

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



Ming Kai Tan

Raffles Museum of Biodiversity Research
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INTRODUCTION

The Orthoptera is the order of insects consisting of the suborder Caelifera (grasshoppers), and suborder Ensifera (crickets and katydids). The overall and up-to-date species list of orthopterans in and around the Bukit Timah Nature Reserve (BTNR) and the Central Catchment Nature Reserve (CCNR) is still poorly known to the scientific community, although there are some papers on the Orthoptera in Singapore published recently (Tan, 2010a, 2010b, 2011a, 2011b, 2012a, 2012b, 2012c, 2012d; Leong, 2011; Robillard, 2011; Tan et al., 2012a, 2012b). The need for quick dissemination of information, in particular in rapidly changing Singapore, prompted the publication of preliminary results while detailed systematics research on the many ensiferans is still being conducted. So far, the surveys have yielded the discovery of numerous undescribed species, of which ten have been published: *Asiophlugis temasek*, *Glenophisis singapura*, *Jambiliara selita*, *Nahlaksia bidadari*, *Gryllotalpa nymphicus*, *Gryllotalpa wallace*, *Trellius neesoon*, *Tremellia timah* and *Phaloria jerelynae* (see Gorochov & Tan, 2011, 2012; Ingrisch & Tan, 2012; Tan, 2012a, 2012d). A new genus of cricket was even described from Singapore: *Singapuriola separata* (see Gorochov & Tan, 2012). This represents the second part of the account of the Orthoptera of the BTNR and CCNR and presents species of the suborder Ensifera collected from the BTNR and CCNR from Oct.2010 to Sep.2011, while Part 1 was dedicated to suborder Caelifera (Tan, 2012c).

METHODS

Specimens were identified by the author using relevant published keys and descriptions (Chopard, 1931, 1968; Ragge, 1961; Murphy, 1973; Otte & Alexander, 1983; Townsend, 1983; Jin & Kevan, 1992; Kevan & Jin, 1993; Ingrisch, 1995, 1997, 1998a, 1998b, 1998c, 2006; Broza et al., 1998; Gorochov, 1998, 2008; Helfert & Sanger, 1998; Willemse, 2001; Kim & Kim, 2002; Wang & Shi, 2005; Liu & Kang, 2007; Zhou et al., 2010; Kim, 2011; Ma & Zhang, 2011; Robillard, 2011; Tan, 2011a, 2011b; Yang & Yang, 2012) and by comparison with of voucher specimens. Where doubtful, the identities of the orthopteran specimens were verified by Andrej Gorochov, Liu Chun-Xiang, Sam Heads, Sigfrid Ingrisch, and Tony Robillard. Please see Tan (2012c) for the complete description of the methods.

The classification and nomenclature of the species were based on the Orthoptera Species File Online Version 2.0/4.1 (Eades et al., 2012). 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 the fastigium to the abdominal apex, exclusive of ovipositor or cercus) of freshly euthanized specimens.

RESULTS AND OBSERVATIONS

Overall, at least 117 known species from 77 genera representing six families from the suborder Ensifera were collected and examined from the BTNR and CCNR. Superfamily Grylloidea (63 species from three families) is most diverse in species, followed by Tettigonioidea (46 species from one family). On the other hand, superfamilies Rhaphidophoroidea and Stenopelmatoidea are represented with merely one family with few species (one and seven species, respectively). Among the orthopteran families, the number of species is significantly higher in Gryllidae (52 species) and Tettigoniidae (46 species), whereas Rhaphidophoridae is monotypic with only a single species.

Order Orthoptera

Suborder Ensifera

Superfamily Grylloidea

Family Gryllidae (52 species)

Family Gryllotalpidae (3 species)

Family Mogoplistidae (8 species)

Superfamily Rhaphidophoroidea

Family Rhaphidophoridae (1 species)

Superfamily Stenopelmatoidea

Family Gryllacrididae (7 species)

Superfamily Tettigonioidea

Family Tettigoniidae (46 species)

ENSIFERA RECORDED FROM BUKIT TIMAH AND CENTRAL CATCHMENT NATURE RESERVES

FAMILY GRYLLIDAE

So far, 52 species from 12 subfamilies of Gryllidae were collected. The subfamilies Trigonidiinae and Podoscirtinae are represented with the greatest number of species (13 and 10, respectively). On the other hand, four subfamilies are represented with two or less species—Landrevinae, Itarinae, Oecanthinae, and Pteroplistinae.

Subfamily **Eneopterinae**

Cardiodactylus singapura Robillard

Fig. 1

Material collected. — ZRC.ORT.105, 1 female, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.123, 1 female, Wallace Trail, 3 Nov.2010, coll. M. K. Tan; ZRC.ORT.133, 1 male, Nee Soon pipeline, 25 Nov.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail.

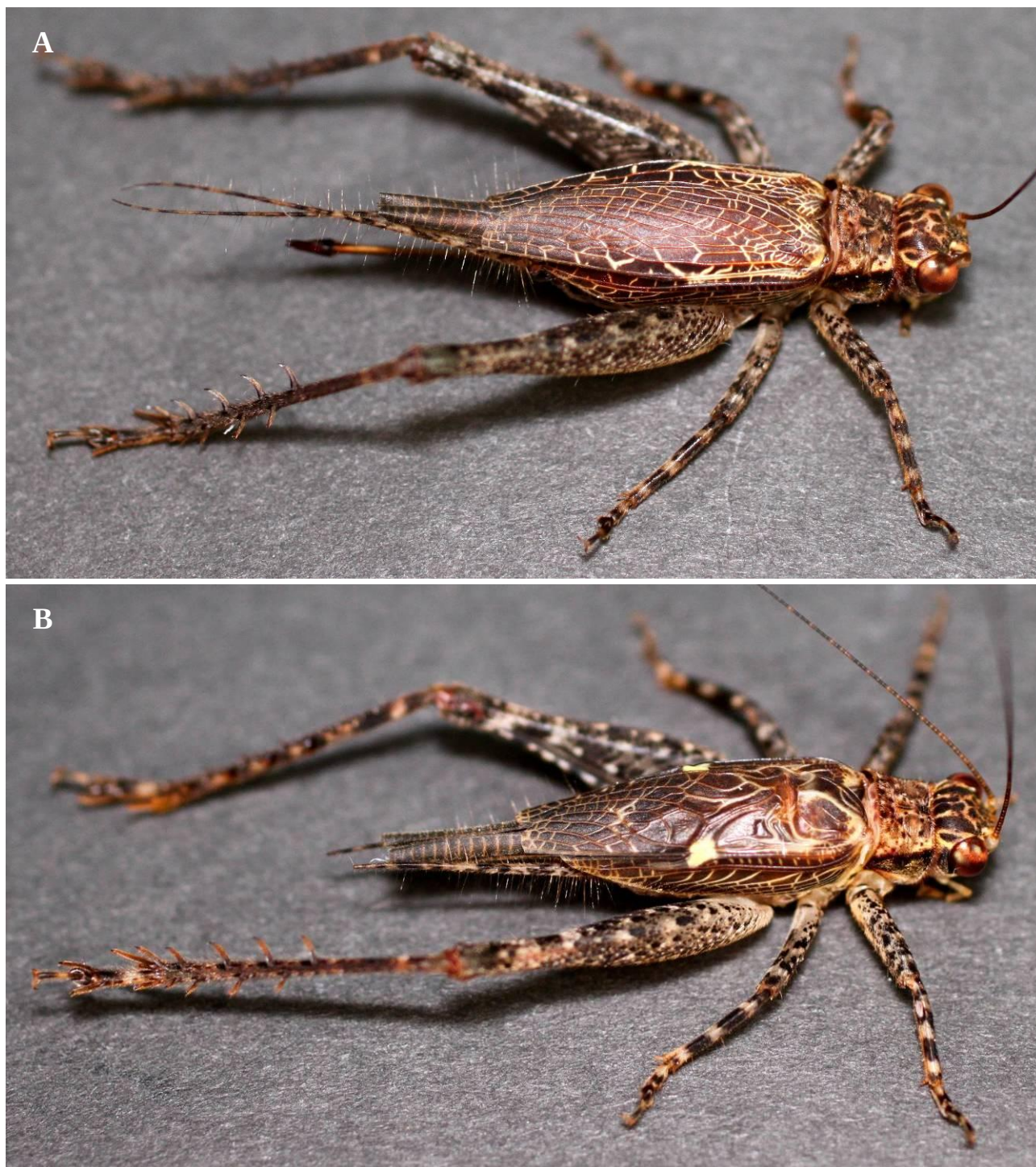


Fig. 1. *Cardiodactylus singapura* Robillard, 2011: ZRC.ORT.123, female, 19.5 mm (A); ZRC.ORT.133, male, 17.7 mm (B).

Lebinthus sp.

Fig. 2

Material collected. — ZRC.ORT.294, 1 male, 1 female, Hindhede Nature Park, 2 Jun.2011, coll. M. K. Tan.

Nisitrus vittatus (de Haan)

Fig. 3

Material collected. — ZRC.ORT.116, 1 male, Hindhede Nature Park, 30 Oct.2010, coll. M. K. Tan.



Fig. 2. *Lebinthus* species: ZRC.ORT.294, female, 17.5 mm (A); ZRC.ORT.294, male, 16.4 mm (B).



Fig. 3. *Nisitrus vittatus* (de Haan, 1842): ZRC.ORT.116, male, 14.8 mm.

Subfamily Euscyrtinae

Beybienkoana sp.

Fig. 4

Material collected. — ZRC.ORT.285, 1 male, Mandai Track 15, 24 Apr.2011, coll. M. K. Tan; ZRC.ORT.280, 1 female, Mandai Track 15, 28 May 2011, coll. M. K. Tan.

Euscyrtus concinnus (de Haan)

Fig. 5

Material collected. — ZRC.ORT.323, 1 male, Mandai Track 15, 21 Jun.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & T. Robillard.



Fig. 4. *Beybienkoana* species: ZRC.ORT.285, male, 14.7 mm (A); ZRC.ORT.280, female, 19.3 mm (B).



Fig. 5. *Euscyrtus concinnus* (de Haan, 1842): ZRC.ORT.323, male, 10.3 mm.

Euscyrtus cf. *hemelytrus* (de Haan)

Fig. 6

Material collected. — ZRC.ORT.284, 1 female, Mandai Track 15, 24 Apr.2011, coll. M. K. Tan;
ZRC.ORT.279, 1 male, Mandai Track 15, 28 May 2011, coll. M. K. Tan.



Fig. 6. *Euscyrtus* cf. *hemelytrus* (de Haan, 1842): ZRC.ORT.284, female, 12.5 mm (A); ZRC.ORT.279, male, 12.2 mm (B).

***Patiscus* sp.**

Fig. 7

Material collected. — ZRC.ORT.336, 1 male, 1 female, Wallace Trail, 6 Aug.2011, coll. M. K. Tan.



Fig. 7. *Patiscus* species: ZRC.ORT.336, female, 15.5 mm.

Subfamily **Gryllinae**

***Gryllus bimaculatus* De Geer**

Fig. 8

Material collected. — ZRC.ORT.134, 1 female, Nee Soon pipeline, 25 Nov.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail.

***Gymnogryllus* sp. 1**

Fig. 9

Material collected. — ZRC.ORT.156, 1 male, Chestnut Track, 17 Dec.2010, coll. M. K. Tan; ZRC.ORT.250, 1 male, Senapang Link, 24 Mar.2011, coll. M. K. Tan; ZRC.ORT.295, 1 male, Hindhede Nature Park, 2 Jun.2011, coll. M. K. Tan.



Fig. 8. *Gryllus bimaculatus* De Geer, 1773: ZRC.ORT.134, female, 22.9 mm.



Fig. 9. *Gymnogryllus* species 1: ZRC.ORT.250, male, 30.4 mm.

***Gymnogryllus* sp. 2**

Fig. 10

Material collected. — ZRC.ORT.299, 2 males, Lornie Trail, 18 Jun.2011, coll. M. K. Tan.



Fig. 10. *Gymnogryllus* species 2: ZRC.ORT.299, male, 35.2 mm.

***Loxoblemmus parabolicus* Saussure**

Fig. 11

Material collected. — ZRC.ORT.169, 2 males, Nee Soon pipeline, 20 Dec.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.275, 1 male, Eco-Bridge CCNR, 16 May 2011, coll. M. K. Tan & R. W. J. Ngiam.

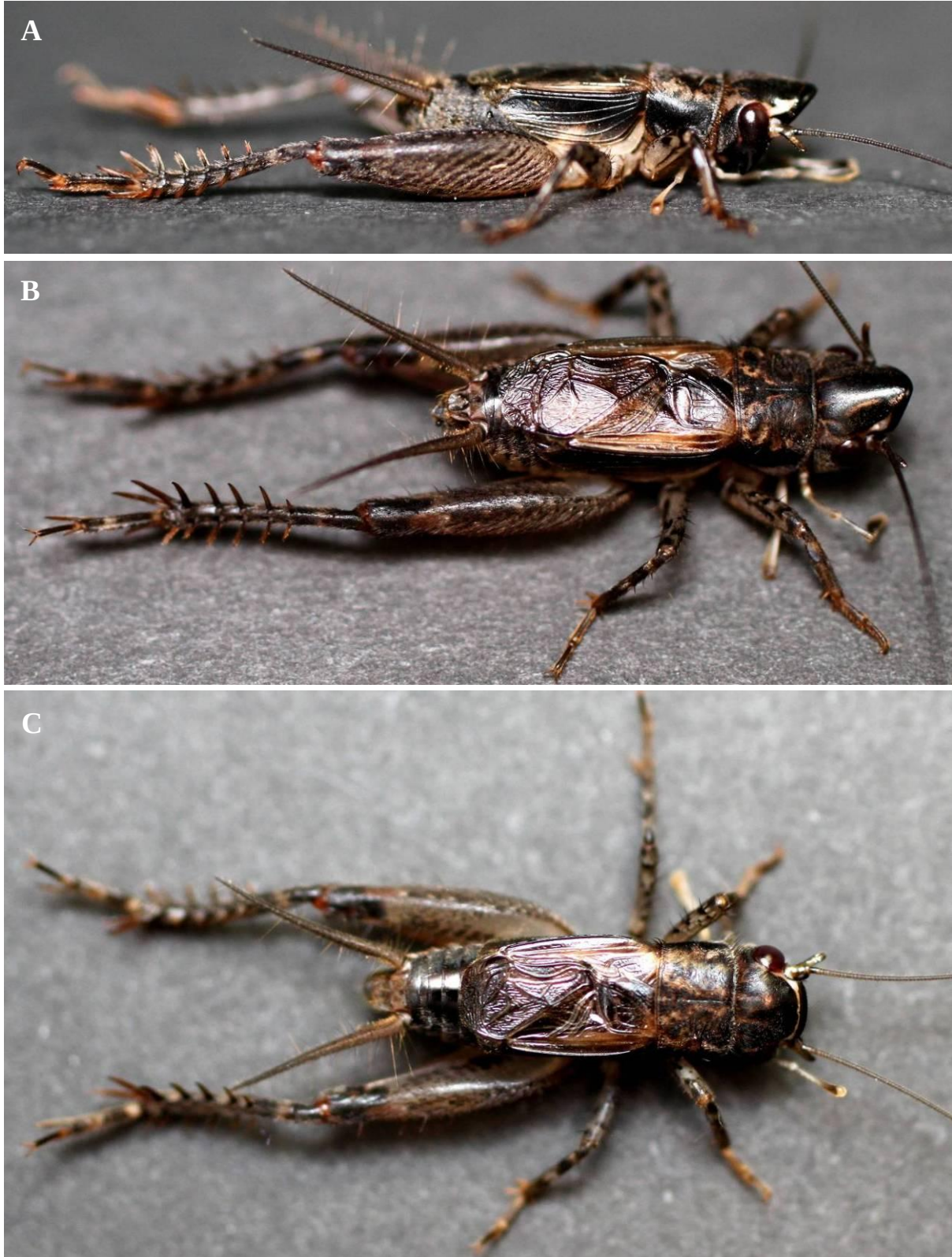


Fig. 11. *Loxoblemmus parabolicus* Saussure, 1877: ZRC.ORT.169, male, 13.8 mm (A); ZRC.ORT.169, male, 13.7 mm (B); ZRC.ORT.275, male, 13.0 mm (C).

***Mitius* sp.**

Fig. 12

Material collected. — ZRC.ORT.271, 1 male, Venus Trail, 2 May 2011, coll. M. K. Tan; ZRC.ORT.329, 1 female, Eco-Bridge CCNR, 26 Jul.2011, coll. M. K. Tan, R. W. J. Ngiam & NParks volunteers.

***Teleogryllus* sp.**

Fig. 13

Material collected. — ZRC.ORT.161, 1 male, Nee Soon pipeline, 20 Dec.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail.



Fig. 12. *Mitius* species: ZRC.ORT.271, male, 11.4 mm (A); ZRC.ORT.329, female, 10.8 mm (B).

***Velarifictorus* cf. *aspersus* (Walker)**

Fig. 14

Material collected. — ZRC.ORT.127, 1 female, Lornie Trail, 15 Nov.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.221, 1 male, Dairy Farm Loop, 7 Feb.2011, coll. M. K. Tan.



Fig. 13. *Teleogryllus* species: ZRC.ORT.161, male, 23.6 mm.



Fig. 14. *Velarifictorus* cf. *aspersus* (Walker, 1869): ZRC.ORT.127, female, 16.1 mm (A); ZRC.ORT.221, male, 14.9 mm (B).

Subfamily **Itarinae**

Itara johni Gorochov

Fig. 15

Material collected. — ZRC.ORT.328, 1 male, Chestnut Track, 26 Jul.2011 (day), coll. R. W. J. Ngiam.

***Itara* sp.**

Fig. 16

Material collected. — ZRC.ORT.269, 1 female, Senapang Link, 28 Apr.2011, coll. M. K. Tan; ZRC.ORT.314, 1 female, Senapang Link, 5 Jul.2011, coll. M. K. Tan & L. F. Cheong.



Fig. 15. *Itara johni* Gorochov, 1997: ZRC.ORT.328, male, 19.5 mm.



Fig. 16. *Itara* species: ZRC.ORT.314, female, 15.9 mm.

Subfamily **Landrevinae**

***Duolandrevus* sp. 1**

Fig. 17

Material collected. — ZRC.ORT.172, 1 male, Belukar Track, 31 Dec.2010, coll. M. K. Tan & H. P. M. Woo; ZRC.ORT.231, 1 female, Chestnut Track, 20 Feb.2011, coll. M. K. Tan; ZRC.ORT.247, 1 male, Mandai Avenue felled forest, 17 Mar.2011, coll. M. K. Tan & R. W. J. Ngiam; ZRC.ORT.289, 1 male, Senapang Link, 29 May 2011, coll. M. K. Tan.

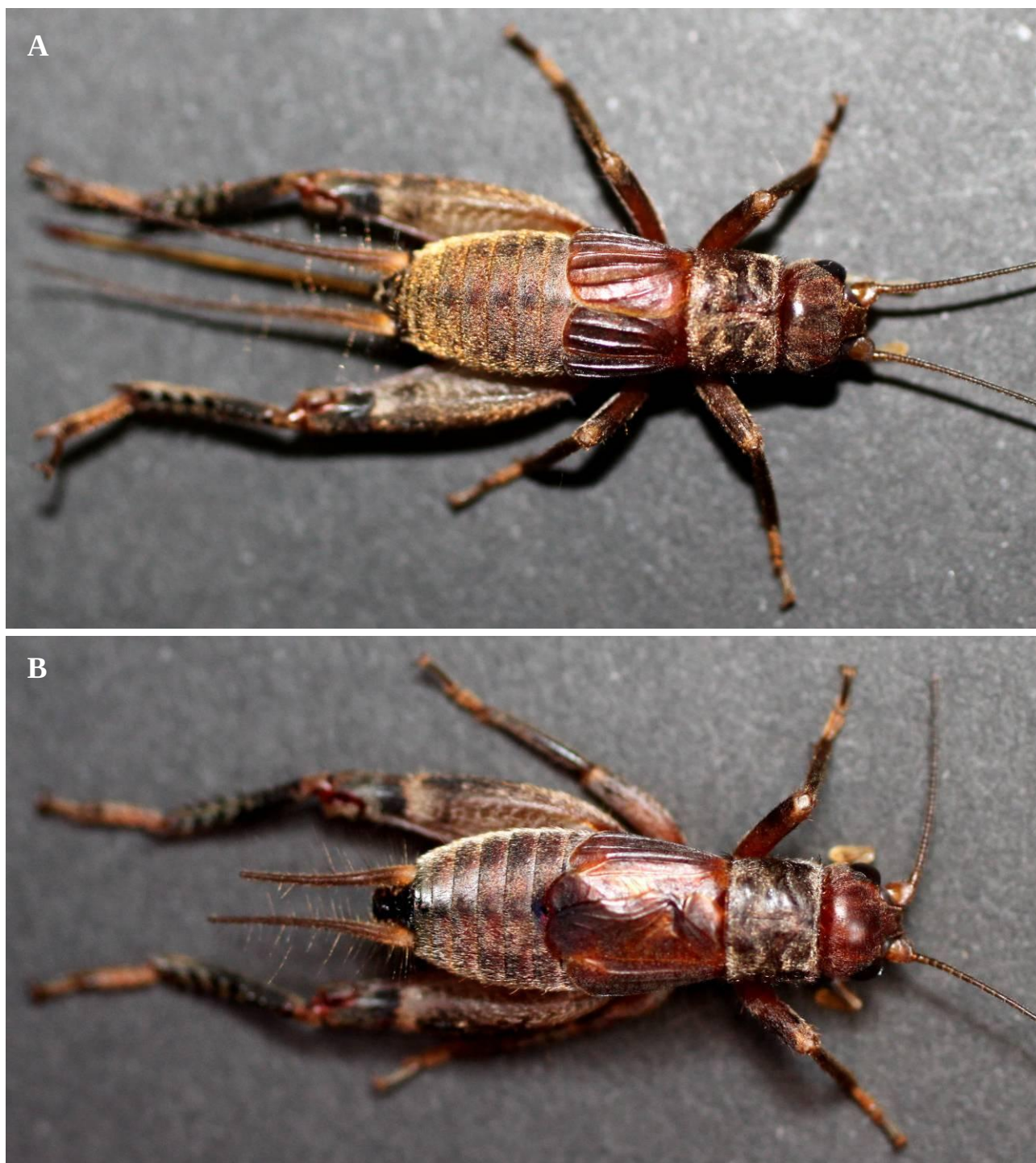


Fig. 17. *Duolandrevus* species 1: ZRC.ORT.231, female, 18.4 mm (A); ZRC.ORT.247, male, 17.9 mm (B).

***Duolandrevus* sp. 2**

Fig. 18

Material collected. — ZRC.ORT.197, 1 male, Rifle Range Link, 23 Jan.2011, coll. M. K. Tan & R. W. J. Ngiam.



Fig. 18. *Duolandrevus* species 2: ZRC.ORT.197, male, 13.7 mm.

Subfamily **Nemobiinae**

***Pteronemobius* sp. 1**

Fig. 19

Material collected. — ZRC.ORT.194, 1 female, Mandai Track 15, 18 Jan.2011, coll. M. K. Tan & H. P. M. Woo; ZRC.ORT.252, 1 male, Mandai Track 15, 30 Mar.2011, coll. M. K. Tan.

***Pteronemobius* sp. 2**

Fig. 20

Material collected. — ZRC.ORT.270, 286, 1 male, 1 female, Venus Trail, 2 May 2011, coll. M. K. Tan; ZRC.ORT.318, 1 male, Rifle Range Link, 7 Jul.2011, coll. M. K. Tan & L. F. Cheong.

***Pteronemobius* sp. 3**

Fig. 21

Material collected. — ZRC.ORT.310, 1 male, Venus Trail, 25 Jun.2011, coll. M. K. Tan.

***Pteronemobius* sp. 4**

Fig. 22

Material collected. — ZRC.ORT.320, 1 male, Nee Soon pipeline, 14 Jul.2011, coll. M. K. Tan, M. R. B. Ismail & L. F. Cheong.

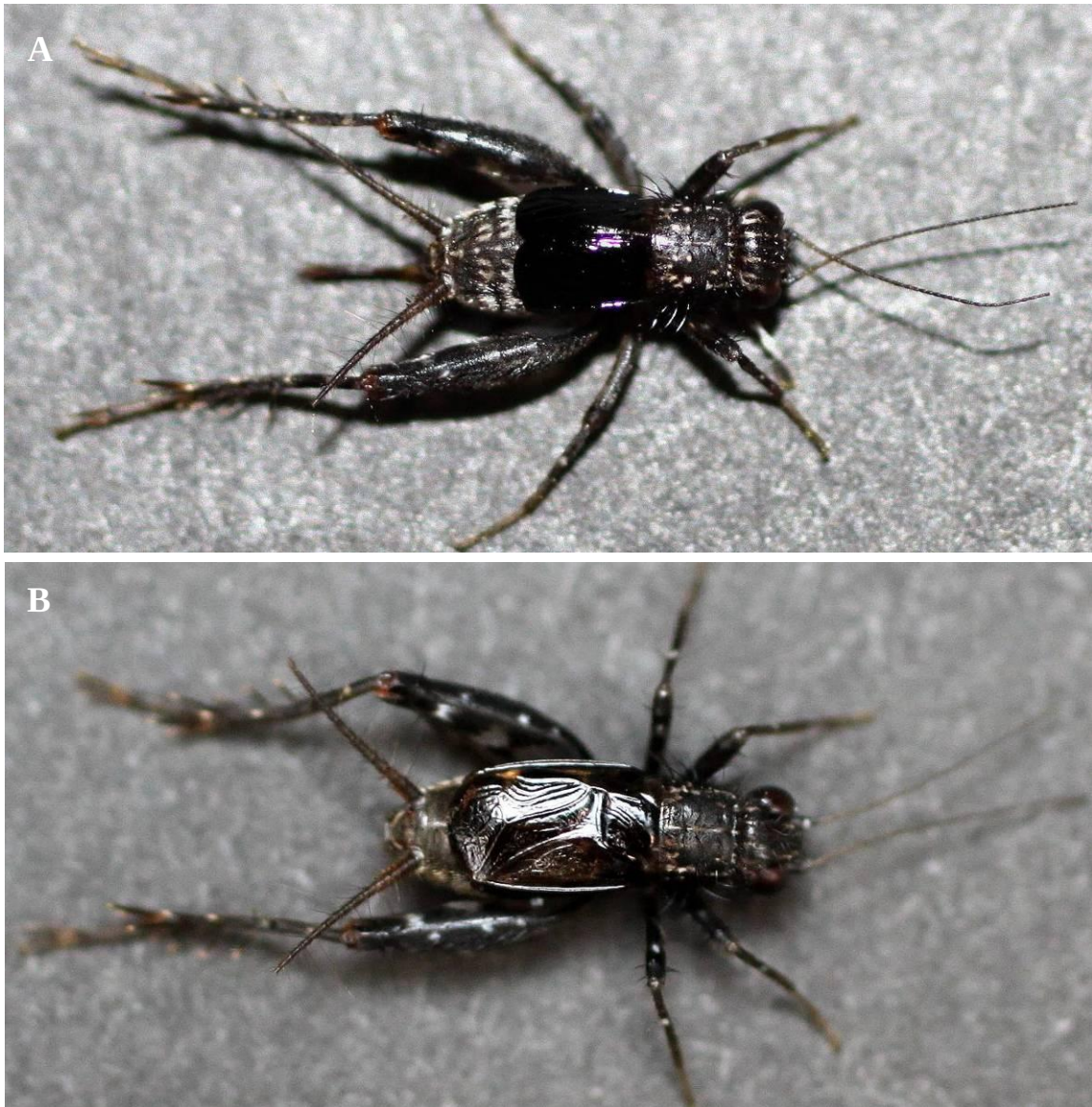


Fig. 19. *Pteronemobius* species 1: ZRC.ORT.194, female, 5.5 mm (A); ZRC.ORT.252, male, 6.2 mm (B).



Fig. 20. *Pteronemobius* species 2: ZRC.ORT.318, male, 7.6 mm.



Fig. 21. *Pteronemobius* species 3: ZRC.ORT.310, male, 6.7 mm.



Fig. 22. *Pteronemobius* species 4: ZRC.ORT.320, male, 5.7 mm.

Subfamily **Oecanthinae**

***Oecanthus* sp.**

Fig. 23

Material collected. — ZRC.ORT.325, 1 male, Mandai Track 15, 9 Aug.2011, coll. M. K. Tan & J. J. Y. Chan.

Xabea sp.

Fig. 24

Material collected. — ZRC.ORT.287, 1 male, MacRitchie Nature Trail, 10 Apr.2011, coll. M. K. Tan; ZRC.ORT.267, 1 male, Woodcutter Trail, 26 Apr.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & W. L. Lim.



Fig. 23. *Oecanthus* species: ZRC.ORT.325, male, 11.2 mm.



Fig. 24. *Xabea* species: ZRC.ORT.267, male, 10.9 mm.

Subfamily **Phaloriinae**

Phaloria jerelynae Gorochov & Tan

Fig. 25

Material collected. — ZRC.ORT.277, 1 male, BTNR main road, 19 May 2011, coll. M. K. Tan & L. F. Cheong.

Tremellia timah Gorochov & Tan

Fig. 26

Material collected. — ZRC.ORT.144, 1 male, Hindhede Nature Park, 30 Oct.2010, coll. M. K. Tan.



Fig. 25. *Phaloria jerelynae* Gorochov & Tan, 2012: ZRC.ORT.277, male, 15.4 mm.



Fig. 26. *Tremellia timah* Gorochov & Tan, 2012: ZRC.ORT.144, male, 16.9 mm.

Trellius neesoon Gorochov & Tan

Fig. 27

Material collected. — ZRC.ORT.266, 1 male, Nee Soon pipeline, 20 Apr.2011 (day), coll. M. K. Tan & M. R. B. Ismail.



Fig. 27. *Trellius neesoon* Gorochov & Tan, 2012: ZRC.ORT.266, male, 15.6 mm.

Subfamily **Podoscirtinae**

***Aphonoides* sp. 1**

Fig. 28

Material collected. — ZRC.ORT.102, 1 male, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.120, 1 male, Lornie Trail, 2 Nov.2010, coll. M. K. Tan.

***Aphonoides* sp. 2**

Fig. 29

Material collected. — ZRC.ORT.115, 1 female, Hindhede Nature Park, 30 Oct.2010, coll. M. K. Tan.

***Aphonoides* sp. 3**

Fig. 30

Material collected. — ZRC.ORT.167, 1 female, Rifle Range Link, 5 Nov.2010, coll. M. K. Tan.



Fig. 28. *Aphonoides* species 1: ZRC.ORT.120, male, 11.8 mm.



Fig. 29. *Aphonoides* species 2: ZRC.ORT.115, female, 13.1 mm.



Fig. 30. *Aphonoides* species 3: ZRC.ORT.167, female, 12.2 mm.

***Aphonoides* sp. 4**

Fig. 31

Material collected. — ZRC.ORT.233, 1 female, Mandai Track 15, 22 Feb.2011, coll. M. K. Tan; ZRC.ORT.296, 1 male, Hindhede Nature Park, 2 Jun.2011, coll. M. K. Tan.

***Mnesibulus* sp.**

Fig. 32

Material collected. — ZRC.ORT.290, 1 female, Senapang Link, 29 May 2011, coll. M. K. Tan.

***Sonotrella* sp.**

Fig. 33

Material collected. — ZRC.ORT.151, 1 male, Dairy Farm Loop, 10 Dec.2010, coll. M. K. Tan & M. R. B. Ismail.

***Varitrella* or *Idiotrella* or *Noctitrella* sp. 1**

Fig. 34

Material collected. — ZRC.ORT.103, 104, 1 male, 1 female, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.170, 1 male, Dairy Farm Pass, 31 Dec.2010, coll. M. K. Tan & H. P. M. Woo.



Fig. 31. *Aphonoides* species 4: ZRC.ORT.233, female, 16.5 mm (A); ZRC.ORT.296, male, 15.5 mm (B).



Fig. 32. *Mnesibulus* species: ZRC.ORT.290, female, 14.7 mm.



Fig. 33. *Sonotrella* species: ZRC.ORT.151, male, 17.5 mm.



Fig. 34. *Varitrella* or *Idiotrella* or *Noctitrella* species 1: ZRC.ORT.170, male, 25.2 mm.

***Varitrella* or *Idiotrella* or *Noctitrella* sp. 2**

Fig. 35

Material collected. — ZRC.ORT.200, 1 male, Hindhede Way, 26 Jan.2011, coll. M. K. Tan.

***Varitrella* or *Idiotrella* or *Noctitrella* sp. 3**

Fig. 36

Material collected. — ZRC.ORT.315, 1 female, Dairy Farm Pass, 6 Jul.2011, coll. M. K. Tan.

***Zvenella* sp.**

Fig. 37

Material collected. — ZRC.ORT.198, 1 female, Rifle Range Link, 23 Jan.2011, coll. M. K. Tan & R. W. J. Ngiam.



Fig. 35. *Varitrella* or *Idiotrella* or *Noctitrella* species 2: ZRC.ORT.200, male, 22.1 mm.



Fig. 36. *Varitrella* or *Idiotrella* or *Noctitrella* species 3: ZRC.ORT.315, female, 21.9 mm.



Fig. 37. *Zvenella* species: ZRC.ORT.198, female, 32.8 mm.

Subfamily **Pteroplistinae**

Singapuriola separata Gorochov & Tan

Fig. 38

Material collected. — ZRC.ORT.274, 1 male, Eco-Bridge CCNR, 16 May 2011, coll. M. K. Tan & R. W. J. Ngiam.



Fig. 38. *Singapuriola separata* Gorochov & Tan, 2012: ZRC.ORT.274, male, 11.2 mm.

Subfamily **Sclerogryllinae**

Sclerogryllus sp.

Fig. 39

Material collected. — ZRC.ORT.222, 1 female, Dairy Farm Pass, 10 Feb.2011, coll. M. K. Tan; ZRC.ORT.281, 1 male, Mandai Track 15, 28 May 2011, coll. M. K. Tan.

Subfamily **Trigonidiinae**

Amusurgus sp. 1

Fig. 40

Material collected. — ZRC.ORT.168, 1 female, Sime Track, 12 Dec.2010, coll. M. K. Tan & R. W. J. Ngiam.

Amusurgus sp. 2

Fig. 41

Material collected. — ZRC.ORT.218, 1 male, Belukar Track, 5 Feb.2011, coll. M. K. Tan; ZRC.ORT.309, 1 female, Venus Trail, 25 Jun.2011, coll. M. K. Tan.

Amusurgus sp. 3

Fig. 42

Material collected. — ZRC.ORT.239, 1 male, Sime Track, 3 Mar.2011, coll. M. K. Tan.



Fig. 39. *Sclerogryllus* species: ZRC.ORT.222, female, 10.7 mm (A); ZRC.ORT.281, male, 9.6 mm (B).



Fig. 40. *Amusurgus* species 1: ZRC.ORT.168, female, 6.2 mm.



Fig. 41. *Amusurgus* species 2: ZRC.ORT.218, male, 6.8 mm.



Fig. 42. *Amusurgus* species 3: ZRC.ORT.239, male, 6.5 mm.

***Amusurgus* sp. 4**

Fig. 43

Material collected. — ZRC.ORT.240, 1 female, Dairy Farm Loop, 5 Mar.2011, coll. M. K. Tan.

***Amusurgus* sp. 5**

Fig. 44

Material collected. — ZRC.ORT.253, 1 male, Mandai Track 15, 30 Mar.2011, coll. M. K. Tan.

***Amusurgus* sp. 6**

Fig. 45

Material collected. — ZRC.ORT.257, 1 female, Dairy Farm Loop, 2 Apr.2011, coll. M. K. Tan.



Fig. 43. *Amusurgus* species 4: ZRC.ORT.240, female, 6.0 mm.



Fig. 44. *Amusurgus* species 5: ZRC.ORT.253, male, 6.0 mm.



Fig. 45. *Amusurgus* species 6: ZRC.ORT.257, female, 5.9 mm.

***Anaxipha* sp. 1**

Fig. 46

Material collected. — ZRC.ORT.217, 1 male, MacRitchie Nature Trail, 2 Feb.2011, coll. M. K. Tan; ZRC.ORT.258, 1 female, Upper Seletar Trail, 5 Apr.2011, coll. M. K. Tan & J. J. Y. Chan.



Fig. 46. *Anaxipha* species 1: ZRC.ORT.217, male, 6.8 mm (A); ZRC.ORT.258, female, 6.4 mm (B).

***Anaxipha* sp. 2**

Fig. 47

Material collected. — ZRC.ORT.242, 1 male, Dairy Farm Pass, 8 Mar.2011, coll. M. K. Tan.

***Anaxipha* sp. 3**

Fig. 48

Material collected. — ZRC.ORT.260, 1 male, Wallace Trail, 7 Apr.2011, coll. M. K. Tan.

***Anaxipha* sp. 4**

Fig. 49

Material collected. — ZRC.ORT.261, 2 males, Wallace Trail, 7 Apr.2011, coll. M. K. Tan.



Fig. 47. *Anaxipha* species 2: ZRC.ORT.242, male, 6.5 mm.



Fig. 48. *Anaxipha* species 3: ZRC.ORT.260, male, 5.5 mm.

***Anaxipha* sp. 5**

Fig. 50

Material collected. — ZRC.ORT.262, 1 female, Venus Trail, 9 Apr.2011, coll. M. K. Tan.

***Anaxipha* sp. 6**

Fig. 51

Material collected. — ZRC.ORT.282, 1 male, Mandai Track 15, 28 May 2011, coll. M. K. Tan; ZRC.ORT.302, 1 female, Mandai Track 15, 21 Jun.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & T. Robillard.



Fig. 49. *Anaxipha* species 4: ZRC.ORT.261, male, 5.5 mm.



Fig. 50. *Anaxipha* species 5: ZRC.ORT.262, female, 5.7 mm.

***Homoeoxipha lycoides* (Walker)**

Fig. 52

Material collected. — ZRC.ORT.324, male, Mandai Track 15, 21 Jun.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & T. Robillard.



Fig. 51. *Anaxipha* species 6: ZRC.ORT.282, male, 5.8 mm (A); ZRC.ORT.302, female, 5.0 mm (B).



Fig. 52. *Homoeoxipha lycoides* (Walker, 1869): ZRC.ORT.324, male, 5.9 mm.

FAMILY **GRYLLOTALPIDAE**
Subfamily **Gryllotalpinae**

Gryllotalpa nymphicus Tan

Fig. 53

Material collected. — ZRC.ORT.254, 1 male, Mandai Track 15, 30 Mar.2011, coll. M. K. Tan.

Gryllotalpa wallace Tan

Fig. 54

Material collected. — ZRC.ORT.255, 1 male, Dairy Farm Loop, 2 Apr.2011, coll. M. K. Tan.

Gryllotalpa fulvipes Saussure

Fig. 55

Material collected. — ZRC.ORT.272, 1 male, Dairy Farm Loop, 3 May 2011, coll. M. K. Tan & J. J. Y. Chan; ZRC.ORT.278, 1 male, Hindhede Way, 25 May 2011, coll. M. K. Tan.



Fig. 53. *Gryllotalpa nymphicus* Tan, 2012: ZRC.ORT.254, male, 45.2 mm.

FAMILY **MOGOPLISTIDAE**
Subfamily **Mogoplistinae**

Apterornebius cf. *chong* Ingrisch

Fig. 56

Material collected. — ZRC.ORT.165, 110, 1 male, 1 female, Lower Peirce Reservoir Park, 22 Oct.2010, coll. M. K. Tan.

Cycloptiloides cf. *timah* Ingrisch

Fig. 57

Material collected. — ZRC.ORT.201, 1 female, Wallace Trail, 27 Jan.2011, coll. M. K. Tan; ZRC.ORT.230, 1 male, 1 female, Woodcutter Trail, 6 Feb.2011, coll. M. K. Tan & R. W. J. Ngiam; ZRC.ORT.300, 1 female, Eco-Bridge CCNR, 21 Jun.2011 (day), coll. M. K. Tan, X. Guo & S. N. C. Wan.



Fig. 54. *Gryllotalpa wallace* Tan, 2012: ZRC.ORT.255, male, 31.8 mm.



Fig. 55. *Gryllotalpa fulvipes* Saussure, 1877: ZRC.ORT.272, male, 21.7 mm.

***Ectatoderus angusticollis* Chopard**

Fig. 58

Material collected. — ZRC.ORT.174, 1 male, Upper Seletar Trail, 7 Jan.2011, coll. M. K. Tan & M. R. B. Ismail.

***Micrornebius* sp.**

Fig. 59

Material collected. — ZRC.ORT.229, 1 male, Sime Track, 1 Feb.2011, coll. M. K. Tan.

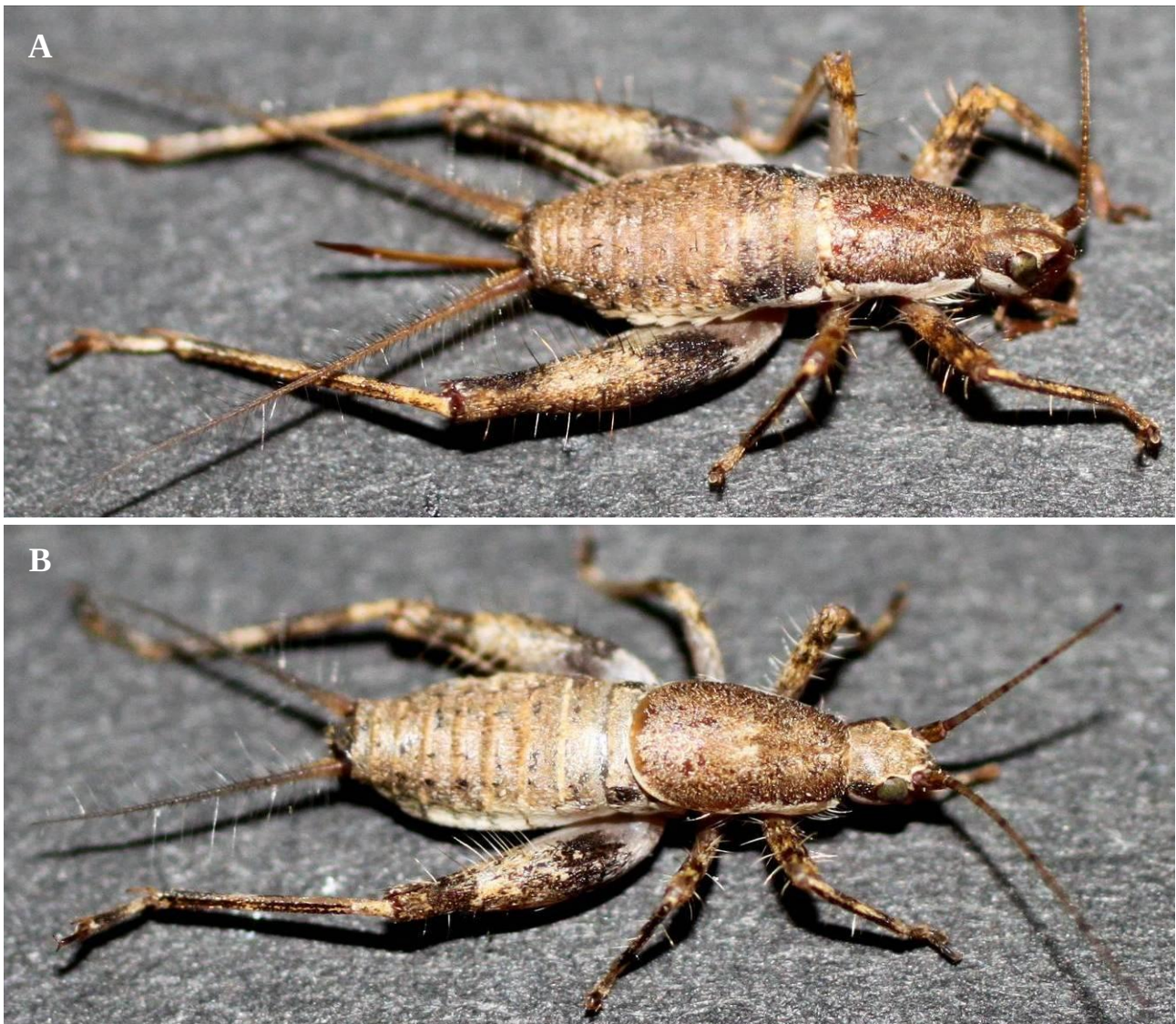


Fig. 56. *Apterornebius* cf. *chong* Ingrisch, 2006: ZRC.ORT.110, female, 10.7 mm (A); ZRC.ORT.165, male, 10.2 (B).

***Ornebius* cf. *albipalpus* Ingrisch**

Fig. 60

Material collected. — ZRC.ORT.136, 1 male, Sime Track, 26 Nov.2010, coll. M. K. Tan, M. R. B. Ismail & T. M. Leong.

***Ornebius* cf. *pullus* Ingrisch**

Fig. 61

Material collected. — ZRC.ORT.129, 1 male, BTNR main road, 23 Oct.2010, coll. M. K. Tan & T. M. Leong; ZRC.ORT.216, 1 male, MacRitchie Nature Trail, 2 Feb.2011, coll. M. K. Tan.

***Ornebius* sp. 1**

Fig. 62

Material collected. — ZRC.ORT.311, 1 male, BTNR main road, 29 Jun.2011, coll. M. K. Tan & J. J. Y. Chan.

***Ornebius* sp. 2**

Fig. 63

Material collected. — ZRC.ORT.297, 1 female, Upper Seletar Trail, 4 Jun.2011, coll. M. K. Tan.

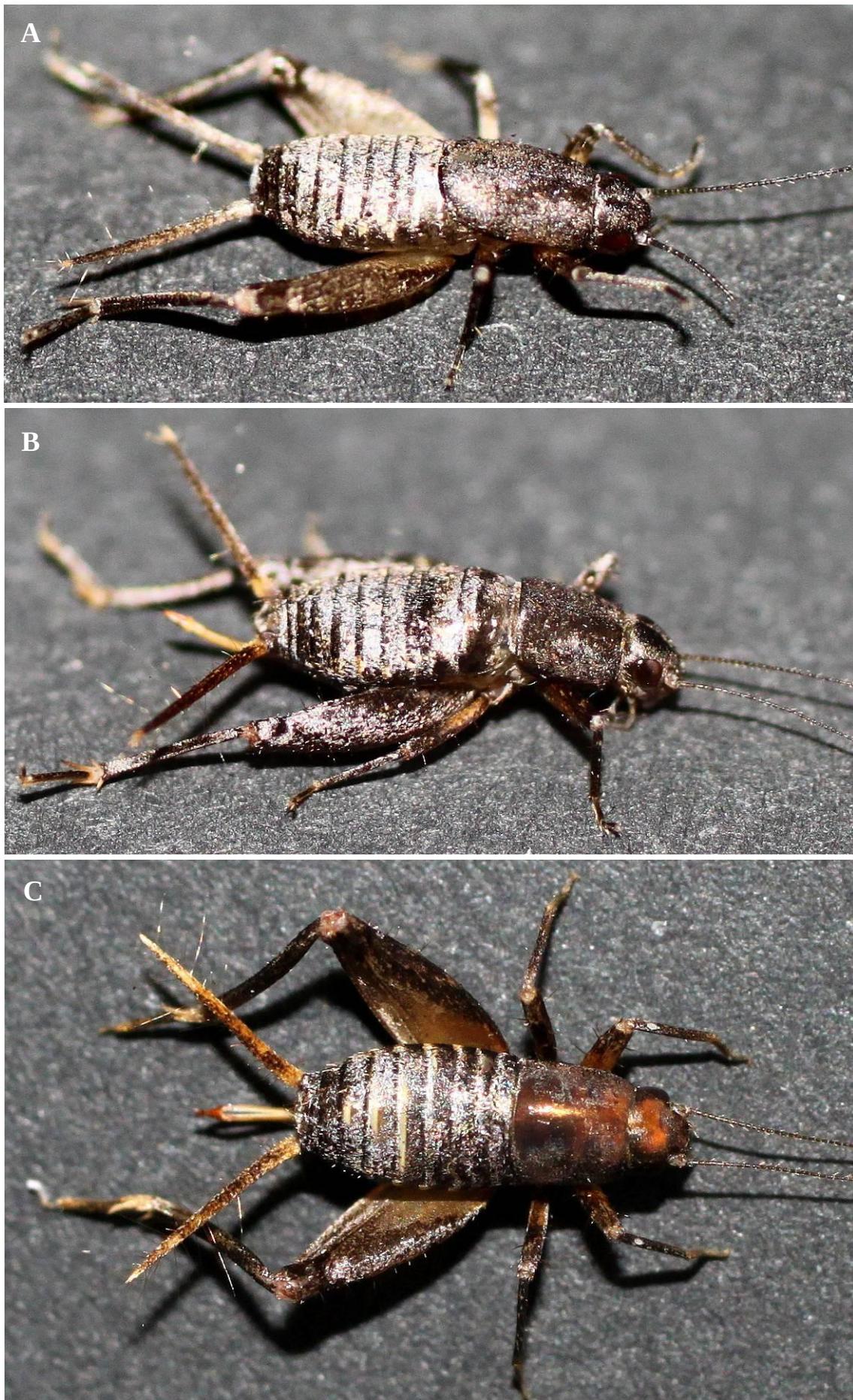


Fig. 57. *Cycloptiloides* cf. *timah* Ingrisch, 2006: ZRC.ORT.230, male, 5.8 mm (A); ZRC.ORT.230, female, 7.1 mm (B); ZRC.ORT.300, female, 5.8 mm (C).

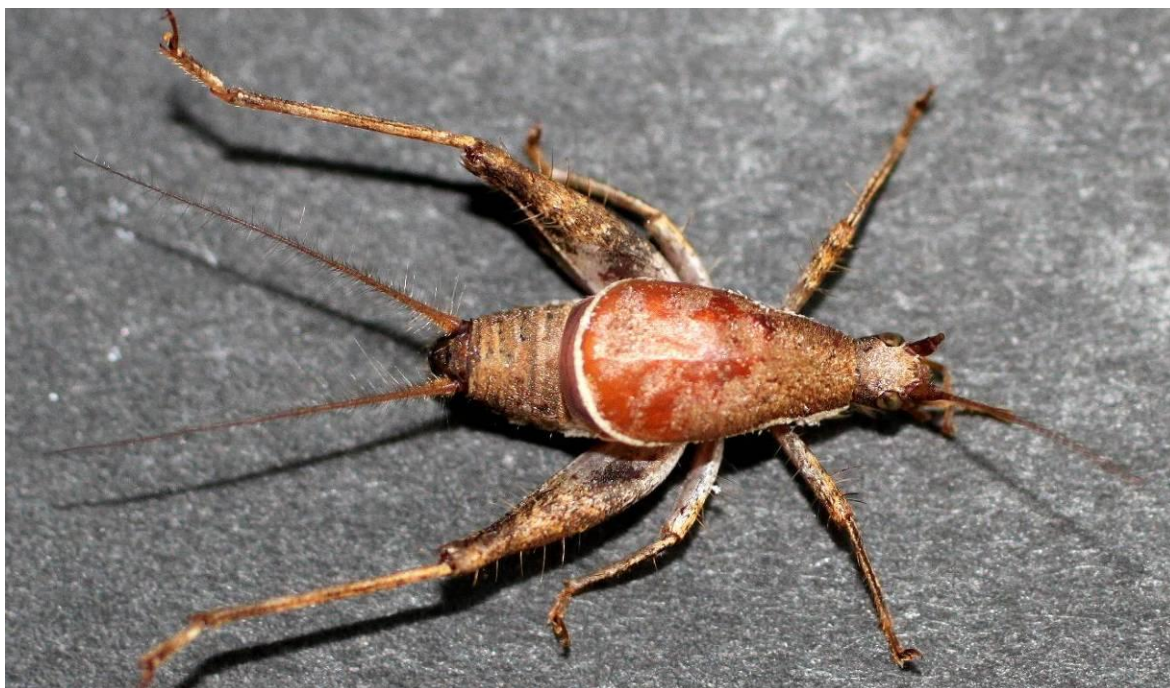


Fig. 58. *Ectatoderus angusticollis* Chopard, 1969: ZRC.ORT.174, male, 11.0 mm.



Fig. 59. *Micronebius* species: ZRC.ORT.229, male, 5.9 mm.



Fig. 60. *Ornebius* cf. *albipalpus* Ingrisch, 2006: ZRC.ORT.136, male, 8.8 mm.



Fig. 61. *Ornebius* cf. *pullus* Ingrisch, 2006: ZRC.ORT.216, male, 8.1 mm.



Fig. 62. *Ornebius* species 1: ZRC.ORT.311, male, 9.4 mm.



Fig. 63. *Ornebius* species 2: ZRC.ORT.297, female, 9.4 mm.

FAMILY RHAPHIDOPHORIDAE

Subfamily **Rhaphidophorinae**

***Rhaphidophora* sp.**

Fig. 64

Material collected. — ZRC.ORT.114, 2 females, Wallace Trail, 29 Oct.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.163, 1 female, Nee Soon Swamp Forest, 20 Dec.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.226, 1 male, 1 female, Upper Seletar Trail, 7 Jan.2011, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.298, 1 male, Woodcutter Trail, 16 Jun.2011, coll. M. K. Tan, R. W. J. Ngiam, M. R. B. Ismail & T. Robillard.

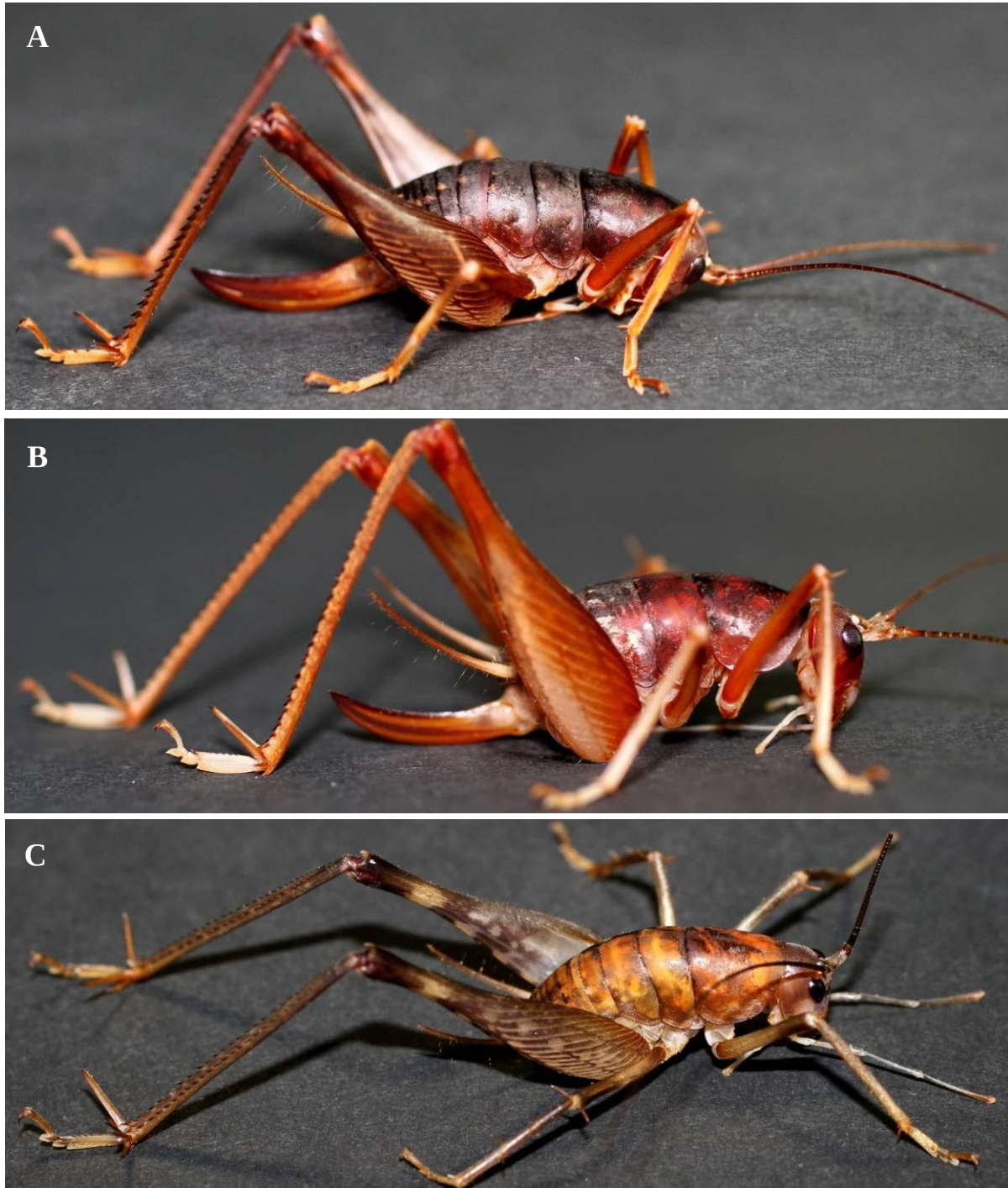


Fig. 64. *Rhaphidophora* species: ZRC.ORT.114, female, 23.4 mm (A); ZRC.ORT.163, female, 21.8 mm (B); ZRC.ORT.298, male, 22.4 mm (C).

FAMILY **GRYLLACRIDIDAE**

Subfamily **Gryllacridinae**

Otidiogryllacris sp.

Fig. 65

Material collected. — ZRC.ORT.265, 1 male, Chestnut Track, 16 Apr.2011, coll. M. K. Tan.

Caustogryllacris sp.

Fig. 66

Material collected. — ZRC.ORT.162, 1 female, Nee Soon Swamp Forest, 20 Dec.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.190, 1 female, Woodcutter Trail, 24 Dec.2010, coll. M. K. Tan, R. W. J. Ngiam, M. R. B. Ismail & W. L. Lim.

Phryganogryllacris sp. 1

Fig. 67

Material collected. — ZRC.ORT.149, 1 female, Wallace Trail, 3 Dec.2010, coll. M. K. Tan.

Phryganogryllacris sp. 2

Fig. 68

Material collected. — ZRC.ORT.347, 1 female, Nee Soon pipeline, 3 Sep.2011, coll. M. K. Tan.

***Gryllacris* (*signifera* group)** sp.

Fig. 69

Material collected. — ZRC.ORT.122, 1 female, Wallace Trail, 3 Nov.2010, coll. M. K. Tan; ZRC.ORT.131, 1 male, Chestnut Track, 20 Nov.2010, coll. M. K. Tan.



Fig. 65. *Otidiogryllacris* species: ZRC.ORT.265, male, 16.6 mm.



Fig. 66. *Caustogryllacris* species: ZRC.ORT.162, female, 25.7 mm.



Fig. 67. *Phryganogryllacris* species 1: ZRC.ORT.149, female, 21.4 mm.



Fig. 68. *Phryganogryllacris* species 2: ZRC.ORT.347, female, 19.5 mm.

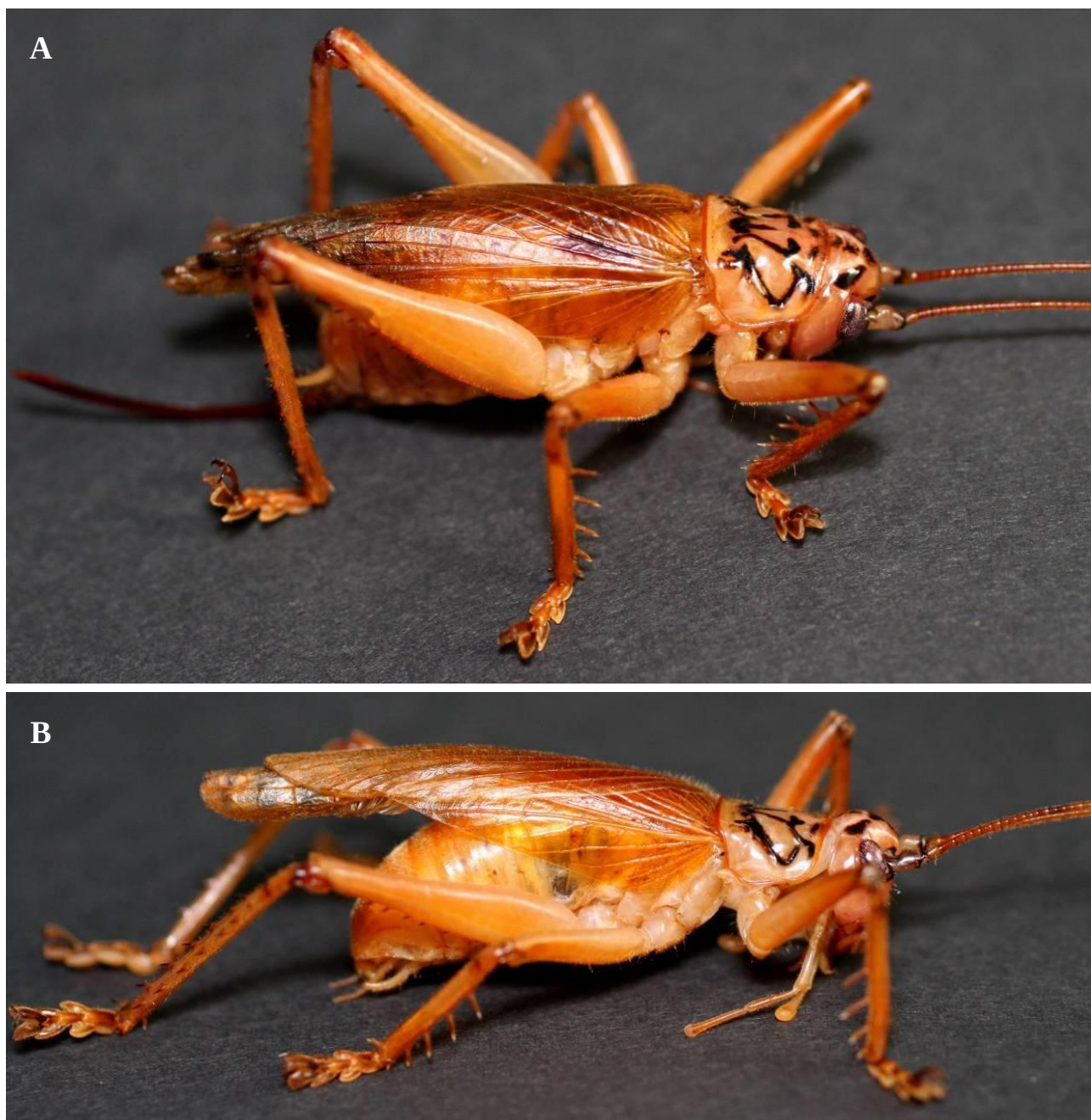


Fig. 69. *Gryllacris* (*signifera* group) species: ZRC.ORT.122, female, 31.1 mm (A); ZRC.ORT.131, male, 30.3 mm (B).

***Gryllacris* sp.**

Fig. 70

Material collected. — ZRC.ORT.148, 1 male, Wallace Trail, 3 Dec.2010, coll. M. K. Tan.

***Larnaca nigrata crassiuscula* (Karny)**

Fig. 71

Material collected. — ZRC.ORT.130, 1 male, Chestnut Track, 20 Nov.2010, coll. M. K. Tan;
ZRC.ORT.158, 1 female, Lornie Trail, 18 Dec.2010, coll. M. K. Tan.



Fig. 70. *Gryllacris* species: ZRC.ORT.148, male, 34.6 mm.



Fig. 71. *Larnaca nigrata crassiuscula* (Karny, 1926): ZRC.ORT.130, male, 23.9 mm (A); ZRC.ORT.158, female, 24.6 mm (B).

FAMILY TETTIGONIIDAE

So far, 46 species from eight subfamilies of Tettigoniidae were collected. Conocephalinae and Phaneropterinae are represented with the greatest number of species (13 and 12 respectively). On the other hand, four subfamilies are represented with two or less species—Hexacentrinae, Lipotactinae, Listroscolidinae, and Mecopodinae.

Subfamily **Conocephalinae**
Tribe **Agraeciini**

Jambiliara selita Ingrisch & Tan

Fig. 72

Material collected. — ZRC.ORT.157, 1 male, Chestnut Track, 17 Dec.2010, coll. M. K. Tan; ZRC.ORT.228, 1 female, Wallace Trail, 27 Jan.2011, coll. M. K. Tan.

Oxylakis sp.

Fig. 73

Material collected. — ZRC.ORT.119, 1 male, Lornie Trail, 2 Nov.2010, coll. M. K. Tan; ZRC.ORT.245, 1 female, Mandai Track 15, 13 Mar.2011, coll. M. K. Tan; ZRC.ORT.251, 1 male, Senapang Link, 24 Mar.2011, coll. M. K. Tan.



Fig. 72. *Jambiliara selita* Ingrisch & Tan, 2012: ZRC.ORT.157, male, 28.3 mm (A); ZRC.ORT.228, female, 30.3 mm (B).



Fig. 73. *Oxylakis* species: ZRC.ORT.245, female, 24.4 mm (A); ZRC.ORT.251, male, 21.7 mm (B).

Nahlaksia bidadari Ingrisch & Tan

Fig. 74

Material collected. — ZRC.ORT.146, 1 female, Sime Track, 26 Nov.2010, coll. M. K. Tan, M. R. B. Ismail & T. M. Leong; ZRC.ORT.160, 1 male, Mandai Track 15, 19 Dec.2010, coll. M. K. Tan & H. P. M. Woo; ZRC.ORT.164, 1 female, Upper Seletar Trail, 21 Dec.2010 (day), coll. M. R. B. Ismail; ZRC.ORT.206, 1 female, Chestnut Track, 29 Jan.2011, coll. M. K. Tan; ZRC.ORT.207, 1 female, MacRitchie Nature Trail, 2 Feb.2011, coll. M. K. Tan; ZRC.ORT.208, 1 male, Belukar Track, 5 Feb.2011, coll. M. K. Tan; ZRC.ORT.225, 1 male, Lornie Trail, 24 Feb.2011, coll. M. K. Tan.

Paragraecia* cf. *gracilis Ingrisch

Fig. 75

Material collected. — ZRC.ORT.204, 1 male, Upper Seletar Trail, 20 Jan.2011, coll. M. K. Tan.

Paragraecia* cf. *maculata Ingrisch

Fig. 76

Material collected. — ZRC.ORT.205, 1 female, Upper Seletar Trail, 25 Jan.2011, coll. M. K. Tan & M. R. B. Ismail.

Peracca conspicuithorax Griffini

Fig. 77

Material collected. — ZRC.ORT.153, 1 female, Nee Soon swamp forest, 13 Dec.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.348, 1 male, Nee Soon pipeline, 3 Sep.2011, coll. M. K. Tan.

Peracca subulicerca (Karny)

Fig. 78

Material collected. — ZRC.ORT.125, 1 male, Lornie Trail, 15 Nov.2010, coll. M. K. Tan & M. R. B. Ismail.



Fig. 74. *Nahlaksia bidadari* Ingrisch & Tan, 2012: ZRC.ORT.160, male, 19.3 mm (A); ZRC.ORT.164, female, 20.3 mm (B).



Fig. 75. *Paragraecia* cf. *gracilis* Ingrisch, 1998: ZRC.ORT.204, male, 22.7 mm.



Fig. 76. *Paragraecia* cf. *maculata* Ingrisch, 1998: ZRC.ORT.205, female, 24.5 mm.



Fig. 77. *Peracca conspicuithorax* Griffini, 1897: ZRC.ORT.153, female, 41.2 mm (A); ZRC.ORT.348, male, 43.5 mm (B).



Fig. 78. *Peracca subulicerca* (Karny, 1926): ZRC.ORT.125, male, 35.0 mm.

Viriacca viridis Ingrisch

Fig. 79

Material collected. — ZRC.ORT.175, 1 male, Upper Seletar Trail, 7 Jan.2011, coll. M. K. Tan & M. R. B. Ismail.



Fig. 79. *Viriacca viridis* Ingrisch, 1998: ZRC.ORT.175, male, 22.1 mm.

Tribe **Conocephalini**

Conocephalus maculatus (Le Guillou)

Fig. 80

Material collected. — ZRC.ORT.330, 1 male, Wallace Trail, 1 Aug.2011, coll. M. K. Tan.



Fig. 80. *Conocephalus maculatus* (Le Guillou, 1841): ZRC.ORT.330, male, 14.0 mm.

Conocephalus melaenus (de Haan)

Fig. 81

Material collected. — ZRC.ORT.304, 1 female, Mandai Track 15, 21 Jun.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & T. Robillard.



Fig. 81. *Conocephalus melaenus* (de Haan, 1842): ZRC.ORT.304, female, 18.2 mm.

***Conocephalus* sp.**

Fig. 82

Material collected. — ZRC.ORT.332, 1 female, Wallace Trail, 1 Aug.2011, coll. M. K. Tan.



Fig. 82. *Conocephalus* species: ZRC.ORT.332, female, 18.6 mm.

Tribe Copiphorini

***Euconocephalus nasutus* (Thunberg)**

Fig. 83

Material collected. — ZRC.ORT.264, 1 male, Chestnut Track, 16 Apr.2011, coll. M. K. Tan.

***Euconocephalus picteti* (Redtenbacher)**

Fig. 84

Material collected. — ZRC.ORT.101, 1 male, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail.



Fig. 83. *Euconocephalus nasutus* (Thunberg, 1815): ZRC.ORT.264, male, 30.6 mm.



Fig. 84. *Euconocephalus picteti* (Redtenbacher, 1891): ZRC.ORT.101, male.

Subfamily **Hexacentrinae**

Glenophisis singapura Tan

Fig. 85

Material collected. — ZRC.ORT.145, 1 female, Rifle Range Link, 5 Nov.2010, coll. M. K. Tan; ZRC.ORT.346, 1 male, Nee Soon pipeline, 3 Sep.2011, coll. M. K. Tan.

Hexacentrus unicolor Serville

Fig. 86

Material collected. — ZRC.ORT.335, 1 female, Wallace Trail, 1 Aug.2011, coll. M. K. Tan.

Subfamily **Lipotactinae**

Lipotactes maculatus Hebard

Fig. 87

Material collected. — ZRC.ORT.159, 1 male, Lornie Trail, 18 Dec.2010, coll. M. K. Tan; ZRC.ORT.211, 1 female, Dairy Farm Pass, 31 Dec.2010, coll. M. K. Tan & H. P. M. Woo; ZRC.ORT.193, 2 males, Lower Peirce Reservoir Park, 15 Jan.2011, coll. M. K. Tan.

Mortoniellus karnyi Griffini

Fig. 88

Material collected. — ZRC.ORT.291, 1 female, Nee Soon pipeline, 31 May 2011, coll. M. K. Tan, R. W. J. Ngiam & W. L. Lim.



Fig. 85. *Glenophisis singapura* Tan, 2012: ZRC.ORT.145, female, 15.6 mm (A); ZRC.ORT.346, male, 13.5 mm (B).

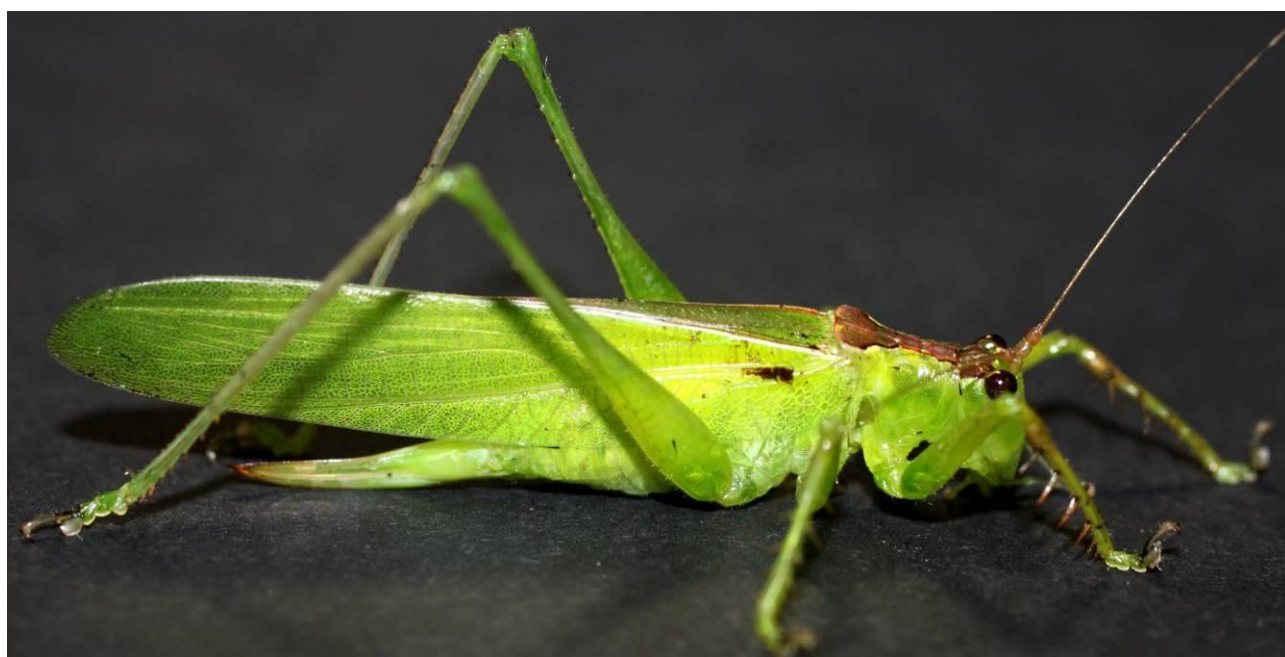


Fig. 86. *Hexacentrus unicolor* Serville, 1831: ZRC.ORT.335, female, 21.8 mm.

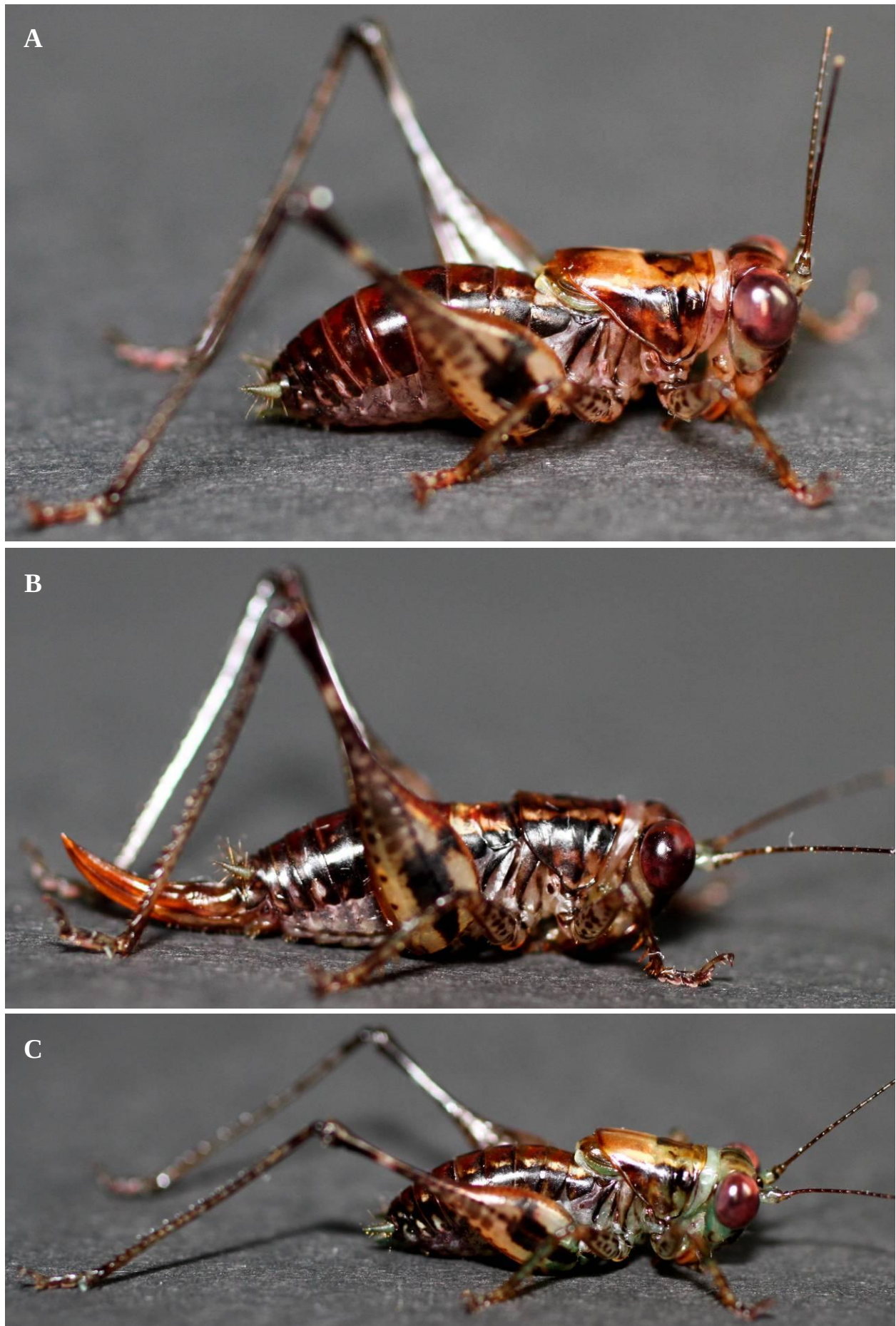


Fig. 87. *Lipotactes maculatus* Hebard, 1922: ZRC.ORT.159, male, 14.5 mm (A); ZRC.ORT.211, female, 14.2 mm (B); ZRC.ORT.193, male, 14.6 mm.



Fig. 88. *Mortoniellus karnyi* Griffini, 1909: ZRC.ORT.291, female, 22.1 mm.

Subfamily **Listroscelidinae**

***Carliphisis* sp.**

Fig. 89

Material collected. — ZRC.ORT.182, 1 female, Dairy Farm Loop, 13 Jan.2011, coll. M. K. Tan; ZRC.ORT.349, 1 female, Eco-Bridge CCNR, 16 Sep.2011, coll. M. K. Tan, R. W. J. Ngiam & J. J. Y. Chan.



Fig. 89. *Carliphisis* species: ZRC.ORT.182, female, 16.9 mm.

***Oceaniphisis* sp.**

Fig. 90

Material collected. — ZRC.ORT.106, 1 female, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.177, 1 male, Wallace Trail, 29 Oct.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.137, 1 female, Sime Track, 26 Nov.2010, coll. M. K. Tan, M. R. B. Ismail & T. M. Leong; ZRC.ORT.196, 1 male, Belukar Track, 19 Jan.2011, coll. M. K. Tan.



Fig. 90. *Oceaniphis* species: ZRC.ORT.177, male, 15.3 mm (A); ZRC.ORT.137, female, 16.5 mm (B).

Subfamily **Meconematinae**
Tribe **Meconematini**

***Alloteratura* sp. 1**

Fig. 91

Material collected. — ZRC.ORT.179, 1 female, Sime Track, 26 Nov.2010, coll. M. K. Tan, M. R. B. Ismail & T. M. Leong; ZRC.ORT.276, 1 female, Eco-Bridge CCNR, 16 May 2011, coll. M. K. Tan & R. W. J. Ngiam; ZRC.ORT.350, 1 male, Eco-Bridge CCNR, 16 Sep.2011, coll. M. K. Tan, R. W. J. Ngiam & J. J. Y. Chan.

***Alloteratura* sp. 2**

Fig. 92

Material collected. — ZRC.ORT.256, 1 male, Dairy Farm Loop, 2 Apr.2011, coll. M. K. Tan; ZRC.ORT.301, 1 male, Eco-Bridge CCNR, 21 Jun.2011 (day), coll. M. K. Tan, X. Guo & S. N. C. Wan.

***Meconematini* sp. 1**

Fig. 93

Material collected. — ZRC.ORT.176, 1 male, Wallace Trail, 29 Oct.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.183, 1 male, Lower Peirce Reservoir Park, 15 Jan.2011, coll. M. K. Tan.



Fig. 91. *Alloteratura* species 1: ZRC.ORT.179, female, 11.9 mm (A); ZRC.ORT.350, male, 10.0 mm (B).



Fig. 92. *Alloteratura* species 2: ZRC.ORT.256, male, 12.6 mm.



Fig. 93. *Meconematini* species 1: ZRC.ORT.183, male, 17.6 mm.

***Meconematini* sp. 2**

Fig. 94

Material collected. — ZRC.ORT.118, 1 female, MacRitchie Nature Trail, 1 Nov.2010, coll. M. K. Tan.



Fig. 94. Meconematini species 2: ZRC.ORT.118, female, 13.7 mm.

***Xiphidiopsis* sp. 1**

Fig. 95

Material collected. — ZRC.ORT.180, 1 male, Chestnut Track, 17 Dec.2010, coll. M. K. Tan; ZRC.ORT.184, 1 female, Lower Peirce Reservoir Park, 15 Jan.2011, coll. M. K. Tan; ZRC.ORT.241, 1 male, Dairy Farm Loop, 5 Mar.2011, coll. M. K. Tan.

***Xiphidiopsis* sp. 2**

Fig. 96

Material collected. — ZRC.ORT.292, 1 female, Nee Soon pipeline, 31 May 2011, coll. M. K. Tan, R. W. J. Ngiam & W. L. Lim.

Tribe **Phlugidini**

***Asiophlugis rete* Gorochov**

Fig. 97

Material collected. — ZRC.ORT.213, 1 male, Wallace Trail, 27 Jan.2011, coll. M. K. Tan.

***Asiophlugis temasek* Gorochov & Tan**

Fig. 98

Material collected. — ZRC.ORT.107, 1 male, Venus Trail, 8 Oct.2010, coll. M. K. Tan & M. R. B. Ismail; ZRC.ORT.108, 1 male, MacRitchie Nature Trail, 1 Nov.2010, coll. M. K. Tan; ZRC.ORT.109, 1 male, BTNR main road, 13 Nov.2010, coll. M. K. Tan; ZRC.ORT.152, 1 male, 1 female, Dairy Farm Loop, 10 Dec.2010, coll. M. K. Tan & M. R. B. Ismail.

***Asiophlugis thaumasia* (Hebard)**

Fig. 99

Material collected. — ZRC.ORT.132, 1 male, Nee Soon pipeline, 25 Nov.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.212, 1 female, Dairy Farm Pass, 19 Jan.2011, coll. M. K. Tan; ZRC.ORT.227, 1 male, Lower Peirce Reservoir Park, 16 Mar.2011, coll. M. K. Tan.



Fig. 95. *Xiphidiopsis* species 1: ZRC.ORT.180, male, 13.0 mm (A); ZRC.ORT.184, female, 13.5 mm (B).



Fig. 96. *Xiphidiopsis* species 2: ZRC.ORT.292, female, 13.6 mm.



Fig. 97. *Asiophlugis rete* Gorochov, 1998: ZRC.ORT.213, male, 12.7 mm.



Fig. 98. *Asiophlugis temasek* Gorochov & Tan, 2011: ZRC.ORT.108, male, 21.2 mm (A); ZRC.ORT.152, female, 12.5 mm (B).



Fig. 99. *Asiophlugis thaumasia* (Hebard, 1922): ZRC.ORT.132, male, 13.3 mm (A); ZRC.ORT.212, female, 15.2 mm (B).

Subfamily **Mecopodinae**

Mecopoda elongata (Linnaeus)

Fig. 100

Material collected. — ZRC.ORT.195, 1 male, Mandai Track 15, 18 Jan.2011, coll. M. K. Tan & H. P. M. Woo.



Fig. 100. *Mecopoda elongata* (Linnaeus, 1758): ZRC.ORT.195, male, 34.5 mm.

Subfamily **Phaneropterinae**
Tribe **Ducetini**

Ducetia japonica (Thunberg)

Fig. 101

Material collected. — ZRC.ORT.308, 1 male, Venus Trail, 25 Jun.2011, coll. M. K. Tan.



Fig. 101. *Ducetia japonica* (Thunberg, 1815): ZRC.ORT.308, male, 18.1 mm.

Tribe **Elimaeini**

Elimaea signata Brunner von Wattenwyl

Fig. 102

Material collected. — ZRC.ORT.192, 1 male, 1 female, Wallace Trail, 10 Jan.2011, coll. M. K. Tan.

Elimaea (Elimaea) sp.

Fig. 103

Material collected. — ZRC.ORT.191, 1 male, Hindhede Way, 26 Dec.2010, coll. M. K. Tan.

Elimaeini sp.

Fig. 104

Material collected. — ZRC.ORT.142, 1 female, BTNR main road, 23 Oct.2010, coll. M. K. Tan & T. M. Leong.

Tribe **Holochlorini**

Arnobia cf. ***pilipes tropica*** Gorochov

Fig. 105

Material collected. — ZRC.ORT.171, 1 female, Dairy Farm Pass, 31 Dec.2010, coll. M. K. Tan & H. P. M. Woo; ZRC.ORT.220, 1 male, Woodcutter Trail, 6 Feb.2011, coll. M. K. Tan & R. W. J. Ngiam.

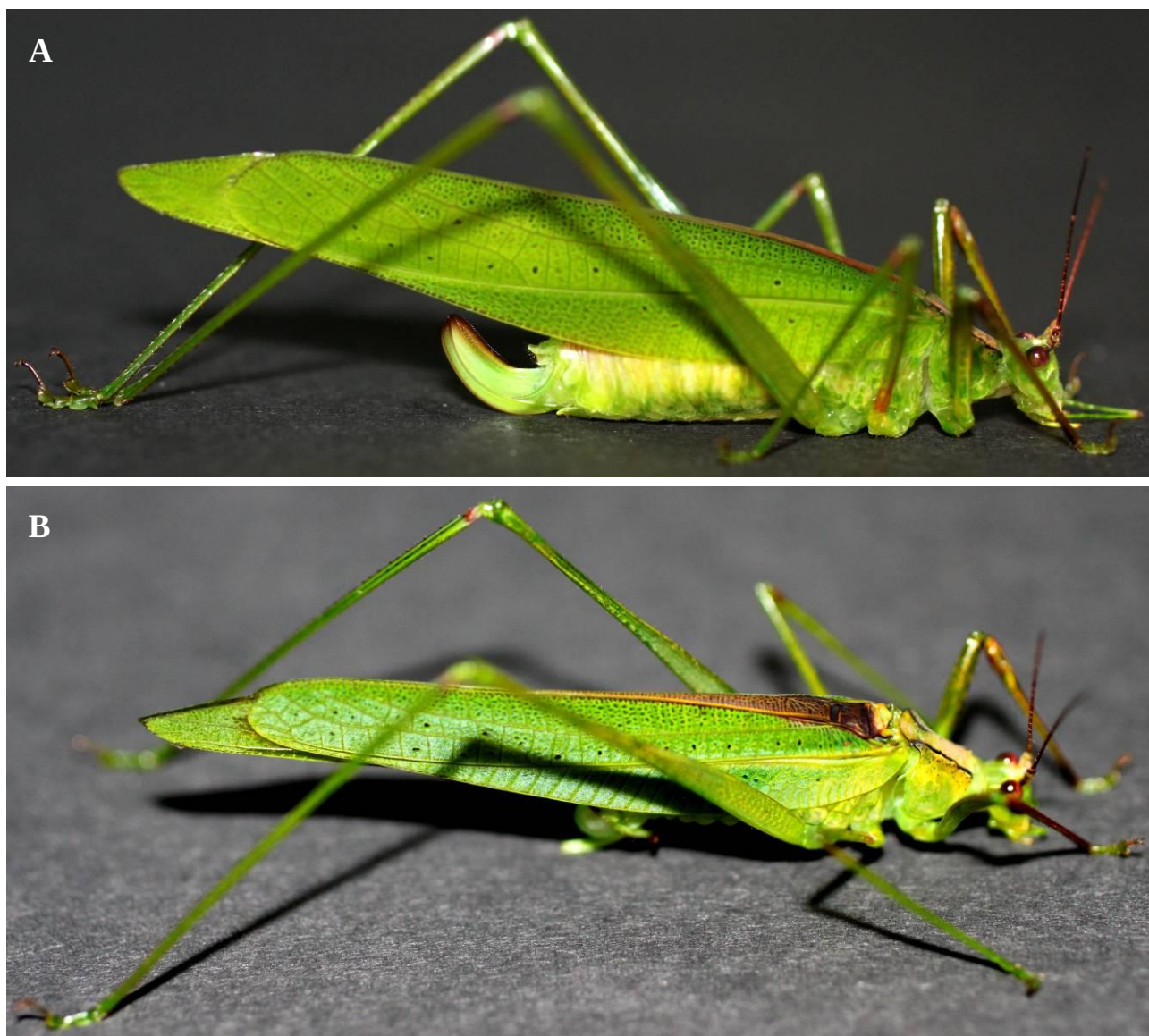


Fig. 102. *Elimaea signata* Brunner von Wattenwyl, 1878: ZRC.ORT.192, female, 26.2 mm (A); ZRC.ORT.192, male, 21.0 mm (B).



Fig. 103. *Elimaea* (*Elimaea*) species: ZRC.ORT.191, male, 26.1 mm.



Fig. 104. Elimaeini species: ZRC.ORT.142, female, 24.5 mm.



Fig. 105. *Arnobia cf. pilipes tropica* Gorochov, 1998: ZRC.ORT.171, female, 28.5 mm (A); ZRC.ORT.220, 24.8 mm (B).

***Casigneta* sp.**

Fig. 106

Material collected. — ZRC.ORT.243, 1 female, Upper Seletar Trail, 12 Mar.2011, coll. M. K. Tan; ZRC.ORT.268, 1 female, Woodcutter Trail, 26 Apr.2011, coll. M. K. Tan, R. W. J. Ngiam, J. J. Y. Chan & W. L. Lim.



Fig. 106. *Casigneta* species: ZRC.ORT.243, female, 26.7 mm (A); ZRC.ORT.268, female, 25.3 mm (B).

***Cesasundana* sp.**

Fig. 107

Material collected. — ZRC.ORT.166, 1 female, Lornie Trail, 2 Nov.2010, coll. M. K. Tan.

***Elbenia* or *Phaulula* sp.**

Fig. 108

Material collected. — ZRC.ORT.150, 1 female, Rifle Range Link, 5 Dec.2010, coll. M. K. Tan; ZRC.ORT.154, 1 female, Nee Soon Swamp Forest, 13 Dec.2010, coll. M. K. Tan & M. R. B. Ismail.

Remarks. — The males of the two genera have characteristic abdominal apices, but otherwise the genus looks homogeneous (S. Ingrisch, in litt.).



Fig. 107. *Cesasundana* species: ZRC.ORT.166, female, 21.7 mm.



Fig. 108. *Elbenia* or *Phaulula* species: ZRC.ORT.150, female, 26.3 mm.

***Holochlora* sp.**

Fig. 109

Material collected. — ZRC.ORT.173, 1 female, Belukar Track, 31 Dec.2010, coll. M. K. Tan & H. P. M. Woo.

***Psyrana* sp.**

Fig. 110

Material collected. — ZRC.ORT.143, 1 female, Wallace Trail, 29 Oct.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail; ZRC.ORT.214, 1 female, Mousedeer Trail, 28 Jan.2011, coll. M. K. Tan.



Fig. 109. *Holochlora* species: ZRC.ORT.173, female, 29.2 mm.



Fig. 110. *Psyrana* species: ZRC.ORT.143, female, 29.1 mm.

Tribe **Phaneropterini**

Phaneroptera brevis (Serville)

Fig. 111

Material collected. — ZRC.ORT.327, 1 male, Hindhede Nature Park, 20 Jul.2011, coll. M. K. Tan.

Tribe **Scambophyllini**

Scambophyllum* cf. *pendleburyi Karny

Fig. 112

Material collected. — ZRC.ORT.219, 2 males, Woodcutter Trail, 6 Feb.2011, coll. M. K. Tan & R. W. J. Ngiam.



Fig. 111. *Phaneroptera brevis* (Serville, 1838): ZRC.ORT.327, male, 11.1 mm.



Fig. 112. *Scambophyllum cf. pendleburyi* Karny, 1926: ZRC.ORT.219, male, 24.8 mm.

Subfamily **Pseudophyllinae**
Tribe **Phyllomimini**

Chondroderella borneensis (Brunner von Wattenwyl)

Fig. 113

Material collected. — ZRC.ORT.113, 2 males, Wallace Trail, 29 Oct.2010, coll. M. K. Tan, R. W. J. Ngiam & M. R. B. Ismail.

***Mioacris* or *Promeca* sp.**

Fig. 114

Material collected. — ZRC.ORT.246, 1 female, Lower Peirce Reservoir Park, 16 Mar.2011, coll. M. K. Tan.

Phyllomimus inversus Brunner von Wattenwyl

Fig. 115

Material collected. — ZRC.ORT.112, 1 male, BTNR main road, 23 Oct.2010, coll. M. K. Tan & T. M. Leong; ZRC.ORT.124, 1 female, BTNR main road, 13 Nov.2010, coll. M. K. Tan; ZRC.ORT.237, 1 female, Lornie Trail, 24 Feb.2011, coll. M. K. Tan.

Phyllomimus elliptifolius (Pictet & Saussure) or ***major*** Brunner von Wattenwyl

Fig. 116

Material collected. — ZRC.ORT.121, 1 female, Lornie Trail, 2 Nov.2010, coll. M. K. Tan.



Fig. 113. *Chondroderella borneensis* (Brunner von Wattenwyl, 1895): ZRC.ORT.113, male, 25.2 mm.



Fig. 114. *Mioacris* or *Promeca* species: ZRC.ORT.246, female, 38.2 mm.



Fig. 115. *Phyllomimus inversus* Brunner von Wattenwyl, 1895: ZRC.ORT.112, male, 28.6 mm (A); ZRC.ORT.124, female, 29.5 mm (B).



Fig. 116. *Phyllomimus elliptifolius* (Pictet & Saussure, 1892) or *major* Brunner von Wattenwyl, 1895: ZRC.ORT.121, female, 44.5 mm.

Tribe Pseudophyllini

Onomarchus cf. *uninotatus* (Serville)

Fig. 117

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



Fig. 117. *Onomarchus* cf. *uninotatus* (Serville, 1839): ZRC.ORT.326, female, 37.3 mm.

SUMMARY

In total, 150 species of Orthoptera (117 species of Ensifera and 33 species of Caelifera) were recorded from the forests of the BTNR and CCNR based on 12 months of collection. More species can be expected with more surveys, based on sightings and observations during the surveys. While

the figures suggest a rich orthopteran diversity existing in the BTNR and CCNR, it is important to note that some species were sighted and/or collected only once.

The conservation status categories of most orthopteran species in Singapore are unknown, which suggests that more studies are necessary to understand the distribution and abundance of the orthopteran populations in Singapore. For example, Tan (2012b) published the recordings of the bioacoustics of Ensifera in the BTNR and its buffer zones (Dairy Farm Nature Park and Hindhede Nature Park) from Jan.2012 to Mar.2012. In this preliminary study, a total of 18 species of Ensifera were recorded. Additionally, other aspects of the biology of the Orthoptera should also be documented, e.g., the natural history observations in the field such as their predators (e.g., *Peracca subulicerca*; see Leong, 2011) and prey (e.g., Copiphorini; see Tan, 2011a).

From the field surveys, there are surprising discoveries of new species and rediscoveries of presumed extinct species, many of which are unique to Singapore. These very recent findings emphasize the need for more comprehensive surveys on our biodiversity or we risk losing our natural heritage before it may be documented. This is especially true given the ever changing landscape and increasing competition for land use in Singapore. More research on the description of new species will be published, hence a key is not provided in this account, in contrast to Part 1. Therefore, the author hopes that the two parts of the documentation of Orthoptera in the BTNR and CCNR contribute to further awareness and appreciation of Singapore's biodiversity, as well as provide useful information required for managing the conservation of the primary and secondary forests in Singapore.

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