment and material is updated here (Tan & Ingrisch, 2013). Further examination of male genitalia also confirmed the species name (Tan & Ingrisch, 2013).

National conservation status. — Vulnerable.

*Ornebius insculpta* Tan & Ingrisch  
(Fig. 63)


Remarks. — Only the generic name was provided in the first edition (*Ornebius* sp. 1). The species name is updated here after the species was formally described (Tan & Ingrisch, 2013). It is an endemic species found only in a small forest patch within the BTNR. It is found among the foliage of understorey plants. The male produces soft chirping calls at night.
National conservation status. — Critically endangered.

Fig. 60. *Micronebius kopsisa* Tan & Ingrisch: ZRC.ORT.229, male, 5.9 mm.

Fig. 61. *Micronebius mandai* Tan: ZRC.ORT.1149, male, BL = 5.1 mm. Image by Visionary Digital System (LKCNHM).
Fig. 62. *Ornebius albipalpus* Ingrisch: ZRC.ORT.136, male, 8.8 mm (A); ZRC.ORT.297, female, 9.4 mm (B).

Fig. 63. *Ornebius insculpta* Tan & Ingrisch: ZRC.ORT.311, male, 9.4 mm.

Remarks. — It is a forest-restricted species. It can be found among the branches and leaves of understorey plants. It is the most common Ornebius species in Singapore. The male produces a soft and continuous chirping call at night.

National conservation status. — Common.

FAMILY GRYLLOTALPIDAE

A key to mole cricket species can be found in Tan (2012d). The adults are very similar morphologically and often can only differentiated by small differences in the male tegminal venation and genitalia.

Subfamily Gryllotalpinae

Gryllotalpa fulvipes Saussure

(Fig. 65)


Remarks. — This species is restricted to forest sites. It is often subterranean and rarely sighted. Its burrows are shallow but might be extensive in area. There is also no distinct opening for its burrows. The male produces a series of lower trilling for around half an hour around 1830 hours. The male...
The calling song was described in Tan & Kamaruddin (2016b). This species can be easily distinguished from the former two species by its colouration. This species was classified as “Endangered” in the Red Data Book (Murphy et al., 2008) but recent observations suggest that it is more common than that. It was also mentioned that it is confined to primary forests but recent observations suggest that this is no longer true.

National conservation status. — Vulnerable.

**Gryllotalpa nymphicus** Tan

(Fig. 66)


Remarks. — This species is a relatively rare and endemic (so far) and restricted to forests. It is often subterranean and rarely sighted. Its burrows are shallow but might be extensive in area. There is also no distinct opening for its burrows. The male produces low resonant buzzes for around half an hour at around 1900 hours. The male calling song was described in Tan (2012d).

National conservation status. — Vulnerable.

**Gryllotalpa wallace** Tan

(Fig. 67)


Remarks. — This is only one record of this endemic species. It is often subterranean and rarely sighted. Its burrows are shallow but might be extensive in area. There is also no distinct opening for its burrows.

National conservation status. — Critically endangered.
Fig. 66. *Gryllotalpa nymphicus* Tan: ZRC.ORT.254, male, 45.2 mm.

Fig. 67. *Gryllotalpa wallace* Tan: ZRC.ORT.255, male, 31.8 mm.
Fig. 68. *Rhaphidophora* species: ZRC.ORT.114, female, 23.4 mm (A); ZRC.ORT.163, female, 21.8 mm (B); ZRC.ORT.298, male, 22.4 mm (C).
FAMILY RHAPHIDOPHORIDAE

Subfamily Rhaphidophorinae

*Rhaphidophora* sp.  
(Fig. 68)


Remarks. — The taxonomy for the Singapore species still requires work and may reveal more species than currently known. This is a forest-restricted species. It is a good jumper and can be found on the forest floor or in fallen tree trunks.

National conservation status. — Vulnerable.

FAMILY GRYLLACRIDIDAE

Subfamily Gryllacridinae

*Capnogryllacris fruhstorferi* (Griffini)  
(Fig. 69)


Remarks. — This species is new to this list. There is only one record of this species from Singapore. Little is known about this species.

National conservation status. — Critically endangered.
Fig. 70. *Caustogryllacris podocausta kuchingiana* (Griffini): ZRC.ORT.162, female, 25.7 mm.

### Caustogryllacris podocausta kuchingiana (Griffini)

(Fig. 70)


Remarks. — Only the generic name was provided in the first edition (*Caustogryllacris* sp.). Further examination of material allowed the species name to be included here. A rare and forest-restricted species that seems to inhabit swamp forest.

National conservation status. — Endangered.

### Gryllacris (signifera group) sp.

(Fig. 71)


Remarks. — Among the more common Gryllacridids in Singapore, it can be found in suburban areas in Singapore. It prefers shrubby and forested areas.

National conservation status. — Common.

### Gryllacris sp.

(Fig. 72)


Remarks. — Of the more common Singapore Gryllacrididae, it can be found in suburban areas. It prefers shrubby and forested areas. It is also found in landward edges of mangrove sites (Tan, 2013).

National conservation status. — Common.
Fig. 71. *Gryllacris* (*signifera* group) species: ZRC.ORT.122, female, 31.1 mm (A); ZRC.ORT.131, male, 30.3 mm (B).

Fig. 72. *Gryllacris* species: ZRC.ORT.148, male, 34.6 mm.
Larnaca (Larnaca) fasciata dammermani (Karny)  
(Fig. 73)


Remarks. — This is a forest-restricted species. It is fairly common among forest understorey plants. This species is new to this list, with the material thought to be the same as the latter species.

National conservation status. — Vulnerable.

Larnaca (Larnaca) nigrata crassiuscula (Karny)  
(Fig. 74)


Remarks. — A forest-restricted species. It is fairly common among forest understorey plants. This species is very similar to the previous species and its nymphs are nearly identical. It is difficult to ascertain which is more common in Singapore especially since the nymphs can be encountered more readily than the adults.

National conservation status. — Vulnerable.

Otidiogryllacris sp.  
(Fig. 75)


Remarks. — A rarely-encountered and forest-restricted species.

National conservation status. — Endangered.
Fig. 74. *Larnaca (Larnaca) nigrata crassiuscula* (Karny): ZRC.ORT.130, male, 23.9 mm.

Fig. 75. *Otidiogryllacris* species: ZRC.ORT.265, male, 16.6 mm.
Phryganogryllacris sp. 1
(Fig. 76)


Remarks. — A rarely-encountered and forest-restricted species. In the previous edition, two species of Phryganogryllacris were recorded. Until there is more material (particularly the males) to validate two distinct species, the females are currently grouped into one species and updated here as such.

National conservation status. — Endangered.

FAMILY TETTIGONIIDAE

So far, 47 species from eight subfamilies of the Tettigoniidae have been collected. Conocephalinae and Phaneropterinae are represented with the greatest number of species (14 and 12, respectively). On the other hand, four subfamilies are represented with two or less species—Hexacentrini, Lipotactinae, Listroscelidinae, and Mecopodinae.

Subfamily Conocephalinae

Conocephalinae katydids are also known as cone-headed katydids because of the presence of conical or protruding vertex. Three tribes can be found in Singapore. The Agraeciini, sometimes also known as the spike-headed katydids, are mostly forest-restricted. The Copiphorini and Conocephalini (both groups also known as the meadow katydids) inhabit grassy areas.
Tribe Agraeciini

*Jambiliara selita* Ingrisch & Tan  
(Fig. 77)


Remarks. — This is a rather rare and forest-restricted species. Adults are not encountered often and may inhabit the forest canopy (Ingrisch & Tan, 2012).

National conservation status. — Endangered.

Fig. 77. *Jambiliara selita* Ingrisch & Tan: ZRC.ORT.157, male, 28.3 mm (A); ZRC.ORT.228, female, 30.3 mm (B).
**Oxylakis (Oxylakis) singapurensis** Ingrisch & Tan
(Fig. 78)


Remarks. — Only the generic name was provided in the first edition (*Oxylakis* sp.). Further examination of the material allowed the species name to be included here. One of the more common Agraeciini members in Singapore. It can sometimes be found along forest edges.

National conservation status. — Vulnerable.

**Nahlaksia bidadari** Ingrisch & Tan
(Fig. 79)


Remarks. — A forest-restricted species but one of the more common Agraeciini members in Singapore. This species tends to be found among the dead branches and twigs of understorey plants. It is observed to hide among hollow branches.

National conservation status. — Vulnerable.

**Paragraecia c.f. gracilis** Ingrisch
(Fig. 80)


Remarks. — A rare and forest-restricted species. Specimens that were collected were found on the foliage of understorey plants but little is known otherwise. It may inhabit the forest canopy.

National conservation status. — Endangered.

**Paragraecia temasek** Tan & Ingrisch
(Fig. 81)


Remarks. — The species was identified as *Paragraecia maculata* Ingrisch in the first edition. The species name is included here after the species was formally described (Tan & Ingrisch, 2014). A rare and forest-restricted species. It may inhabit the forest canopy.

National conservation status. — Endangered.
Fig. 78. *Oxylakis (Oxylakis) singaporensis* Ingrisch & Tan: ZRC.ORT.245, female, 24.4 mm (A); ZRC.ORT.251, male, 21.7 mm (B).

Fig. 79. *Nahlaksia bidadari* Ingrisch & Tan: ZRC.ORT.160, male, 19.3 mm (A); ZRC.ORT.164, female, 20.3 mm (B).
Fig. 80. *Paragraecia* c.f. *gracilis* Ingrisch: ZRC.ORT.204, male, 22.7 mm.

Fig. 81. *Paragraecia temasek* Tan & Ingrisch: ZRC.ORT.205, female, 24.5 mm.

*Peracca (Peracca) macritchiensis* Tan & Ingrisch
(Fig. 82)


Remarks. — It was identified as *Peracca subulicercia* (Karny) in the first edition. It was formally described by Tan & Ingrisch (2014). A forest-restricted species, it tends to be found among rattans.

National conservation status. — Vulnerable.

*Peracca (Peracca) mirzai* Tan & Ingrisch
(Fig. 83)


Remarks. — It was identified as *Peracca conspicuithorax* Griffini in the first edition. It was formally described by Tan & Ingrisch (2014). A rare species restricted to swamp forests.

National conservation status. — Critically endangered.
Fig. 82. *Peracca (Peracca) macritchiensis* Tan & Ingrisch: ZRC.ORT.125, male, 35.0 mm.

Fig. 83. *Peracca (Peracca) mirzai* Tan & Ingrisch: ZRC.ORT.153, female, 41.2 mm (A); ZRC.ORT.348, male, 43.5 mm (B).
Viriacca viridis Ingrisch
(Fig. 84)


Remarks. — A rare species restricted to swamp forests.

National conservation status. — Critically endangered.

Tribe Conocephalini

Conocephalus (Anisoptera) c.f. exemptus (Walker)
(Fig. 85)


Remarks. — Further examination of material allowed the species to be identified. It is a less common and less widely distributed Conocephalus species in Singapore and tends to be found among tall grasses. The male can be heard calling during the day.

National conservation status. — Vulnerable.

Conocephalus (Anisoptera) maculatus (Le Guillou)
(Fig. 86)


Remarks. — Among the most common orthopterans around, it can be found in grassy areas. The male can be heard calling during the day.

National conservation status. — Common.
Fig. 85. *Conocephalus (Anisoptera)* c.f. *exemptus* (Walker): ZRC.ORT.332, female, 18.6 mm.

Fig. 86. *Conocephalus (Anisoptera)* *maculatus* (Le Guillou): ZRC.ORT.330, male, 14.0 mm.

Fig. 87. *Conocephalus (Anisoptera)* *melaenus* (de Haan): ZRC.ORT.304, female, 18.2 mm.
**Tan Ming Kai**

**Conocephalus (Anisoptera) melaenus** (de Haan)
(Fig. 87)


Remarks. — Among the most common orthopterans around, it can be found in grassy and herbaceous plant areas. The adults can even prey on snails. The nymphs are easily distinguishable as being red with a black abdomen. The male can be heard calling in the day.

National conservation status. — Common.

**Tribe Copiphorini**

Tan (2011a) reviewed the diversity of Copiphorini in Singapore and also provided natural history observations and a key to species.

**Euconocephalus nasutus** (Thunberg)
(Fig. 88)


Remarks. — It inhabits grassy areas and oviposits onto grass stems. The male produces resonant, continuous trills.

National conservation status. — Vulnerable.

**Euconocephalus picteti** (Redtenbacher)
(Fig. 89)


Remarks. — It inhabits grassy areas and forest edges. The male produces resonant continuous trills.

National conservation status. — Vulnerable.
Fig. 89. *Euconocephalus picteti* (Redtenbacher): ZRC.ORT.101, male.

Fig. 90. *Xestophrys horvathi* Bolivar.

*Xestophrys horvathi* Bolivar  
(Fig. 90)


Remarks. — This species is new to the list. This species can be found among grassy areas. This species is larger and more robust than the other Copiphorini recorded in the BTNR and CCNR. The male produces loud (much louder than the previous two species), high-pitched and continuous trills. This species was reported as a new record for CCNR in Tan et al. (2015).

National conservation status. — Vulnerable.

Subfamily *Hexacentrinae*

*Glenophisis singapura* Tan  
(Fig. 91)


Remarks. — A rare, endemic and forest-restricted species. Specimens collected were found on the foliage of understorey plants but little is known otherwise.
National conservation status. — Critically endangered.

Hexacentrus unicolor Serville
(Fig. 92)


Remarks. — The male has much broader tegmina, unlike those of the female (more or less straight-winged). One of the most common predatory katydids in Singapore, it is found to prey on caterpillars, flies, and other orthopterans. It is common among forest edges and grassy areas. At night, the male can be heard producing discrete, low-pitched pulses to attract females.

National conservation status. — Common.

Fig. 91. Glenophisis singapura Tan: ZRC.ORT.145, female, 15.6 mm (A); ZRC.ORT.346, male, 13.5 mm (B).
Subfamily **Lipotactinae**

Sometimes referred to as the big-eyed katydids, these katydids also have truncated tegmina modified for stridulation. Although they cannot fly, these katydids are nonetheless very good jumpers.

**Lipotactes maculatus** Hebard  
(Fig. 93)


Remarks. — One of the more common katydids in forest sites, it can be found in the understorey, often hiding among branches, twigs, and the foliage of the lower-lying plants.

National conservation status. — Common.

**Mortoniellus karnyi** Griffini  
(Fig. 94)


Remarks. — There is only one record for this species and it is far more cryptic than the previous species in the same subfamily. The specimen collected was found on the stem of an understorey plant but little is known otherwise.

National conservation status. — Critically endangered.
Fig. 93. *Lipotactes maculatus* Hebard: ZRC.ORT.159, male, 14.5 mm (A); ZRC.ORT.211, female, 14.2 mm (B); ZRC.ORT.193, male, 14.6 mm (C).
Subfamily Listroscelidinae

*Carliphisis c.f. leontopolites* (Karny)  
(Fig. 95)


Remarks. — Only the generic name was listed in the first edition (*Carliphisis* sp.). Further examination of material allowed the species to be better identified but male specimens are needed to confirm the species name. A rare and forest-restricted species. It is often found beneath the foliage of understorey plants. Upon disturbance, it will flatten its body against the foliage while stretching its legs anteriorly and posteriorly.

National conservation status. — Endangered.
Fig. 95. *Carliphisis* c.f. *leontopolites* (Karny): ZRC.ORT.182, female, 16.9 mm.

Fig. 96. *Oceaniphisis* species: ZRC.ORT.177, male, 15.3 mm (A); ZRC.ORT.137, female, 16.5 mm (B).
Oceaniphis sp.
(Fig. 96)


Remarks. — This is a forest-restricted species and often found beneath the foliage of understorey plants. Upon disturbance, it will flatten its body against the foliage while stretching its legs anteriorly and posteriorly. This species differs from the former by the shape of the spurs (movable spines) on the forelegs.

National conservation status. — Vulnerable.

Subfamily Meconematinae

Tribe Meconematini

Alloteratura sp. 1
(Fig. 97)


Remarks. — This is a forest-restricted species that can be found among the understorey plants.

National conservation status. — Vulnerable.
Fig. 98. *Alloteratura* species 2: ZRC.ORT.256, male, 12.6 mm.

Fig. 99. *Euanisous teuthroides* (Bolivar): ZRC.ORT.183, male, 17.6 mm.

**Alloteratura** sp. 2  
(Fig. 98)


Remarks. — This is a forest-restricted species that can be found among understorey plants. The female was observed to oviposit into a tree trunk.

National conservation status. — Vulnerable.

**Euanisous teuthroides** (Bolivar)  
(Fig. 99)


Remarks. — The species was tentatively identified as *Meconematini* sp. 2 in the first edition. Further examination of the material allowed the species to be identified. It is a rare and forest-restricted species that can be found among foliage.

National conservation status. — Endangered.

Remarks. — The species was tentatively identified as *Meconematini* sp. 1 in the first edition. Further examination of material allowed the species to be better identified. It is a rare and forest-restricted species that can be found among foliage.

National conservation status. — Endangered.

*Xiphidiopsis* sp. 1

(Fig. 101)


Remarks. — This species can be found in the forest or along forest edges. It tends to inhabit the foliage of understorey plants.

National conservation status. — Common.

*Xiphidiopsis* sp. 2

(Fig. 102)


Remarks. — Only one collection of this species from swamp forest is available.
National conservation status. — Critically endangered.

Fig. 101. *Xiphidiopsis* species 1: ZRC.ORT.180, male, 13.0 mm (A); ZRC.ORT.184, female, 13.5 mm (B).

Fig. 102. *Xiphidiopsis* species 2: ZRC.ORT.292, female, 13.6 mm.
Tribe Phlugidini

Tan (2011b) reviewed the diversity of *Asiophlugis* in Singapore. Conservation status and a key to species is also provided.

*Asiophlugis rete* Gorochov

(Fig. 103)


Remarks. — Only one collection of this species is available.

National conservation status. — Critically endangered.

*Asiophlugis temasek* Gorochov & Tan

(Fig. 104)


Remarks. — This is a forest-restricted species and often found only on the underside of the foliage of understorey plants.

National conservation status. — Vulnerable.

*Asiophlugis thaumasia* (Hebard)

(Fig. 105)


Remarks. — It is a forest-restricted species and often found on the underside of the foliage of understorey plants. This species was classified as “critically endangered or presumed nationally extinct” in the Red Data Book (Murphy et al., 2008) but observations so far suggest it is not as rare as *Asiophlugis rete* and can sometimes be found along forest edges. Please refer to Murphy (2008) (the species was classified in the genus *Pflugis*) and Tan (2011b) for the interesting history of the discovery of this species and the more common *Asiophlugis temasek*.

National conservation status. — Vulnerable.
Fig. 103. *Asiophlugis rete* Gorochov: ZRC.ORT.213, male, 12.7 mm.

Fig. 104. *Asiophlugis temasek* Gorochov & Tan: ZRC.ORT.108, male, 21.2 mm (A); ZRC.ORT.152, female, 12.5 mm (B).
Subfamily *Mecopodinae*

*Mecopoda elongata* (Linnaeus)  
(Fig. 106)


Fig. 105. *Asiophlugis thaumasia* (Hebard): ZRC.ORT.132, male, 13.3 mm (A); ZRC.ORT.212, female, 15.2 mm (B).

Fig. 106. *Mecopoda elongata* (Linnaeus, 1758): ZRC.ORT.195, male, 34.5 mm.
Remarks. — Probably among the most common and largest Singapore katydids. It can be heard producing discrete trilling calls at night while hiding in the undergrowth. There is also a brown variant.

National conservation status. — Common.

Subfamily Phaneropterinae

Tan (2014b) catalogued the diversity of Phaneropterinae from Singapore and also provided the key to the species.

Tribe Ducetini

*Ducetia malayana* Heller
(Fig. 107)


Remarks. — It is often found in tall grasses or other herbaceous plants. There is also a brown variant. This species was previously identified as *Ducetia japonica* but recent revision indicates that specimens from Singapore belong to a separate new species (Heller et al., 2017).

National conservation status. — Common.

Tribe Elimaeini

*Elimaea signata* Brunner von Wattenwyl
(Fig. 108)


Remarks. — It is a forest-restricted species and tends to be found among the foliage of understorey plants. The calling song is a distinct and isolated low-pitched “zzzt”. It is relatively common during certain periods of the year during which adults can be seen in numbers at night but otherwise rarely encountered.

National conservation status. — Vulnerable.

*Elimaea (Elimaea) chloris* (Haan)
(Fig. 109)


Remarks. — Only the generic name was provided in the first edition (*Elimaea (Elimaea) sp.*). Further examination of material allowed the species to be identified (Tan, 2014b). This species is found in tall grasses or other herbaceous plants.

National conservation status. — Common.
Fig. 107. *Ducetia malayana* Heller, 2017: ZRC.ORT.308, male, 18.1 mm.

Fig. 108. *Elimaea signata* Brunner von Wattenwyl: ZRC.ORT.192, female, 26.2 mm (A); ZRC.ORT.192, male, 21.0 mm (B).
Fig. 109. *Elimaea (Elimaea) chloris* (Haan): ZRC.ORT.191, male, 26.1 mm.

Fig. 110. *Macedna martini* Karsch: ZRC.ORT.142, female, 24.5 mm.

*Macedna martini* Karsch
(Fig. 110)


Remarks. — This species was tentatively identified as *Elimaeini* sp. in the first edition. Further examination of material allowed the species to be identified (Tan, 2014c). It is a rare and forest-restricted species. Little is known about its ecology.

National conservation status. — Endangered.
Tribe Holochlorini

Arnobia c.f. pilipes tropica Gorochov
(Fig. 111)


Remarks. — This is a forest-restricted species that can sometimes be found along forest edges. This species was observed to be feeding on Clidemia hirta.

National conservation status. — Vulnerable.

Fig. 111. Arnobia c.f. pilipes tropica Gorochov: ZRC.ORT.171, female, 28.5 mm (A); ZRC.ORT.220, 24.8 mm (B).
**Fig. 112.** *Casigneta* c.f. *bisinuata* Karny: ZRC.ORT.243, female, 26.7 mm (A); ZRC.ORT.268, female, 25.3 mm (B).

*Casigneta* c.f. *bisinuata* Karny  
(Fig. 112)


Remarks. — Only the generic name was provided in the first edition (*Casigneta* sp.). This rare species is encountered in swamp forests. Further examination of material allowed the species to be identified (Tan, 2014b).

National conservation status. — Endangered.

*Cesasundana lorniensis* Tan  
(Fig. 113)

Remarks. — Only the generic name was provided in the first edition (*Cesasundana* sp.). It is a rare, endemic, and forest-restricted species. The species was formally described by Tan (2014c).

National conservation status. — Critically endangered.

*Elbenia* sp.

(Fig. 114)


Remarks. — This species was tentatively identified as *Elbenia* or *Phaulula* sp. It is a rare and forest-restricted species. Little is known about its ecology. Further examination of material allowed the identification to genus (listed as possibly *Phaululu* sp. in the first edition) and is updated here (Tan, 2014b).

National conservation status. — Endangered.

*Holochlora* c.f. *signata signata* Brunner von Wattenwyl

(Fig. 115)


Remarks. — Only the generic name was provided in the first edition (*Holochlora* sp.). It can be found along forest edges. Further examination of material allowed the species to be better identified (Tan, 2014b).

National conservation status. — Vulnerable.
Fig. 114. *Elbenia* species: ZRC.ORT.150, female, 26.3 mm.

Fig. 115. *Holochlora* c.f. *signata signata* Brunner von Wattenwyl: ZRC.ORT.173, female, 29.2 mm.

*Psyrana cf. sondaica* (Carl)

(Fig. 116)


Remarks. — Only the generic name was provided in the first edition (*Psyrana* sp.). It is a rare and forest-restricted species. Little is known about its ecology. Further examination of material allowed better identification (Tan, 2014b).

National conservation status. — Vulnerable.

Tribe *Phaneropterini*

*Phaneroptera brevis* (Serville)

(Fig. 117)

Remarks. — It is among the most common of katydids in Singapore. It can be found in grasses or other herbaceous plants. It tends to be found in places with abundant flowers (Tan & Tan, 2017; Tan et al., 2017).

National conservation status. — Common.

Genus group **Scambophylla**

*Scambophyllum sanguinolentum* (Westwood)  
(Fig. 118)


Remarks. — It is a forest-restricted species that can be found on understorey plants. The early instars are distinctly different in colouration from the adults: black with white spots whereas the adults have bright orange and red hind wings, often hidden under the tegmina. The species name was corrected (from *Scambophyllum* cf. *pendleburyi* Karny in the first edition) after further examination and is updated here (Tan, 2014b).

National conservation status. — Endangered.

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Fig. 116. *Psyrrana* cf. *sondaica* (Carl): ZRC.ORT.143, female, 29.1 mm.
Subfamily *Pseudophyllinae*

The scientific name for these katydids can be directly translated as ‘false-leafed katydids’ because of the leaf-mimicking tegmina. When disturbed, these katydids also tend to flatten their body against the foliage.

**Tribe Phyllomimini**

*Chondroderella borneensis* (Brunner von Wattenwyl)

(Fig. 119)


Remarks. — This is perhaps the most common Pseudophyllinae member in Singapore. It tends to be found among *Dillenia suffruticosa* leaves in the forest or along forest edges. Upon disturbance, it will flatten its body against the leaf blade. The male can be heard at night producing a loud and distinct “jiiiiit” isolated call.

National conservation status. — Common.
Fig. 119. *Chondroderella borneensis* (Brunner von Wattenwyl): ZRC.ORT.113, male, 25.2 mm.

Fig. 120. *Mioacris* or *Promeca* species: ZRC.ORT.246, female, 38.2 mm.

*Mioacris* or *Promeca* sp.  
(Fig. 120)


Remarks. — This is a rare and forest-restricted species. The adult may inhabit the canopy as it is rarely seen in the understorey.

National conservation status. — Endangered.

*Phyllomimus inversus* Brunner von Wattenwyl  
(Fig. 121)

Remarks. — This is a forest-restricted species that can be found dwelling among foliage. Upon disturbance, it will flatten its body against the foliage. The male’s calling song is distinct, usually heard coming from trees. One syllable consists of a pulse which sounds like “zzzzztsk”.

National conservation status. — Vulnerable.

Fig. 121. *Phyllomimus inversus* Brunner von Wattenwyl, 1895: ZRC.ORT.112, male, 28.6 mm (A); ZRC.ORT.124, female, 29.5 mm (B).

Fig. 122. *Phyllomimus elliptifolius* (Pictet et Saussure): ZRC.ORT.121, female, 44.5 mm.
**Phyllomimus elliptifolius** (Pictet et Saussure)  
(Fig. 122)


Remarks. — This is a rare and forest-restricted species. The adult may inhabit the canopy as it is rarely seen in the understorey. Further examination confirmed its identity and is updated here.

National conservation status. — Endangered.

**Tribe Pseudophyllini**

**Onomarchus c.f. uninotatus** (Serville)  
(Fig. 123)

Material collected. — ZRC.ORT.326, 1 female, Rifle Range Link, 7 July 2011, coll. M. K. Tan & L. F. Cheong (collected as final instar nymph; final moult on 10 July 2011).

Remarks. — This is a fairly rare and forest-restricted species. The adult may inhabit the canopy as it is rarely seen in the understorey.

National conservation status. — Vulnerable.

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