Preliminary data on the fruit flies (Diptera: Tephritidae) of Cambodia

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មូលន័យសង្ខេប

គេមានការយល់ដឹងតិចតួចណាស់អំពីរុយផ្លែឈើ (អំបូរ Tephritidae) នៅក្នុងប្រទេសកម្ពុជា មានត្រឹមតែ ១០ប្រភេទប៉ុណ្ណោះដែលកត់ត្រាដោយHardy ឆ្នាំ១៩៧៣ និង២៧ប្រភេទ (ស្ថិតក្នុងពូក *Bactrocera*) ដោយLeblanc *et al.* ឆ្នាំ២០១៥។ ផ្អែកទៅលើសំណាកដែលប្រមូលបានបន្ថែមក្នុងខែមិថុនា ឆ្នាំ២០១៧ យើងបានធ្វើកំណត់ត្រា ៨ប្រភេទបន្ថែមទៀតសម្រាប់ប្រទេសកម្ពុជា ដែលជាកំណត់ត្រាដំបូង។ យើងក៏បានបង្កើតបញ្ជីដែលមាន ៤៤ប្រភេទរុយ ក្នុងអំបូរTephritidae) មាន១២ពូក ដែលយើងដឹងថាពូកវាមានវត្តមានក្នុងប្រទេសកម្ពុជា រួមជាមួយនិងការបរិយាយអំពីរបាយ និងជីវសាស្ត្ររបស់ពូកវា។

Abstract

The true fruit flies (Tephritidae) of Cambodia are poorly known: only 10 species were recorded by Hardy (1973) and 27 species (all of the genus *Bactrocera*) by Leblanc *et al.* (2015). Based on additional material collected in June 2017, we document eight additional species for the first time in Cambodia. We also provide a list of 44 species of tephritid flies arranged in 12 genera which are currently known to occur in Cambodia, with notes on their distribution and biology.

Keywords Cambodia, Diptera, fruit flies, Tephritidae, new records.

Introduction

In the Oriental Region, the true fruit flies (Tephritidae) include some of the most important economic pests and are represented by almost 1,000 species (Norrbom, 2004 and recent additions). Hardy (1973) listed 211 species in the Tenasserim Division of Myanmar, Thailand, Cambodia, Laos, Vietnam, Peninsular Malaysia and Singapore. This list has not been updated greatly although Hancock (1999, 2004, 2011, 2012), Hancock & Drew (1994a,b, 1999, 2004), Hancock & McGuire (2002) and Chua (2010) added some new species and records and synonymised or transferred many other species from peninsular Southeast Asia. Among these, only 10 species were previously recorded in Cambodia by Hardy (1973), based on a small collection made by N. R. Spencer at 700 m asl (above sea level) in Kirirom National Park (Kampong Speu Province) in April 1961. Additionally, 27 species belonging to the genus *Bactrocera* were collected in traps baited with cue-lure and methyl eugenol at several sites east of Kron Koh Kong in April 2011 by M. San Jose and D. Rubinoff which were documented by Leblanc *et al*. (2015).

During a visit to Cambodia in June 2017, the authors identified additional material deposited at the Cambo-

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dian Entomology Initiatives (CEI) at the Royal University of Phnom Penh and collected by the authors at the Chi Phat Community-based Ecotourism Site in Koh Kong Province (Fig. 1). The purpose of this paper is to summarize current knowledge on the fruit flies of Cambodia and hopefully stimulate further studies on the group.

Methods

In general, tephritid flies can be collected with Malaise traps, rearing of adults from fruit and other plant tissues infested by larvae, using various synthetic and organic lures in McPhail and other traps, as well as by net sweeping. During our study, flies were predominantly collected with an entomological net or aspirator, by sweeping over tree leaves, freshly cut bamboo or faeces.

All specimen material collected was deposited in the collections of I.I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine (SIZK) and CEI at the Royal University of Phnom Penh.

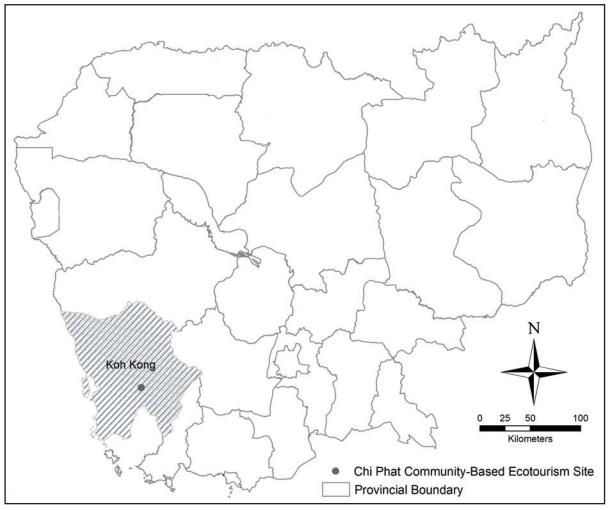

Fig. 1 Study site—Chi Phat Community-Based Ecotourism Site, Koh Kong Province.

Results

Our material comprised nine species, eight of which represent first records for Cambodia. These are documented below, together with 36 species of Tephritidae previously recorded in Cambodia.

Anoplomus Bezzi, 1913

A genus of the tribe Gastrozonini (Dacinae), which can be recognized by the combination of pointed flagellomere 1, plumose arista, 2 frontal setae, rudimentary ocellars, postocellar setae lacking, 2 pairs of scutellar setae and 2 or more long midtibial spines. Hancock (2008) included *Rhaibophleps* Hardy, 1973 and *Sinanoplomus* Zia, 1955 as synonyms. Adults of the Cambodian species were collected on Poaceae grass stems, which are possibly its host (Hardy, 1973; Hancock, 2008). Hancock (2008) provided a key to the seven species included.

Anoplomus seclusa (Hardy, 1973)

Rhaibophleps seclusa Hardy, 1973: 204; Hancock, 1999: 938.

Anoplomus seclusa: Hancock, 2008: 103.

Distribution: Thailand, Laos, Cambodia (Hardy, 1973).

Bactrocera Macquart, 1835

A large genus of ca. 650 described species (Hancock & Drew, 2018b), including four recently described by LeBlanc *et al*. (2018), of predominantly Oriental and Australasian distribution. Similar to other Dacini, they are wasp-like, typically yellow-and-black flies with reduced head and body chaetotaxy (ocellar, postocellar, dorsocentral, presutural acrostichal, and katepisternal setae lacking) usually with hyaline wings except for a brown band along costal margin and a brown anal streak plus a wide cell dm. Species assigned to *Bactrocera* differ from similar species of the genus *Dacus* mainly by having abdominal tergites free rather than fused to each other, but share no obvious synapomorphies. Based on molecular phylogenetic analysis, *Bactrocera* (*sensu* Drew, 1989; White & Elson-Harris, 1992; Norrbom *et al*., 1999) has been regarded as paraphyletic (Virgilio *et al*., 2015; San Jose *et al*., 2018). As a result, species belonging to the *Zeugodacus* group of subgenera are often placed in a separate genus *Zeugodacus* Hendel, 1927 (with 191 species listed by Doorenweerd *et al*., 2018), which has a weak morphological definition and diagnosis. For this and other reasons (lack of support from morphological, biological and molecular clock data), Hancock & Drew (2018b) retained *Zeugodacus* as a subgenus of *Bactrocera*. One of us (VAK) also discussed the possible paraphyly of *Bactrocera* and insisted on keeping all the species under one subgenus until unambiguous arguments are provided. Thus, we follow the nomenclature of Hancock & Drew (2018b) here.

Bactrocera larvae usually feed on the fleshy fruit of a wide range of plant families but some infest the fruit

or flowers of Cucurbitaceae. Some species including *B. dorsalis* are widespread and polyphagous pests.

For descriptions and keys, see White & Elson-Harris (1992), Drew & Hancock (1994) and Drew & Romig (2013, 2016). Nomenclature follows Hancock & Drew (2018a,b).

***Bactrocera (Bactrocera) aethriobasis* (Hardy, 1973)**

Dacus aethriobasis Hardy, 1973: 30.

Bactrocera (Bactrocera) aethriobasis: Drew & Romig, 2013: 37; Leblanc *et al*., 2015: 599.

Bactrocera aethriobasis: Doorenweerd *et al*., 2018: 25.

Distribution: Thailand (Hardy, 1973), Bhutan, Peninsular Malaysia, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Host: *Azadirachta indica* (Meliaceae) (Drew & Romig, 2013).

***Bactrocera (Bactrocera) bhutaniae* Drew & Romig, 2013**

Drew & Romig, 2013: 51; Leblanc *et al*., 2015: 599.

Bactrocera bhutaniae: Doorenweerd *et al*., 2018: 27.

Distribution: Bhutan, India (Andaman Islands), Thailand, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Xylosma brachystachys* (Flacourtiaceae) (Drew & Romig, 2013).

***Bactrocera (Bactrocera) bivittata* Lin & Wang, 2005**

Lin *et al*., 2005: 843; Drew & Romig, 2013: 56; Leblanc *et al*., 2015: 599.

Bactrocera bivittata: Doorenweerd *et al*., 2018: 27.

Distribution: China (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) carambolae* Drew & Hancock, 1994**

Drew & Romig, 2013: 61; Leblanc *et al*., 2015: 599.

Bactrocera bivittata: Doorenweerd *et al*., 2018: 28.

Distribution: Thailand, Peninsular Malaysia, Singapore, Indonesia, India (Andaman Islands), Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015). Introduced to South America (Drew & Hancock, 1994).

Hosts: Wide range of fruit (Drew & Hancock, 1994; Allwood *et al*., 1999).

***Bactrocera (Bactrocera) correcta* (Bezzi, 1916)**

Drew & Romig, 2013: 69; Leblanc *et al*., 2015: 599.

Bactrocera correcta: Doorenweerd *et al*., 2018: 28.

Distribution: Pakistan, India, Nepal, Sri Lanka, Bhutan, Myanmar, Thailand, Southern China, Vietnam, Peninsular Malaysia (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: Wide range of fruit (Allwood *et al*., 1999).

***Bactrocera (Bactrocera) dongnaiae* Drew & Romig, 2013**

Drew & Romig, 2013: 75; Leblanc *et al*., 2015: 599.

Bactrocera dongnaiae: Doorenweerd *et al*., 2018: 29.

Distribution: Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) dorsalis* (Hendel, 1912)**

Dacus (Strumeta) dorsalis: Hardy, 1973: 41.

Dacus (Bactrocera) dorsalis: Hardy, 1977: 49.

Bactrocera (Bactrocera) dorsalis Drew, 1989: 63 (diagnosis of complex); Drew & Hancock, 1994: 17; Norrbom *et al*., 1999: 90; Alwood *et al*., 1999: 7.

Bactrocera dorsalis: Doorenweerd *et al*., 2018: 29.

Study material: Chi Phat, 6, 8.vi.2017, 1♂, 3♀ (V. Korneyev) (SIZK).

Distribution: Nepal, Bhutan, Myanmar, Thailand, Cambodia, Laos, Vietnam, Southern China (including Hong Kong and Taiwan). Introduced in Hawaii, Marianas (USA), eradicated from Ryukyu Islands (Japan) (Drew & Hancock, 1994). Records from India, Bangladesh and Sri Lanka are now included in *B. invadens* Drew, Tsuruta & White, 2005 (Drew & Romig, 2013, 2016).

Hosts: Fruit of 40 different families (for details, see Allwood *et al*., 1999).

***Bactrocera (Bactrocera) eurycosta* Drew & Romig, 2013**

Drew & Romig, 2013: 80; Leblanc *et al*., 2015: 599.

Bactrocera eurycosta: Doorenweerd *et al*., 2018: 29.

Distribution: Peninsular and East Malaysia, Brunei, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) fuscitibia* Drew & Hancock, 1994**

Drew & Romig, 2013: 88; Leblanc *et al*., 2015: 599.

Bactrocera eurycosta: Doorenweerd *et al*., 2018: 30.

Distribution: Peninsular and East Malaysia, Indonesia, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) kanchanaburi* Drew & Hancock, 1994**

Drew & Romig, 2013: 103; Leblanc *et al*., 2015: 599.

Bactrocera kanchanaburi: Doorenweerd *et al*., 2018: 31.

Distribution: Thailand (Drew & Hancock, 1994), Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Artabotrys siamensis* and *Goniothalamus gigantifolius* (Annonaceae) (Allwood *et al*., 1999).

***Bactrocera (Bactrocera) kohkongiae* Leblanc, 2015**

Leblanc *et al*., 2015: 593.

Bactrocera kohkongiae: Doorenweerd *et al*., 2018: 31.

Distribution: Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) laithieuiae* Drew & Romig, 2013**

Drew & Romig, 2013: 107; Leblanc *et al*., 2015: 599.

Bactrocera laithieuiae: Doorenweerd *et al*., 2018: 31.

Distribution: Vietnam, Thailand (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) latilineola* Drew & Hancock, 1994**

Drew & Romig, 2013: 109; Leblanc *et al*., 2015: 599.

Bactrocera latilineola: Doorenweerd *et al*., 2018: 32.

Distribution: Peninsular Malaysia (Drew & Hancock, 1994), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) limbifera* (Bezzi, 1919)**

Drew & Romig, 2013: 110; Leblanc *et al*., 2015: 599.

Bactrocera limbifera: Doorenweerd *et al*., 2018: 32.

Distribution: India (Andaman Islands), Philippines, Indonesia, East Malaysia, Brunei, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Dracontomelon dao* (Anacardiaceae), *Aglaia* sp. (Meliaceae) and *Sterculia* sp. (Sterculiaceae) (Allwood *et al*., 1999; Drew & Romig, 2013).

***Bactrocera (Bactrocera) nigrifacia* Zhang, Ji & Chen, 2011**

Bactrocera (Bactrocera) nigrifacia: Zhang *et al*., 2011: 605; Drew & Romig, 2013: 129; Leblanc *et al*., 2015: 599.

Bactrocera nigrifacia: Doorenweerd *et al*., 2018: 33.

Distribution: China (Yunnan), Thailand (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Callicarpa arborea* (Verbenaceae), *Capparis seblaria* (Capparidaceae), *Mellothria wallichii* (Cucurbitaceae), *Securinega virosa* (Euphorbiaceae) (Drew & Romig, 2013).

***Bactrocera (Bactrocera) nigrotibialis* (Perkins, 1938)**

Dacus (Strumeta) nigrotibialis: Hardy, 1973: 47;

Bactrocera (Bactrocera) nigrotibialis: Norrbom *et al*., 1999: 93; Drew & Romig, 2013: 129; Leblanc *et al*., 2015: 599.

Bactrocera nigrotibialis: Doorenweerd *et al*., 2018: 33.

Distribution: India, Sri Lanka, Thailand, Laos, Peninsular and East Malaysia, Brunei, Vietnam, Philippines, Indonesia (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Psidium guajava* and *Syzygium jambos* (Myrtaceae) (Drew & Romig, 2013). The record of *Ocimum* (Lamiaceae) is in error (D.L. Hancock pers. comm.).

***Bactrocera (Bactrocera) osbeckiae* Drew & Hancock, 1994**

Drew & Romig, 2013: 142; Leblanc *et al*., 2015: 599.

Bactrocera osbeckiae: Doorenweerd *et al*., 2018: 34.

Distribution: Thailand, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: Flowers of *Melastoma* spp. and *Osbeckia* (Melastomataceae) (Drew & Hancock, 1994).

***Bactrocera (Bactrocera) paraarecae* Drew & Romig, 2013**

Drew & Romig, 2013: 144; Leblanc *et al*., 2015: 599.

Bactrocera paraarecae: Doorenweerd *et al*., 2018: 34.

Distribution: Bhutan (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Bactrocera) propinqua* (Hardy & Adachi, 1954)**

Dacus (Strumeta) propinquus: Hardy, 1973: 50; 1977: 52.

Bactrocera (Bactrocera) propinqua: Drew & Hancock, 1994: 54; Norrbom *et al*., 1999: 94; Drew & Romig, 2013: 160.

Bactrocera propinqua: Doorenweerd *et al*., 2018: 35.

Distribution: Peninsular and East Malaysia, Cambodia, Singapore, Thailand, Vietnam (Drew & Romig, 2013).

Hosts: *Garcinia* spp. (Alwood *et al*., 1999), including *G. cowa* and *G. gummi-gutta* (L.) Roxb. (= *G. cambogia*). See Yong (1992) for notes on biology.

***Bactrocera (Bactrocera) thailandica* Drew & Hancock, 1994**

Drew & Romig, 2013: 182; Leblanc *et al*., 2015: 599.

Bactrocera thailandica: Doorenweerd *et al*., 2018: 37.

Distribution: Thailand, China (Yunnan), Bhutan, Brunei, Vietnam (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: *Elaeocarpus lancefolius* (Elaeocarpaceae) (Drew & Hancock, 1994).

***Bactrocera (Bactrocera) umbrosa* (Fabricius, 1805)**

Drew & Romig, 2013: 187; Leblanc *et al*., 2015: 599.

Bactrocera umbrosa: Doorenweerd *et al*., 2018: 38.

Distribution: Peninsular Malaysia and Philippines to Vanuatu and New Caledonia, Micronesia (Norrbom *et al*. 1999), Thailand, Christmas Island (Indian Ocean), Timor, (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

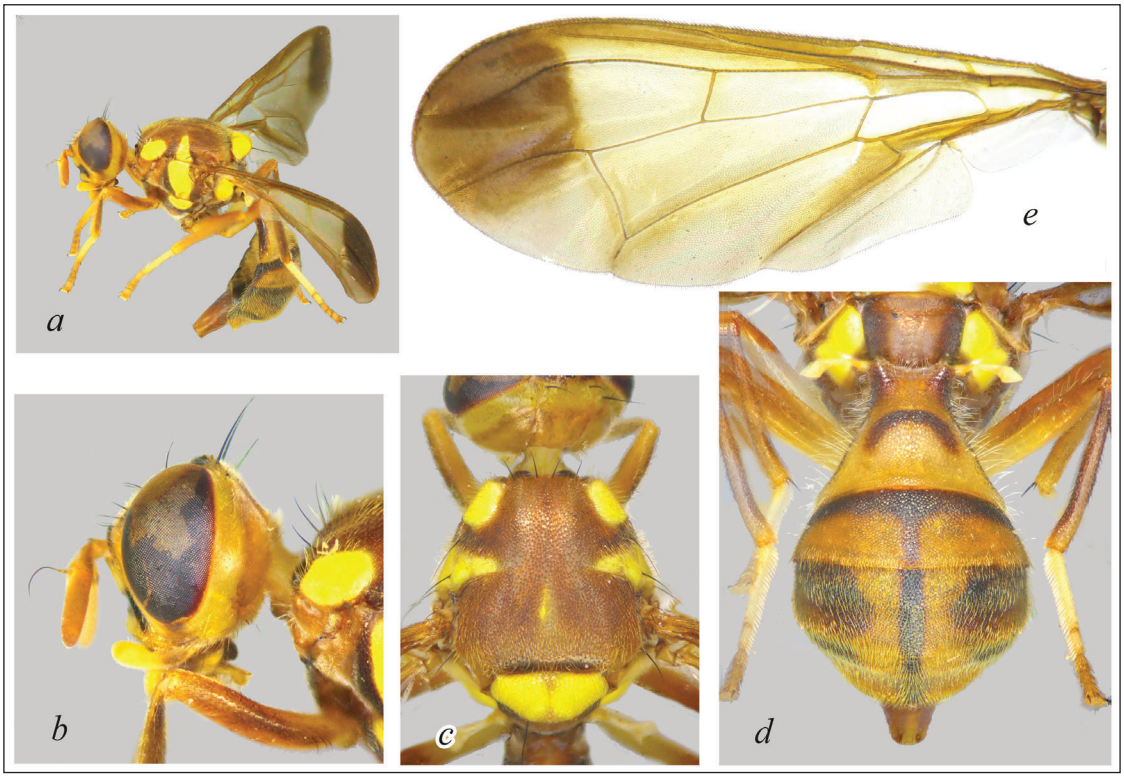

Fig. 2 *Bactrocera (Sinodacus) hochii* (Zia, 1936): A) Habitus (left), B) Head (left), C) Thorax (dorsal), D) Abdomen, E) Wing.

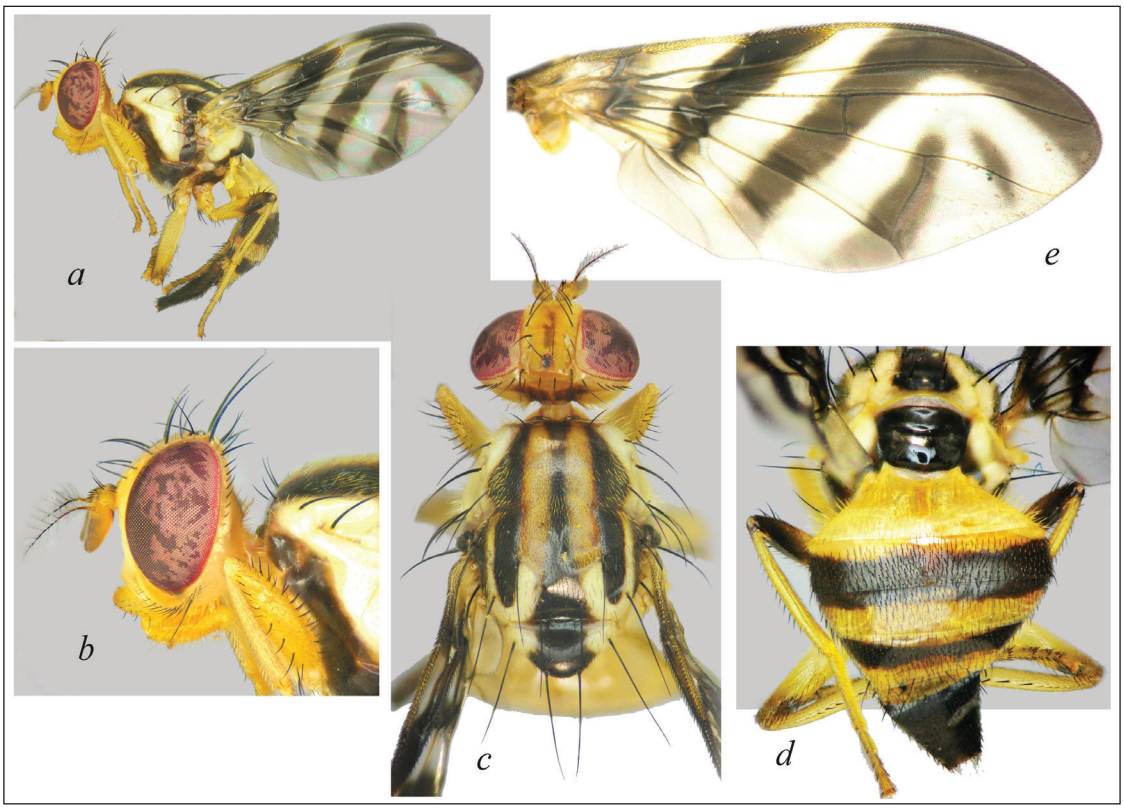

Fig. 3 *Gastrozona soror* (Schiner, 1868): A) Habitus (left), B) Head (left), C) Head and thorax (dorsal), D) Scutellum (posterior) and abdomen, E) Wing.

Hosts: *Artocarpus altilis*, *A. heterophyllus*, *A. incisa*, *A. integer* (Moraceae) (Allwood et al. 1999).

***Bactrocera (Bactrocera) usitata* Drew & Hancock, 1994**

Drew & Romig, 2013: 187; Leblanc *et al*., 2015: 598.

Bactrocera usitata: Doorenweerd *et al*., 2018: 38.

Distribution: Peninsular and East Malaysia, Singapore, Brunei, Indonesia (Kalimantan), Thailand, Vietnam, Philippines (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Javadacus) hatyaiensis* Drew & Romig, 2013**

Bactrocera (Zeugodacus) hatyaiensis Drew & Romig, 2013: 296; Leblanc *et al*., 2015: 599.

Bactrocera (Javadacus) hatyaiensis: Hancock & Drew, 2018b: 262.

Zeugodacus hatyaiensis: Doorenweerd *et al*., 2018: 46.

Distribution: Thailand (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

***Bactrocera (Javadacus) tau* (Walker, 1849)**

Dacus (Zeugodacus) tau: Hardy, 1973: 70.

Bactrocera (Zeugodacus) tau: White & Elson-Harris, 1992: 271; Norrbom *et al*., 1999: 104; Allwood *et al*., 1999: 22; Drew & Romig, 2013: 353.

Bactrocera (Javadacus) tau: Hancock & Drew, 2018b: 259.

Zeugodacus tau: Doorenweerd *et al*., 2018: 50.

Distribution: Cambodia (Hardy, 1973), Bhutan, Brunei, China (mainland and Taiwan), India, Indonesia (Java, Sulawesi, Sumatra), Laos, Peninsular and East Malaysia, Philippines, Sri Lanka, Thailand, Vietnam (White & Elson-Harris, 1992; Drew & Romig, 2013).

Hosts: Various Cucurbitaceae; for more detailed records see Allwood *et al*. (1999).

***Bactrocera (Parasinodacus) pseudocucurbitae* White, 1999**

Bactrocera (Bactrocera) pseudocucurbitae White & Evenhuis, 1999: 502.

Bactrocera (Parasinodacus) pseudocucurbitae: Drew & Romig, 2013: 234; Leblanc *et al*., 2015: 599.

Bactrocera pseudocucurbitae: Doorenweerd *et al*., 2018: 35.

Distribution: Thailand, Peninsular and East Malaysia, Indonesia (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2017).

***Bactrocera (Sinodacus) hochii* (Zia, 1936) (Fig. 2)**

Dacus (Pacifodacus) infestus Hardy, 1973: 22 (misidentification).

Bactrocera (Sinodacus) hochii: Norrbom *et al*., 1999: 100; Drew & Romig, 2013: 252; Hancock & Drew, 2018a: 191.

Zeugodacus hochii: Doorenweerd *et al*., 2018: 48.

Study material: Chi Phat, 3.vi.2017, 1♀ (V. Korneyev) (SIZK).

Distribution: Indonesia, Malaysia, Thailand, Laos, China and Vietnam (Hancock & Drew, 2018a), Cambodia (first record).

Hosts: Fruit of *Gymnopetalum cochinchinensis*, *Luffa aegyptiaca* and *Trichosanthes wawraei* (Cucurbitaceae) (Hancock & Drew, 2018a).

***Bactrocera (Zeugodacus) caudata* (Fabricius, 1805)**

Bactrocera (Zeugodacus) caudata: Norrbom *et al*., 1999: 102; Leblanc *et al*., 2015: 599; Hancock & Drew, 2018b: 262.

Zeugodacus caudatus: Doorenweerd *et al*., 2018: 46.

Distribution: India, Sri Lanka, Myanmar, Thailand, Vietnam, China (Hainan), Taiwan, Peninsular and East Malaysia, Brunei, Indonesia (Drew & Romig, 2013), Cambodia (Leblanc *et al*., 2015).

Hosts: Male flowers of *Cucurbita moschata* (Cucurbitaceae) (Drew & Romig, 2013).

Carpomya Costa, 1854

Medium-sized (3.5–5.0 mm) fruit flies with 3 frontal and 2 orbital setae, pale postocellar seta, variable shape of head, antenna and proboscis, usually brightly patterned, pale yellow to orange mesonotum with shiny black spots and grey microtrichose areas, long and strongly acute posterior lobe of surstylus of male, oviscape with T-shaped desclerotized posteromedial area ventrally, and aculeus either uniformly tapered apically or (in the subgenus *Goniglossum*) serrated. Third instar larva with a few (3–4) serrated oral ridges and stomal sensory organ with strong preoral teeth (Korneyev *et al*., 2017). Six species in Eurasia and one in Central America. Of these, two pest species occur in the Oriental Region: *C. pardalina* Bigot, 1891 in India and *C. vesuviana*. A key was provided by Korneyev *et al*. (2017).

***Carpomya vesuviana* Costa, 1854**

Carpomyia vesuviana: Hardy, 1973: 245.

Study material: Phnom Penh, 16.ii.2016, 1♀ (CEI).

Distribution: Palaearctic Region (Mediterranean), Oriental Region (Indian Subcontinent, Thailand) (Hardy, 1973; Norrbom *et al*., 1999), Cambodia (first record).

Hosts: Larvae in fruit of *Zizyphus jujuba*, *Z. nummularia* and *Z. sativa*.

Freyomyia Hardy, 1974

This genus belongs in the tribe Acanthonevrini of the subfamily Phytalmiinae (Korneyev, 1999). Hancock (2011) revised the concept and diagnosis of this genus and transferred the only Cambodian species here from *Rioxa* Walker. He also considered a record of "*Themara alkestis*"

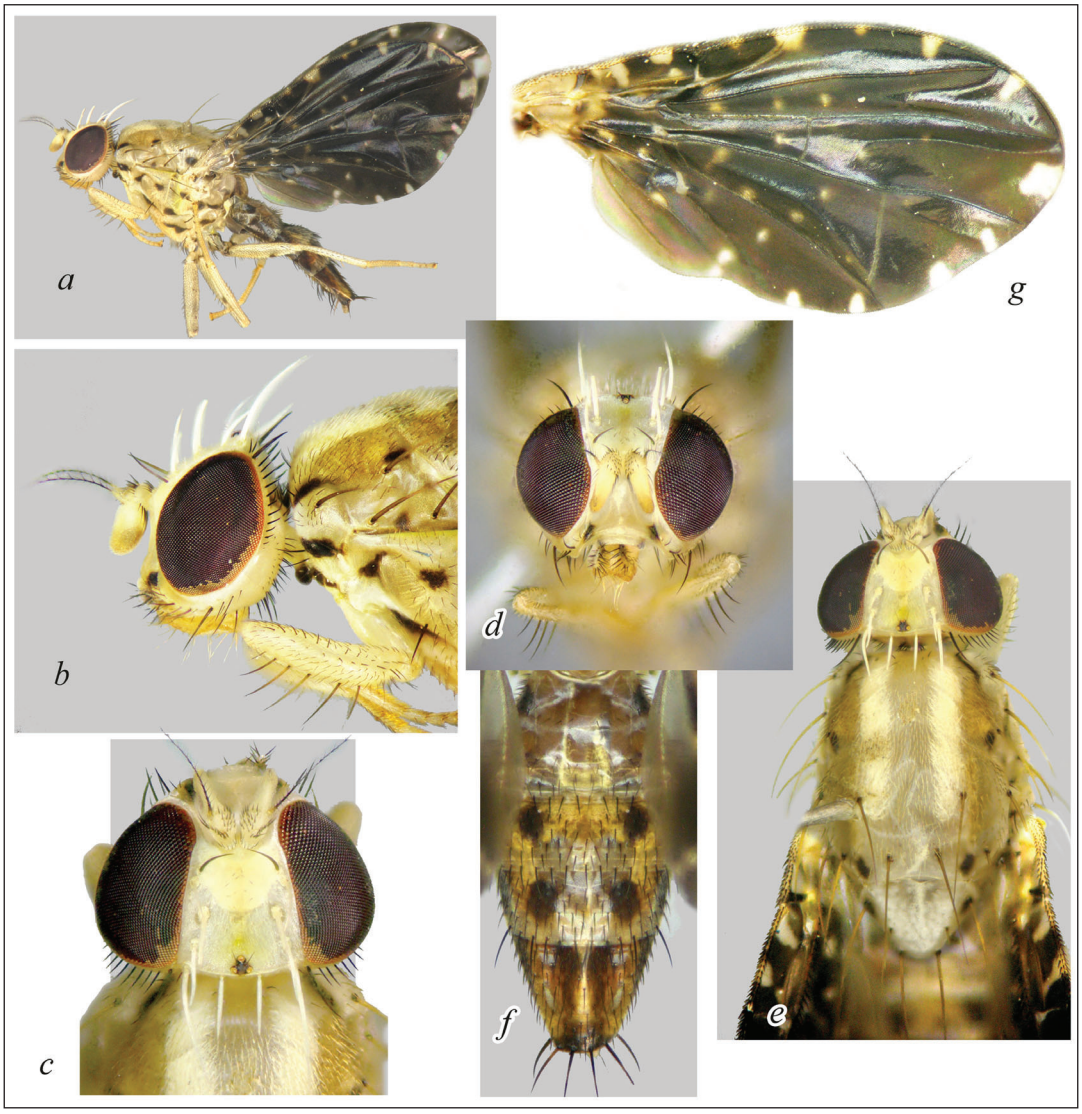

Fig. 4 *Hexacinia radiosa* (Rondani, 1868): A) Habitus (left), B) Head and thorax (left), C) Head (dorsal), D) Head and thorax (anterior), E) Scutellum (posterior, dorsal), F) Abdomen (dorsal), F) Wing.

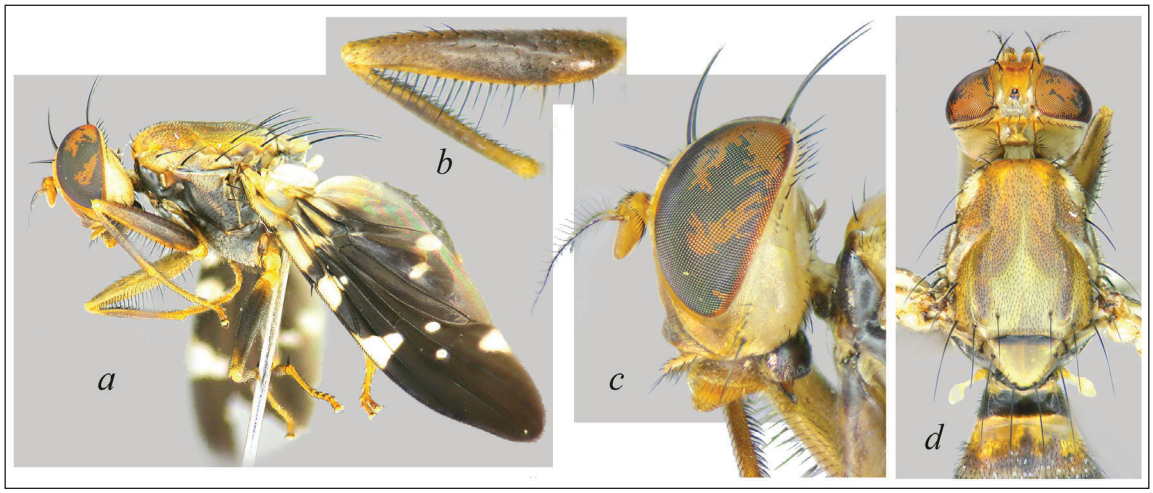

Fig. 5 *Ptilona confinis* (Walker, 1856): A) Habitus (left), B) Fore leg (posterior), C) Head (left), D) Head and thorax (dorsal).

from Kirirom National Park (Hardy, 1973) to be a misidentification of the female of this species. According to Hancock (2011: 116), wing with veins R1 and R2+3 often distinctly bowed and either with the pterostigma large, with 2 triangular hyaline indentations, or with vein R2+3 undulate and wing apex subhyaline; crossvein r-m at distal quarter of cell dm; distal hyaline indentation from costa directed towards apex of cell br and other details of wing pattern; only 2 pairs of scutellar setae (intermediate seta lacking); head rather wide, at least in males; male fore femur and tibia not densely setose ventrally.

***Freyomyia vinnula* (Hardy, 1973)**

Rioxa vinnula Hardy, 1973: 111 (♂).

Freyomyia vinnula: Hancock, 2011: 114; 117.

Themara n.sp. rel. to *alkestis*: Hardy, 1973: 112 (misidentification, ♀); Hancock, 2011: 117.

Biology: Unknown. Larvae possibly saprophagous in fallen trees or bamboo stems, similar to other Acanthonevrini.

Gastrozona Bezzi, 1913

This is the type genus of the tribe Gastrozonini (Dacinae), with nine species (Hancock & Drew, 1999; David & Hancock, 2017).

Hancock & Drew (1999) defined *Gastrozona* as having the head higher than long, with 3–5 pairs of frontal setae; third antennal segment apically rounded, arista plumose; postpronotal lobes yellow; mid tibia with 1 ventroapical thickened seta; wing with oblique brown band crossing through r-m crossvein, separated from pterostigma by a hyaline band or indentation, cell bc hyaline, band across dm-cu crossvein connected with subapical or apical brown markings; scutum black or with 2–3 black vittae, but without black spots except adjacent to scutellum; aculeus elongate, with cercal unit flattened, bearing 2 pairs of steps, long setose; 2 oblong spermathecae.

According to Dohm *et al*. (2014), some *Gastrozona* larvae feed in dead bamboo shoots lying on the ground "on the softer material of the shoot tip, where they were found in large accumulations, turning the substrate into liquid sludge." Adults are often attracted to freshly cut young bamboo shoots. Hancock & Drew (1999) and David & Hancock (2017) provided keys to species.

***Gastrozona soror* (Schiner, 1868) (Fig. 3.)**

Hardy, 1973: 195; 1988: 99; Norrbom *et al.*, 1999: 154; Hancock & Drew, 1999: 732; David & Hancock, 2017: 62.

Study material: Chi Phat, on cut young bamboo shoot, 5, 7, 8.vi.2017, 5♀ (V. Korneyev) (SIZK; CEI).

Distribution: Northeast India, Thailand, Indonesia (Java) (Hancock & Drew, 1999), Bangladesh (Khan *et al*., 2017), Cambodia (first record).

Hosts: Larvae in shoots of *Bambusa* sp. and *Dendrocalamus asper* (Allwood *et al*., 1999).

Hexacinia Hendel, 1914

Another genus of the Phytalmiinae Acanthonevrini (Korneyev, 1999). This genus can be easily recognized by the combination of very wide and dark brown, often metallic blue, disc-shaped wing (2× as long as wide) with numerous paler spots, mainly creamy white body with sparse black pattern; head with 2 pairs of frontal setae at anterior margin, the anterior seta inclinate and posterior one reclinate, often white, as orbital and vertical setae; scutellum with 3 pairs of setae; anepisternum with additional seta at the middle of ventral margin; aculeus poorly sclerotized, with separate, long setose and blunt cercal unit. Hancock (2014) discussed the genus and provided a key to the three species included. Biology is unknown, though apparently saprophagous, as are most Acanthonevrini.

***Hexacinia radiosa* (Rondani, 1868) (Fig. 4)**

Hardy, 1973: 104; 1986: 41; Norrbom *et al*., 1999: 159; Hancock, 2014: 49.

Study material: Chi Phat, attracted to faeces, 5, 8, 10, 11.vi.2017, 4 ♂ (V. Korneyev) (SIZK; CEI).

Distribution: India, Sri Lanka, Myanmar, Thailand, South China (Yunnan), Vietnam, Peninsular Malaysia, Philippines, Brunei, Indonesia (Sumatra) (Hardy, 1973; 1986; Hancock, 2014), Cambodia (first record).

Metasphenisca Hendel, 1914

A genus of the tribe Tephrellini (Tephritinae) with nearly 30 species in Afrotropical and Oriental Regions. Adults can be recognized by the combination of shining black thorax and abdomen, dark brown wing with 2 hyaline indentations from at anterior and 3 at posterior margin of wing, bowed costa and dark band along costal cell, short pterostigma, 3 frontal, 2 orbital, and 2 pairs of scutellar setae. Larvae feed in flowers and seeds of Acanthaceae (*Blepharis* etc.) (Hancock, 1991, 2010).

***Metasphenisca reinhardi* (Wiedemann, 1824)**

Isoconia reinhardi Hardy, 1973: 313.

Metasphenisca reinhardi: Hancock, 1991: 45; Norrbom *et al*., 1999: 159; Hancock & McGuire, 2002: 9; Hancock, 2010: 2.

Distribution: Myanmar, Thailand, Cambodia (Hardy, 1973), Sri Lanka, India, Bangladesh (Hardy, 1977). The East African record is a misidentification.

Fig. 6 *Taeniostola vittigera* Bezzi, 1913: A) Habitus (left), B) Head and thorax (left), C) Same (dorsal), D) Abdomen (dorsal), E) Wing.

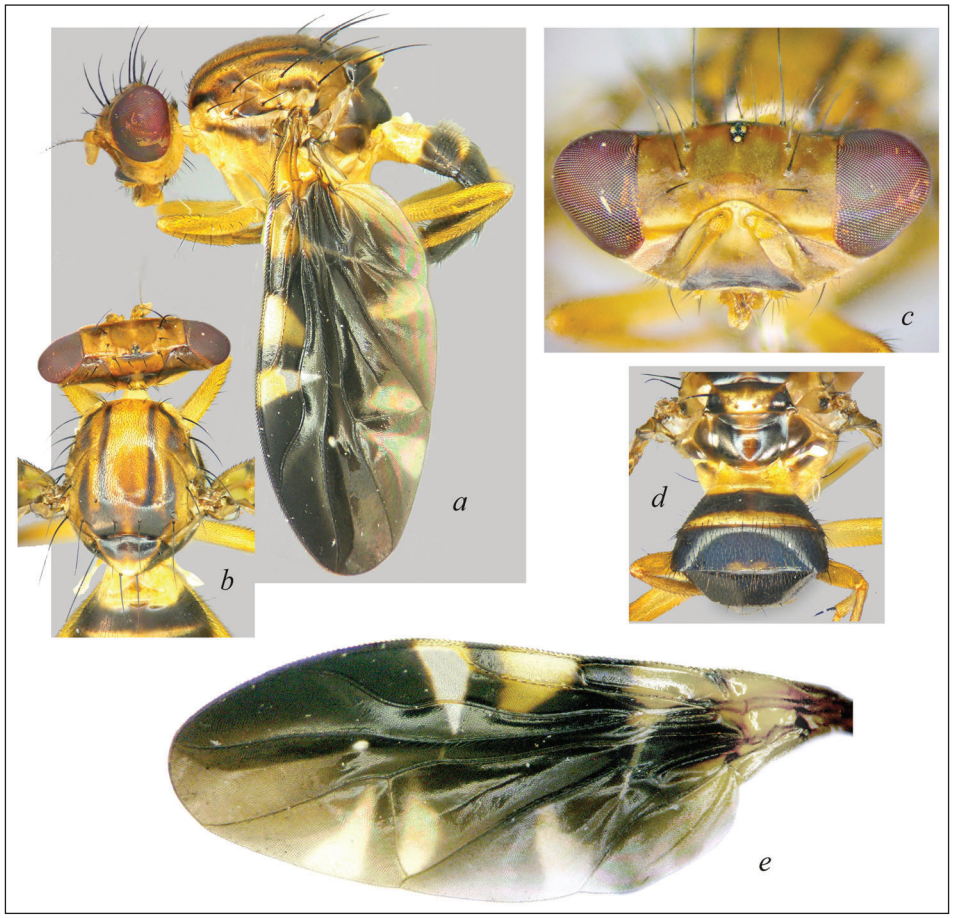

Fig. 7 *Themara yunnana* Zia, 1963: A) Habitus (left), B) Head and thorax (dorsal), C) Head (anterior), D) Scutellum (posterior) and abdomen, E) Wing.

Hosts: Unknown.

Platensina Enderlein, 1911

A genus of the tribe Dithrycini (Tephritinae) with 21 species in the Oriental and Australasian Regions (Afrotropical species assigned to this genus belong elsewhere). Adults can be recognized by the combination of subshining brown thorax and shining brown or black abdomen, dark brown, usually wide wing with numerous isolated hyaline dots, bowed costa and dark band along costal cell, short pterostigma, 3 frontal, 2 orbital, and 1–2 pairs of scutellar setae. Larvae are associated with Onagraceae (Hancock, 2012). Hancock (2012) provided a key to species.

***Platensina acrostacta* (Wiedemann, 1824)**

Hardy, 1973: 301; 1977: 119; Hancock & McGuire, 2002: 9; Hancock, 2012: 306.

Distribution: India, Bangladesh, Sri Lanka, Myanmar, China (Yunnan), Thailand, Cambodia (Hancock, 2012).

Hosts: Larvae induce galls on *Ludwigia* (= *Jussiaea*) (Onagraceae) in India (Hardy, 1973).

***Platensina intacta* Hardy, 1973**

Hardy, 1973: 305; 1977: 120; Hancock & McGuire, 2002: 9.

Distribution: Thailand, Cambodia, Vietnam (Hardy, 1973).

***Platensina quadrula* Hardy, 1973**

Hardy, 1973: 307.

Distribution: India, Thailand, Cambodia, Vietnam (Hardy, 1973; Hancock, 2012).

***Platensina zodiacalis* (Bezzi, 1913)**

Tephritis zodiacalis Bezzi, 1913: 163.

Platensina zodiacalis: Hardy, 1973: 309; 1977: 120; 1988: 49; Hancock & McGuire, 2002: 10; Hancock, 2012: 309.

Distribution: India, Sri Lanka, Nepal, Bangladesh, Myanmar, Thailand, Malaysia, Singapore, China, Laos, Cambodia, Philippines, Indonesia, Australia (Hancock, 2012).

Ptilona Wulp, 1880

This genus belongs in the tribe Acanthonevrini of the subfamily Phytalmiinae (Korneyev, 1999) with eight species occurring in the Oriental Region. According to Hancock (2011: 117), *Ptilona* can be recognized by the pleurotergite with fine, erect hairs, vein R2+3 straight, base of pterostigma with hyaline indentation usually extending to vein R4+5, only 2 pairs of scutellar setae (intermediate pair lacking), 1 or seta, and male fore femur and tibia densely setose ventrally. Larvae saprophagous, often semiaquatic in dead bamboo culms: internode cavities, under remains of sheaths, in cracks of bamboo wall, near insect holes (Dohm *et al*., 2014).

***Ptilona confinis* (Walker, 1856) (Fig. 5.)**

Hardy, 1973: 161, 1983: 200; Norrbom *et al*., 1999: Hancock, 2011: 117.

Study material: Chi Phat, 5.vi.2017, 1♂ (V. Korneyev) (SIZK).

Distribution: Northeast India, South China (mainland and Taiwan), Philippines, Bangladesh, Burma, Thailand, Laos, Vietnam, Malaysia (Peninsular and, Sarawak), Brunei, Indonesia (Java, Kalimantan, Sulawesi and Ambon), Cambodia (first record).

***Ptilona conformis* Zia, 1965**

Hancock, 2011: 117.

Study material: Chi Phat, 3.vi.2017, 1♂ (V. Korneyev) (SIZK).

Distribution: Southern China (Yunnan), Thailand, Laos, West Malaysia, Brunei and Cambodia (first record).

Sphaeniscus Becker, 1908

A genus of the tribe Tephrellini (Tephritinae) with eight species in the Oriental, Palaearctic and Afrotropical Regions. It can be recognized by the combination of head with 3 frontal, 2 orbital, and black postocular setae, 2 pairs of scutellar setae, entirely black mesonotum and shining black abdomen, and especially by the black-crossbanded wing. Larvae apparently in the flowers of Lamiaceae.

***Sphaeniscus atilius* (Walker, 1849)**

Hardy, 1973: 120; 1987: 259; Hancock & McGuire, 2002: 9.

Distribution: India to eastern Russia, China, Korea, Japan (Norrbom *et al*., 1999), widespread over Oriental, Australasian and Oceanian regions (Hardy, 1987), including Cambodia (Hardy, 1973).

Taeniostola Bezzi, 1913

A genus of the tribe Gastrozonini (Dacinae), with two species (Hancock & Drew, 1999; Kovac *et al*., 2006).

Hancock & Drew (1999) defined *Taeniostola* as having head higher than long, face projecting at ventral margin, antenna with flagellomere 1 apically rounded, arista plumose; 2-3 frontal and strong ocellar setae; mid tibia with 1 strong ventroapical seta; postpronotal lobes yellow; scutum with or without black vittae but without black spots except posteriorly adjacent to scutellum, wing with brown transverse bands parallel, that through dm-cu crossvein; male without anal papillae; aculeus with cercal unit blunt, long setose; 2 oval spermathecae.

According to Dohm *et al*. (2014), *Taeniostola* adults were "reared from larvae found in felled shoots lying on the ground." Adults are attracted to freshly cut young bamboo shoots. Hancock & Drew (1999) provided a key to species.

***Taeniostola vittigera* Bezzi, 1913 (Fig. 6)**

Hancock & Drew, 1999: 761 (synonymy); Kovac *et al*., 2006: 191 (catalogue).

Taeniostola apicata: Hardy, 1973: 210; 1988: 117; Norrbom *et al*., 1999: 212.

Study material: Chi Phat, on cut young bamboo shoot, 6, 7, 9.vi.2017, 6♂, 1♀ (V. Korneyev) (SIZK; CEI).

Distribution: China (Taiwan, Yunnan), India (Assam), Myanmar, Thailand, Laos, Malaysia (Peninsular, Sarawak, Sabah), Indonesia (Borneo), Cambodia (first record).

***Themara* Walker, 1856**

This genus belongs in the tribe Acanthonevrini of the subfamily Phytalmiinae (Korneyev, 1999) with 10 species in the Oriental Region (Hancock, 2011, 2013; Hancock & Whitmore, 2014). According to Hancock (2011: 112), *Themara* can be recognized by the pleurotergite bare, wing vein R2+3 undulate, veins M normally and Cu1, including basal portion always setulose dorsally; males usually with head broadened or eyes distinctly stalked; 3 pairs of scutellar setae (intermediate pair short but present), arista plumose, 1 frontal and 2 orbital setae, and male foreleg not densely setose ventrally. Larvae saprophagous in rotting wood (Hancock, 2013). For key, see Hancock (2011).

***Themara yunnana* Zia, 1963 (Fig. 7)**

Hancock, 2011: 115 (key, revised concept).

Study material: Chi Phat, 9.vi.2017, 1♂ (V. Korneyev) (SIZK).

Distribution: China (Yunnan), India (Hancock, 2011), Cambodia (first record).

Discussion

Research on the fruit flies of Cambodia is in its infancy and the country's fauna remains poorly known. For instance, at least 140 species are known from neighbouring Thailand (Norrbom, 2004), whereas the number of species in continental Southeast Asia exceeds 210 (Hardy, 1973). Over the course of two short collecting trips in the last 10 years, the number of species recorded in Cambodia increased from 10 to 44 as a result of collections mostly made in easily reached and unprotected areas. We estimate that Cambodia supports approximately 110–120 species of Tephritidae, and anticipate that the current species list will continue to grow as further studies are undertaken.

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