

# **Integrative taxonomy of the Singapore Mycetophilidae (Diptera: Bibionomorpha): sequencing, imaging, description and species delimitation**

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## **Abstract.**

Delimiting species with multiple data sources is the gold standard in taxonomy, but it is challenging for “dark taxa”; i.e., high-diversity clades characterized by large numbers of specimens and unknown species. We here argue that these problems can be overcome by carrying out taxonomic revisions at restricted geographic scales. We discuss and document the validity of the approach by revising Singapore’s fungus gnats (Mycetophilidae) based on 3,032 specimens, which yielded 137 – 163 putative species, ultimately rendering 120 species and one new genus. The revision went through five-phases. During the first phase – collecting – we obtained the specimens from 107 collecting sites across 941 Malaise trap samples from mangroves, swamp forests, freshwater swamps, primary rainforests, and different secondary forests (old, maturing, young, urban) over >4 years. During the second phase – molecular – we used fast and low-cost NGS barcoding based on Illumina (313bp) to obtain barcodes for these specimens. The barcode data were then analyzed with multiple species delimitation algorithms (PTP, mPTP, OC 2–5%, ABGD  $P=0.001$ ,  $P=0.01$ ,  $P=0.04$ ) that grouped the specimens into 137 – 163 putative species. This was followed by the use of genome skimming and multiplexed tagged amplicon sequencing to obtain mitochondrial and 28S rDNA markers for species-level phylogenetic reconstruction. During the third phase – morphology – congruence between morphology and barcode clusters was assessed for ~40% of these specimens that represent ~80% of the total species, with actual reciprocal illumination between both sources of data. We found that the clusters obtained with 4% “Objective Clustering” had the highest congruence (95%) and mPTP the lowest congruence (63.5%) with morphological evidence. All data were then used in the fourth phase – integrative taxonomy – to describe new species and identify specimens of previously been described. A total of 15 species for which we could not establish a morphological diagnosis were described, but not named. Overall, the revision increases the number

of described Oriental species of Mycetophilidae by 27% (ca. 450 to >570), confirming that fungus gnats are a dark taxon given that the species diversity **in the region itself** exceeds 1000 species and the proportion of known species is likely <10%. Much of the diversity of the family in Singapore (~61%) belongs to three of the 21 genera with Singaporean species: *Manota* Williston (14 species), *Neoempheria* Osten-Sacken (31 species) and *Epicypta* Winnertz (29 species). **Overall, there is evidence to support the contention that the true mycetophilid diversity in Singapore exceeds 150 species.** Firstly, 18.3% and 31.6% of all species are only known from one or two specimens respectively. Secondly, we have evidence based on only one data source (DNA or morphology) for an additional **21 – 47** species. Thirdly, not all relevant habitats have been sampled. Lastly, we discuss how to further increase the efficiency of our five-phase revision approach and urge taxonomists to inform the public about new discoveries by placing images for all new species on online portals such as “Biodiversity of Singapore” (<https://singapore.biodiversity.online>). The 120 species in 22 genera (one new) correspond to: four known species, 101 new species described, imaged and formally named, and 15 species known only from females that are described and imaged but not named—**Sciophilinae:** *Leptomorphus rafflesii*, sp.nov.; *Monoclonia simhapura*, sp.nov.; *Azana demeijeri*, sp.nov.; *Azana leekongchiani*, sp.nov. **Tetragoneurinae:** *Tetragoneura crawfurdi*, sp.nov.; *Tetragoneura chola*, sp.nov.; *Tetragoneura dayuan*, sp.nov.; *Tetragoneura farquhari*, sp.nov.; *Ectrepesthoneura johor*, sp.nov. **Leiinae:** *Mohelia zubirsaidi*, sp.nov.; *Allactoneura tumasik*, sp.nov.; *Allactoneura limbosengi*, sp.nov.; *Eumanota racola* Søli; *Manota banzu*, sp.nov.; *Manota tantocksengi*, sp.nov.; *Manota bukittimah*, sp.nov.; *Manota chiamassie*, sp.nov.; *Manota danmaxi*, sp.nov.; *Manota mahuan*, sp.nov.; *Manota temenggong*, sp.nov.; *Manota* sp. A; *Manota* sp. B; *Manota* sp. C; *Manota* sp. D; *Manota* sp. E; *Manota* sp. F; *Manota* sp. G; *Clastobasis sritribuana*, sp.nov.; *Clastobasis bugis*, sp.nov.; *Clastobasis oranglaut*, sp.nov. **Gnoristinae:** *Chalastonepsia* sp.; *Metanepsia malaysiana* Kallweit; **Mycomyinae:** *Parempheriella defectiva* Edwards; *Parempheriella mait*, sp.nov.; *Parempheriella longyamen*, sp.nov.; *Parempheriella peranakan*, sp.nov.; *Neoempheria dizonalis* Edwards; *Neoempheria sachmatich*, sp.nov.; *Neoempheria merlio*, sp.nov.; *Neoempheria sabana*, sp.nov.; *Neoempheria sangabo*, sp.nov.; *Neoempheria shicheng*, sp.nov.; *Neoempheria ujong*, sp.nov.; *Neoempheria subaraji*, sp.nov.; *Neoempheria kokoiyeeae*, sp.nov.; *Neoempheria mandai*, sp.nov.; *Neoempheria malacca*, sp.nov.; *Neoempheria sinkapho*, sp.nov.; *Neoempheria singapura*, sp.nov.; *Neoempheria xinjiapo*, sp.nov.; *Neoempheria chantek*, sp.nov.; *Neoempheria puluochung*, sp.nov.; *Neoempheria merdeka*, sp.nov.; *Neoempheria neesoon*, sp.nov.; *Neoempheria pulau*, sp.nov.; *Neoempheria cinkappur*, sp.nov.; *Neoempheria temasek*, sp.nov.; *Neoempheria polunini*, sp.nov.; *Neoempheria fajar*, sp.nov.; *Neoempheria riatanae*, sp.nov.; *Neoempheria* sp. A; *Neoempheria* sp. B; *Neoempheria* sp. C; *Neoempheria* sp. D; *Neoempheria* sp. E; *Neoempheria* sp. F; *Neoempheria* sp. G.

**Mycetophilinae:** *Allodia glorialimae*, sp.nov.; *Allodia murphyi*, sp.nov.; *Allodia limitzepengi*, sp.nov.; *Allodia teopohlengi*, sp.nov.; *Exechia tanswiehiani*, sp.nov.; *Exechia yangchangmanae*, sp.nov.; *Mycetophila chngseoktinae*, sp.nov.; *Mycetophila chaenae*, sp.nov.; *Mycetophila aishaae*, sp.nov.; *Platyprosthiogyne phanwaithongae*, sp.nov.; *Platyprosthiogyne gohsookhima*, sp.nov.; *Platyprosthiogyne rahimahae*, sp.nov.; *Platyprosthiogyne lynetteseahae*, sp.nov.; *Platyprosthiogyne neilaae*, sp.nov.; *Platyprosthiogyne snehalethaae*, sp.nov.; *Platurocypta adeleneweeae*, sp.nov.; *Platurocypta tanhoweliangi*, sp.nov.; *Epicypta constancesingamae*, sp.nov.; *Epicypta jennylauae*, sp.nov.; *Epicypta limchiumeiae*, sp.nov.; *Epicypta janetyeeae*, sp.nov.; *Epicypta kohkhenglianae*, sp.nov.; *Epicypta daintoni*, sp.nov.; *Epicypta holltumi*, sp.nov.; *Epicypta alii*, sp.nov.; *Epicypta ridleyi*, sp.nov.; *Epicypta chezaharaae*, sp.nov.; *Epicypta tanjiakkimi*, sp.nov.; *Epicypta gehmina*, sp.nov.; *Epicypta jackieyingae*, sp.nov.; *Epicypta khatijunae*, sp.nov.; *Epicypta purchoni*, sp.nov.; *Epicypta foomaosheng*, sp.nov.; *Epicypta ganengsengi*, sp.nov.; *Epicypta leechooneoae*, sp.nov.; *Epicypta nanyangu*, sp.nov.; *Epicypta nus*, sp.nov.; *Epicypta peterngi*, sp.nov.; *Epicypta maggielimae*, sp.nov.; *Epicypta yupeigaoae*, sp.nov.; *Epicypta annwee*, sp.nov.; *Epicypta wallacei*, sp.nov.; *Epicypta lamtoongjini*, sp.nov.; *Epicypta catherinelimae*, sp.nov.; *Epicypta grootaerti*, sp.nov.; *Epicypta joaquimae*, sp.nov.; *Aspidionia cheesweeleeae*, sp.nov.; *Aspidionia janetjesudasonae*, sp.nov.; *Aspidionia fatimahae*, sp.nov.; *Integricypta fergusondavie*, sp.nov.; *Integricypta teosoonkimae*, sp.nov.; *Integricypta shirinae*, sp.nov.; *Integricypta hoyuenhoeae*, sp.nov. A total of 26 additional species had material sequenced and recognized. For different reasons they are not formally described and named here but provide information on the actual size of the Singapore fauna of the family: in the Sciophilinae, one species of *Azana*; in the Tetragoneurinae, one species of *Tetragoneura*; in the Leiinae, one species of *Eumanota* and three species of *Manota*; in the Mycomyiinae, five species of *Neoempheria*; in the Mycetophilinae, two species of *Allodia*, one species of *Exechia*, one species of *Platyprosthiogyne*, one species of *Platurocypta* and ten species of *Epicypta*.

**Key words:** Mycetophilidae, Integrative Taxonomy, Reverse Taxonomic Workflow, Oriental Insect Fauna, NGS barcodes

## Introduction

Biodiversity assessment and monitoring are among the biggest and most urgent challenges of modern biology given that many natural environments are disappearing fast and biodiversity loss is destabilizing whole ecosystems. However, due to taxonomic impediments (e.g., Quentin et al., 2004; Evenhuis, 2007; de Carvalho et al. 2007), regular biodiversity assessments are difficult to carry out for many invertebrate clades. Such impediments are particularly severe in many tropical

countries and for taxa that are characterized by high species diversity and specimen abundance. It is here that the preferred approaches to taxonomy fail because they work best for taxa that contain few species, are not particularly abundant, and/or have specimens that yield taxonomically important information without time-consuming procedures (e.g., genitalia preparations, slide-mounts). If these three conditions are satisfied, taxonomist can be “completists”; i.e., they can revise entire clades at geographic scales that are aligned to the distribution of the targeted clade (e.g. global, biogeographic region). Such completist revisions cover most/all specimens and can be updated through individual species descriptions whenever new species are discovered.

Over the last 250 years, this approach to taxonomy led to the descriptions of supposedly 10-20% of all existing Metazoan species. However, it has also led to the neglect of those taxa that are particularly species rich and abundant. This is undesirable, because they likely contain most metazoan species and a large proportion of biomass and functional diversity. For example, a recent study barcoded 7059 specimens of phorid flies collected by one Malaise trap over the short period of 8 weeks in a Ugandan National Park and found evidence for >650 species with the site species richness likely exceeding 1000 species (Srivathsan et al. 2019). Yet, only 462 phorid species have been described for the entire Afrotropical region (Phorid Catalog, 2021). Similarly, the diversity of the family Cecidomyiidae has been estimated to be 800+ species in a single-site of Costa Rica (Brown et al., 2018, Borkent et al., 2018) and close to 8,500 species for Canada although only about 100 species are described (Herbert et al. 2016). Clearly, new solutions for tackling the taxonomy of such hyperdiverse taxa are needed.

Hyperdiverse and abundant taxa are sometimes called “open-ended” to indicate that they will frustrate attempts at carrying out completist taxonomic revisions. An alternative term is “dark taxa” which is nowadays more commonly used although it was initially introduced for taxa only known from DNA barcodes (Page 2011, 2016). Hartop et al. (2021) proposed that only those clades should be called “dark taxa” for which supposedly <10% of the fauna has been described and the total diversity is estimated to exceed 1,000 species worldwide. Such taxa cannot be tackled realistically using the completist paradigm. Instead, they require alternative approaches that involve compromises. This means that none of the approaches are ideal but arguably all are preferable to the current paradigm of widespread neglect. The compromises include (1) restricting the geographic scope of a revision to an area small enough that most/all available specimens can be covered, but too small that full ranges of most species are covered, (2) studying only some of the available specimens, (3) limiting the amount of time spent on each specimens, and/or (4) limiting the amount of morphological information to what is needed for identification, not an exhaustive description or to what would be needed to infer intrageneric relationships.

We here mostly pursue the first approach, by limiting the geographic scope of our revision to Singapore, and largely follow the fourth point. The main advantage is that “only” 3,032 specimens for >120 species had to be covered. Furthermore, the results were immediately valuable for monitoring the biodiversity of these fungus-dependent species, in a country that has lost much of its natural vegetation and where the remaining forests are likely to depend on fungal diversity. The main disadvantage of restricting the geographic scope is sparse species- and intraspecific sampling. In other words, a study with a wider geographic scope may later find that what looked like discontinuous variation in Singapore (=multiple species) was really continuous variation when more populations are sampled (=one species). This was largely avoided with a careful construction of morphological diagnoses, especially, when possible, of male terminalia features, in which clear, separate patterns can be recognized. In particular, we would argue that different character systems should evolve under different selection regimes and, while revising the fauna of small areas, using different sources of data for species delimitation would make it less likely to be misled by the evidence from a single signal. One combination of data that satisfy this criterion is DNA barcodes and morphology. Among closely related lineages, COI sequences mostly vary with regard to synonymous mutations; i.e., this signal likely evolves via neutral evolution and thus mostly reflects time of divergence. Changes in morphological features, however, are much more likely reflect natural/sexual selection.

A second downside of carrying out revisions at limited geographic scale is the need to regularly combine information from multiple regional treatments from the same biogeographic region. Combining DNA data is straightforward and automatically accomplished by DNA databases as long as the data are submitted. This makes DNA barcodes an attractive tool, but unfortunately a significant proportion of all species lack species-specific barcodes. Furthermore, the problem is likely to increase in the future because the current barcode databases severely undersample the genetic diversity of most clades. Such undersampling leads to an overestimate of the size of barcoding gaps, thus pushing an overconfidence in the results obtained by the present limited knowledge of barcode diversity. We would thus suggest that barcodes should only be used to provide preliminary grouping hypotheses that then require testing with other data. This would be daunting if hundreds of clusters would have to be studied by obtaining data from thousands of specimens. However, this may not be needed: Hartop et al. (2021) recently showed that there may be quantitative ways to predict which species hypotheses based on barcodes are most likely to be incorrect. It is still necessary to test whether these techniques can be more widely used and this is what is done here for the Singaporean diversity of Mycetophilidae. If such techniques could be used more widely, one could forego a further testing of those hypotheses based on barcodes that are very

likely to be correct and devote all attention to those which are more likely to require careful revision.

Regardless of these problems, there are few scientists who doubt the value of DNA barcodes for taxonomic purposes and the ongoing debate (see also [XXXX](#)) is mostly about the degree to which barcodes should be used. Three recent developments have the potential to boost the use of DNA barcodes for taxonomic work on dark taxa. The first is the widespread use of Malaise traps for monitoring insect populations in many countries. Most specimens in Malaise trap samples belong to dark taxa and are so fresh that they contain high-quality DNA. This greatly facilitates mass-barcoding. The second is the dramatically lowered cost and technical sophistication needed for obtaining barcodes. Slow and costly DNA extraction has been replaced with quick and almost free “DNA leaching” with alkaline buffers. Amplicons are now obtained with tagged primers and thousands can be processed and sequenced simultaneously with 2<sup>nd</sup> and 3<sup>rd</sup> generation sequencing technologies. PCR cost per amplicon can be as low as 5 cents per specimen and sequencing with Illumina’s NovaSeq costs only 1-2 cents/barcode. Furthermore, a self-contained barcoding lab covering all steps from specimens to barcodes can now be installed for <USD 10,000. Such labs utilize Oxford Nanopore Technologies sequencers (e.g., MinION), which, however, raises the sequencing cost for DNA barcodes to ca. 10 cents per specimens. This means that the consumable cost for barcoding the ~3,000 specimens in our study would today range from USD 150 to USD 375. The third development is the introduction of robotic specimen handling. Although still in the experimental stage, it promises to be particularly suitable for taxa given that they are characterized by high specimen abundance and small specimen size. The latter facilitates specimen movement with suction devices. The application of machine learning furthermore means that specimens representing specific taxa can be picked from a mass sample.

Overall, we therefore believe that barcodes will be widely used for pre-sorting specimens belonging to dark taxa into putative species. Barcoding all/most specimens as the first step of species delimitation was first proposed by Puillandre et al. (2012), but at that time the cost of barcodes remained prohibitively high. This only changed recently, which led Wang et al. (2019) to propose a “reverse workflow” for taxonomic purpose. This reverse workflow starts with the fast and cost-effective barcoding all specimens and is then followed by a thorough analysis of the barcode data and further testing of barcode clusters with morphology. This is the approach adopted in our study of the fauna of mycetophilids in Singapore.

## Singapore Mangrove Insect Project

This study is part of a larger project to study the Singaporean fauna of insects using Malaise traps projects—the Singapore Mangrove Insect Project—and an inverted protocol: specimens are

first sequenced for minibarcode [Wang et al. 2019, Yeo et al. 2021], then physically brought together based on nearest-neighbor clusters, imaged, checked for conspecificity based on morphology and then described. This paper is an effort of a diversified team of researchers to use this protocol to develop an integrative study the fauna of one of the large families of flies, the Mycetophilidae fungus-gnats.

## Fungus-gnats and Mycetophilidae diversity

The most recent classification system for the Mycetophilidae includes six subfamilies, Sciophilinae, Gnoristinae, Tetragoneurinae, Mycomyinae, Mycetophilinae and Leiinae (Oliveira & Amorim, 2012). Some of the subfamilies are more speciose in temperate areas, but some groups of mycetophilids are particularly speciose in tropical areas of different continents. The Oriental fauna of the family includes almost 450 species, described in 49 of about 146 genera. Southeast Asian mycetophilids have been described from Borneo, Sumatra, Malaysia, Thailand etc, but virtually nothing, however, is known from the mycetophilids in Singapore. The world fauna of Mycetophilidae includes almost 4,200 species, but it is estimated to be one of the most species-rich families of flies in the planet. In Hebert et al.'s (2016) study of the Canadian temperate fauna of insects based on Malaise trap material, the Mycetophilidae is the fifth in number of BINs (1,038, very close to the Ceratopogonidae, with 1,054 BINs). This number of mycetophilid BINs is three times larger than the number of species already described for Canada. In Brown et al.'s (2018) single site inventory of the Diptera fauna, of a patch of cloud tropical forest in Costa Rica—see also Borkent et al. (2018)—the Mycetophilidae have the fourth highest number of species, while the family is the third richest in Great Britain (Duff et al. 2012).

### Goals of the paper ?

## Material and Methods

### Sampling strategy [Darren/Rudolf]

Malaise traps were deployed at 107 sites in Singapore (Figs. 1A–B) at varying periods from April 2012 to June 2019. The trapping sites represented different habitat types: rainforest, swamp forest, mangroves, urban forest, coastal forest and freshwater swamp (Fig. 2A–E). The freshwater swamp, in contrast to the swamp forest, lacks mature trees. The coastal forests differ from mangroves by being dry and lacking the typical mangrove trees and waterlogged substrate. The trap samples were collected weekly and the specimens preserved in 70% ethanol. The samples were sorted to order/family by parataxonomists and by fly specialists, and the mycetophilid specimens were extracted for this study. Mycetophilids were present in at least 46 of the sampling sites.

- Forest
- Old secondary forest
- Swamp forest
- Primary forest
- Planted mangrove
- Old mangrove
- Degraded urban secondary forest
- Maturing secondary forest

### *Inverted sorting*

### *Depository institutions*

All holotypes and most paratypes and identified specimens are housed in the Zoological Research Collection (ZRC) in the Lee Kong Chian Natural History Museum, National University of Singapore (LKCHNM). All specimens in the list of examined material are in the ZRC except if stated in contrary. Some of the paratypes and identified specimens are deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP). The types of some of the Oriental species of mycetophilids referred to the paper were examined at the Natural History Museum (NHM), London. All specimens studied in this paper (receiving the ZRC\_BDP code) were collected in Singapore.

### ***Imaging protocol [Yuchen]***

Two types of images are produced for this paper: high resolution macro-photographs of habituses and other body-parts, as well as slide images of terminalia. Macro-photographs were acquired with the Dun Inc. Passport II Imaging system, using a Canon 6D MkII chassis fitted with a MP-E 65mm lens. Specimens were imaged at different depths of field; these (usually 30-40) image ‘slices’ were then focus-stacked using Zerene Stacker LLC to achieve a fully-focused image of the specimen. The images were then processed to publication quality using TopazLab© ’s ‘Mask AI’, ‘Sharpen AI’ and ‘DeNoise AI’ plugins, as well as Adobe Photoshop© CS6 for manual image clean-up and figure plating. Slide images for terminalia were acquired using a Leica DC500 camera attached to a Leica stereomicroscope model MZ-16 or a compound microscope model Leica DM2500, photos being stacked with Helicon Focus 6.

Overall, >9,000 specimen photographs of habituses and other morphological details were produced and processed for the 120 species treated in this paper. These high-resolution images are stored on the open-access *Biodiversity of Singapore* platform (<https://singapore.biodiversity.online/taxon/A-Arth-Hexa-Dipt-Mycetophilidae>), hosted by the LKCNHM, to be used as sources for future studies of the holotypes and paratypes.

## *Compromise: assessment of entire faunas, generic revisions, standards of species descriptions* [OK]

We established a compromise between a large-scale faunal assessment and formal taxonomic descriptions, with a balance between information coming from morphological and molecular data. The taxonomical approach is slightly less detailed than most revisionary papers—especially in the discussion about relationships between species and illustrating male and female terminalia. We document all species referred to in the paper with photos of the habitus and details of the morphology that could help in species identification—besides the information provided by the sequencing and general descriptions. Illustration plates were designed to be useful to non-specialists, with caption of structures needed for identification. Most species have high resolution photos of the habitus of the male and/or female, also available, as mentioned above, in the *Biodiversity of Singapore* website.

By protocol, we did not formally name any species known only from females for which we were not able to provide a morphological diagnosis. This applies to seven species of *Manota* and seven species of *Neoempheria*: they are all sufficiently divergent from other species, are described and illustrated in the manuscript, but not formally named—they are referred to by letters (“sp. A”, “sp. B” etc.). This approach perfectly allows estimating the overall local diversity of the fauna of the family without the nuisance of having names that cannot be applied without sequencing. Males of these species should be collected in further studies of the fauna of Singapore and sequence-matching will allow naming these species.

We extensively considered the literature on the Oriental fauna of the family. For each mycetophilid subfamily or genus, there is a brief discussion on the known diversity in the region. The types of some of the Oriental species of mycetophilids described by Edwards (1925, 1926, 1927, 1928, 1929, 1931, 1933, 1935, 1940) deposited at the Natural History Museum, London, were examined and photographed. Most of the species described more recently are well illustrated and carefully described, and can be reasonably recognized without examining the holotypes. The types of many of some the older species are lost and unavailable (especially from Sri Lanka).

The patterns of species description in the literature varies. This is partly due to differences in the morphology but also due to idiosyncrasies in the literature on the way species are described in different genera. We tried as much as possible to follow the standards of species description for each genus. The consequence is that there is some variation in the structure of species descriptions between genera along the paper. The description of at least one species in each genus is more extensive, whereas the description of the other species are then more concentrated on what varies between congeneric species. We included only the wing length and the wing width (always in millimeters) as measurements. Specimens that were only sequenced are included in the material examined for each species and referred to as “additional sequenced specimens”.

We prepared slide-mountings of available males and females of all species. Most specimens were cleared with KOH, dehydrated in ethanol, dissected separating wings, abdomen with terminalia, and head/thorax, mounted in Euparal (modified from Walker and Crosby, 1988; Huber and Reis, 2011) under three separate coverslips. DNA extraction with Proteinase K, used here as part of the sequencing protocol for mitogenome, works well to dissolve protein tissues and preserves the chitinous exoskeleton of specimens in the preparation of slide-mountings (Santos et al., 2018). The results are good for more sclerotized specimens, but soft specimens may collapse, bringing an issue of quality of some of the slide-mounting photos.

#### *Homology and morphological nomenclature for mycetophilids* [OK]

We largely follow the morphological nomenclature in Cumming & Wood (2017). This especially affects the homology and terminology of the wing venation. We follow Søli's (1997) monograph for the morphological nomenclature of structures typical of the Mycetophilidae. There are some few cases of inconsistency between both systems, e.g., we use here prosternum (Cumming & Wood 2017) for Søli's (1997) basisternum. For the particularly complex and diverse male terminalia morphology (and, hence, nomenclature) of *Manota*, we basically follow Hippa & Ševčík (2013). The term “macroseta” is used here for flat, capitulate setae, as typically seen in *Manota*, but also present in species of *Platurocypta*.

We use the interpretation for the branching of Rs in Bibionomorpha discussed in Amorim (1993) and Amorim & Rindal (2007), in which the Anisopodiformia preserve R<sub>2+3</sub> (branching more basally than the insertion of r-m, with R<sub>4</sub> lost), while the remaining members of the suborder preserve R<sub>4</sub> (with the branching of Rs much beyond the base of r-m, with R<sub>2+3</sub> lost), with some few secondary cases of displacement of R<sub>4</sub> towards the base, closer to the insertion of r-m. The question of homology of the cubital and anal veins in flies is largely solved in Cumming & Wood (2017). There are some minor, additional problems for wing vein interpretation in the Mycetophilidae. In sciophilines, there is a well-defined CuP (formerly referred to as A<sub>1</sub>) and a sclerotized cubital fold or pseudovein adjacent to CuA—with no evidence of any anal vein. Two further important changes along the evolution of mycetophilids blur this original pattern. On the one hand, the anal lobe has a very weak fold, e.g., in tetragoneurines and leiines, that becomes more evident in mycomyines and well sclerotized in mycetophilines. In the literature it is often dealt with as a true anal vein. It is referred to here as an “anal fold” (af). On the other hand, CuP and the cubital pseudovein seem to be fused in some genera and it is hard to distinguish between them.

Strict homology criteria are applied to name morphological structures. The maxillary palpus in mycetophilids, for example, range from one to five palpomeres. The maxillary palpus, e.g., with

three palpomeres often results from the loss of palpomeres 1 and 2. In this case, we refer to the existing palpomeres as 3, 4 and 5 (not 1, 2 and 3).

All measurements are given in millimeters. The list of abbreviation used in the illustration plates is as follows:

<b>aap</b> , aedeagal apodeme;	<b>hypd</b> , hypandrium;
<b>ae</b> , aedeagus;	<b>ibr</b> , internal branch of gonostylus;
<b>aea</b> , aedeagal apodeme;	<b>jgs</b> , juxtagonostylar lobe;
<b>af</b> , sclerotized anal fold;	<b>kts</b> , katepisternum;
<b>allgc</b> , apico-lateral lobe of gonocoxite;	<b>lbl</b> , labellum;
<b>anp</b> , antepronotum;	<b>loc</b> , lateral ocellus;
<b>ans</b> , anepisternum;	<b>lt</b> , laterotergite;
<b>asp</b> , anterior spiracle;	<b>mdt</b> , mediotergite;
<b>avlgc</b> , apico-ventral lobe of gonocoxite;	<b>mk</b> , medial keel of scutum;
<b>car</b> , cardo;	<b>moc</b> , mid ocellus;
<b>ce</b> , cercus;	<b>mem</b> , mesepimeron;
<b>ce1–2</b> , cercomere 1–2;	<b>mtem</b> , metepimeron;
<b>ces</b> , cervical sclerite;	<b>mtp</b> , metepisternum;
<b>cly</b> , clypeus;	<b>mtg</b> , mediotergite;
<b>cpv</b> , cubital pseudovein;	<b>mxp1–5</b> , maxillary palpomeres 1–5;
<b>cxI–III</b> , coxae I–III;	<b>oc s</b> , ocellar seta;
<b>es</b> , tergite 9 megaseta;	<b>ocf</b> , occipital foramen;
<b>fc</b> , face;	<b>ocp</b> , occiput;
<b>flg</b> , flagellomere;	<b>pa</b> , paramere;
<b>fmv</b> , false medial vein;	<b>pal</b> , parastylar lobe;
<b>frf</b> , frontal furrow;	<b>pap</b> , parameral apodeme;
<b>fr</b> , frons;	<b>pda</b> , parameral distal arm;
<b>Ge</b> , gonocoxite;	<b>ped</b> , antennal pedicel;
<b>gca</b> , gonocoxal apodeme;	<b>ppm</b> , postpronotum;
<b>gcd</b> , gonocoxal distal setae on lateral projection;	<b>pem</b> , proepimeron;
<b>gepb</b> , gonocoxite posterior ventral border;	<b>pep</b> , proepisternum;
<b>gdl</b> , gonocoxite dorsal lobe;	<b>prs</b> , prosternum;
<b>gil</b> , gonocoxite internal lobe;	<b>ps</b> , parameral spine;
<b>gll</b> , gonocoxite lateral lobe;	<b>psl</b> , parastylar lobe;
<b>gvl</b> , gonocoxite ventral lobe;	<b>ssp</b> , posterior spiracle;
<b>gci</b> , gonocoxal inner seta on latera projection;	<b>pst</b> , pseudotrachaea;
<b>gfk</b> , genital fork;	<b>S1–10</b> , sternites 1–10;
<b>glp</b> , gonocoxite lateral projection;	<b>sai</b> , scutum anterior incision;
<b>gmp</b> , gonocoxite mesal projection;	<b>scl</b> , scutellum;
<b>gn</b> , gena;	<b>sep</b> , scape;
<b>gop</b> , genital opening;	<b>sc</b> , scutum;
<b>gon ap</b> , gonocoxal apodeme;	<b>spd</b> , spermathecal duct;
<b>gp<sub>b</sub></b> , gonocoxite posterior border;	<b>sep</b> , maxillary palpus sensory pit;
<b>Gs</b> , gonostylus;	<b>sgms</b> , syngonocoxite medial suture;
<b>gsbl</b> , gonostylus basal lobe;	<b>sgvp</b> , syngonocoxite medioventral process;
<b>gsdl</b> , gonostylus dorsal lobe;	<b>sti</b> , stipes;
<b>gsil</b> , gonostylus inner lobe;	<b>syngc xm</b> , syngonocoxite medial sclerite;
<b>gsl</b> , gonostylus main lobe;	<b>T1–9</b> , tergites 1–9;
<b>gsml</b> , gonostylus medial lobe;	<b>tr</b> , trochanter;
<b>gsol</b> , gonostylus outer lobe;	<b>vgf</b> , vaginal furca
<b>gspl</b> , gonostylus posterior lobe;	<b>vrt</b> , vertex;
<b>gsvl</b> , gonostylus ventral lobe;	<b>wf</b> , wing medial fold;
<b>hal</b> , halter;	

#### *Putative species sorting with NGS barcoding* [Darren / Rudolf]

A short 313-bp fragment of the cytochrome oxidase I gene (*cox1*) was amplified for each myctophilid specimen using a protocol described in Meier et al. 2016. In the early phases of

the study, Direct-PCR (Wong et al. 2014) was employed, where 1 – 2 legs of each specimen were used as the DNA template for amplification. In later samples, DNA extraction was performed by immersing the whole specimen in Lucigen QuickExtract solution or HotSHOT buffer (Montero-Pau et al. 2008). PCR was performed with the primer pair mlCO1intF: 5'-GGWACWGGWTGAACWGTWTAYCCYCC-3' (Leray et al. 2013) and jgHCO2198: 5'-TANACYTCNGGRTGNCCRAARAAYCA-3' (Geller et al. 2013). These primers were labelled at the 5' end with 9-bp oligonucleotides that differed from each other by at least three bases. Every specimen in each sequencing library was assigned a unique combination of forward and reverse primer labels. This enabled the sequenced reads to be assigned to their specimen of origin. A negative control was used for each 96-well PCR plate to detect contamination. Amplification success was assessed via gel electrophoresis of eight random wells from each plate.

The amplicons were first pooled at equal volume within each plate. Equimolar pooling across plates was performed by approximating concentration based on the presence and intensity of the gel bands. The pooled samples were cleaned with Bioline SureClean Plus before being sent for library preparation at AITbiotech using TruSeq Nano DNA Library Preparation Kits (Illumina) or the Genome Institute of Singapore (GIS) using NEBNext DNA Library Preparation Kits (NEB). Paired-end sequencing was performed on Illumina Miseq (2x300-bp or 2x250-bp) or Hiseq 2500 platforms (2x250-bp). Sequencing was performed across multiple runs, which allowed the troubleshooting and re-sequencing of specimens which failed to yield sufficient reads. Some of the specimens were also sequenced on the MinION (Oxford Nanopore) platform using primers with slightly longer tags (13-bp), using the protocol described in Srivathsan et al. 2019. The raw Illumina reads were processed with the bioinformatics and quality-control pipeline underlined in Meier et al. 2016. A BLAST search to NCBI GenBank's nucleotide (nt) database was also conducted to identify and discard contaminant sequences. The BLAST output was parsed through *readstidendifier* (Srivathsan et al. 2015) and barcodes with incorrect matches at >97% identity were removed.

The barcodes were aligned via MAFFT v7 (Katoh & Standley 2013) using default parameters and screened for stop codons. In a “reverse workflow” outlined in Wang et al. 2019, the initial putative species pre-sorting was performed by clustering the *cox1* barcodes at a 3% uncorrected p-distance threshold. The clustering was performed with a python script that implements the objective clustering algorithm underlined in Meier et al. 2006. The specimens were then physically sorted into bins that correspond to these 3% p-distance clusters for morphological verification.

### *Haplotype networks [Darren]*

Minimum spanning networks were generated in POPART (Leigh & Bryant 2015), with the proportion of specimens found in the various habitats represented for each haplotype. The networks were subsequently edited in Adobe Photoshop to also indicate congruence or conflict with morphology for each species delimitation algorithm and parameter used.

### *Species delimitation assessment*

In order to conduct a more thorough analysis of the molecular data, the aligned barcodes were analysed using three different species delimitation algorithms: objective clustering (Meier et al. 2006), Automatic Barcoding Gap Discovery (ABGD: Puillandre et al. 2012) and Poisson Tree Process (PTP: Zhang et al. 2013). Objective clustering was performed using a range of uncorrected p-distance thresholds (2–4%) commonly used in the literature for species delimitation (Ratnasingham & Hebert 2013). ABGD was performed using uncorrected p-distances and minimum slope parameter (-X) 0.1, with the default range of priors ( $P = 0.001 - 0.1$ ). Lastly, a maximum likelihood phylogeny was generated from the barcode sequences in RAxML v.8 (Stamatakis 2014) on CIPRES (Miller et al. 2010) with the GTRCAT model and rapid bootstrapping (-f a). Sciarid and keroplatid barcodes were included as an outgroup to root the tree. The barcode tree was then used for the PTP analysis using both single and multi-rate (mPTP: Kapli et al. 2017) algorithms. The clusters derived from each algorithm and parameter set were compared in a pairwise manner with the species delimited through morphology.

### *Genome-skimming and phylogenetics*



Representatives from each morphospecies were selected for further sequencing, in order to obtain more mitochondrial genes and 28S rDNA for phylogenetic analysis. Mitochondrial genomes were sequenced using a genome-skimming approach highlighted in Crampton-Platt et al. 2016. Genomic DNA was extracted using the QIAGEN QIAcube platform and QIAamp 96 HT kits and pooled in a manner such that each library only contained species with *cox1* p-distances at least 5% apart from each other. Within each library, the samples were also grouped into three size classes based on specimen size. The DNA concentration of five subsamples from each size class were measured on a Qubit Fluorometer (Thermofisher Scientific) and used to approximate equimolar pooling within a library. The pooled samples were sent to the Genome Institute of Singapore (GIS) for library preparation using NEBNext

DNA Library Preparation Kits (NEB) and 150-bp paired-end sequencing on an Illumina Hiseq 4000 platform.

The Illumina reads were first processed via adapter trimming with Trimmomatic v0.36 (Bolger et al. 2014) and a BLAST search was conducted against a database consisting of full Diptera mitochondrial genomes from NCBI GenBank. The BLAST hits were then used to screen for “mitochondrial gene-like” reads. These reads were assembled using four different assemblers: 1) SPAdes [--meta -k 21,33,55,77] (Bankevich et al. 2012), 2) Ray [k 61, -minimumseedlength 100, -minimumcontiglength 1000] (Boisvert et al. 2010), 3) IDBA-UD [--mink 60, --maxk 150] (Peng et al. 2012) and CLCGenomics [*de novo* assembly, create simple contig sequences] (<https://digitalinsights.qiagen.com>). The contigs from the assemblers were screened with a second BLAST check against the same reference database and filtered with a minimum contig length of 1000-bp. The remaining contigs were then assembled into supercontigs in Geneious R10 [*de novo* assembly: 1000-bp minimum overlap, 1% maximum mismatches per read] (Kearse et al. 2012).

Mitochondrial gene baits for associating the supercontigs to species were obtained through multiplexed tagged amplicon sequencing. Four additional Diptera-specific primer pairs were designed to amplify short fragments of the cytochrome oxidase III (*cox3*), NADH dehydrogenase subunit 4 (*nd4*), cytochrome b (*cytb*) and *16S* rDNA genes. These primer pairs were tagged with 5' 7-bp oligonucleotides. Multiplex PCR using the QIAGEN Multiplex PCR Kit was performed with a mix of these four primers, as well as the 313-bp *cox1* primer, on the same genomic DNA extracts used for genome skimming. Amplification success was assessed using gel electrophoresis and amplicons were pooled, cleaned and sent to GIS for library preparation using NEBNext DNA Library Preparation Kits (NEB) and 250-bp paired-end sequencing on an Illumina Hiseq 2500 platform. The data was demultiplexed and processed through quality-control filters using the same approach as the NGS barcodes (Meier et al., 2016).

The mitochondrial baits were mapped onto the supercontigs in Geneious (Kearse et al. 2012) [100-bp minimum overlap, 0% maximum mismatches per read] to associate the supercontigs to species. Supercontigs with baits from multiple species were deemed as chimeric assemblies and discarded. The baited supercontigs were then annotated in Geneious with reference to annotated Diptera mitochondrial genomes from NCBI GenBank. The thirteen coding (*cox1*, *cox2*, *cox3*, *cytb*, *nd1*, *nd2*, *nd3*, *nd4*, *nd4l*, *nd5*, *nd6*, *atp6*, *atp8*) and two ribosomal genes (*16S* and *12S*) were extracted and aligned in MAFFT v7 (Katoh & Standley 2013). The alignments were screened for large insertions and stop codons.

*28S* nuclear rDNA was also sequenced for species from a few representative genera. Using the multiplex tagged amplicon sequencing approach, 15 primer pairs were designed to amplify overlapping gene fragments that tiled to entire *28S* sequence. They were amplified in two separate multiplex PCR reactions per species, such that adjacent fragments were in different reactions. As with the mitochondrial baits, the amplicons were similarly processed and sequenced on an Illumina Hiseq 2500 platform, 250-bp paired-end. The reads were initially processed in the same pipeline as the NGS barcodes (Meier et al., 2016). After which, the *28S* rDNA fragments were aligned to full Diptera *28S* sequences from NCBI GenBank with MAFFT v7 (Katoh & Standley 2013) using the --addfragments function. Using an in-house Python script, sequences with overlapping regions were merged if the overlapping regions were identical. If not, the conflicting sequences were excluded. The assembled *28S* rDNA sequences were then aligned in MAFFT v7.

Keroplatid and sciarid outgroups were added to the 15 mitochondrial genes and *28S* rDNA. The aligned gene sets were then concatenated in SequenceMatrix v1.8 (Vaidya et al., 2011). The maximum likelihood tree was reconstructed in RAxML v.8 (Stamatakis 2014) on CIPRES (Miller et al. 2010) with the GTRCAT model and rapid bootstrapping (-f a).

## Results

### Taxonomy

A total of 22 of the 50 mycetophilid genera known for the Oriental region were found in the samples examined along this study. This includes the first records for the Oriental region of the genera *Mohelia*, *Platyprosthiogyne* and *Aspidionia*; additionally, there is a new genus of Mycetophilini. Some of the mycetophilid genera known from the Oriental region not present in our samples are basically known from higher altitudes or from along the transition to the Palaearctic region, and not expected to be part of the Singaporean fauna of the family. This includes the genera *Aglaomyia* Vockeroth, *Anaclileia* Meunier, *Anatella* Winnertz, *Boletina* Staeger, *Brevicornu* Marshall, *Coelosia* Winnertz, *Deimyia* Kallweit, *Docosia* Winnertz, *Greenomyia* Brunetti, *Hemisphaeronotus* Saigusa, *Katatopygia* Martinsson & Kjaerandsen, *Macrobrachius* Dzidziecki, *Neuratelia* Rondani, *Phronia* Winnertz, *Polylepta* Winnertz, *Pseudexechia* Tuomikoski, *Pseudobrachypeza* Tuomikoski, *Saigusaia* Vockeroth, *Sciophila* Meigen, *Synapha* Meigen, *Trichonta* Winnertz. As seen below, *Vecella* Wu & Yang is synonymized to *Parempheriella* Matile.

Other 15 mycetophilid genera not sampled in this study have been recorded for tropical areas in the Oriental or Australian regions and, hence, may come be found in Singapore—*Acnemia* Winnertz, *Acrodicrania* Skuse, *Brachyradia* Ševčík & Kjærandsen, *Chalastonepsia* Søli, *Cordyla* Meigen, *Indoleia* Edwards, *Leia* Meigen, *Mycomya* Rondani, *Paradoxa* Marshall, *Paramanota* Tuomikoski, *Pectinepsia* Ševčík & Hippa, *Promanota* Tuomikoski, *Pseudexechia* Tuomikoski, *Rondaniella* Johannsen, and *Speolepta* Edwards.

The 120 species we recognize in 22 genera (one new) includes four known species—*Eumanota racola* Søli, *Metanepsia malaysiana* Kallweit, *Parempheriella defectiva* Edwards, *Neoempheria dizonalis* Edwards—, 101 new species, and seven species of *Manota* and seven species of *Neoempheria* known only from females (that are described but not formally named), and one species known from females that may be one of the described species of *Chalastonepsia*.

### Key for the genera of Mycetophilidae of Singapore (modified from Søli 2017).

1.     Legs with trichia arranged in regular rows along entire length of tibia (Fig. 19) ..... 2
- Legs with trichia irregularly arranged along entire length of tibia (Fig. 18), although sometimes tending to form rows towards apex ..... 15

- 2(1). All postgenal setae long, besides a crown of erect setae on occiput behind eye; face rectangular, wide; basisternum in lateral view, laterally to proepisternum, shield-like, well developed, wide; basisternum pubescent, with dense setae over entire surface (Fig. 13) ..... (Leiinae Manotini) 3
- Postgenal ventral setae all short or with 2 or 3 setae longer than others; no crown of erect setae on occiput behind eye; face and basisternum not as described above (Fig. 13) ..... 5
- 3(2). Three longitudinal folds on wing, one across r-m, one posterior to  $M_2$  and one posterior to CuA; cerci bilobate, ovoid ..... *Allactoneura* de Meijere  
 — Wings without longitudinal folds ..... 4
- 4(3).  $M_{1+2}$  missing,  $M_1$  and  $M_2$  present as detached veins;  $R_5$  originating very basally in the wing, running close to C; proepimeron elongated and medially prominent. Last palpomere more than 1.5x length of the penultimate, but not extremely elongated ..... *Manota* Williston  
 —  $M_{1+2}$  present, connecting to r-m;  $R_5$  originating at or beyond midpoint of wing, running close to C mostly on distal end; proepimeron rectangular. Last palpomere extremely long, much longer than others ..... *Eumanota* Edwards
- 5(2). Head always with 2 ocelli inserted far from eye margin;  $R_4$  present or absent; microtrichia on wing membrane not arranged in regular lines (Fig. 20) ..... (Mycomyinae) 6
- Head with 2 or 3 ocelli, lateral touching eye margin (Figs 12, 14);  $R_4$  always absent; microtrichia on wing membrane (especially close to apex) arranged in more or less regular longitudinal lines (Fig. 21) ..... (Mycetophilinae) 8
- 6(5). C ending at apex of vein  $R_5$  (Fig. 27) ..... [*Mycomya* Rondani]  
 — C produced beyond apex of  $R_{4+5}$  (e.g., Figs 28, 29) ..... 7
- 7(6).  $R_4$  absent, r-m about twice as long as first sector of Rs (Fig. 24) ..... *Parempheriella* Matile  
 —  $R_4$  usually present, if absent, then r-m as long as first sector of Rs (Figs 28, 29) ..... *Neoempheria* Osten-Sacken
- 8(5). Anepisternum bare (Fig. 7) ..... (Mycetophilinae/Exechiini) 9  
 — Anepisternum with strong setae on dorsoposterior margin (Fig. 12) ..... (Mycetophilinae Mycetophilini) 10
- 9(8). Origin of  $M_4$  beyond level of furcation of medial fork; r-m at least twice as long as  $M_{1+2}$  ..... *Exechia* Winnertz  
 — Origin of  $M_4$  more basal than origin of  $M_{1+2}$ ; r-m about as long as stem of  $M_{1+2}$  ..... *Allodia* Winnertz
- 10(8). Border of scutum straight above anterior spiracle (Fig. x) ..... 11  
 — Border of scutum with a conspicuous incision above anterior spiracle (Fig. X) .... 12
- 11(10).  $R_1$  and  $R_5$  running distant from C;  $M_4$  slightly divergent from  $M_2$ , parallel with or convergent towards CuA (Fig. 52); posterior wing margin only gently emarginated at level of tip of CuA (Fig. 12) ..... *Mycetophila* Meigen

- $R_1$  and  $R_5$  running close to C;  $M_4$  slightly convergent with towards CuA (Fig. 56); posterior wing margin clearly emarginated at level of tip of CuA ..... *Platyprosthiogyne* Enderlein
- 12(10).  $M_4$  connected to CuA at base ..... 13
  - $M_4$  either disconnected from CuA at base or absent ..... 14
- 13(12). Antepronotum and proepisternum entirely fused, suture visible at most at anterior end;  $R_5$  long, gently curved distally, reaching C slightly before or after level of tip of  $M_1$  ..... *Epicypta* Winnertz
  - Antepronotum and proepisternum not fused, suture complete between both sclerites;  $R_5$  mostly straight, short, reaching C at level of tip of  $M_2$  ..... *Platurocypta* Enderlein
- 14(12).  $M_4$  disconnected from CuA at base ..... *Integricypta* gen.n.
  - $M_4$  entirely absent ..... *Aspidionia* Colless
- 15(1). Thorax with mediotergite setulose; wing membrane with numerous distinct macrotrichia and usually also microtrichose (Figs. 30, 33) (Sciophilinae) ..... 16
  - Thorax with mediotergite bare; wing membrane without macrotrichia, or at most, with a few short macrotrichia near posterior margin, always with dense microtrichia (Fig. 38) ..... 18
- 16(15).  $M_4$  produced, posterior fork present (Fig. 30) ..... *Leptomorphus* Curtis
  - $M_4$  absent (or present in some *Monocloina* species), posterior fork absent (e.g., Fig. 31) ..... 17
- 17(16).  $M_2$  produced, medial fork present (Fig. 30) ..... *Monocloina* Mik
  - $M_2$  absent, only two posterior veins ( $M_1$  and CuA), without forks (Fig. 31) ..... *Azana* Walker
- 18(15).  $R_1$  shorter than r-m length (Fig. 36);  $R_4$  absent; lateral ocelli close to eye margin (except in *Mohelia*), median ocellus present or absent (Leiinae/Megophthalmidiini and Leiini) ..... 19
  - $R_1$  longer than r-m length, usually ending in distal half of wing (Fig. 36), if not (*Metanepsia*), then  $M_{1+2}$  much longer than r-m (Fig. 43);  $R_4$  present or absent; lateral ocelli inserted far from eye margin; median ocellus present ..... 20
- 19(18). Lateral ocelli touching eye margin. Hind tibia with numerous bristles at least twice longer than width of tibia at apex (Fig. 9). C ending at vein  $R_5$ ; Sc ending in C;  $M_4$  disconnected from CuA basally. Flagellomeres dark at basal half, antenna banded (Fig. 1) ..... *Clastobasis* Skuse
  - Lateral ocelli not touching eye margin. Hind tibia without strong setae or bristles. C extending much beyond tip of  $R_5$ ; Sc ending close to bR;  $M_4$  connected to CuA basally. Flagellomeres with ochre-yellowish, not banded (Fig. 1) ..... *Mohelia* Matile
- 20(18).  $R_4$  present (Tetragoneurinae) ..... 21
  - $R_4$  absent (Gnoristinae) ..... 22
- 21(20). Sc short. Origin of  $M_4$  close to basal end of  $M_{1+2}$  (Fig. 72) ... *Tetragoneura* Winnertz

- Sc long. Origin of M<sub>4</sub> close to origin of Sc (Fig.73) ..... *Ectrepesthoneura* Enderlein
- 22(20). First sector of Rs and r-m extremely short; M<sub>1+2</sub> longer than medial fork (Fig. 43)  
..... *Metanepsia* Edwards
- First sector of Rs and r-m well-developed; M<sub>1+2</sub> shorter than medial fork (Fig. 44) ....  
..... *Chalastonepsia* Johannsen

## **Sciophilinae**

Søli's (1997) phylogenetic study of the Mycetophilidae showed that the "Sciophilinae s.l.", with all mycetophilids except those in the subfamily Mycetophilinae, correspond to a large paraphyletic group. This has been corroborated by all phylogenies of the family published more recently. In a strict delimitation, the Sciophilinae comprises mostly species with macrotrichia over the wing membrane, including about 37 genera in the world (Borkent & Wheeler, 2013). Søli's (1997) phylogeny had a small clade with *Drepanocercus* Vockeroth and *Paratinia* Mik sister to the remaining mycetophilids, meaning that even in this stricter sense the sciophilines may be paraphyletic. In Borkent & Wheeler's (2013) complete phylogenetic analysis of the Sciophilinae (ranked as a tribe), *Drepanocercus*, *Paratinia*, *Loicia* Vockeroth and *Acomoptera* Vockeroth are present in a clade sister to the set of remaining genera of the subfamily.

The Oriental fauna of Sciophilinae is composed of eight genera—*Acnemia*, *Anaclileia*, *Azana*, *Leptomorphus*, *Monoclona*, *Neuratelia*, *Polylepta*, and *Sciophila*. Of these genera, only *Azana*, *Leptomorphus*, *Monoclona* are present in our Singapore samples so far.

### ***Leptomorphus* Curtis**

*Leptomorphus* Curtis, 1831: 365. Type species, *Leptomorphus walkeri* Curtis, by monotypy.

*Diomonus* Walker, 1848: 87 (Type species: *Diomonus nebulosus* Walker, by monotypy).

Edwards (1925: 556), synonymization of *Diomonus*.

The worldwide diversity of *Leptomorphus* was revised by Borkent & Wheeler (2012). The phylogeny of the genus proposed by Borkent & Wheeler (2012) demonstrate that the subgeneric arrangement in *Leptomorphus* rendered paraphyletic taxa. The genus now includes 45 species, of which nine are from the Oriental region, while other five species occur East of the Wallace line, into the Australasian region. We carefully considered the knowledge on the genus of the region and the species in our samples does not fit into any of the described species—although it certainly belongs into a small group of species.

*Leptomorphus rafflesii* Amorim & Oliveira, sp.nov.

(Figs. A1A-D, A2A-D)

**Diagnosis.** Antennal scape yellowish, pedicel and flagellum brown. Thorax mostly brown, metepisternum light brown on anterior half, yellowish on posterior half. Scutum with scarce fine yellowish setation, especially along dorsocentral line. Tibiae with short, sparse darker setae, but not densely distributed anteroventrally. R<sub>4</sub> absent. Abdominal tergites 1–2 and 6–7 brown, tergites 3–5 brown with a yellowish band on anterior third or half. Terminalia longer than wide, with a short distal pointed beak on the gonocoxite; gonostylus articulated distally on gonocoxite, folded backwards, “phallic organ” present, wide.

**Description. Male** (Fig. A1A). Wing length, 4.08; width, 1.24. Body mostly dark brown.

**Head** (Fig. A1B). Head yellow, palpus and antennal scape light brownish-yellow, pedicel brown, flagellum light brown, flagellomeres slightly flattened (flagellum 11–14 missing on holotype). Ocellar triangle black, ocelli large. Anterior ocellus only slightly anterior to lateral ocelli. Lateral ocelli far from eye margins. Prefrons ventrally with four stronger setae and some other smaller setae. Eyes bare. Palpomere 3 short, with a deep sensorial pit, distal palpomere slender, twice longer than penultimate palpomere. **Thorax** (Fig. A1C). Scutum dark brown, scutellum cream-yellow. Scattered yellowish thin setae over scutum, with a more or less regular row of dorsocentrals. Scutellum small, weakly sclerotized, entirely bare. Pleural sclerites brown, except for metepisternum light brown on anterior half, yellowish on distal half, and dark brown laterotergite and mediotergite; pleural membrane around anterior spiracle yellowish. Some few thin setae on antepronotum, one single thin fine seta on proepisternum; anepisternum, katepisternum, mesepimeron and metepisternum entirely devoid of setation, three stronger setae dorso-posteriorly on laterotergite, about 15 fine setae and three pairs of stronger setae on mediotergite laterally on ventral half. Coxae yellow, femora yellow with brown proximal and distal fifth, tarsi light brown. Unaligned microsetae on tibiae, short scattered macrosetae on all tibiae. Empodia not developed, claws minute with a basal tooth. **Wing** (Fig. A1D). Membrane fumose light brownish, with dense macrotrichia, veins brown. All veins with dorsal setae, all veins but M<sub>4</sub> and second sector of CuA with ventral setae. Sc reaching C before mid of wing; sc-r close to apex of Sc. R<sub>1</sub> long, reaching C at distal fifth of wing, M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> weakly sclerotized close to wing margin. M<sub>1+2</sub> about half of length of M<sub>1</sub>, M<sub>4</sub> with a gentle depression on distal fourth. CuA gradually and gently

divergent from M<sub>4</sub>. CuP sclerotized, reaching margin at about level of mid of second sector of CuA. Haltere brown. **Abdomen.** Abdominal tergites 1–2 and 6–7 brown, tergites 3–5 yellow on anterior half, brown on distal half; sternites 1–2 light brown, sternites 3–5 yellow on anterior half, brown on distal half, sternites 6–7 brown, tergite and sternite 8 short, light brown. Distribution of setae on tergite 8 slightly asymmetrical, sternite 8 rhomboid, larger. **Terminalia.** (Figs. A2A–C). Whitish-yellow. Gonocoxites longer than wide and fused to each other Antero-medially, without sclerotized suture medially; laterodistal lobe of gonocoxites short, with a short spine projecting at distal borders. Gonostylus folded backwards, articulated distally on gonocoxal lobe, more sclerotized basally, bare, with a condylus-like projection on internal margin midway to apex and a short digitiform process distally at dorsal margin. “Phallic organ” wide, present medio-distally between gonocoxites in ventral view, ejaculatory apodeme long. Cercus weakly sclerotized, with fine setae.

**Female.** Unknown.

**Material examined.** **Holotype:** male, ZRC\_BDP0066807, Bukit Timah, maturing secondary forest (BT08), 16.August.2016, MIP leg. (slide-mounted). **Additional sequenced specimens:** male, ZRC\_BDP0066806, Bukit Timah (BT08), maturing secondary forest, 16.August.2016, Mangrove Insect Project leg.

**Etymology.** This species is named after Sir Thomas Stamford Raffles (1781–1826), knighted in 1816, British East Indian administrator, largely responsible for the creation of Britain’s Far Eastern empire. The Raffles Museum of Biodiversity Research, National University of has its origins in the Raffles Museum, founded in 1849 due to an initiative by Raffles. Considered the founder of Modern Singapore (in 1819) by the Singaporean government, he was also a naturalist collector who inspired the establishment of a natural history collection of Southeast Asian biodiversity—resulting in the Zoological Research Collection (ZRC) now housed in the Lee Kong Chian Natural History Museum, National University of Singapore.

**Remarks.** In Borkent & Wheeler’s (2012) key for the genus, this species runs into *Leptomorphus tagbanua* Borkent, from the Philippines, but they are obviously separate species, as can be seen by different aspects of the male terminalia. It is also similar to *L. ascuttellatus* Ševčík, from Thailand, but the differences in the male gonostylus are striking. The shape of the “phallic organ” shows that *L. rafflesii*, sp.nov. clearly belongs in the clade of the genus including, e.g., *L. hyalinus* Coquillett, *L. titiwangsensis* Borkent and *L. tagbanua*. This species was collected only in Bukit (=hill) Timah and there is a single haplotype in our material for this species. (Fig. A2D).

### ***Monoclona* Mik**

*Staegeria* van der Wulp, 1876: xlix (preoccupied Rondani, 1856). Type species: *Sciophila halterata* Staeger, 1840: 275 (monotypy) [= *rufilatera* (Walker)].

*Monoclona* Mik, 1886: 279 (nom.n. for *Staegeria* Wulp).

Of 18 species of *Monoclona* described for the world (Borkent & Wheeler, 2013), only one is known so far from the Oriental region—*M. laosilvatica* Ševčík, from Laos. The remaining species are from the Palearctic (six), Nearctic (four), and Neotropical (seven) regions. The species from Singapore, described here based on females, clearly diverges from *M. laosilvatica*, as discussed below. There are no worldwide revisions of the genus or a phylogeny for the species of *Monoclona*.

### ***Monoclona simhapura* Amorim & Oliveira, sp.nov.**

(Figs. A3A-F)

**Diagnosis.** Brownish head, scutum and abdominal tergites, with ochreous-yellow thoracic pleura, wing approximately 2 mm long.

**Description. Female** (Fig. A3A). Wing length, 2.04 mm, width, 0.92 mm. **Head** (Fig. A3B). Elliptical, higher than long. Vertex dark brown, frons brown, lighter ventrally, setose, ocellar triangle dark brown. Three ocelli, lateral ocelli close to each other, away from eye margin, mid ocellus small. Occiput light yellowish-brown on ventral half laterally, ochre-brown towards vertex, brown around ocelli. Eye with small inter-ommatidial setae. Antennal scape and pedicel light ochre-brown, with small setae, scape slightly longer than pedicel; 14 light brown flagellomeres, darker towards apex, almost as long as wide, with scattered setae. Fronto-clypeus light ochre-brown, covered with short setae; labella cream, elongate; five palpomere, basal one hardly visible, palpomeres two and three light brown, distal two segment whitish-brown, palpomeres gradually longer, no evidence of sensorial pit on third palpomere. **Thorax** (Fig. A3B). Scutum and scutellum mostly light brown, yellowish only at anterior margin of scutum. Two parallel rows of irregular acrostical setae and a pair of irregular rows of dorsocentral larger setae, separated anteriorly and coming close together

near scutoscutellar suture. Some stronger setae along entire lateral margin of scutum, with some supra-alars and some prescutellars. Transverse suture short but well-marked. Pronotum and proepisternum light brown, anepisternum brownish-ochre, katepisternum cream-yellow, mesepimeron slightly darker, laterotergite and mediotergite brown, pleural membrane whitish-yellow. Scutellum with some setulae on disc, at least four longer and many shorter setae along distal margin. Prosternum with seven setae. Antepronotum with four stronger and 10 smaller setae, proepisternum quite small, subquadrate, with two larger and 12 smaller setae, proepimeron elongate, bare. Anepisternum, katepisternum, mesepimeron and metepisternum entirely bare, mesepimeron reaching ventral margin of thorax. Laterotergite bulging, with 11-14 setae of different sizes. Mediotergite only slightly curved in profile, ventral half with three delicate setae. Haltere pedicel whitish-yellow, knob brown, with setulae on both parts. **Legs.** Front coxa brownish ochre, mid and hind coxae light ochre with some brownish tinge on distal third of wing; femora brownish-ochre, slightly darker on distal half, tibiae yellowish-brown, strongly setose, trochanters light brown. Length of tarsomere 1 more than twice second tarsomere in all legs. Tibial spurs brownish, length more than twice tibia width at apex, spurs subequal in length. Tarsal claws with a conspicuous tooth midway to apex. **Wing** (Fig. A3C). Membrane homogenously fumose, densely covered with microtrichia and macrotrichia, macrotrichia reflexed, directed towards wing base, all wing veins setose except sc-r, first sector of Rs, r-m and M<sub>1+2</sub>. Sc complete, ending at C slightly beyond base of Rs. C extending slightly beyond R<sub>5</sub>. First sector of Rs oblique. R<sub>1</sub> long, reaching C close to level of tip of M<sub>2</sub>; R<sub>4</sub> absent; R<sub>5</sub> gently sinuous on distal fifth, reaching C clearly before wing apex; r-m oblique, distal end more base than basal end, well sclerotized. M<sub>1+2</sub> present, very short, shorter than r-m, M<sub>1</sub> and M<sub>2</sub> produced, base of M<sub>2</sub> less sclerotized. No trace of M<sub>4</sub>, CuA well-sclerotized, CuP absent. **Abdomen.** Tergites 1 yellowish-brown, tergites 2-6 light brown, tergite 7 yellowish-brown, sternites 1-7 light brownish-yellow, sternite 6 yellowish-brown. **Terminalia** (Figs. A3D-E). Terminalia yellowish, sternite 8 slightly darker, with some few darker setae at distal margin. Sternite 8 with a pair of medial wide projections with setae along distal margin. Tergite 8 and 9 very short, partially fused to each other, bare. Tergite 10 slender, wide, projecting latero-distally towards ventral margin of terminalia, with 6-7 pairs of setae, most of which originating at tip of small projections. Two cercomeres, distal one short, nearly fused to cercomere 1.

**Male.** Unknown.

**Material examined.** **Holotype:** female, ZRC\_BDP0048567, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (slide-mounted). **Paratype,** 1 female: ZRC\_BDP0048568, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg.

**Etymology.** The specific epithet of this species name comes from the Sanskrit original form of the name of Singapore, with the words *simha*, for lion, and *pura*, for place or town. The noun is used in apposition.

**Remarks.** We have only females from this species in our samples. *M. laosilvatica* is mostly yellowish, including the abdomen (Ševčík, 2001, p. 159), while *M. simhapura*, sp.nov. is mostly brownish. Also, *M. simhapura*, sp.nov. is smaller, with the wing about 2 mm long, while *M. laosilvatica*, sp.nov. is larger, the wing length being 3.15 mm. Since we are able to establish a morphological diagnosis for this species, we formally name it. This species was collected only in the swamp forest and both specimens share the same haplotype (Fig. A3E).

#### *Azana* Walker

*Azana* Walker, 1856: 26 (type-species: *Azana scatopsoides* Walker 1856: 26, by monotypy; = *Azana anomala* Staeger 1840).

There are no revisions available for the Oriental species of *Azana*. Recent publications on the genus include a new species for the Neotropical region (Amorim et al., 2008a,b) and two new species for the Nearctic region (Kerr, 2010). The Oriental region so far includes four species—*A. asiatica* Senior-White (from Sri Lanka) (Senior-White 1922), and *A. grandispinosa* Xu & Wu and *A. sinensis* Xu & Wu (from China, Zhejiang) (Xu & Wu, 2002). There are consistent differences of color and shape of the terminalia sclerites from the species from China that allow to safely describe the species from Singapore as new. We have examined an “allotype” of *Azana asiatica* at the NHM, which is basically brown in color—which is possibly not be conspecific with the holotype, referred to as yellowish in the original description (Senior-White, 1922).

#### *Azana demeijeri* Amorim & Oliveira, sp.nov.

(Figs. A4A-I)

**Diagnosis.** Abdomen cream-yellow to ochre-yellow, with brown transverse marks on posterior half of tergites 3–6. Male gonostylus with a bifid end at tip, outer branch strongly sclerotized. Female gonocoxite 8 with short medial incision on posterior border, lobes more rounded.

**Description. Male. Head** (Figs. A4B–D). Elliptical, higher than long. Vertex and frons cream-yellow, setose, ocellar triangle dark brown, epicranial suture evident, from mid ocellus to ventral margin of vertex. Three ocelli, lateral ocelli close to mid ocellus, mid ocellus about half width of lateral ocelli. Occiput cream-yellow. Eye with inter-ommatidial setulae. Antennal scape and pedicel brownish-yellow, rounded, with small setulae, pedicel with some slightly longer setae dorsally; flagellomeres light brown, slightly shorter than wide, with scattered setae. Face cream-yellow, covered with short setae. Labella light yellow, well-developed, projected backwards. Five palpomeres, first three light brown, distal segment whitish-brown, palpomeres gradually longer; first palpomere hardly recognizable, third palpomere with sensorial setulae, no pit. **Thorax** (Figs. A4B–D). Scutum and scutellum homogenously dark cream-yellow. Pleural sclerites light cream-yellow, pleural membrane whitish-yellow. Thorax short, scutum arched, covered with scattered small setae, an irregular band of longer and shorter dorsocentrals. Scutellum with about four pairs of slightly stronger setae and additional smaller setae along posterior margin, setulae on disc. Prosternum present, setose. Antepronotum with some 6–7 setae, proepisternum large, setose, proepimeron bare. Anepisternum with 9–11 setulae, katepisternum small, bare. Mesepimeron wide, extending to ventral margin of thorax, bare. Laterotergite only slightly bulging, with 19 larger and smaller setae, suture at contact with mediotergite incomplete dorsally. Mediotergite slightly curved in profile, with two pairs of longer setae. Haltere whitish-yellow, knob darker, covered with setulae. **Legs.** Front coxa brownish-yellow, mid and hind coxae light yellow; trochanters dark brown, femora, tibiae, and tarsi brownish-yellow. Tarsomere 1 more than twice the length of second one in all legs; mid and hind tibiae with erect darker bristles along almost entire outer length, mid and hind tarsi with some slightly longer, darker setae. Front tibia with a wide Antero-apical depressed area covered with some setulae irregularly distributed and a regular comb of setae. Mid and hind tibial spurs about twice the tibia width at apex, mid and hind internal spurs shorter than outer spur. Tarsal claws with a long median tooth. **Wing** (Fig. A4E). Membrane homogenously fumose, densely covered with microtrichia and macrotrichia. Sc short, ending free slightly beyond humeral vein. C ending almost halfway between  $R_5$  and  $M_1$ . First sector of  $Rs$  transverse, short.  $R_1$

short, reaching C slightly before middle of wing; R<sub>4</sub> absent; R<sub>5</sub> reaching C well before wing apex; r-m perfectly longitudinal, well sclerotized. No trace of M<sub>1</sub>, connection M<sub>1+2</sub> to tip of r-m very basal at wing, basal third of medial vein (supposedly M<sub>1+2</sub>) hardly sclerotized, recognizable by a well-defined row of setae. No trace of M<sub>4</sub>. CuA well sclerotized, basal fifth of CuP visible, weak. All veins with dorsal macrotrichia, except Sc and first sector of Rs.

**Abdomen.** Tergites 2-6 yellow with a brown medial transverse band, setose, slender, T<sub>1</sub> and T<sub>7</sub> yellow. Sternites 1-2 whitish-yellow, sternites 3-7 yellowish. Tergite and sternite 8 produced. **Terminalia** (Fig. A4F). Terminalia brownish-yellow. Gonocoxites well-developed, ending in a short peak slightly more projected than insertion of gonostylus. Gonostylus well-sclerotized, elongate, bifid distally. Parameres separate, elongate, with a comb of small spines distally.

**Female** (Fig. A4A). As male, except as follows. Wing length, 2.42; width, 0.98. **Terminalia** (Figs. A4G-H). Sternite 8 setose, trapezoid, posterior margin with a short medial wide incision. Tergite 8 large, tergite 9 short and wide. Cercomere 1 elongate, 1.6× length of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000762>)

**Material examined. Holotype:** male, ZRC\_BDP0048550, Nee Soon (NS1), swamp forest, Malaise trap, 29.March-04.April.2012, Mangrove Insect Project leg. (slide-mounted) **Paratypes:** 9 females, ZRC\_BDP0048548, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg.; ZRC\_BDP0048549, Nee Soon (NS1), swamp forest, 03-09.May.2012, MIP leg.; ZRC\_BDP0048691, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0047941, Nee Soon (NS2), swamp forest, 14-20.November.2013, MIP leg. (slide-mounted); ZRC\_BDP0048551, Nee Soon (NS2), swamp forest, 07-13.June.2012, MIP leg.; ZRC\_BDP0048554, Nee Soon (NS2), swamp forest, 17-23.January.2013, MIP leg.; ZRC\_BDP0048553, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg.; ZRC\_BDP0048555, Nee Soon (NS2), swamp forest, 12-18.April.2012, MIP leg.; ZRC\_BDP0078992, Singapore, no date, MIP leg.

**Etymology.** The species epithet of this species honors the Dutch naturalist Johannes Cornelis Hendrik de Meijere (1866–1947), specialized in Diptera and Coleoptera systematics, who gave relevant contribution to the understanding of the Oriental diversity of flies.

**Remarks.** We have two haplotypes for the genus and different delimitation algorithms generate no conflict for the species delimitation (Fig. A4I). *Azana demeijeri*, sp.nov. is present in the mangrove and in swamp forest samples.

***Azana leekongchiani* Amorim & Oliveira, sp.nov.**

(Figs. A5A-F)

**Diagnosis.** Abdomen segments 2–6 ochre-brown to brown, with a slender ochre-yellowish transverse band along posterior margin. Male gonostylus complex, with three branches, inner branch more sclerotized towards tip, outer branch weakly sclerotized, with more setulae. Female sternite 8 with deeper distal medial incision, genital fork with a pair of well characterized anterior flaps.

**Description. Male.** Wing length, 1.76, width, 0.79 (Fig. A5C). **Head** (Fig. A5B). Vertex and frons light brownish-yellow, **Thorax** (Fig. A5B). Scutum and scutellum dark cream-yellow, posterior fourth of scutum darker. Pleural sclerites light brownish-yellow. **Abdomen.** Tergite 1 light brownish-yellow, tergites 2-6 ochre-brown, with a slender ochre-yellowish transverse band along posterior margin, T7 brownish-yellow. **Terminalia** (Fig. A5D). Terminalia brownish-yellow. Sternite 9 present as an independent setose plate. Gonocoxite large, not projected beyond base of gonostylus. Gonostylus large, complex, well sclerotized, with three branches, ventral branch wider, with a group of setae along margin, a medial branch weakly sclerotized, dorsal branch digitiform, more well sclerotized. Aedeagus tubular, projected first dorsally and then distally, with a pair of digitiform basal projections ending as small hooks. Parameres well-developed, digitiform, widened distally, with a long comb of short spinules on inner margin distally. Cercus small, lobose.

**Female** (Fig. A5A). As males except as for the following. Wing length, 1.84; width, 0.84.

**Terminalia** (Figs. A5E–F). Terminalia brownish-yellow. Sternite 8 wide, with a pair of projections with a posterior incision in between, a row of longer setae along distal margin, tergite 9 partially fused to tergite 8, slightly projecting distally at sides; tergite 10 produced, with a row of setae along posterior margin, sternite 10 triangular, with a number of distal setulae. Cercus 2-segmented, clearly separated, distal cercomere about one fourth of basal cercomere.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000800>)

**Material examined. Holotype:** male, ZRC\_BDP0048268, Pulau Semakau (SMO2), old mangrove, 04-10.October.2013, MIP leg. (slide-mounted). **Paratypes:** 7 males, 4 females. **Males:** ZRC\_BDP0048146, Sungei Buloh (SB1), mangrove, 26.September-02.October.2013, MIP leg.; ZRC\_BDP0048258, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.; ZRC\_BDP0048312, Sungei Buloh (SB1), mangrove, 13-19.June.2013, MIP leg.; ZRC\_BDP0049277, National University of Singapore (Uhall), 09-15.April.2015, MIP leg.; ZRC\_BDP0049296, National University of Singapore (Icube), 07-13.May.2015, MIP leg.; ZRC\_BDP0049320, National University of Singapore (Uhall), 26.March-01.April.2015, MIP leg.; ZRC\_BDP0278186, Pulau Ubin (PU18), mangrove, 31-May-18, MIP leg. **Females:** ZRC\_BDP0048079, Sungei Buloh (SB1), mangrove, 28.August-04.September.2013, MIP leg.; ZRC\_BDP0049121, Nee Soon (NS1), 18-

24.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0279131, Singapore, 26-Apr-18, MIP leg.;  
ZRC\_BDP0284192, Singapore, (date range 2012-2018), MIP leg.

**Etymology.** This species proudly honors Lee Kong Chian [1893–1967], a prominent Chinese businessman who founded the Lee Foundation. He poured his wealth into education and other philanthropic work in Singapore, investing between 1952 and 1993 over US\$ 200 million to various causes with no conditions attached. He was the first Chancellor of the National University of Singapore (1962-1965). The Lee Kong Chian Museum of Natural History, of the National University of Singapore, is named after him.

**Remarks.** *A. leekongchiani*, sp.nov. was collected in different kinds of environment in Singapore, including urban forests and there are three haplotypes detected (Fig. A4I). *A. leekongchiani*, sp.nov. can be clearly separated from *A. demeijeri* based on the color patterns of the abdomen and by the shape of the gonostylus.

## Tetragoneurinae

There is a group of mycetophilid genera about which there has been scarce agreement in the literature about its placement within the family—*Tetragoneura* Winnertz, *Ectrepesthoneura* Enderlein, *Novakia* Strobl and *Docosia* Winnertz. They have been alternately placed in the Gnoristinae, in the Leiinae or in a higher taxon of their own. These genera are connected to a number of fossils, known from the Valanginian to the Campanian along the Cretaceous (Blagoderov & Grimaldi 2004; Oliveira & Amorim, 2021). Oliveira & Amorim's (2021) extensive study of the Leiinae showed that they do not belong in the subfamily and that they need a taxon of subfamily rank, the Tetragoneurinae, previously available in the literature.

Of the four extant genera belonging to the subfamily, we found in the Singapore samples *Tetragoneura* and *Ectrepesthoneura*. The mitogenome tree shows *Ectrepesthoneura* and *Tetragoneura* apart from the clades with the Leiinae genera. Indeed, *Ectrepesthoneura* in the tree appears as sister of (*Tetragoneura* + (*Chalastonepsia* + *Metanepsia*)). The paraphyly of the tetragoneurines is not expected and taxon sampling here, particularly of *Tetragoneura* species, is very limited. Its connection to the gnoristines corresponds to one of the solutions for an unsolved polytomy in Oliveira & Amorim's (2021) relationships between mycetophilid subfamilies.

### ***Tetragoneura* Winnertz**

*Tetragoneura* Winnertz, 1846: 18. Type species: *Tetragoneura distincta* Winnertz, 1846

[*Sciophila sylvatica* Curtis, 1837], designated Johannsen, 1909: 34.

**Diagnosis.** Flagellomeres about as long as wide. Three ocelli, lateral ocelli remote from eye margin. Laterotergite and mediotergite bare. C extending beyond tip of  $R_5$  at wing margin;  $R_1$  at most slightly longer than  $r-m$ ; Sc incomplete, short;  $R_4$ , when present, forming a small cell;  $M_4$  originating beyond level of origin of  $M_{1+2}$ . Male terminalia flexed, ventral face often directed posteriorly.

*Tetragoneura* is a quite large genus, with nearly 140 species, particularly diversified in the Neotropical region, with 79 described species, and the Australasian region, with 26 species. There are no previous records for the Oriental region. No comprehensive studies have been made so far for the genus worldwide and it is not possible to group the species described here with the species found elsewhere.

We found four species of *Tetragoneura* in the samples from Singapore. The haplotypes for these species are either gathered as two species (mPTP) or four species (all other method and parameters) (Fig. B0). Some of the New Zealand species of the genus show the long, curved blade-like parameres with tips extending beyond the base of the gonostylus, as seen in all species described here from Singapore except *Tetragoneura crawfurdi*, sp.nov. Indeed, the mitogenome tree shows *Tetragoneura crawfurdi*, sp.nov as sister of the set of the remaining species of the genus in Singapore.

The morphology of the male terminalia of the four species are clearly distinct from each other and the mitogenome tree show a large divergence between all four species. All species of *Tetragoneura* were obtained only from mangrove samples.

### ***Tetragoneura crawfurdi* Amorim & Oliveira, sp.nov.**

(Figs. B1A–D)

**Diagnosis.** Scutum yellowish. Male with anterior half of abdomen yellowish, brown marks only medially on tergites 2–4, tergites 5–6 blackish-brown; female with tergite and sternite 1

yellowish, segments 2–6 dark brown. Syngonocoxite medially with a pair of slightly divergent posterior projections, gonocoxites laterally not projecting beyond base of gonostylus. Gonostylus with a pointed short projection on outer face, no long, curved blade. Parameres short, not curved.

**Description. Male** (Fig. B1A). Wing length, 1.81; width, 0.74. **Head.** Blackish-brown. Three ocelli, lateral ocelli separated from eye margin by distance much larger than its own diameter, mid ocellus at posterior end of frontal furrow. Clypeus brownish, with scattered short setae, palpus and labella whitish. Eyes densely covered by inter-ommatidial setulae. Antennal scape and pedicel whitish-yellow, with a crown of brownish short setae and an additional conspicuous dorsal bristle; flagellomere 1 light yellowish-brown, other flagellomeres brown. Flagellomeres about as long as wide, except first and last, slightly longer than wide. Mouthparts slightly projected. Maxillary palpus 5-segmented, second segment very short, third segment with a well-developed, deep sensorial pit, fourth segment slightly longer than third, distal segment almost twice longer than fourth, thin, weakly sclerotized. **Thorax.** Scutum and scutellum yellowish, scutellum yellowish-brown laterally. Pleural sclerites cream-yellowish, except for anepisternum, only slightly more brownish, dorsal half of mesepimeron, dorsal half of laterotergite and mediotergite, light brownish-yellow. Scutum with scattered brownish short setae and a line of nine conspicuous dorsocentrals, some longer setae along acrostichal line; some longer supra-alars; scutellum with one pair of strong setae and one pair of smaller setae closer to lateral margins. Antepronotum and proepisternum with bristles and setae, other pleural sclerites bare. Haltere mostly yellowish, light brown at base of knob; some setulae along pedicel. **Wing** (Fig. B1B). Wing largely greyish-brown, membrane brown on distal third of wing, at tip of costal cell, on cell  $r_1$ , and along second sector of CuA on cell cua. C extending over almost three-fourth of distance between  $R_5$  and  $M_1$ . Sc short, ending free.  $R_4$  present.  $R_1$  longer than  $r-m$ ;  $r-m$  longitudinal on most of its length, slightly curved basally towards posterior margin, aligned to second sector of Rs and to bM.  $M_{1+2}$  much shorter than medial fork.  $M_4$  originating slightly beyond level of origin of  $M_{1+2}$ , with very gentle depression on distal half. CuA slightly sinuous beyond origin of  $M_4$ . All veins with dorsal setae, except for Sc, first sector of Rs,  $R_4$ ,  $M_{1+2}$  and bM. No trace of CuP. **Legs.** Coxae whitish-yellow; femora light brownish-yellow, hind femur brownish at distal fifth; tibiae and tarsi greyish-brown. Front tibia without bristles except at tip, mid and hind tibiae and tarsi with a long regular row of small dark dorsal bristles, scattered laterally. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs

dark brown, more than 4× width of tibiae at apex. Tarsal claw with a strong basal tooth.

**Abdomen.** Tergites 1–3 yellowish, tergites 4–7 dark brown, sternites 1–2 yellowish, sternite 3 light brown, sternites 4–7 brown. **Terminalia** (Figs. B1C–D). Dark brown. Gonocoxites with deep V-shaped median cleft, reaching anterior third of terminalia; medial area of syngonocoxite more sclerotized, with a pair of projections densely covered with microtrichia. Gonostylus at tip of gonocoxites, well-developed, with three basal branches in addition to main branch densely covered with setae: a long, slender, bare blade, a pointed basal branch covered with setulae, and a short digitiform projection densely covered with setulae. Aedeagus short, hardly detectable. Aedeagal-parameral complex well sclerotized medially, with a pair of short lateral horns and a pair of elongate, curved slender blades inside terminalia, each branch crossing towards the other side of terminalia but not extending beyond tip of aedeagus. Gonocoxal bridge wide, gonocoxal apodemes short, well separated. Tergite 9 weakly sclerotized, wide and short, not reaching posteriorly level of base of gonostylus. Cerci small, lobose, covered with microtrichia and some elongate fine setae.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0048499, Nee Soon (NS1), swamp forest, 21–27.June.2012, MIP leg. (slide-mounted).

**Etymology.** This species is named after John Crawfurd FRS (1783–1868), a Scottish physician, with an important role in founding Singapore, the second and last British Resident of Singapore (as this position was later replaced with the Governor of the Straits Settlements). He was an important and efficient administrator, laying out many crucial foundations that ensured the growth of modern Singapore. He was also an author, known for his work on Asian languages and his History of the Indian Archipelago.

**Remarks.** This is the only species of *Tetragoneura* in Singapore that does not present the long, curved paramere blades crossing sides in the male terminalia and in the mitogenome tree it stands as the sister of the set of the remaining species in the genus. It is known only from the holotype, collected in the mangrove traps.

***Tetragoneura chola* Amorim & Oliveira, sp.nov.**

(Figs. B2A–E)

**Diagnosis.** Scutum yellowish. Males with anterior half of abdomen yellowish, with brown marks only medially on tergites 2–4, tergites 5–6 blackish-brown (female unknown).

Syngonocoxite medially without a pair of conspicuous posterior projections, gonocoxites laterally not projecting beyond base of gonostylus. Gonostylus with a long, curved slender blade that extends distally. Parameres long, curved and slender, crossing inside terminalia, ending with a brush-like concentration of setae.

**Description. Male** (Fig. B2A). Wing length, 1.91–2.22; width, 0.79 (n=2). **Head.** Blackish-brown. Three ocelli, lateral ones separated from eye margin by distance of its own diameter, mid ocellus at posterior end of frontal furrow. Clypeus brownish with scattered short setae, palpus and labella whitish-yellow. Eyes densely covered by inter-ommatidial setulae. Antennal scape and pedicel dirty-yellow, with a crown of blackish-brown short setae and one additional dorsal bristle, flagellomere 1 brownish-yellow, other flagellomeres dark brown. Flagellomeres about as long as wide, except last one, slightly longer. Mouthparts slightly projected. Maxillary palpus 5-segmented, second segment very short, third segment with a well-developed, deep sensorial pit, fourth segment slightly longer than third, distal segment almost twice longer than fourth, thin, weakly sclerotized. **Thorax.** Scutum yellowish, scutellum yellowish-brown. Pleural sclerites cream-yellowish, except for anepisternum, only slightly more brownish, dorsal half of mesepimeron and dorsal half of laterotergite and mediotergite, brownish. Scutum with scattered brownish short setae and a line of nine conspicuous dorsocentrals, some longer setae along acrostichal line; some longer supra-alars; scutellum with one pair of strong setae and one pair of smaller setae closer to lateral margins. Antepronotum and proepisternum haired and with bristles, other pleural sclerites bare, including laterotergite and mediotergite. Haltere mostly yellowish, light brown at base of knob. **Wing** (Fig. B2A). Wing largely greyish-brown, membrane brown on distal third of wing, at tip of costal cell, over cell m<sub>4</sub>, and along CuA on cell cua; veins dark brown except for M<sub>1+2</sub>, basal fourth of M<sub>1</sub>, bM and first section of CuA, which are weakly sclerotized. C extending over almost three-fourth distance between R<sub>5</sub> and M<sub>1</sub>. Sc short, ending free. R<sub>4</sub> present. R<sub>1</sub> longer than r-m; r-m longitudinal on most its length, slightly curved basally towards posterior margin, aligned to second sector of Rs and to bM. M<sub>1+2</sub> much shorter than medial fork. M<sub>4</sub> originating slightly beyond level of origin of M<sub>1+2</sub>, with very gentle depression on distal half. CuA slightly sinuous beyond origin of M<sub>4</sub>. All veins with dorsal

setae, except for Sc, first sector of Rs, R<sub>4</sub>, M<sub>1+2</sub> and bM. No trace of CuP. **Legs.** Coxae whitish-yellow, femora light brownish-yellow, tibiae and tarsi greyish-brown; front tibia without bristles except at tip, mid and hind tibiae and tarsi with some scattered small dark bristles. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs dark brown, more than 4× width of tibiae at apex. Tarsal claw with long, strong basal tooth. **Abdomen.** Tergite 1 yellowish, tergites 2–3 yellowish with a medial longitudinal brown band, tergite 4 yellowish with a medial brown band that expands laterally at distal margin, tergites 5–7 dark brown, sternite 1–4 yellowish, sternite 5 light brownish, sternite 6–7 dark brown. **Terminalia** (Figs. B2C–D). Dark brown. Gonocoxites with deep median V-shaped cleft, reaching anterior third of terminalia; a small area bulging on each gonocoxite with a group of concentrated setulae. Gonostylus relatively small, bifid from the base, one branch straight with setulae, other branch long, curved projecting medially on basal half then distally on distal half. Aedeagus short, hardly detectable. Parameres extremely long, with a pair of curved slender blades inside the terminalia, each branch crossing towards the other side of terminalia, tip of blades not reaching level of tip of syngonocoxite projections. Gonocoaxal bridge wide, gonocoaxal apodemes short, well separated. Tergite 9 weakly sclerotized, wide and short, not reaching posteriorly level of base of gonostylus. Cerci small, lobose, covered with microtrichia and some elongate fine setae.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0047776, Nee Soon (NS1), swamp forest, 22-28.August.2013, MIP leg. (slide-mounted). **Paratypes:** 5 males: ZRC\_BDP0047848, Nee Soon (NS1), swamp forest, 20-26.June.2013, MIP leg.; ZRC\_BDP0048501, Nee Soon (NS1), swamp forest, 14-20.June.2012, MIP leg.; ZRC\_BDP0049175, Nee Soon (NS2), 07-13.May.2015, MIP leg. (extracted); ZRC\_BDP0049186, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0155113, Singapore, NSM2, 25-Feb-15, MIP leg. (slide-mounted).

**Etymology.** This species is named after Rajendra Chola I, a Tamil Chola emperor of South India, who succeeded his father to the throne in 1014 CE. He greatly extended the influence of the Chola empire – North through the banks of the river Ganga, South to Sri Lanka, and East through South East Asia, conquering much of the Malay Peninsula (including Singapore) and parts of Indonesia. There are no records, however, of his visit to the island of Singapore itself. The noun is used in apposition.

***Tetragoneura dayuan* Amorim & Oliveira, sp.nov.**

(Figs. B3A–F)

**Diagnosis.** Scutum yellowish. Male with anterior half of abdomen yellowish, brown marks only medially on tergites 2–4, tergites 5–6 blackish-brown; female with tergite and sternite 1 yellowish, segments 2–6 dark brown. Syngonocoxite medially with a pair of parallel posterior projections, gonocoxites latero-distally with a short projection beyond base of gonostylus. Gonostylus simple, without long, curved blade or pointed projections. Parameres long, curved inside the terminalia crossing medially, without a distal brush.

**Description. Male** (Fig. B3A). Wing length, 2.17; width, 0.89. **Head** (Fig. B3B). Blackish-brown. Three ocelli, lateral ones separated from eye margin by distance much larger than its own diameter. Clypeus light brown, with scattered short setae, palpus whitish-yellow, labella whitish. Eyes densely covered by inter-ommatidial setulae. Antennal scape and pedicel whitish-yellow, with a crown of brownish short setae and an additional conspicuous dorsal bristle; flagellomere 1 light yellowish-brown, other flagellomeres brown. Flagellomeres about as long as wide, first flagellomere 1  $1.5 \times$  length of flagellomere 2. Clypeus extended into a short proboscis. Maxillary palpus 5-segmented, second segment very short, third segment with a well-developed sensorial pit, fourth segment slightly longer than third, distal segment almost twice longer than fourth, thin, weakly sclerotized. **Thorax** (Fig. B3C). Scutum yellowish, slightly darker posterior to transverse suture, with scattered blackish short setae, some supra-alars and scattered stronger setae, scutellum yellowish-brown laterally. Pleural sclerites cream-yellowish, except for a dirty-yellow anepisternum, laterotergite mostly brownish, yellowish only ventrally, mediotergite brownish on dorsal half. Antepronotum and proepisternum with some scattered thin setae, antepronotum with three bristles, proepisternum with two bristles along ventral margin. Other pleural sclerites bare, including laterotergite and mediotergite. **Legs.** Coxae whitish-yellow; trochanters with brownish marks, front and mid femora whitish-yellow, hind femora cream-yellowish with a brown mark close to tip, front tibia and tarsus light greyish-brown, mid tibia and tarsus greyish-brown, hind tibia and tarsus brownish. Front coxa with internal face covered with fine setae, mid coxa covered with fine setae on distal half of internal face, hind coxa with a regular row of fine setae along mid of external face. Front tibia without bristles except at tip, mid and hind tibiae and tarsi with long regular row of small dark dorsal and lateral bristles. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs dark brown, about  $3 \times$  width of tibiae at apex. Tarsal claw with strong basal tooth. Haltere mostly yellowish, light brown at base of knob. **Wing** (Fig. B3D). Wing largely greyish-

brown, membrane brown on distal fourth of wing, at tip of costal cell, over cell m<sub>4</sub>, and along CuA on cell cua; veins dark brown except for basal fourth of M<sub>1</sub>, M<sub>1+2</sub> and bM. R<sub>4</sub> present. C extending over three-fourth distance between R<sub>5</sub> and M<sub>1</sub>. Sc short, ending free. R<sub>1</sub> longer than r-m; r-m longitudinal on most its length, slightly curved basally towards posterior margin, aligned to second sector of Rs and to bM. M<sub>1+2</sub> much shorter than medial fork, M<sub>2</sub> slightly curved anteriorly on distal half. M<sub>4</sub> originating slightly beyond level of origin of M<sub>1+2</sub>, with very gentle depression on distal half. CuA slightly sinuous beyond origin of M<sub>4</sub>. All veins with dorsal setae, except for Sc, first sector of Rs, R<sub>4</sub>, M<sub>1+2</sub> and bM. Three setae on a weakly sclerotized CuP. **Abdomen.** Tergite 1–3 yellowish, tergite 4 brown with yellowish longitudinal lateral bands, tergites 5–7 dark brown, sternites 1–3 yellowish, sternite 4 light brown, sternites 4–7 brown. **Terminalia** (Figs. B3E–F). Dark brown. Gonocoxites with V-shaped deep median cleft, reaching anterior third of terminalia; medial part of posterior margin syngonocoxite with a pair of distal projections with a number of fine setulae; part of posterior margin of syngonocoxite at each side of these projections slightly bulging, with a group of concentrated setulae; gonocoxite with a distal-posterior extension beyond base of gonostylus. Aedeagus short, weakly sclerotized, triangular distally. Aedeagal-parameral complex, with a pair of elongate, curved slender blades inside terminalia, each branch curved basally and then crossing towards other side of terminalia, extending almost to level of tip of medial syngonocoxite projections. Gonocoxal bridge wide, gonocoxal apodemes short, well separated. Tergite 9 weakly sclerotized, wide and short, not reaching posteriorly level of base of gonostylus. Cerci small, lobose, covered with microtrichia and some elongate fine setae.  
**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0048504, Nee Soon (NS2), swamp forest, 20–26.September.2012, MIP leg. (slide-mounted).

**Etymology.** This species is named after Wang Dayuan [=汪大淵] (1311–1350), a 14th Century Yuan Dynasty Chinese traveler who visited Singapore around 1330. His book, Dao Yi Zhi Lue [=島夷志略; A Brief Account of Island Barbarians], is one of the few records documenting life in Dan Ma Xi [=淡馬錫; transcription of Malay Temasek], a small settlement in early Singapore. The noun is used in apposition.

***Tetragoneura farquhari* Amorim & Oliveira, sp.nov.**

(Figs. B4aA–D, B4bA–B)

**Diagnosis.** Scutum yellowish with a brownish mark above wing base. Male with anterior half of abdomen yellowish, brown marks only medially on tergites 2–4, tergites 5–6 blackish-brown; female with tergite and sternite 1 yellowish, segments 2–6 dark brown.

Syngonocoxite medially with a pair of posterior projections distally rounded, gonocoxites latero-distally with a short, pointed projection beyond base of gonostylus. Gonostylus simple, with a pointed basal short projection on outer face. Parameres long, curved inside the terminalia crossing medially, without a distal brush.

**Description. Male.** Wing length, 2.14–2.30; width, 0.89 (n=2). **Head** (Fig. B4aB). Blackish-brown. Three ocelli, lateral ocelli separated from eye margin by distance much larger than its own diameter. Clypeus light brown, with scattered short setae, palpus whitish-yellow, labella whitish. Eyes densely covered by inter-ommatidial setulae. Antennal scape and pedicel whitish-yellow, with a crown of brownish short setae and an additional conspicuous dorsal bristle; flagellomere 1 light yellowish-brown, other flagellomeres brown. Flagellomeres about as long as wide, except first and last, slightly longer than wide. Clypeus extended into a short proboscis. Maxillary palpus 5-segmented, second segment very short, third segment with a deep sensorial pit, fourth segment slightly longer than third, distal segment almost twice longer than fourth, thin, weakly sclerotized. **Thorax** (Fig. B4aC). Scutum yellowish except for a brownish mark above wing base, scutellum brownish-yellow. Pleural sclerites cream-yellowish, except for a dirty-yellowish anepisternum, laterotergite brownish dorso-posteriorly, mediotergite brownish on dorsal half, dirty-yellowish on ventral half.

Antepronotum and proepisternum with some scattered thin setae, antepronotum with three bristles in line, proepisternum with two bristles along ventral margin. Other pleural sclerites bare, including laterotergite and mediotergite. **Legs.** Coxae whitish-yellow; trochanters with brownish marks; front and mid femora yellowish, hind femur yellowish with a brown mark close to tip, front tibia and tarsus light brown, mid tibia and tarsus brown, hind tibia and tarsus dark brown. Front coxa with internal face covered with fine setae, mid coxa covered with fine setae on distal half of internal face, hind coxa with a regular row of fine setae along mid of external face. Front tibia without bristles except at tip, mid and hind tibiae and tarsi with long regular row of small dark dorsal and lateral bristles. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs dark brown, about 3× width of tibiae at apex. Tarsal claw with a strong basal tooth. Haltere mostly yellowish, light brown at base of knob. **Wing** (Fig. B4aD). Wing membrane brown on distal fourth of wing, at distal

third of costal cell, over cell m<sub>4</sub>, and along CuA on cell cua; veins brown except for basal fourth of M<sub>1</sub>, M<sub>1+2</sub> and bM. R<sub>4</sub> present. C extending over two-thirds of distance between R<sub>5</sub> and M<sub>1</sub>. Sc short, ending free. R<sub>1</sub> longer than r-m; r-m longitudinal on most its length, gently curved basally towards posterior margin, aligned to second sector of Rs and to bM. M<sub>1+2</sub> much shorter than medial fork, M<sub>2</sub> slightly curved anteriorly on distal half. M<sub>4</sub> originating slightly beyond level of origin of M<sub>1+2</sub>, with a very gentle depression on distal half. CuA slightly sinuous beyond origin of M<sub>4</sub>. All veins with dorsal setae, except for Sc, first sector of Rs, R<sub>4</sub>, M<sub>1+2</sub> and bM. CuP absent. **Abdomen.** Tergite 1 yellowish, tergites 2–3 yellowish with a brownish medial area, tergite 4 brown with yellow areas along anterior margin and along lateral margin, tergites 5–7 dark brown, sternites 1–3 yellowish, sternite 4 light brown, sternites 4–7 brown. **Terminalia** (Figs. B4bA–B). Dark brown. Gonocoxites connected on anterior half of terminalia; medial part of posterior margin syngonocoxite with a pair of distal projections with fine setulae; gonocoxite with a distal pointed short projection beyond base of gonostylus. Aedeagus short, weakly sclerotized. Aedeagal-parameral complex with a pair of elongate, curved slender blades inside terminalia, each branch curved basally and then extending distally almost to level of tip of medial syngonocoxite projections, not crossing to other half of terminalia. Gonocoaxal bridge wide, gonocoaxal apodemes short, well separated. Tergite 9 weakly sclerotized, wide and short, not reaching posteriorly level of base of gonostylus. Cerci small, lobose, covered with microtrichia and some elongate fine setae.

**Female** (Fig. B4aA). As male, except for the following. **Wing.** Length, 2.14; width, 0.82.

**Abdomen.** Tergites brownish, sternites brownish-yellow, distal segments darker. **Terminalia** (Figs. B4bC–D). Sternite 8 with a pair of elongated lobes distally, connected along anterior half; no chambers on lobes, scattered microtrichia on lobes, some setulae on distal half of lobes and longer setae along posterior margin. Sternite 9 (vaginal furca) weakly sclerotized, hardly visible, without typical Y-shape. Sternite 10 weakly sclerotized, hardly visible. Tergite 8 with a row of fine setae along posterior margin. Tergite 9 short, slender, with a row of elongate fine setae. Tergite 10 short, slender, not fused to sternite 9, with a single row of fine elongate setae. Cercus 2-segmented, cercomere 1 about 3× length of cercomere 2, tip of cercomere 1 projecting slightly beyond insertion of cercomere 2.

**Material examined.** **Holotype:** male, ZRC\_BDP0048710, Nee Soon (NS2), 22–28.January.2015, MIP leg. (extracted, slide-mounted). **Paratypes:** 4 males, 2 females. **Males:** ZRC\_BDP0048500, Nee Soon (NS1), swamp forest, 19–25.April.2012, MIP leg.; ZRC\_BDP0048716, Nee Soon (NS2), 22–28.January.2015, MIP leg.; ZRC\_BDP0048739, Nee Soon (NS1), 19–25.February.2015, MIP leg.; ZRC\_BDP0154852, Singapore, MIP leg. (slide-mounted). **Females:** ZRC\_BDP0048502, Nee Soon (NS1), swamp forest, 17–23.May.2012, MIP leg.; ZRC\_BDP0048503, Nee Soon (NS1), swamp forest, 29.March–04.April.2012, MIP leg. (slide-mounted).

**Etymology.** The species name honors William Farquhar, a Scottish employee of the East India Company, who was the first British Resident and Commandant of Singapore. He was designated by Raffles to manage the colony of Singapore according to specific plans set in the period from 1819 to 1823.

**Remarks.** Specimens of this species came from both, the swamp forest and the mangrove. This species is closely related to *Tetragoneura dayuan*, sp.nov. as can be seen in different details of the male terminalia.

### ***Ectrepesthoneura* Enderlein**

*Ectrepesthoneura* Enderlein, 1911: 155. Type species *Tetragoneura hirta* Winnertz, by original designation and monotypy.

*Ectrepesthoneura* has about 20 described species worldwide, most of which from the Nearctic and Palearctic regions. The genus has two Cretaceous and two Cenozoic fossil species described (Blagoderov & Grimaldi 2004). This is the first non-Holarctic species of the genus. The long Sc ending free is a quite unique feature of this species within *Ectrepesthoneura*, the Holarctic species having Sc fused to R<sub>1</sub>. Only samples of the Nee Soon swamp forest had this species.

**Diagnosis.** Three ocelli, lateral ocelli remote from eye margin. Maxillary palpomeres 2 and 3 more or less swollen. Laterotergite and mediotergite setose. C produced beyond tip of R<sub>5</sub>; Sc long, ending free or fused to R<sub>1</sub> distally; R<sub>4</sub> present; first section of CuA very short, M<sub>4</sub> originating close to wing base. Male terminalia flexed, ventral face directed posteriorly.

### ***Ectrepesthoneura johor* Amorim & Oliveira, sp.nov.**

(Figs. B5A–J)

**Diagnosis.** Head dark brown. Male mid tibia dorsally with a sensory organ at basal fourth. Scutum ochre-yellowish, thoracic pleural sclerites greyish brown. Abdomen tergite 1 cream-yellowish, tergites 2–7 greyish-brown. Gonocoxites with a short pointed blade directed

inwards medially on posterior margin of ventral face; gonostylus small, spine-like distally; tergite 9 largely developed.

**Description. Male** (Fig. B5A). Wing length, 1.89; width, 0.82. **Head** (Fig. B5C). Blackish-brown. Three ocelli, lateral ocelli separated from eye margin by distance twice its own diameter. Clypeus light brown, with scattered setae, palpus dirty whitish-yellow, labella whitish. Antennal scape and pedicel whitish-yellow, flagellomere 1 dirty-yellowish, remaining flagellomeres light ochre-brownish; scape and pedicel with a crown of short setae around distal margin, one strong dorsal bristle at distal margin of pedicel. Flagellomeres slightly wider than long, except first and last, slightly longer than wide. Clypeus bulging, covered with setulae and some few longer setae, not projecting into a proboscis. Maxillary palpus 5-segmented, basal palpomere slightly elongate, second very short, third well-developed, widening towards apex, projecting beyond base of next flagellomere, a shallow sensorial pit on basal half at inner face and a shallow depression on distal half, tapering end; second palpomere slightly longer than first, third palpomere about twice longer than second.

**Thorax** (Fig. B5D). Scutum ochre-yellowish, with a blackish pre-sutural mark along anterior margin medially, dark marks posterior to transverse suture and above wing. Small setae scattered over scutum, some scattered stronger supra-alars and a pair of regular strong dorsocentrals. Scutellum brown, yellowish laterally, a pair of strong scutellars and some additional fine setae. Antepronotum blackish on anterior half, cream-yellowish on posterior half, anterior margin of proepisternum blackish, remaining sclerite cream-yellowish, anepisternum, katepisternum and mesepimeron with cream-yellowish diffuse marks over a brownish background, laterotergite and metepisternum brown, mediotergite mostly brownish yellowish-brown laterally. Antepronotum with a row of three bristles and some fine setae, proepisternum with fine setae and one strong seta close to ventral margin and another one more dorsally; other pleural sclerites bare. **Legs**. Coxae whitish-yellow, some light brown tinge at anterior tip; trochanters with brownish marks, femora whitish-yellow, tibiae and tarsi light greyish-brown, mid and hind tibiae and tarsi slightly darker. Front coxa with scattered setae frontally and on external face, mid coxa with setae on distal half of external face and along entire anterior face, hind coxa with a regular row of setae medially on external face. Hind femur slightly wider medially. Front tibia without bristles except at tip, mid tibia with irregular rows of small dark bristles on external, dorsal and internal faces, hind tibia with irregular rows of small bristles on external and dorsal faces. Tarsomeres 1–2 with a row of ventral stronger setae and a group of setae at tip, tarsomeres 3–4 with a pair of distal setae,

only setulae on distal tarsomere. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs dark brown, about  $3\times$  width of tibiae at apex. A long basal tooth on tarsal claw. Haltere mostly yellowish, light brown at base of knob. **Wing** (Fig. B5E). Wing light greyish; anterior veins brown, posterior veins with a light brownish tinge,  $M_{1+2}$  and basal fourth of  $M_1$  weakly sclerotized. C extending over three-fourth distance between  $R_5$  and  $M_1$ . Sc long, ending free, bare.  $R_1$  slightly longer than r-m;  $R_4$  present; r-m longitudinal on most its.  $R_5$  short, ending at level of tip of  $M_2$ .  $M_{1+2}$  less than a third medial fork length,  $M_4$  originating from CuA slightly beyond level of humeral vein, CuP weakly sclerotized but produced on basal third. Dorsal macrotrichia on  $R_1$ ,  $R_5$ , r-m, distal two-thirds of  $M_1$ ,  $M_2$ ,  $M_4$ , CuA and CuP. **Abdomen**. Tergite 1 yellowish-brown, tergites 2–7 brownish, sternites 1–3 yellowish with light brown diffuse areas, sternites 4–7 light brown. **Terminalia** (Figs. B5F–G). Brownish-yellow. Gonocoxites in contact medially only at anterior end of terminalia, elongate, posterior margin with a pointed blade-like extension at each side crossing medially, two other pointed projections medially and a longer projection external to base of gonostylus. Gonostylus small, strongly sclerotized on distal half, falciform, distal end curved outwards, a few fine setulae on basal half, articulating on inner end of distal margin of gonocoxite. Gonocoxal bridge conspicuous, with well-developed apodemes. Aedeagal-parameral complex well-developed, aedeagus with an elongate apodeme anteriorly, a pair of distal projections with rounded end and a short medial projection. Tergite 9 wide, covering entirely dorsal face of terminalia, with a V-shape medial incision on posterior margin. Cerci delicate, short, weakly sclerotized, with lateral apodemes extending anteriorly.

**Female** (Fig. B5B). As male, except for the following. **Terminalia** (Figs. B5H–I). Sternite 8 wide, without lobose distal projections, medially along posterior margin with an inverted triangular depression densely covered with microtrichia and fine setulae. Sternite 9 without Y-shape sclerotized area, gonopore on a more sclerotized area. Tergite 8 wide, short, weakly sclerotized, only with few fine setulae. Tergites 9 and 10 separate, weakly sclerotized except for band along anterior margin, with microtrichia and setulae. Cercus 2-segmented, basal cercomere much longer than second.

**Material examined.** **Holotype:** male, ZRC\_BDP0047876, Nee Soon (NS1), swamp forest, 13-19.June.2013, MIP leg. (extracted, slide-mounted). **Paratypes:** 1 male, 1 female. Male: ZRC\_BDP0048505, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (slide-mounted). Female: ZRC\_BDP0048506, Nee Soon (NS2), swamp forest, 09-15.August.2012, MIP leg. (slide-mounted).

**Etymology.** The species name refers to Johor [sometimes Johor-Riau or Johor-Riau-Lingga], the name of the Sultanate founded in 1528 by Sultan Alauddin Riayat Shah II (son of the Malaccan Sultan Mahmud Shah), originally part of the Malaccan Sultanate, before Portugal's 1511 conquer of Malacca's capital. At its height, the sultanate included areas of modern-day Malaysia and Indonesia, as Johor, Riau, Muar, Batu Pahat, etc., besides Singapore. The noun is used in aposition.

**Remarks.** There is a single haplotype for *Ectrepesthoneura johor*, sp.nov. in our samples (Fig. B5J).

## Leiinae

The only complete phylogenetic study on Leiinae phylogeny was provided by Oliveira & Amorim (2021), with a sampling of all genera of the subfamily and genera of all other subfamilies, including a discussion of the mycetophilid fossil record. *Allactoneura* joins *Sticholeia* and the manotine genera in a clade deeply nested within the (Oliveira & Amorim, 2021). The mitogenome tree obtained in this paper shows *Manota* and *Eumanota* in a clade sister of the remaining mycetophilids, what was also found in Ševčík et al.'s (2013) molecular phylogeny of mycetophilids. In our mitogenome tree, *Allactoneura* gathers *Clastobasis*, while in some of the alternative mitogenome trees (*Manota* + *Eumanota*) is not sister of the remaining mycetophilids. There is no paleontological or morphological support for the manotines to be sister of the remaining mycetophilids (Oliveira & Amorim, 2021) and that position seems to be the consequence of long branch attraction. Our Singapore samples include, among the leiines, the genera *Mohelia*, *Allactoneura* *Eumanota*, *Manota* and *Clastobasis*.

## *Mohelia* Matile

*Mohelia* Matile, 1979a: 270. Type-species, *M. nigricauda* Matile (orig. desig.).

**Diagnosis.** Labrum elongated, almost twice length of clypeus, triangular, labella also elongated, almost as long as head height.  $R_1$  about as long as r-m, r-m almost longitudinal, laterotergite with setae, mediotergite bare.

*Mohelia* was created by Matile (1979a) for a single Afrotropical species, *M. nigricauda* Matile, while three additional Afrotropical species were added more recently by Oliveira (2015). *Mohelia* was considered by Matile (1979a) to be related to the strictly Neotropical genus *Aphrastomyia* Coher & Lane, as well as to *Megophthalmidia* Dziedzicki. This later genus has seven species described from the Neotropical region, nine from the Nearctic and ten from the Palearctic (Bechev, 1999; Chandler et al., 2005; Oliveira & Amorim, 2014; Kerr, 2014). Jaschhof & Kallweit's (2004) understanding about this group was similar to Matile's (1979a) position and reinforced the possible relationship between these *Aphrastomyia* and *Mohelia*. Kerr (2014) made a careful revision of the Nearctic species of *Megophthalmidia* and also mentioned its similarities with *Aphrastomyia*.

It is interesting to note that there are no published keys for mycetophilids including all three genera, *Aphrastomyia*, *Mohelia* and *Megophthalmidia*. The species from Singapore described here unquestionably belongs to the clade (*Megophthalmidia* + (*Mohelia* + *Aphrastomyia*)) but is quite puzzling: depending on the key used, it would fit in a different genus. All species of *Aphrastomyia* have an obvious sclerotization of the posterior border of the syngonocoxite ventrally, not seen in the Singaporean species. *Megophthalmidia* has a flat and elongate syngonocoxite and a largely modified tergite 9 (Kerr, 2014), also absent in *Mohelia zubirsaidi*, sp.nov. The Afrotropical species of *Mohelia* have simpler terminalia, but with a general shape and details on most sclerites that differ from the species from Singapore, except for the simple, band-like tergite 9 (Oliveira, 2015). The problem of the limits between *Aphrastomyia* and *Mohelia* was already in need of solution. Such a solution is beyond the scope of this paper. Some features of this Singaporean species suggest that its inclusion in *Mohelia* may be the best solution for the time being—as the presence of a short proboscis, the shape of some of the wing veins etc.

The mitogenome tree shows our species of *Mohelia* as sister of (*Chalastonepsia* + *Metanepsia*), in a clade that also includes *Tetragoneura*; the taxon sampling of these genera, as we mentioned above, is pretty small. In Oliveira & Amorim's (2021) phylogeny, the clade with *Aphrastomyia*, *Mohelia* and *Megophthalmidia* belongs in the Leiinae, but not far from the base of the subfamily. The presence of *Mohelia* in Southeast Asia results in another case of an Afro-oriental distribution pattern (see, e.g., Amorim & Tozoni, 1995; Matile, 1999)—that sometimes extends into tropical areas of the Australasian region. Among the mycetophilid genera in our samples, this pattern is also seen in *Allactoneura*, *Metanepsia*, *Parempheriella*, *Platyprosthiogyne* and *Aspidionia*.

***Mohelia zubirsaidi* Amorim & Oliveira, sp.nov.**

(Figs. C1A–G, C2)

**Diagnosis.** Scutum yellowish-brown, darker on anterior half, pleural sclerites mostly dark ochre-yellowish. Tergite 1 yellowish with antero-medial brown mark, tergites 2–6 brownish with a cream-yellow band at posterior fourth. Gonocoxites with a deep V-shaped medial cleft; gonostylus small, with a pair of distal spines on apical projection; aedeagus long, coiled. Tergite 9 wide, short, weakly sclerotized.

**Description. Male** (Fig. C1A). Wing length, 1.48–1.63; width, 0.64–0.74 (n=2). **Head.** Dark ochre-yellowish, area across ocelli dark brown, face yellowish-brown, brown along laterals, clypeus cream-yellowish. Three ocelli, lateral ocelli separated from eye margin by about 1.5 its own diameter, mid ocellus at posterior end of frontal furrow. Face with scattered short setae, clypeus cream-yellowish, palpus and labella whitish-yellow. Eyes densely covered by inter-ommatidial setulae. Maxillary palpus with four palpomeres, third palpomere with sensorial pit, distal palpomere about twice length of preceding palpomere. Antennal scape and pedicel whitish-yellow, with a crown of blackish-brown setae along distal border, with one stronger and longer dorsal setae. Flagellum light brownish-yellow, flagellomeres wider than long, last flagellomere slightly more projected ventrally than dorsally. Mouthparts slightly projected as a short proboscis. Maxillary palpus 5-segmented, second segment very short, third segment with a well-developed, deep sensorial pit, fourth segment slightly longer than third, distal segment almost twice longer than fourth, thin, weakly sclerotized. Labella well developed, directed backwards with pseudotrachaea. **Thorax.** Scutum yellowish-brown, darker on anterior half, with scattered brownish setae, supra-alars only slightly stronger. Scutellum yellowish-brown laterally. Pleural sclerites dark ochre-yellowish, with light brown maculae on anepisternum, katepisternum, laterotergite and mediotergite. Antepronotum with some small setulae and three larger setae. Proepisternum well-developed, with 11–13 smaller setae, 2–3 stronger setae along ventral margin. Anepisternum, katepisternum, mesepimeron, metepisternum, and mediotergite bare, laterotergite with 4–8 setae. Mesepimeron not reaching ventral margin of thoracic pleura, katepisternum dorso-posteriorly in contact with laterotergite. Haltere pedicel yellowish-brown, knob brown. **Legs.** Fore coxa dirty-yellowish, mid and hind coxae whitish-yellow, femora dirty-yellowish, tibiae and tarsi greyish brown. Front tibia without bristles except at tip, mid and hind tibiae with some few slightly longer

setae dorsally and laterally, tibia without regularly arranged trichia; tarsomeres with some setae ventrally, particularly basal ones. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibial spurs dark brown, more than 4× width of tibiae at apex. Tarsal claw with strong basal tooth. **Wing** (Fig. C2). Wing light brownish fumose, veins brownish. C extending over four-fifth distance between R<sub>5</sub> and M<sub>1</sub>. Sc short, ending free close to bR. R<sub>1</sub> shorter than r-m; r-m strictly longitudinal, aligned to second sector of Rs and to bM; R<sub>4</sub> absent; R<sub>5</sub> short, reaching C at level of midway between M<sub>2</sub> and M<sub>4</sub>; r-m gently curved, perfectly aligned to second sector of Rs. M<sub>1+2</sub> shorter than medial fork, M<sub>1</sub> and M<sub>2</sub> quite parallel along most their length, M<sub>1+2</sub> shorter than medial fork, M<sub>1</sub> slightly less sclerotized, especially at basal half, but not interrupted. M<sub>4</sub> originating slightly beyond origin of M<sub>1+2</sub>, M<sub>4</sub> and CuA unsclerotized close to margin; CuA unsclerotized at tip, not reaching wing margin. Cubital pseudovein present, no trace of CuP, anal fold absent. Macrotrichia dorsally on bR, R<sub>1</sub>, second sector of Rs, r-m, distal half of M<sub>1</sub> and M<sub>2</sub> and distal fourth of M<sub>4</sub>. Haltere mostly yellowish, light brown at base of knob. **Abdomen**. Tergite 1 yellowish, brown Antero-medially, tergites 2–6 brownish with a cream-yellow band at posterior fourth, wider at laterally. Sternites 1–7 dirty-yellowish, darker towards tip of abdomen. **Terminalia** (Figs. C1B–D). Brown. Gonocoxites large, occupying most of anterior face of terminalia, setose, fused medially on anterior half of terminalia, with a deep V-shaped median cleft, which is slender anteriorly, gonocoxites with a pair of pointed projections at distal border ventrally and a latero-posterior projection reaching level of tip of gonostylus, from which a short blade projects inwards dorsally to gonostylus. Gonostylus small, complex, more or less rounded on basal two-thirds, with an apical slender projection bearing a pair of distal spines and a pair of additional short beaks. Gonocoxal bridge with a pair of long arms extending anteriorly, gonocoxal apodemes close together. Aedeagus long, partially coiled inside terminalia, projecting beyond tip of gonostylus and then curved ventrally. Tergite 9 wide, weakly sclerotized, not reaching posteriorly level of base of gonostylus. Cerci lobose, covered with microtrichia and some elongate fine setae.

**Female.** As males, except for the following. **Wing.** Wing length, 1.56; width, 0.64.

**Abdomen.** Tergites yellowish-brown, darker laterally. Sternites yellowish, sternites 5–7 brownish medially on distal half. **Terminalia** (Figs. C1E–F). Sternite 8 with a pair of distal elongated lobes, which are connected along their anterior half; lobes with a small chamber on inner face densely covered by microtrichia; setulae scattered on ventral face of the lobes, some longer setae along lobe posterior margin and on inner face. Sternite 9 (vaginal furca) weakly sclerotized, hardly visible, not with the typical Y-shape. Sternite 10 weakly

sclerotized, hardly visible. Tergite 8 separated from tergite 9, anterior border with sclerotized band extending laterally into apodemes directed ventrally, with scattered elongate fine setae. Tergite 9 short, slender, also with sclerotized band on anterior margin projecting laterally, with elongate fine setae. Tergite 10 short, slender, not fused to tergite 9, with a single row of fine elongate setae. Cercus 2-segmented, cercomere 1 about 1.5× length of cercomere 2.

**Material examined. Holotype:** male, ZRC\_BDP0133972, Singapore, MIP leg. (extracted, slide-mounted).  
**Paratypes:** 11 males, 4 females. Males: ZRC\_BDP0048725, Nee Soon (NS2), 09-15.April.2015, MIP leg.; ZRC\_BDP0048940, Nee Soon (NS2), 28.November-03.December.2014, MIP leg. (extracted, slide-mounted); ZRC\_BDP0048951, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0048984, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049011, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049195, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0072459, Bukit Timah, old secondary forest (BT07), 02-08.December.2016, MIP leg.; ZRC\_BDP0074038, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg.; ZRC\_BDP0074039, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg.; ZRC\_BDP0078990, Singapore, MIP leg.; ZRC\_BDP0133980, Singapore, MIP leg.. **Females:** ZRC\_BDP0078997, Singapore, MIP leg. (extracted, slide-mounted); ZRC\_BDP0048999, Nee Soon (NS2), 11-17.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0066748, Bukit Timah, maturing secondary forest (BT06), 22-28.September.2016, MIP leg.; ZRC\_BDP0134012, Singapore, MIP leg.

**Etymology.** This species honors Zubir bin Said (1907-1987), a prolific Singaporean composer who wrote the national anthem of Singapore, “*Majulah Singapura*” in 1959. He was awarded the *Bintang Bakti Masyarakat* (Public Service Star) in 1963 by the Republic in recognition of his contributions in song and music and to Singapore.

**Remarks.** Specimens from both, the swamp forest and the tropical forest are represented in the samples for this species, with a single haplotype.

### *Allactoneura* de Meijere

*Allactoneura* de Meijere, 1907: 201. Type-species: *Allactoneura cincta* De Meijere. Scottella Enderlein, 1910: 60.

The genus *Allactoneura* was revised by Zaitzev (1982), who provided a key for the six species of the genus known to him. More recently, a species was added to the genus by Bechev (1995). *Allactoneura* is basically Afro-oriental in distribution, extending to New Guinea and northern Australia. In Oliveira & Amorim's (2021) study of the phylogeny of the Leiinae, *Allactoneura* is sister of a clade with the manotine genera.

*Allactoneura* has a particularly puzzling wing venation, with M<sub>4</sub> detached from CuA, originating close to the wing base and a stump arising from Rs directed towards the wing

base, which results in an intricate problem of homology. The stump, however puzzling, is only a secondary sclerotization of a fold going across r-m. In different manotine and leiine genera, for example, r-m originates longitudinally at the tip of the first sector of Rs, extending basally, becoming oblique at its proximal end. There is a careful discussion of the homology of the leiine male terminalia sclerite in Oliveira & Amorim (2021).

The species of *Allactoneura* in our samples would run into *A. nigrofemorata* de Meijere in Zaitzev's (1982) key, which type locality (of a female) is Java and with a supposedly conspecific female known from Sumatra—no males are known of this species. The antenna of *A. nigrofemorata* has the scape and pedicel yellow, while in our specimens the antenna is darker, ochre-yellow. Also, in *A. nigrofemorata* the fore coxa is entirely whitish, while in one of our species the base of the coxa is brown, as in the other coxae. The abdomen color pattern of *A. tumasik*, sp.nov. concurs with *A. nigrofemorata*. The details of the male terminalia of *A. tumasik*, sp.nov. are clearly different from those of the males of *A. cincta* de Meijere, *A. formosana* Enderlein, and *A. ussuriensis* Zaitzev. We believe the differences between both species from Singapore and the description of *A. nigrofemorata* are enough to accept that they are separate species.

There are two main clusters of *Allactoneura*, with a 3.85% divergence between them. Species delimitation at this level had a high level of conflict. They were initially treated as one species and slide-mountings of males of both cluster showed two consistent terminalia patterns, which were then taken as separate morphological species.

#### ***Allactoneura tumasik* Amorim & Oliveira, sp.nov.**

(Figs. C3A–B, C4A–E)

**Diagnosis.** Front coxa entirely whitish, mid and hind coxae whitish with brown basal band. Front femur and tibia whitish, mid femur whitish basally with a blackish-brown distal fourth, tibiae greyish-yellow. Male abdominal tergites 3–5 with cream-yellow marks on antero-lateral corners. Gonostylus with a strong tooth on inner margin midway to apex, distally with a pair of short projections.

**Description. Male** (Fig. C3A). Wing length, 3.27, width, 1.02. **Head.** Vertex dark brown, with scattered setulae and some strong, black setae. Three ocelli in line, mid ocellus much

smaller than lateral ocelli, lateral ocelli not close to eye margin. Occiput dark brown, with a crown of longer setae posteriorly to eye margin, at ventral end three stronger bristles at the postgena, projecting laterally on posterior border. Ommatidia small, no inter-ommatidial setulae. Scape and pedicel light brownish-yellow; scape elongate, with strong blackish setae on distal half; pedicel about as long as wide, with smaller, black setae on distal half; flagellomeres 1–5 ochre-yellow, flagellomeres 6–14 brownish, flagellomeres about as long as wide, with scattered setae. Frons blackish-brown, face dark brown, both with scattered setulae; clypeus longer than face, yellowish-brown, ventral margin lighter, densely covered with dark brown setae; labella whitish; palpomeres whitish, apical ones increasingly longer, last one about twice length of penultimate. Labella longer than length of head capsule, a row of 6-8 dark, long setae at anterior end. **Thorax** (Fig. C3B). Cervical sclerite robust. Scutum shinning dark brown, dorsally compressed, entirely covered with scattered setae, no bristles except for a pair of black, strong prescutellar bristles. Scutellum dark brown, with a pair of long bristles. Pleural sclerites brown. Pleural membrane yellowish. Antepronotum largely developed, projected towards proepisternum, covered with yellowish setulae. Prosternum shield-like, projecting above front coxae anteriorly, with longer setae directed downwards at ventral margin in addition to more dorsal setulae. Proepisternum relatively small with some setulae. Proepimeron large, extending ventro-posteriorly to articulate with antero-dorsal corner of katepisternum and extending dorsally beyond anterior spiracle, ventral end of proepimeron with a fold. Anepisternum and katepisternum bare, anapleural suture incomplete; katepisternum slightly compressed dorsoventrally. Anepisternum wide, extending dorso-posteriorly over mesepimeron, posterior anepisternal sclerite well-developed. Mesepimeron bare, inclinate, not reaching ventral margin of thorax, dorso-posterior end of katepisternum fused to antero-ventral end of laterotergite. Metepisternum short and wide, bare. Laterotergite bulging, flattened, with five bristles along outer margin dorsally, in addition to smaller setae at dorsal surface. Mediotergite strongly curved in profile. Haltere whitish. **Legs.** Fore, mid and hind coxae whitish-yellow, with a dark brown band basally and some brownish tinge at tip. Trochanters whitish-yellow with brownish areas; fore femur whitish-yellow, darker at tip, fore tibia whitish-yellow, darker basally at dorsal side; tarsi whitish-yellow densely covered by blackish setulae, giving a greyish appearance. Mid femur whitish-yellow at basal 4/5, dark brown at tip; hind femur entirely dark brown; mid and hind tibiae and tarsi light yellowish-brown, with dense coverage of blackish setulae. Mid and hind coxae twice wider than forecoxa. Front leg tarsomere 1 slightly longer than fore tibia; tibiae and tarsi with erect darker short bristles along almost

entire length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs very long, front tibia spur yellowish-brown, mid and hind tibial spurs whitish, internal spurs slightly longer than inner spur. Mid and hind tibiae and tarsomeres 1-2 with short, spiny black setulae, tarsomeres 3-4 with a pair only with black setulae at distal margin. Tarsal claws with a large basal tooth. **Wing** (Fig. C4A). Membrane homogenously brownish, with distal fourth slightly darker; membrane densely covered with irregularly arranged microtrichia on all cells. Macrotrichia absent on membrane, present on all veins dorsally except on first sector of Rs, base of r-m, M<sub>2</sub>, basal two-thirds of M<sub>4</sub>, and bM; ventral setae only on Sc and R<sub>1</sub>; dorsal setae on R<sub>1</sub> and Rs in two rows, setae slightly flattened, as slender scales. Sc well sclerotized, complete, reaching C way before base of Rs. C ending at tip of R<sub>5</sub>, before wing apex. First sector of Rs nearly transverse, bare, less than fourth length of r-m. R<sub>1</sub> relatively long, reaching C on distal fifth of wing; R<sub>4</sub> absent; R<sub>5</sub> reaching C before wing apex; r-m strictly longitudinal at origin on Rs, then transverse crossing wing fold; a well sclerotized, setose wing fold from r-m towards base. M<sub>1+2</sub> almost one fifth of medial fork; M<sub>1</sub> and M<sub>2</sub> running more or less parallel along most of their length; M<sub>4</sub> long, disconnected from CuP at base; M<sub>4</sub> and CuA reaching wing margin, CuA also detached from other veins at base. A conspicuous fold along the anal lobe. **Abdomen.** Tergites and sternites 1-7 dark brown, except for tergite 2, sternite 2, and tergite 5 light brown, tergites 3-4 whitish-yellow on ventral half and brown on distal half, sternites 3-4 yellowish-brown, sternite 5 yellowish-brown, lighter mesally. Abdominal sclerites with flattened setae, especially along posterior margin. **Terminalia** (C4B-C). Terminalia dark brown with yellowish cercus. Gonocoxite very long, distal end almost reaching level of tip of gonostylus; gonocoxites close together at medially at anterior end, no evidence of sternite 9, distal end with an apical spine; a small, rounded lobe on internal face midway to apex, bearing 5-6 small setae and a long seta. Gonostylus very long, displaced to a dorsal position, partially articulated to tergite 9, internal face covered with setation, a long tooth midway to apex, distally with a short subapical tooth and a pair of short digitiform projections apically. Gonocoxal bridge present at anterior end of terminalia, apodemes more or less close to each other. Aedeagus large, projected distally, strongly sclerotized at tip. Tergite 9 short, trapezoid, with four elongate setae medially, typically a pair of sutures extending anteriorly from posterior margin. Sternite 10 small, weakly sclerotized, with a pair of short lobes on posterior margin. Cerci small, elongate, with microtrichia all over surface and some fine setae along posterior border.

**Female.** As male, except as following. **Wing.** Length, 3.65; width, 1.15. **Abdomen.** Entirely brown except for antero-lateral corners of tergite 4 and across sternite 4. **Terminalia** (Figs.

C4D–E). Sternite 8 well-developed, trapezoid, medial posterior projection rounded. Sternite 9 slender, with a short anterior extension, membranous area between posterior arms slightly more sclerotized around genital opening. Tergite 8 wide, entirely bare, sclerotized medially along posterior margin. Tergite 8 short, largely membranous, with a sclerotized slender band along anterior margin and a row of setae and setulae. Tergite 9+10 slender, with a large setose area inside. Cerci 1-segmented, elongated, fused together along anterior half.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000789>)

**Material examined. Holotype:** male: ZRC\_BDP0048240, Sungei Buloh (SB1), mangrove, 04-10.July.2013, MIP leg. (imaged, slide-mounted). **Paratypes**, 2 females: ZRC\_BDP0048284, Pulau Semakau (SMO2), old mangrove, 11-17.October.2013, MIP leg. (slide-mounted); ZRC\_BDP0048772; female, ZRC\_BDP0278288; female, ZRC\_BDP0284273; female, ZRC\_BDP0278334; female, ZRC\_BDP0278211. **Additional sequenced specimens:** ZRC\_BDP0048284; ZRC\_BDP0048772; ZRC\_BDP0314178; ZRC\_BDP0314108; ZRC\_BDP0314177; ZRC\_BDP0314074; ZRC\_BDP0314168; ZRC\_BDP0314170; ZRC\_BDP0314121; ZRC\_BDP0314128; ZRC\_BDP0314099; ZRC\_BDP0314115; ZRC\_BDP0314117; ZRC\_BDP0314103; ZRC\_BDP0069322; ZRC\_BDP0314176.

**Etymology.** The specific epithet of this species refers to the name used in the Old Javanese [=Kawi] epic poem *Nagarakretagama*, written in the 14th century, to refer to the settlement (also referred to elsewhere as Temasek, meaning “sea town”) in the island that is now Singapore. The noun is used in apposition.

**Remarks.** There are some differences in the color pattern both *Allactoneura* species we found, but were able to detect significant intraspecific variation in *Allactoneura limbosengi*, sp.nov., of which we have more specimens. In the type-series of *A. tumasik*, the front femur is whitish, the mid femur is whitish on its basal third, and tergites and sternite 3–5 have cream-yellowish antero-lateral marks. In *A. tumasik* females, there is some variation on the extent of light areas on these sternites. The gonostylus in *A. tumasik*, sp.nov. has typically a pair of small projections at the tip and the gonocoxites are more slender; in *A. limbosengi*, sp.nov. the gonocoxites are larger and the gonostylus is blunt distally, with the posterior end hardly sclerotized. The haplotype network (Fig. C4F) shows three small subclusters in the swamp forest, separated from a subcluster in the mangrove. The PTP, mPTP etc. dendograms split them into separate species, but morphology and OC keep these two 4–5% divergence subclusters into the same species, with the caveat that there are two genetic signatures within it.

*Allactoneura limbosengi* Amorim & Oliveira, sp.nov.

(Figs. C5A–D)

**Diagnosis.** Gonocoxite large, with a long seta and a pair of small spines distally on inner face, Gonostylus with a strong tooth on inner margin midway to apex, blunt distally with a well-sclerotized tip.

**Description. Female** (Fig. C5A). Wing length, 3.65; width, 1.15. **Head** (Fig. C5B). Vertex dark brown, occiput dark brown. Scape and pedicel light brownish-yellow; flagellomeres ochre-brownish, darker towards apex. Frons blackish-brown, face dark brown; clypeus yellowish-brown, ventral margin lighter; labella whitish; palpomeres whitish. Labella whitish-yellow. **Thorax.** Scutum dark shinning brown, dorsally compressed, scutellum dark brown. Pleural sclerites brown. Pleural membrane ochre-brown. Anepisternum, katepisternum, mesepimeron and metepisternum bare. Laterotergite bulging, flattened, with five bristles along outer margin dorsally. Mediotergite strongly curved in profile. Haltere whitish. **Legs.** All coxae whitish-yellow, with a dark brown band basally and some brownish tinge at tip. Trochanters brown. All femora brown, tibiae and tarsi brown, tarsi densely covered by blackish setulae giving a greyish tinge. Front leg tarsomere 1 slightly longer than fore tibia; tibiae and tarsi with erect darker short bristles along almost entire length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs very long, front tibia spur yellowish-brown, mid and hind tibial spurs whitish, internal spurs slightly longer than inner spur. Mid and hind tibiae and tarsomeres 1-2 with short, spiny black setulae, tarsomeres 3-4 with a pair only with black setulae at distal margin. Tarsal claws with a large basal tooth.

**Abdomen** (Fig. C5C). Entirely brown except whitish antero-lateral corners of tergite 4 and whitish sternite 4. **Terminalia.** Sternite 8 and tergite 8 light caramel-brown, rest of terminalia distally whitish.

**Male.** As females, except for the following. **Terminalia.** Terminalia dark brown, cercus lighter. Gonocoxites fused together at anterior end, no evidence of sternite 9, gonocoxite wide at base, extending ventrally way beyond insertion of gonostylus, distal end almost at level of tip of gonostylus, inner face of distal third with a row of one very long seta, some smaller setae and 2–3 small spines. Gonostylus very long, displaced to a more dorsal position basally, also articulated to tergite 9, outer face densely setose, inner face also with setae, a long tooth along inner margin on distal third, more slender at distal end, strongly sclerotized at tip.

Paramere elongate, with some fine setae along its length; aedeagus large, elongate, more sclerotized at tip. Tergite 9 short, trapezoid, bare. Sternite 10 elongate, weakly sclerotized. Cerci elongate, densely covered with microtrichia and with some fine setae distally.

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**Material examined. Holotype:** male, ZRC\_BDP0278244 (slide-mounted). **Paratypes:** 8 females: female, ZRC\_BDP0047786, Nee Soon (NS2), swamp forest, 20-26.February.2014, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0047874, Nee Soon (NS1), swamp forest, 13-19.June.2013, MIP leg.; ZRC\_BDP0047846, Nee Soon (NS1), swamp forest, 20-26.June.2013, MIP leg.; ZRC\_BDP0047880, Nee Soon (NS1), swamp forest, 19-25.September.2013, MIP leg.; ZRC\_BDP0048563, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen, extracted); ZRC\_BDP0048564, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048707, Nee Soon (NS2), 22-28.January.2015, MIP leg. female (broken); ZRC\_BDP0048981, Nee Soon (NS2), 11-17.December.2014, MIP leg. **Additional sequenced specimens:** ZRC\_BDP0154977 (website photo specimen); ZRC\_BDP0058711; female, ZRC\_BDP0134000; female, ZRC\_BDP0134057; ZRC\_BDP0137098; ZRC\_BDP0142312; ZRC\_BDP0154884; ZRC\_BDP0155047; missing abdomen, ZRC\_BDP0278162; ZRC\_BDP0278163; ZRC\_BDP0278166; male, ZRC\_BDP0278169; male, ZRC\_BDP0278173; male, ZRC\_BDP0278174; male, ZRC\_BDP0278176; ZRC\_BDP0278183; ZRC\_BDP0278184; ZRC\_BDP0278185; ZRC\_BDP0278195; ZRC\_BDP0278196; ZRC\_BDP0278197; ZRC\_BDP0278200; ZRC\_BDP0278201; female, ZRC\_BDP0278202; ZRC\_BDP0278203; ZRC\_BDP0278204; ZRC\_BDP0278205; ZRC\_BDP0278206; male, ZRC\_BDP0278210; male, ZRC\_BDP0278213; ZRC\_BDP0278214; ZRC\_BDP0278216; male, ZRC\_BDP0278221; ZRC\_BDP0278222; ZRC\_BDP0278224; ZRC\_BDP0278225; ZRC\_BDP0278226; ZRC\_BDP0278227; ZRC\_BDP0278229; ZRC\_BDP0278230; ZRC\_BDP0278231; ZRC\_BDP0278232; ZRC\_BDP0278235; ZRC\_BDP0278236; ZRC\_BDP0278239; ZRC\_BDP0278245; ZRC\_BDP0278246; ZRC\_BDP0278247; ZRC\_BDP0278250; ZRC\_BDP0278251; ZRC\_BDP0278252; ZRC\_BDP0278253; ZRC\_BDP0278255; ZRC\_BDP0278257; ZRC\_BDP0278262; male, ZRC\_BDP0278264; ZRC\_BDP0278265; ZRC\_BDP0278266; ZRC\_BDP0278267; ZRC\_BDP0278268; ZRC\_BDP0278270; ZRC\_BDP0278271; ZRC\_BDP0278272; ZRC\_BDP0278273; ZRC\_BDP0278274; ZRC\_BDP0278275; ZRC\_BDP0278276; ZRC\_BDP0278277; female, ZRC\_BDP0278278; ZRC\_BDP0278279; ZRC\_BDP0278280; ZRC\_BDP0278285; ZRC\_BDP0278286; ZRC\_BDP0278295; ZRC\_BDP0278296; ZRC\_BDP0278297; female, ZRC\_BDP0278298; ZRC\_BDP0278302; ZRC\_BDP0278316; male, ZRC\_BDP0278317; ZRC\_BDP0278318; ZRC\_BDP0278319; ZRC\_BDP0278320; ZRC\_BDP0278322; male, ZRC\_BDP0278323; ZRC\_BDP0278328; ZRC\_BDP0278329; ZRC\_BDP0279111; ZRC\_BDP0279112; ZRC\_BDP0279139; female, ZRC\_BDP0284167; male, ZRC\_BDP0284168; female, ZRC\_BDP0284170; male, ZRC\_BDP0284171; male, ZRC\_BDP0284172; male, ZRC\_BDP0284174; male, ZRC\_BDP0284175; male, ZRC\_BDP0284176 (slide-mounted); male, ZRC\_BDP0284179; female, ZRC\_BDP0284243; ZRC\_BDP0314077; ZRC\_BDP0314093; ZRC\_BDP0314094; ZRC\_BDP0314097; ZRC\_BDP0314098; ZRC\_BDP0314100; ZRC\_BDP0314101; ZRC\_BDP0314102; ZRC\_BDP0314104; ZRC\_BDP0314105; ZRC\_BDP0314106; ZRC\_BDP0314107; ZRC\_BDP0314109; ZRC\_BDP0314110; ZRC\_BDP0314111; ZRC\_BDP0314112; ZRC\_BDP0314113; ZRC\_BDP0314114; ZRC\_BDP0314116; ZRC\_BDP0314118; ZRC\_BDP0314119; ZRC\_BDP0314120; ZRC\_BDP0314122; ZRC\_BDP0314123; ZRC\_BDP0314125; ZRC\_BDP0314126; ZRC\_BDP0314127; ZRC\_BDP0314129; ZRC\_BDP0314130; ZRC\_BDP0314136; ZRC\_BDP0314143; ZRC\_BDP0314144; ZRC\_BDP0314169; ZRC\_BDP0314171; ZRC\_BDP0314172; ZRC\_BDP0314173; ZRC\_BDP0314174; ZRC\_BDP0314175; ZRC\_BDP0314179; ZRC\_BDP0314180.

**Etymology.** The specific epithet of this species honors Lim Bo Seng (1909–1944), a Chinese resistance fighter based in Singapore and Malaya during World War II. Before the outbreak of War World II, he was a prominent businessman among the Chinese community in Singapore. When the Second Sino-Japanese War broke, he participated in anti-Japanese

activities in Malaya and Singapore. He was captured and died while interred. After the war, he is remembered as a war hero in Singapore.

**Remarks.** Most specimens of *Allactoneura limbosengi*, sp.nov. have dark front and mid femora and a small whitish-yellow mark on the tergite 4 and only the sternite 4 with a posterior whitish-yellow band. Because we have a larger number of specimens of this species, however, it is possible to see some males with the front femur and the mid femur with a basal two-thirds whitish, but with the terminalia strictly similar to that of the holotype. This means that the color pattern cannot be used alone as a diagnosis to discriminate between the two species.

### ***Eumanota* Edwards**

*Eumanota* Edwards, 1933: 231. Type species: *Eumanota leucura* Edwards, 1933, by original designation.

Ten species of *Eumanota* have been described to date, with an additional female not formally described. The known distribution of the genus includes Taiwan, Myanmar, Thailand, Malaysia (Pahang and Borneo), Indonesia (Sumatra and Maluku Utara), and Papua New Guinea (Edwards, 1933, Søli, 2002, Papp, 2004, Hippa et al. 2005), with an additional species described from the Colombian highlands (Amorim et al., 2018). The description of all these species includes careful illustrations of the male terminalia. The shape of the gonostylus leaves no question that the species from Singapore fits into a small group to which belongs *Eumanota racola* Søli, *E. suthepensis* Søli, *E. kambaiti* Hippa et al. and *E. humeralis* Edwards. As discussed below, the shape of the posterior margin of the gonocoxites ventrally and dorsally is characteristic of each species of *Eumanota*, and the specimens from Singapore seem to be conspecific with the holotype of *E. racola*.

### ***Eumanota racola* Søli**

*Eumanota racola* Søli 2002: 50, male terminalia (figs. 14–16). Type locality: Thailand, Phang Nga Province, Koh Ra.  
(Figs. C6A–H)

**Diagnosis** (modified from Søli 2002). Posterior, ventro-medial corner of the gonocoxites less pronounced, gonostylus not produced into a small hook distally, subtriangular with a blunt, well sclerotized distal end.

**Redescription. Male.** Wing length, 2.60, width, 0.92. **Head** (Fig. C6B). Vertex brown, with scattered setulae. Three ocelli, lateral ocelli separated from eye margin by less than their own diameter, mid ocellus about half size of lateral ocelli. Occiput dark brown dorsally, brown towards ventral margin. Occiput and postgena with several strong bristles projecting along lateral border, posteriorly to eye. Eye with dense inter-ommatidial setulae. Scape and pedicel yellow, rounded, with setae distally, no strong seta dorsally on pedicel; flagellomeres 1–8 brown with basal yellow band, flagellomeres 9–14 brown, flagellomeres longer than wide, with scattered setae. A crown of setae on occiput around eyes. Frons, face and clypeus light brown; frons with some strong setae, face densely covered with setae medially and some dark brown setae along laterals, clypeus very short, with a line of setae and setulae. Palpomeres yellow, with four palpomeres, second palpomere widely developed, with a conspicuous apical sensory pit, third palpomere inserted subapically on previous palpomere and about as long as palpomere 2, distal palpomere about 5× length of penultimate; a strong seta on palpomere 1, microtrichia all over surface of palpomeres, elongate setulae on distal face and a group of stronger dorsal setae on palpomere 2, a number of stronger setae dorsally along entire palpomere 3 length, fine setulae along entire dorsal side of palpomere 4. Labella yellow, well-developed. **Thorax.** Scutum compressed, light brown with yellow anterior corners and lateral margins. Scutellum darker than scutum. Scutum covered with small setae and some few scattered slightly longer setae. Scutellum with eight scutellar bristles close to posterior margin, plus a large number of small setae covering most of disk. Pleural sclerites yellowish, except for light brown laterotergite, a distal light brown band on mesepimeron, and light brown borders of anepisternum. Pleural membrane yellow. Basisternum largely developed, projected between front coxa and antepronotum, covered with short setae and some longer setae along posterior margin. Antepronotum largely developed, covered with small setae and a row of longer setae along rounded posterior border. Proepisternum reduced in size, triangular, extending from ventro-posterior corner of antepronotum. Anepisternum larger than katepisternum, entirely covered with setulae and some few longer setae close to posterior margin. Mesepimeron wide, reaching ventral margin of pleura, bare. Laterotergite bulging, with over 30 setulae and about 12 longer setae, suture separating from mediotergite incomplete dorso-posteriorly. Mediotergite curved in profile, bare. Haltere whitish, some few

setae on pedicel, knob densely covered with setulae. **Legs.** Legs whitish, tips of mid and hind coxae with a brown macula, trochanters brown. Mid and hind coxae twice wider than front coxa. Front coxa with small setae on frontal and lateral faces, some stronger setae on distal end; mid coxa covered with small setae on frontal face; hind coxa with a line of fine setae along entire length. Front tibia shorter than femur; mid and hind tibiae longer than femora. Antero-apical depressed area on inner face of front tibia wide, lined with setulae. Tibiae and tarsi with aligned trichia, tibia and first two tarsomeres of front leg with rows of setae ventrally, mid and hind tibiae with a pair of dorsolateral rows of setae and a ventrolateral row of setae. Mid and hind tarsomeres 1 and 2 with rows of ventrolateral setae. Tarsomere 1 almost 1.5 length of second one. Tibial spurs yellowish, about twice the tibia width at apex, internal spur almost half of length of outer tibial spur. Tarsal claws with a large basal tooth.

**Wing (Fig. C6B).** Membrane homogenously light greyish-brown, lighter close to wing base; membrane densely covered with microtrichia on all cells, macrotrichia on cells m1, m2, m4 and cu<sub>a</sub>, anal lobe extensively setose. Sc short, ending in bR. C ending much beyond apex of R<sub>5</sub>, covering about three-fourth of extension of M<sub>1</sub>. R<sub>1</sub> short, reaching C on distal fourth of wing. First sector of Rs nearly transverse, devoid of setae, much less than half length of r-m, less sclerotized than R<sub>1</sub> and Rs. R<sub>4</sub> absent. R<sub>5</sub> gradually curved on distal half, reaching C before wing apex; r-m almost transverse, well sclerotized, setose, more than twice length of R<sub>1</sub>; bM about twice r-m length, cell br conspicuously wider at level of insertion of M<sub>1+2</sub>. M<sub>1+2</sub> very short, less than one fourth of length of r-m; M<sub>1</sub> and M<sub>2</sub> gradually diverging along most of their length, M<sub>1+2</sub> weakly sclerotized, M<sub>1</sub> not sclerotized at base. M<sub>4</sub> originating at base of wing, not directly in contact with CuA, slightly sinuous on distal third. CuP extending almost to level of origin of M<sub>1+2</sub>, with a row of setae along its distal fifth. All veins with dorsal macrotrichia except first sector of Rs. **Abdomen.** Abdomen greyish-brown, except for yellowish sternites 1–4. **Terminalia (Figs. C6D–E).** Terminalia brown, with yellow cercomere. Gonocoxites fused along anterior fourth of ventral face of terminalia, incision deep, wide on distal half, almost closed on anterior end; no posterior lobes projecting beyond tip of gonostylus, with a short dorso-posterior projection at corners of tergite 9 and a short inner projection at ventral face, to which fit tip of gonostylus. Gonostylus subtriangular, rounded on dorsal margin, ending into a sclerotized acute projection. Gonocoxal bridge with a pair of long apodemes directed towards mid of terminalia anteriorly. Aedeagal-parameral complex with a pair of wide lateral plates that extend at each side into a digitiform posterior projection reaching level of base of gonostylus, bearing around 20 setae placed very close to each other; aedeagus protruding beyond tip of parameres, with a slender sclerotized axis,

opening distally into a membranous area that extends almost to level of tip of gonostylus. Tergite 9 about as long as broad, but wider midway to apex. Cercus fused to each other on anterior half, extending way beyond tip of gonostylus, densely covered with microtrichia and elongate setae; sternite 10 membranous, with a pair of distal lobes, almost as long as cerci, densely covered with microtrichia and elongate setae.

**Female.** As male, except for the following. Wing length, 2.70; width, 0.92. **Terminalia** (Figs. C6F–G). Sternite 8 constituted by a pair of long lobes entirely separated from each other, having microtrichia and setulae all over ventral face and some darker setae, especially at distal end. Tergite 8 well sclerotized, wide, with a sclerotized band along entire anterior and posterior margins, setose on posterior third. Sternite 9 (vaginal furca) with elongate, curved anterior arm. Tergite 9+10 weakly sclerotized, with microtrichia, some scattered setulae, and a row of short digitiform bases from which longer setae emerge. Cerci long, 1-segmented, with microtrichia and setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000765>)

**Material examined.** 6 males, 3 females. Males: ZRC\_BDP0047923, Nee Soon (NS1), swamp forest, 25-31.July.2013, MIP leg.; ZRC\_BDP0047931, Nee Soon (NS1), swamp forest, 11-17.July.2013, MIP leg.; ZRC\_BDP0048560, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (slide-mounted); ZRC\_BDP0048561, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048562, Nee Soon (NS2), swamp forest, 29.August-05.September.2012, MIP leg.; ZRC\_BDP0048954, Nee Soon (NS1), 09-15.April.2015, MIP leg. **Females:** ZRC\_BDP0047833, Nee Soon (NS1), swamp forest, 18-24.July.2013, MIP leg.; ZRC\_BDP0048927, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0133453, Singapore, (date range 2012-2018), Nee Soon Swamp Forest, MIP leg.

**Remarks.** This species is obviously close to *Eumanota humeralis*, *E. suthepensis* and *Eumanota parahumeralis*, which have the quite triangular gonostylus with a distal, sclerotized short projection. There are differences between these three species in the shape of the posterior border of the gonocoxites, the shape of the tergite 9 and the parameres, and in details of the gonostylus itself. Our specimens fit in all details with *E. racola*, which type locality is Koh Ra, in the Phang Nga Province, an island with lowland tropical forest along the Malaysian peninsula. There are two haplotypes among our specimens (Fig. C6H) and no delimitation conflicts.

### ***Manota***

*Manota* Williston, 1896: 260. Type-species, *M. defecta* Williston (mon.).

**Diagnosis.** Head with a row of strong bristles around posterior margin of eye, directed posteriorly; three ocelli. Sc short, incomplete; R<sub>4</sub> missing; r-m and bM perfectly aligned, almost longitudinal; M<sub>1+2</sub> missing, M<sub>1</sub> and M<sub>2</sub> present as detached veins reaching wing margin.

*Manota* is presently one of the largest genera of Mycetophilidae, with almost 320 species described, 56 of which from the Afrotropical region (see Kurina & Hippa, 2014), 17 from the Palaearctic (review in Hippa & Saigusa, 2016), one from the Nearctic (Jaschhof et al., 2011), 39 from the Oceanian/Australian (Kurina & Hippa, 2015; Kurina et al., 2019), 109 from the Oriental (Hippa & Kurina, 2018) and 96 from the Neotropical regions (Kurina & Hippa, 2021).

The knowledge about the Oriental diversity of the genus is concentrated in Thailand (e.g. Hippa, 2009, 2011) and Peninsular Malaysia (Hippa, 2006), with some species also known from Nepal and China (Hippa & Saigusa, 2016), Sulawesi (Hippa & Kurina, 2018) etc. The species of the genus *Manota* are largely homogeneous, ochre-yellowish in color and there are only some few features in the general morphology that could be used to separate groups of species, except for differences in the male terminalia. There are no identification keys for the set of Oriental species and co-specificity is inferred based on the complex male terminalia features, which are mostly very well described and illustrated.

Of the 14 species we found in the Singapore samples, seven are known only from females. As stated above, by protocol we describe here but do not formally name the species of *Manota* for which we cannot present a morphological diagnosis, which is the case of these seven species with only females available in our sample. We carefully compared the male terminalia of the species from Singapore with those in published papers on Oriental *Manota*. We could not find any described species that could fit the species in our samples that have males available. Only one species has delimitation conflicts in our haplotype network (Fig. C7A).

***Manota banzu* Amorim & Oliveira, sp.nov.**

(Figs. C7B–C, C8A-D)

**Diagnosis.** Thorax dirty ochre-yellowish. Laterotergite bare. Anal lobe devoid of setae. Abdomen with segments 1–3 mostly greyish-yellow, segments 4–6 with tergites caramel-

brown. Gonocoxites directed latero-posteriorly, posterior margin ventrally not extending beyond base of gonostylus; parastylar lobe short, two long setae directed ventrally; short juxtagonostylar lobe with two long, strong, curved setae; gonostylus relatively small, slightly elongate, flat, with long setae on outer face, distally with seven long, slightly curved setae. Tergite 9 with wide posterior incision separating a pair of lateral lobes, internal posterior margin dorsally projected much beyond base of gonostylus, six strong setae concentrated on distal short beak.

**Description. Male** (Fig. C7B). Wing length, 1.89; width, 0.71. **Head** (Fig. C7C). Brownish-yellow, brown along ocelli line, occiput darker posteriorly to eye margin and dorsally to occiput condyle medially. Antenna light brown, scape and pedicel paler. Face light brown, clypeus, palpus and labella whitish-yellow. Mid ocellus present, slightly smaller than lateral ocelli, at posterior end of frontal furrow, lateral ocelli separated from eyes by a distance larger than ocellus width. About 10–12 strong postocular setae. Eyes densely covered by inter-ommatidial setulae. Scape only slightly longer than pedicel, flagellomeres 1 not longer than following flagellomeres, flagellomeres 1–5 about as long as wide, flagellomeres 6–13 slightly longer than wide, flagellomere 14 about twice as long as wide. Scape with fine setae on external face and around distal end, four ventral setae stronger; internal face with a concentrated group of dorsal setae distally. Pedicel with fine setae on external face and around distal end, four ventral stronger setae. Frons with a pair of sutures laterally extending from internal dorsal corner of eye straight backwards ending behind level of ocellar line; anteriorly frons projected medially as an inverted triangle, reaching level of insertion of antennae, frontal furrow reaching anterior end of triangular extension; frons almost entirely devoid of setae, except for 10–11 setae on a slender ventral extension of frons that connects with face and small setae dorso-laterally, externally to lateral ocelli. Clypeus rectangular, elongate, slightly bulging, entirely covered with elongate setae; clypeus short, trapezoid, covered with setae, some stronger setae on ventral half. Maxillary palpomere 1 pretty much reduced; palpomere 2 short, with microtrichia and small setae; palpomere 3 well-developed, sensorial pit elongate, with opening laterally on internal face, apico-medial digitiform projection extending well beyond base of palpomere 4, setae on dorsal and external faces, palpomere 4 with small subdistal parasegment,  $1.6 \times$  length of palpomere 3; palpomere 5 weakly sclerotized, elongate, almost twice longer than palpomere 4. Labellae short, weakly sclerotized. **Thorax**. Mostly cream-yellow, medial part of scutum and scutellum somewhat darker, anepisternum dark ochre-yellowish, dorso-posterior corner of katepisternum and

ventral half of mesepimeron dark ochre-brown, metepisternum greyish, cream-yellowish on Antero-ventral corner, laterotergite and mediotergite brownish-yellow. Scutum densely covered with scattered small setae, 8–9 larger setae restricted to more sclerotized area along margin above wing and a row of long prescutellars. Scutellum well-developed, with scattered small setae and two pairs of stronger marginal setae, inner pair stronger. Cervical sclerite small. Basisternum dorso-posterior arms elongate, bare of setae. Antepronotum largely developed, lateral lobes connected medially by a slender, bare stripe, posterior end covered with short setae; proepisternum well-developed, extending dorsally to level of spiracular sclerite, covered with small setae and a row of about 10 longer setae along ventral margin. Anepisternum densely covered with small setae, no longer setae along posterior margin; katepisternum bare except for a medial line of small setae along Antero-ventral margin; anterior basale with no setae; katepisternum well-developed; mesepimeron reaching ventral margin of thorax, bare, suture separating from katepisternum absent; laterotergite bulging, bare; metepisternum with 17 fine small setae distributed along sclerite length. Mediotergite strongly curved medially, bare. Haltere pedicel yellow, knob brown, small setae on pedicel and on knob. **Legs.** Coxae whitish, femora whitish-yellow, tibiae and tarsi light yellowish. Front coxa largely developed, covered with small setae on entire face, some stronger setae along anterior end of ventral face and at distal margin posteriorly. Mid coxa covered with small setae anteriorly, less densely on external face, and some strong setae along distal margin of anterior face; hind coxa relatively smaller, a band of small setae medially along entire external face and some few stronger setae on distal margin anteriorly. Femora laterally compressed, mid and hind femora larger, densely covered with small setae, a sequence of longer setae on ventral edge distally. Tibiae and tarsi with trichia more or less aligned. Front tibia with one subapical small bristle and a row of setae lateroventrally on external face, besides distal setae. Front tibia with a wide Antero-apical depressed area lined with setulae; mid tibia with an irregular row of stronger setae along dorsal edge, some additional lateral and lateroventral setae; hind tibia with an irregular row of stronger setae along dorsal and ventral edges, some additional lateral setae on external face. Front tibia slightly shorter than femur, first front tarsomere about as long as tibia. Mid and hind tibial organs absent. Tarsal claws with a longer, more distal tooth coming out on inner face and a more basal, blunt sclerotized tooth. **Wing** (Fig. C8A). Membrane slightly fumose. Sc present, incomplete, ending free.  $R_1$  short, meeting C before basal half of wing. First sector of Rs weakly sclerotized.  $R_5$  short, reaching C at level of tip of  $M_4$ ; r-m long, slightly longer than  $R_1$ . Tip of medial and cubital veins hardly sclerotized.  $M_1$  sclerotized only distally, a line of dorsal setae

present on non-sclerotized part of vein more basally.  $M_2$  originating beyond level of tip of  $R_1$ .  $M_4$  continuous with first sector of CuA, second sector of CuA disconnected from first sector by a short unsclerotized part. Cubital pseudovein present, CuP absent. Sclerotized anal fold present, long, curved, not reaching posterior wing margin. Dorsal macrotrichia on Sc, bR,  $R_1$ , second sector of Rs, r-m,  $M_1$ ,  $M_2$ ,  $M_4$ , CuA and anal fold; ventral setae on bR,  $R_1$ , second sector of Rs, and r-m. **Abdomen.** Tergites 1–3 brownish-yellow, darker medially, tergites 4–6 light brown, tergite 7 yellowish; sternites 1–4 whitish-yellow, sternites 5–6 light brown. Tergite and sternite 8 trapezoid, wide basally, rounded posteriorly. Abdominal setosity pale brown. **Terminalia** (Figs. C8B–D). Cream-yellowish. Sternite 9 wide anteriorly, not fused to gonocoxites, posterior margin broadly convex, lateral ends anteriorly with a small apodeme, no medioventral process, mostly covered with fine setae, 4–5 long setae on each side along posterior margin. Medial margins of gonocoxites widely separated, posterior margin short ventrally, gonocoxites directed laterally, posterior margin ventrally not extending beyond base of gonostylus, parastylar lobe short, with two long setae directed ventrally; a short juxtagonostylar lobe with two long, strong, curved setae. Gonostylus relatively small, subquadrate, slightly elongate, flat, with long setae on outer face, distally with seven long, slightly curved setae. Aedeagus subtriangular, elongated distally, apex curved ventrally. Tergite 9 with wide posterior incision separating a pair of lateral lobes, internal posterior margin dorsally projected much beyond base of gonostylus, six strong setae concentrated on distal short beak and a line of smaller setae along margin inwards, long setae more laterally on ventral face, laterally and on dorsal face. Cerci medially separate, elongate, reaching level of tip of gonocoxites dorsally.

**Female.** As male, except for the following. **Wing.** Length, 1.71; width, 0.64. **Terminalia.** Sternite 8 wide at base, trapezoid, distal end with a pair of short lobes bearing a shallow medial incision, setation restricted to lobes distally to base of incision. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, distal medial end of sternite 9 reaching level of tip of lobes of sternite 8. Tergite 8 wide, not overlapping laterally with lateral border of sternite 8, covered with microtrichia and fine setae. Tergite 9 covered with microtrichia and scattered fine setae. Tergite 10 reduced to an inconspicuous slender band and two pairs of short digitiform projections each bearing a long seta. Cercomere 1 slender, almost 10× longer than wide, over 3× longer than cercomeres 2, both covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000756>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047877, Nee Soon (NS1), swamp forest, 13-19.June.2013, MIP leg. (slide-mounted). **Paratypes:** 7 males, 3 females. **Males:** ZRC\_BDP0048517, Nee Soon (NS1), swamp forest, 03-9.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048675, Nee Soon (NS2), swamp forest, 26.April-02.May.2012, MIP leg.; ZRC\_BDP0048699, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048708, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048822, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048973, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0049185, Nee Soon (NS2), 07-13.May.2015, MIP leg. **Females:** ZRC\_BDP0048677, Nee Soon (NS2), swamp forest, 07-13.June.2012, MIP leg. (slide-mounted); ZRC\_BDP0048997, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0072693, Bukit Timah, maturing secondary forest (BT06), 07-13.October.2016, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0078993; female, ZRC\_BDP0155093; female, ZRC\_BDP0137281.

**Etymology.** The species epithet refers to the locality of Ban Zu [=班卒, from the Malay word pancur, meaning “spring of water”] as recorded by the 1300s Chinese traveler Wang Dayuan—thought to be present day Fort Canning Hill—an important 14th century settlement in the island of Singapore. The noun is used in apposition.

**Remarks.** Specimens from the swamp forest and from the Bukit Timah forest compose the material examined of this species. In a certain extension, *Manota banzu*, sp.nov. is similar to *M. stricta* Hippa & Ševčík, from Brunei (Hippa & Ševčík 2010); and to *M. aconcinna* Hippa and *M. inflata* Hippa and *M. submirifica* Hippa (Hippa 2008), from Thailand, to *M. biunculata* Hippa, from Papua-New Guinea, and to *M. gemela* Hippa, from Maluku Utara (Hippa 2007).

***Manota tantocksengi* Amorim & Oliveira, sp.nov.**

(Figs. C9A–E)

**Diagnosis.** Scutum ochre-yellow on anterior third, brownish yellow on posterior third, darker towards posterior end. Pleural sclerites brownish cream-yellow. Laterotergite setose. Anal lobe devoid of setae. Abdomen with tergites 1–6 brownish. Gonocoxites large, ventro-medial margin lobes setose, approximate to each other, setae on posterior margin longer; parastylar lobe small, devoid of setae; juxtagonostylar lobe digitiform, extending distally, with one juxtagonostylar long seta distally; an apico-lateral digitiform lobe with a distal megaseta; gonostylus ovoid, elongate, evenly covered with fine setae on ventral face, some stronger setae on distal margin and a group of concentrated small setae on dorsal face. Tergite 9 with wide posterior incision separating a pair of lateral lobes projecting beyond level of base of gonostylus, with a projection on inner margin bearing distally a group of concentrated strong

setae and more anteriorly at inner margin a group of longer setae, dorsal face of gonocoxite with fine setae.

**Description. Male** (Fig. C9A). Wing length, 1.51; width, 0.61. **Head.** Brownish-yellow, darker dorsally. Antenna light brown, scape and pedicel light brownish-yellow. Face, clypeus, palpus and labella dirty-yellowish. Occiput with line of 9–10 strong postocular setae. **Thorax.** Basically cream-yellow with brownish tinge, as well as antepronotum; proepisternum, anepisternum and mesepimeron dark ochre-yellowish, katepisternum and metepisternum lighter; laterotergite brown, mediotergite light brown. Anepisternum covered with fine setae except for antero-ventral corner; anterior basalare setose; katepisternum with some fine setae close to posterior border; laterotergite with 23 setae; metepisternum bare. Haltere pedicel yellow, knob brown. **Legs.** Coxae whitish, front femur whitish-yellow, mid and hind femora light brownish-yellow; tibiae and tarsi light greyish-brown. Mid- and hind tibial organs absent. **Wing** (Fig. C9B). Membrane light greyish-brown;  $R_1$  meeting C before mid of wing; sclerotized part of  $M_2$  originating slightly beyond level of tip of  $R_1$ ; CuA not connected basally to  $M_4$ . **Abdomen.** Tergites 1–2 brownish-yellow, tergites 3–7 light brown; sternites 1–3 light brown, sternite 4–6 light yellowish-brown. **Terminalia** (Figs. C9C–D). Cream-yellowish. Sternite 9 trapezoid with deep anterior medial incision, on anterior third of gonocoxite, fused to gonocoxites at lateral ends, with two groups of elongate setae separate from each other, no incision at posterior margin medially. Gonocoxites large, lobes of ventro-medial margin setose, approximate to each other, setae on posterior margin longer; parastylar lobe small, devoid of setae; juxtagonostylar lobe digitiform, extending distally, with one juxtagonostylar long distal seta; an apico-lateral digitiform lobe with a distal megaseta. Gonostylus ovoid, elongate, evenly covered with fine setae on ventral face, some stronger setae on distal margin and a group of concentrated small setae on dorsal face. Gonocoxal bridge well-marked, no apodeme directed anteriorly. Tegmen with a pair of distal digitiform extensions separated by a deep posterior incision, extending anteriorly into a pair of lateral apodemes. Sternite 10 well-developed, wider and projected more distally than tegmen, distal margin rounded, setose, medially with stronger setae. Tergite 9 with wide posterior incision separating a pair of lateral lobes, projecting beyond level of base of gonostylus, with a projection on inner margin bearing distally a group of concentrated strong setae and more anteriorly at inner margin a group of longer setae, dorsal face of gonocoxite with fine setae. Cerci elongate, entirely separate, with fine setae and microtrichia, placed behind tergite 9.

**Females.** As males, except for the following. Wing length, 1.73; width, 0.66. **Terminalia** (Fig. C9E). Sternite 8 trapezoid, wide at base, distal end with a pair of short lobes bearing a shallow medial incision, setation restricted to lobes distally to base of incision. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, medial end of sternite 9 posteriorly reaching level of tip of sternite 8 lobes, with setulae along distal margin. Tergite 8 wide, not overlapping laterally with lateral border of sternite 8, covered with microtrichia and fine setae. Tergite 9 covered with microtrichia and scattered fine setae. Tergite 10 reduced to an inconspicuous slender band and two pairs of short digitiform projections each bearing a long seta. Cercomere 1 slender, 3.5× longer than wide, covered with microtrichia and fine setae [both cercomeres 2 broken].

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000758,-002093>)

**Material examined. Holotype:** male, ZRC\_BDP0072684, Bukit Timah, primary forest (BT05), 16-22.December.2016, MIP leg. (slide-mounted). **Paratypes:** 3 males, 3 females. Males: ZRC\_BDP0048525, Nee Soon (NS2), swamp forest, 17-23.May.2012, MIP leg. (abdomen separated from thorax) (website photo specimen) (extracted); ZRC\_BDP0072735, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0074028, Bukit Timah, primary forest (BT02), 16-22.December.2016, MIP leg. (slide-mounted). **Females:** ZRC\_BDP0047933, Nee Soon (NS1), swamp forest, 11-17.April.2013, MIP leg.; ZRC\_BDP0072664, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg.; ZRC\_BDP0072744, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg. (slide-mounted). **Additional sequenced specimens:** male, ZRC\_BDP0072720; male, ZRC\_BDP0137247 (website photo specimen); ZRC\_BDP0047933, ZRC\_BDP0058605, ZRC\_BDP0058654, ZRC\_BDP0066724, ZRC\_BDP0066744, ZRC\_BDP0072664, ZRC\_BDP0120477, ZRC\_BDP0120531, ZRC\_BDP0128593, ZRC\_BDP0128594, ZRC\_BDP0133411, ZRC\_BDP0137118, ZRC\_BDP0137119.

**Etymology.** The species name honors Tan Tock Seng (1798–1850), merchant and philanthropist, acting Kapitan China of Singapore (government-appointed head of the Chinese community), a successful businessman and the city's first Asian Justice of Peace. He offered \$5,000 for the construction of Singapore's first privately funded hospital. Many of these immigrants were poor and destitute, and malnutrition was common; it was estimated that about 100 immigrants died each year from starvation. The British government set up a pauper's hospital in the 1820s, closed in the 1830s due to insufficient funds, suggesting that better-off members of each community take care of their own poor.

**Remarks.** The species was collected in different environments in Singapore, from the mangrove to the swamp forest and the primary tropical forest. There are three haplotypes for this species that group together on any of the delimitation approaches.

***Manota bukittimah* Amorim & Oliveira, sp.nov.**

(Figs. C10A–G)

**Diagnosis.** Thorax ochre-yellowish. Laterotergite bare. Membrane with macrotrichia on cell cua and on anal lobe. Abdomen basically ochre-yellowish, slightly darker medially. Gonocoxites large, ventro-medial margin lobes setose, setae on posterior margin longer; parastylar lobe large, with microtrichia and a pair of long setae directed inwards; juxtagonostylar lobe slender, digitiform, with a pair of long, hook-like juxtagonostylar setae distally directed inwards; no apico-lateral lobe; gonostylus with a short neck basally, subquadrate distally, flat, inner face with elongate setae, distal margin with long, curved setae, outer face with microtrichia medially and some setae close to margin; tergite 9 with wide posterior incision separating a pair of lateral lobes, posterior margin extending straight inwards and then curved anteriorly, an internal short lobe on dorso-posterior corner with a group of concentrated setae, inner margin with a long row of setae, posterior margin with five stronger, dorsal face with long setae.

**Description. Male.** Wing length, 1.81; width, 0.74. **Head.** Light brownish-yellow, face and clypeus dirty-yellow, vertex with brown mark along line of ocelli, occiput darker posteriorly to eye margin and dorsally to occiput condyle medially. Antennal scape and pedicel light brownish-yellow. Maxillary palpus and labella whitish. Flagellum light brown; flagellomeres 1–8 about as long as wide, flagellomeres 9–13 slightly longer than wide. Maxillary palpomere 4 with small subdistal parasegment,  $1.3 \times$  length of palpomere 3; palpomere 5 slightly over twice longer than palpomere 4. About 8 strong postocular setae on each side.

**Thorax.** Scutum mostly ochre-yellowish, darker medio-posteriorly, scutellum light brown, antepronotum, proepisternum, anepisternum, mesepimeron, laterotergite and mediotergite ochre-yellowish, katepisternum whitish-brown, metepisternum whitish-brown on anterior fourth, brownish on posterior three-fourth. Anepisternum with over 50 small scattered setae, except ventro-medially; anterior basalare bare; laterotergite and metepisternum bare. **Legs.** Coxae whitish, femora whitish-yellow, tibiae and tarsi light yellowish. Haltere stem light brown, knob dark brown. **Wing** (Fig. C10B). Membrane greyish infuscate. C ending at about three-fourth of distance to  $M_1$ ;  $R_1$  meeting C before mid of wing; sclerotized part of  $M_2$  originating slightly beyond level of tip of  $R_1$ . Membrane with macrotrichia on cell cua and on anal lobe. **Abdomen.** Tergites 1–6 yellowish-brown, darker medially, tergite 7 light

yellowish-brown; sternites 1–3 light brown, sternite 4–6 light yellowish-brown, sternite 7 yellowish. **Terminalia** (Figs. C10C–E). Cream-yellowish. Sternite 9 trapezoid, with rounded posterior end and a deep antero-medial incision, almost half of gonocoxite length, with a slender fusion to gonocoxites at lateral ends, mesal depression separating two elongate, setose pair of lobes. Gonocoxites large, margin of ventro-medial lobes setose, approximate to each other, setae on posterior margin longer; parastylar lobe large, with microtrichia and a pair of long setae directed inwards; juxtagonostylar lobe slender, digitiform, with a pair of long, hook-like juxtagonostylar setae distally directed inwards; no apico-lateral lobe. Gonostylus with a short neck, subquadrate distally, flat, inner face with elongate setae, distal margin with long, curved setae, outer face with microtrichia medially and some setae close to margin. Gonocoxal bridge with no anteriorly directed apodeme. Tegmen triangular, with an elongate distal, curved projection ending pointed. Sternite 10 well-developed, wide, projected to level of tip of tegmen, distal margin rounded, with two pairs of setae medially and a stronger additional external pair. Tergite 9 with a wide posterior incision separating a pair of lateral lobes, posterior margin extending straight inwards and then curved anteriorly, an internal short lobe on dorso-posterior corner with a group of concentrated setae, inner margin with a long row of setae, posterior margin with five stronger setae, dorsal face with long setae. Cerci elongate, flat, entirely separate from each other, with microtrichia and fine setae, long setae distally.

**Female.** As male, except as follow. Wing. Length, 1.86; width, 0.69. Wing membrane with few dorsal macrotrichia on anal lobe and cell cua. **Terminalia** (Figs. C10F–G). Sternite 8 trapezoid, wide at base, distal end with a pair of lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, two longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to a pair of gonoducts. Tergite 8 wide, laterally barely overlapping lateral border of sternite 8, covered with microtrichia and fine setae. Tergite 9 about as long as tergite 8 and more slender, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, about 4× longer than wide, cercomere 2 ovoid, covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000757>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047832, Nee Soon (NS1), swamp forest, 18-24.July.2013, MIP leg. (slide-mounted). **Paratypes:** 2 males, 4 females. Males: ZRC\_BDP0048530, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048522, Nee Soon (NS1), swamp forest, 31.May-6.June.2012, MIP leg. **Females:** ZRC\_BDP0048527, Nee Soon (NS2), swamp forest, 08.August.2012, MIP leg. (slide-mounted); ZRC\_BDP0048528, Nee Soon (NS2), swamp forest, 04.July.2012, MIP leg.; ZRC\_BDP0048673, Nee Soon (NS1), swamp forest, 26.April-02.May.2012, MIP leg.; ZRC\_BDP0048678, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0137035 (website photo specimen).

**Etymology.** This species epithet refers to the Bukit Timah Nature Reserve, a 1.64km<sup>2</sup> reserve of primary tropical forest on the slopes of Bukit [=hill in Malay] Timah, near the geographic center of Singapore. Together with the neighbouring Central Catchment Nature Reserve, it houses over 840 species of flowering plants. Its status as a biological reserve goes back to 1882, when Nathaniel Cantley, then Superintendent of the Singapore Botanic Gardens, was commissioned by the Government of the Straits Settlements to prepare a report on the forests of the settlements and Bukit Timah was one of the first forest reserves established, in 1883. By 1937, the forest reserves were depleted under economic pressures for development. Three areas, however, including the Bukit Timah Reserve, were retained for the protection of flora and fauna, under the management of the Singapore Botanic Gardens. In 1951, a Nature Reserves Board was established for the administration of the reserves, which total some 28km<sup>2</sup> in area. The noun is used in apposition.

**Remarks.** This species was sampled in the Bukit Timah tropical forest, as well as in the swamp forest and in mangroves.

***Manota chiamassie* Amorim & Oliveira, sp.nov.**

(Figs. C11A–F)

**Diagnosis.** Thorax ochre-yellowish. Laterotergite bare. Macrotrichia on anal lobe. Abdomen light brownish-yellow. Gonocoxites large, medial lobes of ventral margin setose; parastylar lobe with a pair of elongate fine setae directed inwards; juxtagonostylar lobe slender, digitiform, with a pair of long, hook-like juxtagonostylar setae directed inwards distally; no apico-lateral lobe; gonostylus with a short neck, subquadrate distally, flat, inner face with elongate setae, distal margin with long, curved setae, outer face with microtrichia medially and some setae close to margin; tergite 9 with wide posterior incision separating a pair of

lateral lobes, posterior margin extending straight inwards, dorso-posterior corner truncate, with a line of longer setae.

**Description. Male** (Fig. C11A). Wing length, 1.79; width, 0.66. **Head** (Fig. C11B). Vertex brown, face light yellowish-brown, clypeus whitish-yellow, occiput light brown, a brown band along line of ocelli and along posterior margin of eye; nine strong postocular setae on each side. Antennal scape and pedicel whitish-yellow, darker dorsally, flagellum light brown. Maxillary palpus and labella whitish. Flagellomeres slightly longer than wide, except distal flagellomere, twice longer than wide. **Thorax**. Scutum mostly ochre-yellowish, scutellum light brown. Antepronotum and proepisternum ochre-yellowish, anepisternum, mesepimeron and laterotergite ochre with brownish tinge, katepisternum whitish, mediotergite light brown on dorsal half, ochre on ventral half, metepisternum light brown. Three pairs of long prescutellars. Anepisternum covered with scattered small setae except at ventral fourth; anterior basalare bare; katepisternum with a band of fine setae dorso-posteriorly; laterotergite bare; metepisternum with about 30 fine setae along its length. Haltere stem light brown, knob dark brown. **Legs**. Coxae whitish, femora, tibiae and tarsi whitish-yellow, tarsi with a brownish tinge. **Wing** (Fig. C11C). Membrane with light brown infuscation. C ending at about four-fifth of distance to  $M_1$ ;  $R_1$  meeting C before mid of wing; sclerotized part of  $M_2$  originating at level of tip of  $R_1$ . Membrane with macrotrichia on anal lobe. **Abdomen**. Tergites 1–6 yellowish-brown, darker medially, tergite 7 light yellowish-brown; sternites 1–3 light brown, sternite 4–6 light yellowish-brown, sternite 7 yellowish. **Terminalia** (Figs. C11E–F). Sternite 9 trapezoid with rounded posterior end and a deep anterior medial incision, almost half of gonocoxite length, with a slender fusion to gonocoxites at lateral ends, mesal depression separating two elongate, setose pair of lobes. Gonocoxites large, ventro-medial margin lobes setose; parastylar lobe with a pair of elongate fine setae directed inwards; juxtagonostylar lobe slender, digitiform, with a pair of long, hook-like juxtagonostylar setae directed inwards distally; no apico-lateral lobe. Gonostylus with a short neck, subquadrate distally, flat, inner face with elongate setae, distal margin with long, curved setae, outer face with microtrichia medially and some setae close to margin. Gonocoxal bridge with oblique apodemes. Tegmen triangular, with an elongate distal, curved projection with pointed end, apodemes anteriorly directed obliquely outwards. Sternite 10 well-developed, wide, projected to level of tip of tegmen, distal margin rounded, with two pairs of setae medially and a stronger additional pair externally. Tergite 9 with wide posterior incision separating a pair of lateral lobes, posterior margin straight extending inwards, dorso-posterior corner truncate,

with a line of longer setae. Cerci elongate, flat, entirely separate from each other, with microtrichia and fine setae, long setae distally.

**Female.** As males, except for the following. **Terminalia.** Light yellowish-brown. Sternite 8 wide at base, trapezoid, distal end with a pair of lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, two longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior end very thin, distal end of sternite 9 medially almost reaching level of tip of lobes of sternite 8, gonopore connected to one single gonoduct. Tergite 8 apparently fused to tergite 9, slightly longer latero-posteriorly than medially, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band with two pairs of setae at tip of long digitiform projections, one pair at lateral corners and one pair sub-medially [tip of cercomeres 1 broken, cercomeres 2 missing].

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000781>)

**Material examined. Holotype:** male, ZRC\_BDP0048953, Nee Soon (NS1), 09-15.April.2015, MIP leg. (website photo specimen, slide-mounted). **Paratype:** 16 males, 4 females. **Males:** male, ZRC\_BDP0066795, Bukit Timah, primary forest (BT05), 22.September.2016, MIP leg.; male, ZRC\_BDP0066801, Bukit Timah, primary forest (BT05), 14.December.2016, MIP leg.; male, ZRC\_BDP0066822, Bukit Timah, primary forest (BT09), 05.October.2016, MIP leg.; ZRC\_BDP0071106, Bukit Timah, primary forest (BT01), 09.November.2016, MIP leg.; male, ZRC\_BDP0078968, Singapore, no date, MIP leg.; male, ZRC\_BDP0078998, Singapore, no date, MIP leg.; male, ZRC\_BDP0079013, Singapore, no date, MIP leg.; male, ZRC\_BDP0136941, Bukit Timah, primary forest (BT08), 12.July.2017, MIP leg.; male, ZRC\_BDP0136970, Bukit Timah, primary forest (BT08), 12.July.2017, MIP leg.; male, ZRC\_BDP0136989, Bukit Timah, primary forest (BT06), 28.June.2017, MIP leg.; male, ZRC\_BDP0136990, Bukit Timah, primary forest (BT06), 28.June.2017, MIP leg.; male, ZRC\_BDP0136993, Bukit Timah, primary forest (BT06), 28.June.2017, MIP leg.; male, ZRC\_BDP0137013, Bukit Timah, primary forest (BT06), 19.April.2017, MIP leg.; male, ZRC\_BDP0137015, Bukit Timah, primary forest (BT06), 19.April.2017, MIP leg.; male, ZRC\_BDP0137043, Bukit Timah, primary forest (BT06), 07.June.2017, MIP leg.; male, ZRC\_BDP0278178, Bukit Timah, maturing secondary forest (BT08), 10.May.2018, MIP leg.; male, ZRC\_BDP0137089, Bukit Timah, primary forest (BT05), 15.Mar.17, MIP leg. **Females:** female, ZRC\_BDP0137009, Bukit Timah, maturing secondary forest (BT06), 19.Apr.17, MIP leg.; female, ZRC\_BDP0137077, Bukit Timah, maturing secondary forest (BT06), 17-Oct-17, MIP leg.; female, ZRC\_BDP0137109, Bukit Timah, old secondary forest (BT07), 17-May-17, MIP leg.; female, ZRC\_BDP0049262, Nee Soon (NS1), 04-10.December.2014, MIP leg. (slide-mounted).

**Additional sequenced specimens:** ZRC\_BDP0058600; ZRC\_BDP0058610; ZRC\_BDP0058642; ZRC\_BDP0058653; ZRC\_BDP0058710; ZRC\_BDP0058768; ZRC\_BDP0066700; ZRC\_BDP0066734; ZRC\_BDP0066747; ZRC\_BDP0066761; empty vial, ZRC\_BDP0066821; ZRC\_BDP0082312; ZRC\_BDP0136983 (empty vial); ZRC\_BDP0079014 (broken abdomen); ZRC\_BDP0137007 (broken abdomen); ZRC\_BDP0137256; ZRC\_BDP0137258; ZRC\_BDP0137269; ZRC\_BDP0137273; ZRC\_BDP0137293; ZRC\_BDP0154803; ZRC\_BDP0154886 (broken abdomen); ZRC\_BDP0155086;

**Etymology.** The species epithet refers to the transcription of “Temasek” by Marco Polo.

Temasek is an early name of a settlement corresponding to modern Singapore. The noun is used in apposition.

**Remarks.** The sequences we have include specimens from both, Bukit Timah Forest and from Nee Soon Swamp Forest.

***Manota danmaxi* Amorim & Oliveira, sp.nov.**

(Figs. C12A-H)

**Diagnosis.** Thorax ochre-yellowish on anterior half, more brownish towards posterior end, katepisternum lighter. Laterotergite bare. Macrotrichia on anal lobe. Abdominal tergites more brownish. Gonocoxites ventro-medial margin lobes well separate, setose; parastylar lobe long, with a pair of long setae distally, a small basal projection with a single small fine seta distally directed ventrally; juxtagonostylar lobe with a pair of long, hook-like juxtagonostylar setae directed inwards distally; no apico-lateral lobe; gonostylus rectangular, flat, elongate, one megaseta and nine smaller setae distally, a basal digitiform projection with three elongate setae at apex; tergite 9 with wide posterior incision separating a pair of lateral lobes, dorsal face covered with elongate setae, longer closer to posterior margin, an internal lobe near posterior margin with five elongate setae directed inwards and a concentrated group of elongate small setae slightly more anteriorly.

**Description. Male** (Fig. C12A). Wing length, 1.84; width, 0.74. **Head.** Greyish-brown. Antennal scape and pedicel light greyish-brown, flagellum light brown. Face light yellowish-brown, clypeus, palpus and labella whitish. Occiput with ten strong postocular setae. Flagellomeres 1–5 about as long as wide, flagellomeres 6–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Maxillary palpomere 4 only slightly longer than palpomere 3; palpomere 5 only slightly longer than palpomere 4. **Thorax** (Fig. C12C). Scutum light brown, darker medially on posterior end, scutellum light brown; antepronotum and proepisternum light ochre-brown; anepisternum and mesepimeron ochre with brownish tinge, katepisternum cream-yellowish with light brownish tinge, laterotergite greyish-ochre, mediotergite light brown on dorsal half, greyish-ochre on ventral half; metepisternum greyish-brown. Anepisternum with small scattered setae over dorsal three-fourth; anterior basalare bare; katepisternum with a medial vertical line with 10 small setae near posterior end; mesepimeron bare; laterotergite bare; metepisternum with 12 small fine setae on anterior half. Haltere stem light brown, knob dark brown. **Legs.** Coxae whitish, fore coxa with light

brownish tinge, femora brownish-yellow, tibiae and tarsi light-brown. **Wing** (Fig. C12B).

Membrane brownish fumose; C extending for four-fifth of distance to M<sub>1</sub>; R<sub>1</sub> meeting C before mid of wing; sclerotized part of M<sub>2</sub> originating slightly beyond level of tip of R<sub>1</sub>.

Membrane of anal lobe, cell cua and cell m<sub>4</sub> distally with dorsal macrotrichia. **Abdomen**.

Tergites 1–6 brownish; sternites 1–6 light brown, tergite and sternite 7 light brown.

Abdominal setosity brownish. **Terminalia** (Figs. C12D–F). Light brown, with yellowish cerci. Sternite 9 trapezoid with rounded posterior end, a deep anterior medial incision almost reaching mid of gonocoxite length, a slender fusion laterally to gonocoxites, mesal depression separating a pair of elongate, setose lobes. Gonocoxites ventro-medial margin lobes well separate, setose; parastylar lobe long, with a pair of long setae distally, a small basal projection with a single small fine seta distally directed ventrally; juxtagonostylar lobe with a pair of long, hook-like juxtagonostylar setae directed inwards distally; no apico-lateral lobe. Gonostylus rectangular, flat, elongate, one megaseta and nine smaller setae distally, a basal digitiform projection with three elongate setae at apex. Gonocoaxal bridge with apodemes directed obliquely inwards. Tegmen triangular, aedeagus elongate, curved forwards and sinuous distally, anteriorly with a pair of oblique apodemes directed outwards. Sternite 10 well-developed, projected to level of tip of tegmen, distal margin rounded, with two pairs of setae medially and a stronger additional external, a pair of wide digitiform projections with a number of fine setae distally laterad to opening of aedeagus. Tergite 9 with wide posterior incision separating a pair of lateral lobes, dorsal face covered with elongate setae, longer closer to posterior margin, an internal lobe near posterior margin with five elongate setae directed inwards and a concentrated group of elongate small setae slightly more anteriorly. Cerci elongate, flat, entirely separate from each other, with microtrichia and fine setae, long setae distally.

**Female.** Wing length, 1.76; width, 0.66. **Head.** Flagellomeres 1–7 about as long as wide, flagellomeres 8–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. **Thorax.** Metepisternum with 21 small fine setae along sclerite. **Wing.** Macrotrichia dorsally on membrane of anal lobe. **Terminalia** (Figs. C12G–H). Sternite 8 wide at base, trapezoid, distal end with a pair of elongate lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, three longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior arm weakly sclerotized, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to two gonoducts. Tergite 8 apparently fused to tergite 9, slightly longer posterior

at laterals than medially, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, 3.5× longer than wide, cercomere 2 rounded, covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000783>)

**Material examined. Holotype:** male, ZRC\_BDP0049202, Nee Soon (NS2), 07-13.May.2015, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 1 male, 1 female. Male: ZRC\_BDP0049193, Nee Soon (NS2), 07-13.May.2015, MIP leg. Female: ZRC\_BDP0074033, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg. (slide-mounted). **Additional sequenced specimens:** male, ZRC\_BDP0137040 (website photo specimen).

**Etymology.** The species epithet refers to the transcription of “Temasek” as recorded in Yuan and Ming Chinese documents as Dan Ma Xi [=淡馬錫]. Temasek is an early name of a settlement corresponding to modern Singapore. The noun is used in apposition.

**Remarks.** Bukit Timah specimens and Nee Soon specimens are part of the material examined of this species.

***Manota mahuan* Amorim & Oliveira, sp.nov.**

(Figs. C13A–F)

**Diagnosis.** Thorax bright ochre-yellowish, more brownish on posterior fourth medially, pleura very light brown, katepisternum lighter. Laterotergite setose. Macrotrichia on anal lobe. Anterior abdominal segments more dirty-yellowish, segments 4–6 brown. Gonocoxite ventro-medial margin lobe setose; parastylar lobe with a digitiform projection ventrad bearing three elongate setae at tip; juxtagonostylar lobe with a wide ventral area from which a slender digitiform is projected, distally with a pair of long juxtagonostylar megasetae directed inwards, one of them pointed, the other one capitate at tip; dorso-medial border of gonocoxite approximate to each other medially, posterior margin with a distal extension with a number of long setae at dorsal face and a strong curved setae distally, inner posterior corner with 4–5 setae directed ventrally; gonostylus more or less flattened, inner and outer faces with microtrichia and elongate setae, distal margin with long, curved setae, a subdistal beak directed dorsally with three bristles directed anteriorly.

**Description. Male** (Fig. C13A). Wing length, 1.84; width, 0.66. **Head.** Brown, a dark brown band at level of line of ocelli. Occiput with 10 strong postocular setae on each side. Antennal scape light brownish-yellow, pedicel and basal two flagellomeres light brown, flagellomeres 3–14 brownish. Face light brown, clypeus, palpus and labella whitish-brown. Flagellomeres 1–2 about as long as wide, flagellomeres 3–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Maxillary palpomere 4  $1.4 \times$  palpomere 3 length, palpomere 4 with parasegment; palpomere 5  $1.4 \times$  palpomere 4 length. **Thorax.** Scutum brownish-yellowish, darker on posterior fourth, a brown band medio-posteriorly; scutellum light brown. Antepronotum and proepisternum ochre-yellowish, anepisternum brownish-yellow, katepisternum whitish with light brown tinge, mesepimeron light brownish-yellow, laterotergite ochreish-brown, mediotergite light brown on dorsal half, ochreish-brown on ventral half, metepisternum light brown. Anepisternum covered with small setae on dorsal three-fourth, katepisternum with a vertical band of small fine setae at level of ventral end of anepisternum; anterior basalare bare; laterotergite setose; metepisternum with 13 fine small setae on anterior three-fourth. Haltere stem light brown, knob dark brown. **Legs.** Coxae whitish, femora light brownish-yellow, tibiae and tarsi light brown, darker towards tip. **Wing** (Fig. C13B). Membrane brownish fumose. C extending to four-fifth of distance to  $M_1$ ;  $R_1$  meeting C before mid of wing; sclerotized part of  $M_2$  originating slightly beyond level of tip of  $R_1$ . Macrotrichia on membrane of anal lobe and on cell cua. **Abdomen.** Tergites 1–3 light brownish-yellow with brown mark medio-posteriorly, tergite 4 mostly brownish, with brownish-yellow antero-lateral corners, tergites 5–6 brownish, tergite 7, brownish-yellow; sternites 1–5 light brown, sternite 5–6 brown, sternite 7 brownish-yellow. **Terminalia** (Figs. C13C–D). Terminalia brownish-yellow with whitish gonostylus. Sternite 9 trapezoid, a pair of lobes with a deep anterior medial incision on posterior end and on anterior end, about half of gonocoxite length, slender fusion to gonocoxites at lateral ends. Gonocoxite lobe at ventro-medial margin setose, oblique on distal half; parastylar lobe with digitiform projection ventrally bearing three elongate setae at tip; juxtagonostylar lobe with a wide ventral area from which a slender digitiform is projected, distally with a pair of long juxtagonostylar megasetae directed inwards, one of them pointed, the other one capitate at tip; dorso-media border of gonocoxite approximate to each other medially, posterior margin with a distal extension bearing a number of long setae at dorsal face and a strong distal curved setae, inner posterior corner with 4–5 setae directed ventrally. Gonostylus about half of gonocoxite length, elongate, more or less flattened, inner and outer faces with microtrichia and elongate

setae, distal margin with long, curved setae, a subdistal beak directed dorsally with three strong setae directed anteriorly. Gonocoxal bridge with apodemes directed obliquely. Tegmen triangular, with curved distal end tubular ending pointed, reaching level of mid of gonostylus, apodemes anteriorly directed obliquely outwards. Sternite 10 well-developed, triangular, projected to level of tip of aedeagus opening, with three long setae at distal end, a row of long curved setae on each side directed ventralwards laterally close to tip. Tergite 9 arched distally, with scattered microtrichia dorsally and a band of setae along distal margin, four strong setae at margin medially. Cerci elongate, flat, entirely separate from each other, with microtrichia and fine setae, long setae distally.

**Female.** Wing length, 1.76; width, 0.64. **Head.** Flagellomeres 1–4 about as long as wide, flagellomeres 5–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. **Thorax.** Metepisternum with 21 small fine setae along sclerite. **Wing.** Macrotrichia dorsally on membrane of anal lobe. **Terminalia** (Figs. C13E–F). Sternite 8 wide at base, trapezoid, distal end with a pair of elongate lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, three longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior arm weakly sclerotized, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to two gonoducts. Tergite 8 apparently fused to tergite 9, slightly wider at posterior margin than medially, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of long outer setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 over 3× longer than cercomere 2 rounded, both covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000817>)

**Material examined. Holotype:** male, ZRC\_BDP0047061, National University of Singapore (PGP), 02-08.July.2015, MIP leg. (slide-mounted). **Paratypes:** 7 males, 3 females. **Males:** ZRC\_BDP0047100, National University of Singapore (PGP), 02-08.Jul+y.2015, MIP leg.; ZRC\_BDP0047101, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0049301, National University of Singapore (Icube), 26.March-01.April.2015, MIP leg.; ZRC\_BDP0066723, Bukit Timah, maturing secondary forest (BT06), 10-16.August.2016, MIP leg.; ZRC\_BDP0048305, Pulau Semakau (SMO2), old mangrove, 20-26.December.2013, MIP leg.; ZRC\_BDP0048762, Nee Soon (NS1), 19-25.February.2015, MIP leg. (extracted); ZRC\_BDP0049338, National University of Singapore (PGP), 02-08.April.2015, MIP leg. (extracted, website photo specimen). **Females:** ZRC\_BDP0048936, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049137, National University of Singapore (PGP), 16-22.April.2015, MIP leg. (slide-mounted); ZRC\_BDP0072694, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg. **Additional sequenced specimens:** ZRC\_BDP0066834, ZRC\_BDP0278038, ZRC\_BDP0278057, ZRC\_BDP0278263, ZRC\_BDP0278269, ZRC\_BDP0278474, ZRC\_BDP0279125, ZRC\_BDP0279176,

ZRC\_BDP0284245, ZRC\_BDP0284246, ZRC\_BDP0284247, ZRC\_BDP0284250, ZRC\_BDP0284251, ZRC\_BDP0284254, ZRC\_BDP0284256, ZRC\_BDP0132821, ZRC\_BDP0132822, ZRC\_BDP0133477, ZRC\_BDP0133516, ZRC\_BDP0133523, ZRC\_BDP0133532, ZRC\_BDP0133533; ZRC\_BDP0049072, ZRC\_BDP0049301, ZRC\_BDP0058603, ZRC\_BDP0058613, ZRC\_BDP0066736, ZRC\_BDP0069305, ZRC\_BDP0069334, ZRC\_BDP0069336, ZRC\_BDP0070038, ZRC\_BDP0070110, ZRC\_BDP0070116, ZRC\_BDP0070133, ZRC\_BDP0070139, ZRC\_BDP0070141, ZRC\_BDP0070143, ZRC\_BDP0070438, ZRC\_BDP0070439, ZRC\_BDP0070441, ZRC\_BDP0070443, ZRC\_BDP0070451, ZRC\_BDP0070618, ZRC\_BDP0070619, ZRC\_BDP0071089, ZRC\_BDP0071091, ZRC\_BDP0120465, ZRC\_BDP0120522, ZRC\_BDP0128626, ZRC\_BDP0132809, ZRC\_BDP0132811, ZRC\_BDP0132817, ZRC\_BDP0132818, ZRC\_BDP0132819, ZRC\_BDP0132820, ZRC\_BDP0132823, ZRC\_BDP0132826, ZRC\_BDP0132827, ZRC\_BDP0132828, ZRC\_BDP0132834, ZRC\_BDP0132839, ZRC\_BDP0132842, ZRC\_BDP0132844, ZRC\_BDP0132898, ZRC\_BDP0133142, ZRC\_BDP0133152, ZRC\_BDP0133374, ZRC\_BDP0133376, ZRC\_BDP0133379, ZRC\_BDP0133387, ZRC\_BDP0133390, ZRC\_BDP0133470, ZRC\_BDP0133472, ZRC\_BDP0133473, ZRC\_BDP0133480, ZRC\_BDP0133481, ZRC\_BDP0133493, ZRC\_BDP0133497, ZRC\_BDP0133499, ZRC\_BDP0133503, ZRC\_BDP0133519, ZRC\_BDP0133524, ZRC\_BDP0133527, ZRC\_BDP0133530, ZRC\_BDP0133531, ZRC\_BDP0133536, ZRC\_BDP0136998, ZRC\_BDP0137037, ZRC\_BDP0137087, ZRC\_BDP0137100\_imaged\_extracted, ZRC\_BDP0140702, ZRC\_BDP0142305, ZRC\_BDP0143104, ZRC\_BDP0155999, ZRC\_BDP0326320, ZRC\_BDP0040986, ZRC\_BDP0040994, ZRC\_BDP0040995, ZRC\_BDP0040996, ZRC\_BDP0040997, ZRC\_BDP0040998, ZRC\_BDP0040999, ZRC\_BDP0041001, ZRC\_BDP0041006, ZRC\_BDP0041012, ZRC\_BDP0041013, ZRC\_BDP0041014, ZRC\_BDP0041018, ZRC\_BDP0041021, ZRC\_BDP0041024, ZRC\_BDP0041025, ZRC\_BDP0041026, ZRC\_BDP0041035, ZRC\_BDP0041036, ZRC\_BDP0047059

**Etymology.** This species is named after Ma Huan [=马欢], a Chinese Muslim voyager and scribe who followed the Chinese Admiral Zheng He exploring Southeast Asia and much of the rest of the old world. His book Ying Ya Sheng Lan [=瀛涯胜览; The Overall Survey of the Ocean's Shores] was one of the first extensive natural and cultural history records of Southeast Asia, long before Wallace and other Western naturalists. His records mention the Long Ya Men [=龙牙门; Dragon's Teeth Gate], a navigational rock off the coast of Singapore. The noun is used in apposition.

**Remarks.** This is a widespread species in Singapore, occurring in different environments, from the mangroves to the swamp forest, the primary tropical forest, and as well in degraded secondary forest in urbanized areas. This species is similar to, e.g., *Manota anceps* Hippa & Ševčík and *Manota capillata* Hippa & Ševčík, from Sumatra, *Manota dolichothrix* Hippa & Ševčík (Malaysia) and *Manota hyboloma* Hippa & Ševčík, from Brunei (Hippa & Ševčík 2010).

***Manota temenggong* Amorim & Oliveira, sp.nov.**

(Figs. C14A–E)

**Diagnosis.** Small specimens, < 1.50 mm. Head, thorax and abdomen brown, distal third of hind femur brownish. Laterotergite setose. Anal lobe devoid of setation. Gonocoxite ventro-medial margin lobe large; parastylar lobe with digitiform projection bearing three elongate fine setae at tip directed inwards; juxtapoststylar lobe slender digitiform, distally with a pair of fine long juxtapoststylar setae directed inwards; dorso-medial border of gonocoxite with a distal extension, almost reaching tip of gonostylus, inner face with a dense group of strong curved setae. Gonostylus about half of gonocoxite length, distal margin with a pair of short, more or less pointed projections with microtrichia and elongate setae on external face, distal margin with long, curved setae, long setae directed inwards on distal half of inner face. Tergite 9 arched distally, with scattered microtrichia dorsally and a band of setae along distal margin, four strong setae at margin medially.

**Description. Male** (Fig. C14A). Wing length, 1.40; width, 0.54. **Head.** Brown, a darker band at level of line of ocelli and on occiput posteriorly to eye. Antennal scape brownish-yellow, pedicel and flagellum light brown. Flagellomere 1 about as long as wide, flagellomeres 2–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Face, clypeus, palpus and labella whitish-brown. Maxillary palpomere 4 only slightly palpomere 3 length, palpomere 5 slightly over 2.0× palpomere 4 length. Eight strong postocular setae on each side. **Thorax** (Fig. C14C). Scutum brown, darker medially, scutellum brown. Antepronotum, proepisternum, anepisternum, mesepimeron, laterotergite and metepisternum light brown, mediotergite light brown, brown medially, katepisternum whitish with a light brown tinge. Anepisternum covered with small setae on dorsal three-fourth; anterior basalare bare; katepisternum bare; laterotergite with 19 small setae; metepisternum with eight small fine setae on anterior half. Haltere stem light brown, knob brown. **Legs.** Coxae whitish, femora yellowish, hind femur brown on distal fifth of wing; tibiae and tarsi brownish, darker towards tip. **Wing** (Fig. C14B). Membrane brownish fumose, posterior margin slightly emarginated at tip of CuA. C extending to four-fifth of distance to M<sub>1</sub>; R<sub>1</sub> meeting C before mid of wing; sclerotized part of M<sub>2</sub> originating well beyond level of tip of R<sub>1</sub>. M<sub>2</sub> gently curved at basal fourth. CuA not disconnected from M<sub>4</sub> at base. **Abdomen.** Tergites 1–6 brownish with lighter lateral margins, tergite 7 light brown; sternites 1–7 light brown. **Terminalia** (Figs. C14D–E). Yellowish-brown. Sternite 9 trapezoid, a pair of lobes with a deep anterior medial incision on posterior end and on anterior end, about half of gonocoxite length. No fusion of sternite 9 laterally to gonocoxites. Gonocoxite ventro-medial margin lobe large, ventral face bare only at inner corner anteriorly; parastylar lobe with digitiform projection bearing three elongate

fine setae at tip directed inwards; juxtapoststylar lobe as a slender digitiform distally with a pair of fine long juxtapoststylar setae directed inwards; dorso-medial border of gonocoxite with a distal extension almost reaching tip of gonostylus, dorsal face with long fine setae, inner face with a group of concentrated strong curved setae. Gonostylus about half of gonocoxite length, subquadrate elongate, more or less flattened, distal margin with a pair of short, more or less pointed projections, with microtrichia and elongate setae on external face, distal margin with long, curved setae, long setae directed inwards on distal half of inner face. Gonocoxal bridge with apodemes directed obliquely, slightly curved. Tegmen triangular, with curved tubular distal end pointed at tip, reaching level of base of gonostylus, pointed apodemes at anterior end directed obliquely outwards. Sternite 10 well-developed, triangular, projected to level of tip of aedeagus opening, with three long setae at distal end, close to tip laterally with a row of long curved setae directed ventrally on each side. Tergite 9 arched distally, with scattered microtrichia dorsally and a band of setae along distal margin, four strong setae at margin medially. Cerci elongate, flat, entirely separate from each other, with microtrichia and fine setae, long setae distally.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000814>)

**Material examined. Holotype:** male, ZRC\_BDP0049118, Nee Soon (NS1), 18-24.December.2014, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet is a reference to “Temenggong”, an old Malay title of nobility, usually given to the chief of public security, responsible for the safety of the Sultan and overseeing the state’s security forces. The Temenggong Abdul Rahman, of the Johor Sultanate, helped Raffles set a formal treaty with the Sultan Hussein of Johor, signed on February 6, 1819, resulting in Singapore’s colony status. The noun is used in apposition.

***Manota* sp. A**

(Figs. C15A–E)

**Description. Female.** Wing length, 1.81; width, 0.71. **Head.** Brownish-yellow, a dark brown band at level of line of ocelli and on occiput posteriorly to eyes. Antenna light yellowish-brown, scape and pedicel lighter. Face, clypeus, palpus and labella dirty-yellowish. Occiput with line of 9–10 strong postocular setae. **Thorax.** Scutum brownish cream-yellow, as well as

antepronotum; proepisternum, anepisternum and mesepimeron dark ochre-yellowish, katepisternum and metepisternum lighter; laterotergite brown, mediotergite light brown. Five supra-alars, two pairs of prescutellars. Anepisternum covered with fine setae except for anterior margin, including antero-ventral corner; anterior basalare bare; katepisternum with some fine setae close to posterior border; laterotergite bare; metepisternum with 18–20 setulae. Haltere brownish-yellow, setae on pedicel, knob densely setose. **Legs.** Coxae whitish, front femur whitish-yellow, mid and hind femora light brownish-yellow; tibiae and tarsi light greyish-brown. Mid and hind tibial organs absent. **Wing** (Fig. C15A). Membrane light greyish-brown. C almost reaching tip of  $M_1$ ,  $R_1$  meeting C before mid of wing. First sector of Rs not produced. Sclerotized part of  $M_2$  originating at level of tip of  $R_1$ ; CuA not connected basally to  $M_4$ . **Abdomen.** Tergites 1–2 brownish-yellow, tergites 3–7 light brown; sternites 1–3 light brown, sternite 4–6 light yellowish-brown. **Terminalia** (Fig. C15B). Sternite 8 wide at base, trapezoid, distal end with a pair of short lobes bearing a medial incision posteriorly, fine setae entirely covering sclerite, larger setae on lobes, setae on distal margin of lobes longer. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, distal medial end of sternite 9 reaching level of tip of lobes of sternite 8, with setulae along posterior margin, gonopore connected to a pair of gonoducts. Tergite 8 wide and short, almost not overlapping laterally with lateral border of sternite 8, covered with microtrichia and fine setae. Tergite 9 longer than tergite 8, covered with microtrichia and scattered fine setae. Sternite 10 with two pairs of longer setae. Tergite 10 reduced to an inconspicuous slender band, two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, over 3× longer than wide, cercomere 2 ovoid, covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000759>)

**Material examined.** 3 females, ZRC\_BDP0047870, Nee Soon (NS1), swamp forest, 20-26.March.2014, MIP leg.; ZRC\_BDP0048529, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048672, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg.

**Remarks.** Only specimens from the swamp forest are known for this species.

*Manota* sp. B

(Figs. C16A–C)

**Description. Female** (**Fig. C16A**). Wing length, 1.76; width, 0.66. **Head.** Light brown. Antennal scape light brownish-yellow, pedicel and flagellum light brown. Flagellomeres 1–5 about as long as wide, flagellomeres 6–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Face light brown, clypeus, palpus and labella whitish. Maxillary palpomere 4  $2.0 \times$  length of palpomere 3; palpomere 5  $1.1 \times$  palpomere 4 length. Occiput with ten strong postocular setae. **Thorax.** Scutum yellowish-brown, darker medially; antepronotum and proepisternum light ochre-brown; anepisternum, mesepimeron, laterotergite and mediotergite yellowish-brown, katepisternum whitish-brown, metepisternum whitish-brown on anterior fourth, brownish on posterior three-fourth, laterotergite with blackish-brown mark on ventral end. Anepisternum with small scattered setae over dorsal half; anterior basalare bare; katepisternum with a medial vertical line with 10 small setae; mesepimeron bare; laterotergite with about 30 scattered fine setae; metepisternum with nine small setae on anterior half. Haltere stem light brown, knob dark brown. **Legs.** Coxae whitish, trochanters brownish, femora brownish-yellow, tibiae and tarsi yellowish-brown. **Wing** (**Fig. C16B**). Membrane brownish;  $R_1$  meeting  $C$  before mid of wing; sclerotized part of  $M_2$  originating at level of tip of  $R_1$ . No dorsal macrotrichia on wing membrane. **Abdomen.** Tergites 1–6 brownish; sternites 1–6 light brown, tergite and sternite 7 light brown. Abdominal setosity brownish. **Terminalia** (**Fig. C16C**). Light brown, with yellowish cerci, brownish tinges ventrally. Sternite 8 wide at base, trapezoid, distal end with a pair of lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, two longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior arm ending very thin, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to a single gonoduct. Tergite 8 apparently fused to tergite 9, slightly longer posterior laterally than medially, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, about  $3 \times$  longer than wide, cercomere 2 ovoid, covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000820> and -000759)

**Material examined.** 2 females, ZRC\_BDP0047826, Nee Soon (NS1), swamp forest, 28.February-6.March.2013, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0048529, Nee Soon (NS02), swamp forest, 30.May.12, MIP leg. (website photo specimen)

**Remarks.** The two known specimens of this species were collected in the swamp forest.

***Manota* sp. C**

(Figs. C17A–E)

**Description. Female** (Fig. C17A). Wing length, 1.79; width, 0.66. **Head** (Fig. C17B).

Brown, ocellar line darker. Antennal scape light brownish-yellow, pedicel and flagellum light brown. Flagellomeres 1–10 about as long as wide, flagellomeres 11–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Face densely setose. Face and clypeus light brown, labella yellowish-brown [both maxillary palpi missing]. Nine strong postocular setae on each side. **Thorax** (Fig. C17C). Scutum and scutellum light brown. Antepronotum and proepisternum, anepisternum, mesepimeron, laterotergite and mediotergite light brown, katepisternum whitish with brown tinge, metepisternum light brown dorsally, whitish ventrally. Anepisternum covered with small setae except for bare antero-ventral corner; anterior basalare bare; laterotergite bare, metepisternum with some setulae on anterior half. Haltere stem light brown, knob brown. **Legs.** Coxae whitish, femora brownish-yellow, tibiae and tarsi brownish, darker towards tip, covered with regular rows of brownish setulae and regular rows of short brown bristles. Front tibia shorter than femur and shorter than first tarsomere. **Wing** (Fig. C17D). Membrane brownish fumose. Wing margin slightly emarginated at level of tip of CuA. C extending over four-fifth of distance to M<sub>1</sub>. R<sub>1</sub> meeting C before mid of wing; sclerotized part of M<sub>2</sub> originating beyond level of tip of R<sub>1</sub>. **Abdomen.** Tergites 1–6 brownish; sternites 1–6 light brown, tergite and sternite 7 light brown.

Abdominal setosity brownish. **Terminalia** (Figs. C17E–F). Light brown, cerci yellowish with brownish tinge. Sternite 8 wide at base, trapezoid, distal end with a pair of lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, two longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior arm weakly sclerotized, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to a pair of gonoducts. Tergite 8

apparently fused to tergite 9, slightly longer laterally than medially, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, slightly over 3× longer than wide, cercomere 2 ovoid, short, covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000773>)

**Material examined.** 1 female, ZRC\_BDP0048300, Pulau Semakau (SMO1), old mangrove, 14-20.December.2012, MIP leg. (website photo specimen, slide-mounted).

### *Manota* sp. D

(Figs. C18A–D)

**Description. Female** (Fig. C18A). Wing length, 1.99; width, 0.69. **Head.** Vertex brown, face light brown, clypeus whitish-yellow, occiput yellowish with light brownish tinge, brown along posterior margin of eye; 11 strong postocular setae on each side. Antennal scape and pedicel whitish-yellow, flagellum light brown. Maxillary palpus and labella whitish.

Flagellomeres slightly shorter than long, except for distal flagellomere. **Thorax.** Scutum mostly ochre-yellowish, scutellum light brown. Antepronotum and proepisternum ochre-yellowish, anepisternum, mesepimeron and laterotergite ochre with brownish tinge, katepisternum whitish, and mediotergite light brown on dorsal half, ochre on ventral half, metepisternum light brown. Three pairs of long prescutellars. Anepisternum covered with scattered small setae except at ventral fourth; anterior basalare bare; katepisternum with a band of fine setae dorso-posteriorly at level of ventral end of anepisternum; laterotergite bare; metepisternum with about 30 fine setae along its length. Haltere stem light brown, knob dark brown. **Legs.** Coxae whitish, femora and tibiae whitish-yellow, tarsi with brownish tinge.

**Wing** (Fig. C18B). Membrane with light brown infuscation. C ending at about four-fifth of distance to  $M_1$ ;  $R_1$  meeting C before mid of wing; sclerotized part of  $M_2$  originating at level of tip of  $R_1$ . Membrane with no macrotrichia. **Abdomen.** Tergites 1–6 yellowish-brown, darker medially, tergite 7 light yellowish-brown; sternites 1–3 light brown, sternites 4–6 light yellowish-brown, sternite 7 yellowish. **Terminalia** (Figs. C18C–D). Sternite 8 wide at base,

trapezoid, distal end with a pair of lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, two longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally and diverging towards anterior end, extending anteriorly to distal end of segment 7, distal medial end of sternite 9 almost reaching level of tip of lobes of sternite 8, gonopore connected to a pair of gonoducts. Tergite 8 wide, barely overlapping laterally with lateral border of sternite 8, covered with microtrichia and fine setae. Tergite 9 about as long as tergite 8, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae, each at tip of a long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 slender, about 2.0× longer than wide, cercomere 2 ovoid, slightly elongate, covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000825>)

**Material examined.** 1 female, ZRC\_BDP0048676, Nee Soon (NS2), swamp forest, 17-23.May.2012, MIP leg. (website photo specimen).

***Manota* sp. E**

(Figs. C19A–C)

**Description. Female** (Fig. C19A). Wing length, 1.40; width, 0.51. **Head.** Brown, a darker band at level of line of ocelli and on occiput posteriorly to eyes. Antennal scape and pedicel yellowish-brown, flagellum light brown. Flagellomere 1–6 wider than long, flagellomeres 7–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Face light brown, clypeus yellowish-brown, palpus and labella whitish. Maxillary palpomere 4 only slightly palpomere 3 length, palpomere 5 1.7× palpomere 4 length. Occiput with eight strong postocular setae. **Thorax.** Scutum light brown, lighter along margin on anterior half, scutellum light brown. Antepronotum, proepisternum, anepisternum, mesepimeron, laterotergite and metepisternum light brown, mediotergite light brown on ventral half, brown on dorsal half, katepisternum whitish with a light brown tinge. Anepisternum covered with small setae on dorsal three-fourth; anterior basalare bare; katepisternum with a vertical band of small, fine setae at level of ventral end of anepisternum; laterotergite with 19 small setae;

metepisternum with 13 small fine setae on its anterior three-fourth. Haltere stem light brown, knob brown. **Legs.** Coxae whitish with a yellowish tinge, hind coxa with a brown band on basal end, femora whitish, hind femur brown on distal half; tibiae and tarsi light brown, darker towards tip. **Wing** (Fig. C19B). Membrane brownish fumose, posterior margin slightly emarginated at tip of CuA. C extending for four-fifth of distance to M<sub>1</sub>; R<sub>1</sub> meeting C before mid of wing. Sclerotized part of M<sub>2</sub> originating beyond level of tip of R<sub>1</sub>. CuA not disconnected from M<sub>4</sub> at base. Anal fold weakly sclerotized. One single macrotrichium on membrane of anal lobe. **Abdomen.** Tergites 1–6 light brown, darker medio-anteriorly, tergite 7 light yellowish-brown; sternites 1–7 light yellowish-brown. **Terminalia** (Fig. C19C). Yellowish-brown. Sternite 8 wide at base, trapezoid, distal end with a pair of elongate lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, three longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally, diverging towards anterior end, anterior arm weakly sclerotized, distal end of sternite 9 almost reaching level of mid of cercomere 1, gonopore connected to two gonoducts. Tergite 8 apparently fused to tergite 9, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of short digitiform projections, one pair at lateral corners and one pair submedially. Cercomere 1 slender, flat, over 8× longer than cercomere 2, cercomere 2 very short, both covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002076>)

**Material examined.** 35 females, ZRC\_BDP0047060, National University of Singapore (PGP), 02-08.July.2015, MIP leg. (slide-mounted); ZRC\_BDP0047062, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0047079, National University of Singapore (PGP), 16-22.July.2015, MIP leg.; ZRC\_BDP0278303, Singapore, 10-May-18, MIP leg.; ZRC\_BDP0279123, Singapore, 31-May-18, MIP leg.; ZRC\_BDP0279127, Singapore, 31-May-18, MIP leg.; ZRC\_BDP0284252, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0132837, Singapore, (date range 2012-2018), NUSInsectSurvey, MIP leg.; ZRC\_BDP0133108, Singapore, (date range 2012-2018), NUSInsectSurvey, MIP leg.; ZRC\_BDP0133113, Singapore, (date range 2012-2018), NUSInsectSurvey, MIP leg.; ZRC\_BDP0133122, Singapore, (date range 2012-2018), NUSInsectSurvey, MIP leg.; ZRC\_BDP0133175, Singapore, (date range 2012-2018), NUSInsectSurvey, MIP leg.; ZRC\_BDP0069329, Singapore, PU01, 11-Jun-16, MIP leg.; ZRC\_BDP0132841, National University of Singapore (PGP), 24-May-17, NUSInsectSurvey, MIP leg.; ZRC\_BDP0132853, National University of Singapore (PGP), 24-May-17, NUSInsectSurvey, MIP leg.; ZRC\_BDP0132885, National University of Singapore (PGP), 5-Jul-17, MIP leg.; ZRC\_BDP0133097, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133105, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133109, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133110, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133117, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133126, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133131, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133134, National University of Singapore (PGP), 17-May-17, MIP leg.;

ZRC\_BDP0133144, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133380, National University of Singapore (PGP), 14-Apr-17, MIP leg.; ZRC\_BDP0133392, National University of Singapore (PGP), 14-Apr-17, MIP leg.; ZRC\_BDP0133393, National University of Singapore (PGP), 14-Apr-17, MIP leg.; ZRC\_BDP0133394, National University of Singapore (PGP), 14-Apr-17, MIP leg.; ZRC\_BDP0133486, National University of Singapore (PGP), 9-May-17, MIP leg.; ZRC\_BDP0133488, National University of Singapore (PGP), 9-May-17, MIP leg.; ZRC\_BDP0133494, National University of Singapore (PGP), 31-May-17, MIP leg. (website photo specimen); ZRC\_BDP0133498, National University of Singapore (PGP), 31-May-17, MIP leg.; ZRC\_BDP0133515, National University of Singapore (PGP), 3-May-17, MIP leg.; ZRC\_BDP0133526, National University of Singapore (PGP), 3-May-17, MIP leg..

**Remarks.** The mitogenome tree shows (*Manota temenggong*, sp.nov. + *Manota* sp. D) in a small clade. Indeed, these two are distinctive, small, entirely brownish species of *Manota*.

### ***Manota* sp. F**

(Figs. C20A–E)

**Description. Female** (Fig. C20A). Wing length, 1.86; width, 0.66. **Head** (Fig. C20B).

Brown, a dark brown band at level of line of ocelli and on occiput posteriorly to eye.

Antennal scape, pedicel and flagellum light brown. Flagellomere 1 and flagellomeres 6–13 slightly longer than wide, flagellomeres 2–5 as long as wide, flagellomere 14 more than twice as long as wide. Face, clypeus, palpus and labella light brown. Maxillary palpomere 4 about as long as palpomere 3, palpomere 5 1.5× palpomere 4 length. Occiput with eight strong postocular setae. **Thorax.** Scutum light ochre-brown, darker medio-posteriorly, scutellum light brown. Antepronotum, proepisternum, anepisternum, mesepimeron, laterotergite and metepisternum light ochre-brown, mediotergite light brown dorsally, brown medially, katepisternum whitish with a light brown tinge. Anepisternum almost entirely covered with small setae; anterior basalare bare; katepisternum with a vertical group of small, fine setae medially at level of ventral end of anepisternum; laterotergite bare; metepisternum with three small fine setae along its length. Haltere stem light brown, knob brown. **Legs.** Coxae light yellowish, front and mid femora whitish; front, mid tibiae and tarsi light brown, darker towards tip [hind femora, tibia and tarsi missing]. **Wing** (Fig. C20C). Membrane brownish fumose, posterior margin slightly emarginated at tip of CuA. C extending for four-fifth of distance to M<sub>1</sub>; R<sub>1</sub> meeting C before mid of wing. A row of macrotrichia along part of non-sclerotized M<sub>1</sub>, sclerotized part of M<sub>2</sub> originating slightly beyond level of tip of R<sub>1</sub>. CuA not disconnected from M<sub>4</sub> at base. Macrotrichia on membrane of anal lobe and cell cu<sub>a</sub>.

**Abdomen.** Tergites 1–6 brownish with lighter lateral margins, tergite 7 light brown; sternites 1–7 light brown. **Terminalia** (Figs. C20D–E). Yellowish-brown. Sternite 8 wide at base,

trapezoid, distal end with a pair of elongate lobes, a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, three longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally, diverging towards anterior end, extending anteriorly to distal end of segment 7, anterior arm weakly sclerotized, distal end of sternite 9 medially almost reaching level of tip of lobes of sternite 8, gonopore connected to two gonoducts. Tergite 8 apparently fused to tergite 9, slightly longer laterally, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of setae at tip of long digitiform projection, one pair at lateral corners and one pair sub-medially. Cercomere 1 over 3× longer than cercomere 2, which is rounded, both covered with microtrichia and fine setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002075>)

**Material examined.** 2 females, ZRC\_BDP0278396, Singapore Botanical Gardens (CUGE), 3-Nov-17, MIP leg.; ZRC\_BDP0058640, Bukit Timah Forest (BT08), 14-Sep-16, MIP leg.; Two specimens with abdomen missing: ZRC\_BDP0072692, Bukit Timah Forest, (BT06), 13-Oct-16, MIP leg.; ZRC\_BDP0133440, Nee Soon Swamp Forest (NSM1), 28-Jan-15, MIP leg. (website photo specimen).

***Manota* sp. G**

(Figs. C21A–F)

**Description. Female** (Fig. C21A). Wing length, 1.79–1.99; width, 0.66–0.74 (n=2). **Head** (Figs. C21B–C). Brown, a band at level of line of ocelli and occiput posteriorly to eye darker. Antennal scape, pedicel and flagellomere 1 yellowish-brown, flagellum light brown. Flagellomere 2–4 wider than long, flagellomeres 1 and 7–13 slightly longer than wide, flagellomere 14 more than twice as long as wide. Face brown, clypeus light brown, palpus and labella yellowish-brown. Maxillary palpomere 4 about as long as palpomere 3, palpomere 5 1.7× palpomere 4 length. Occiput with nine strong postocular setae. **Thorax**. Scutum light brown, darker medio-posteriorly, scutellum brown. Antepronotum, proepisternum, anepisternum, mesepimeron, laterotergite and metepisternum light brown, mediotergite light brown on ventral half, brown on dorsal half, katepisternum whitish with a light brown tinge. Anepisternum covered with small setae on dorsal four-fifth; anterior basalare bare; katepisternum with a group of small, fine setae medially at level of ventral end of anepisternum; laterotergite bare; metepisternum with 15 small setae along its entire length.

Haltere stem light brown, knob brown. **Legs.** Coxae whitish with a yellowish tinge, hind coxa with a brownish tinge on basal end, femora light yellowish-brown; tibiae and tarsi light brown, darker towards tip. **Wing** (Fig. C21D). Membrane brownish fumose. Posterior margin slightly emarginated at tip of CuA. C extending for four-fifth of distance to M<sub>1</sub>; R<sub>1</sub> meeting C before mid of wing. A row of setae along part of the unsclerotized line of M<sub>1</sub>; sclerotized part of M<sub>2</sub> originating beyond level of tip of R<sub>1</sub>; distal end of M<sub>4</sub> gently sinuous. CuA not disconnected from M<sub>4</sub> at base. Anal fold weakly sclerotized. Macrotrichia on membrane of anal lobe and cell cua. **Abdomen.** Tergites 1–6 light brown, darker medially, tergite 7 yellowish-brown; sternites 1–7 light yellowish-brown. **Terminalia** (Figs. C21E–F). Yellowish-brown. Sternite 8 wide at base, trapezoid, distal end with a pair of elongate lobes and a medial incision posteriorly, fine setae entirely covering sclerite, especially on lobes, three longer setae at tip of each lobe. Sternite 9 present as a pair of long sclerotized bands connected distally, diverging towards anterior end, anterior arm weakly sclerotized, distal medial end of sternite 9 almost reaching level of mid of cercomere 1, gonopore connected to two gonucts. Tergite 8 apparently fused to tergite 9, covered with microtrichia and scattered fine setae. Sternite 10 with one pair of outer long setae and one pair of inner short setae on distal margin. Tergite 10 reduced to an inconspicuous slender band and with two pairs of long setae at tip of long digitiform projections, one pair at lateral corners and one pair sub-medially [distal end of both cercomere 1 broken, cercomere 2 missing].

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002068>)

**Material examined.** 25 females, ZRC\_BDP0278331, Singapore, 3-May-18, MIP leg. (slide-mounted); ZRC\_BDP0058745, Bukit Timah Forest (BT08), 11-Aug-16, MIP leg.; ZRC\_BDP0071045, Bukit Timah Forest (BT04), 17-Nov-16, MIP leg.; ZRC\_BDP0132805, National University of Singapore (PGP), 7-Jun-17, MIP leg.; ZRC\_BDP0132813, National University of Singapore (PGP), 7-Jun-17, MIP leg.; ZRC\_BDP0132830, National University of Singapore (PGP), 24-May-17, MIP leg.; ZRC\_BDP0132831, National University of Singapore (PGP), 24-May-17, MIP leg. (extracted; website photo specimen); ZRC\_BDP0132835, National University of Singapore (PGP), 24-May-17, MIP leg.; ZRC\_BDP0132846, National University of Singapore (PGP), 24-May-17, MIP leg.; ZRC\_BDP0132848, National University of Singapore (PGP), 24-May-17, MIP leg.; ZRC\_BDP0133093, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133096, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133107, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133120, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133123, National University of Singapore (PGP), 17-May-17, MIP leg.; ZRC\_BDP0133145, National University of Singapore (PGP), 14-Jun-17, MIP leg.; ZRC\_BDP0133146, National University of Singapore (PGP), 14-Jun-17, MIP leg.; ZRC\_BDP0133148, National University of Singapore (PGP), 14-Jun-17, MIP leg.; ZRC\_BDP0133150, National University of Singapore (PGP), 14-Jun-17, MIP leg.; ZRC\_BDP0133154, National University of Singapore (RVR), 3-May-17, MIP leg.; ZRC\_BDP0133469, National University of Singapore (PGP), 9-May-17, MIP leg.; ZRC\_BDP0133474, National University of Singapore (PGP), 9-May-17, MIP leg.; ZRC\_BDP0133482, National University of Singapore (PGP), 9-May-17, MIP leg.; ZRC\_BDP0133528, National University of Singapore (PGP), 3-May-17, MIP leg.; ZRC\_BDP0136975, Bukit Timah Forest (BT08), 17-Apr-17, MIP leg..

### *Clastobasis* Skuse

*Clastobasis* Skuse, 1890:617. Type-species, *Clastobasis tryoni* Skuse, by monotypy.

In Oliveira & Amorim's (2021) study of the Leiinae of the world, *Clastobasis* and *Leia* appear mutually paraphyletic. There is certainly a core group of *Clastobasis* species that conforms a clade. This includes, e.g., *C. villiersi* Matile and a number of Afrotropical species assigned to the genus of the *maculicoxa*-group of species (Olavi Kurina, pers.com.). Two of the three species of the genus we found in Singapore belong in this group. All three species from Singapore share details of the wing venation, the lateral ocelli touching the eye margins, but especially the presence of dark rings on the flagellomeres that indicate they fit in *Clastobasis*.

There are seven formally described Oriental species of *Clastobasis*, four species of them described from India (Brunetti, 1912) and three from Sri Lanka (Sivec & Plassmann, 1982). Some of Brunetti's (1912) types of mycetophilids are badly damaged (Väisänen, 1996). There are, however, about 20 Oriental species assigned to *Leia* that may actually correspond to species of *Clastobasis*—most of which described from India, Pakistan, Nepal and China (see, e.g., Colless and Liepa, 1973). Four species of *Leia* are known from the Malay Peninsula and Indonesia: *L. albicincta* de Meijere, *L. major* Edwards, *L. nigriventris* Edwards, and *L. nigripalpis* Edwards. The original description of all these species have enough information on the color patterns of the thorax and abdomen to allow the recognition of our material of *Clastobasis* as not belonging to any of these species. There is one species described by Colless (1966) from Micronesia in *Leia* that clearly fits into the delimitation of *Clastobasis*, but the color pattern also differs from the species from Singapore.

*Clastobasis sritribuana*, sp.nov. has specimens were collected in the swamp forest and in the rainforest. The other two species of *Clastobasis* had specimens collected in the mangrove, but also in impacted urban forests. The haplotype network (Fig. C22E) for the genus is complex, with a number of conflicts. *Clastobasis sritribuana*, sp.nov. and *C. bugis*, sp.nov. are well defined, mixed with *Clastobasis oranglaut*, sp.nov. in a single cluster with mPTP. There are five small groups of haplotypes that are separated from the main haplotype in *Clastobasis oranglaut*, sp.nov. by PTP.

*Clastobasis sritribuana* Amorim & Oliveira, sp.nov.

(Figs. C22A–D)

**Diagnosis.** Head and most of thorax dark brown, only shoulders whitish-yellow. Coxae whitish, no marks, femora and tibiae cream-yellowish. Abdominal tergites 1–4 and 6 brown, tergites 3–5 cream-yellow, sternite 1–2 and 6 brown, sternites 3–5 cream-yellow with slender brownish lateral marks.

**Description. Female** (Fig. C22A). Wing length, 2.76–2.98; width, 0.94–0.99 (n=2). **Head.** Vertex brown, with scattered setae posteriorly to ocelli, an irregular crown of longer setae on occiput around eyes. Mid ocellus present, placed at posterior end of frontal furrow, less than half of diameter of lateral ocelli, lateral ocelli nearly touching eye margin. Frons, face and clypeus yellow. Frons devoid of setae, frontal furrow complete, reaching mid ocellus; face slender, bare, entirely separated from clypeus; clypeus large, truncate ventrally, entirely covered with setae. Scape twice length of pedicel, yellowish. Scape with a subapical crown of setulae and a distal crown of stronger setae; pedicel with a single distal crown of setulae and larger setae, dorsally a conspicuous seta. Flagellomeres 1–8 yellowish with a brown distal band, flagellomeres 9–14 light brown. Maxillary palpus yellowish, five palpomeres, basal one weakly sclerotized, bare, palpomere 2 short, with dorsal setae, palpomere 3 well-developed, with a well-defined sensorial pit opening laterally on basal third and scattered setulae on dorsal face, about 4× length of palpomere 2; palpomere 4 elongate, weakly sclerotized, slightly longer than palpomere 2, with scattered setulae dorsally; palpomere 5 more than twice palpomere 4 length, slender, weakly sclerotized, with scattered dorsal setulae. Labella yellow, large, with a pair of tracheae. **Thorax.** Scutum dark brown, scutellum brown. Scutum covered with scattered short setae, some stronger supra-alars and prescutellars; a pair of strong scutellar bristles, a pair of strong setae more externally and 2–4 setulae laterally. Pleural sclerites brown, membrane whitish. Basisternum with wide dorso-posterior arms. Antepronotum wide, with five bristles and additional small setae; proepisternum well-developed, with three bristles and two setulae on ventral half. All remaining pleural sclerites bare except for laterotergite, with about 35 setae and setulae. Mesepisternum wide on ventral half, reaching ventral margin of pleura, mediotergite long, only gently curved. Haltere whitish, setose. **Legs.** Coxae whitish-yellow, distal margin of mid and hind coxae and mid and hind trochanters with dark brown markings, hind coxa with a dark brown mark on basal fifth. Mid and hind femora, tibiae and tarsi light brownish yellow [both front legs broken]. Fore coxa with fine setae covering entire frontal and

lateral faces, and some few strong bristles on distal margin; mid coxa covered with setae on frontal face and on distal half of lateral face, some few strong bristles on distal margin; hind coxa with setae restricted to basal fifth of frontal face, some few strong bristles on distal margin. Mid and hind tibiae and tarsi with irregularly distributed trichia; tibia with two irregular rows of short bristles dorso-laterally, hind tibia with a pair of irregular dorsolateral rows and a dorsal row of short bristles. Mid and hind tarsomeres 1 and 2 with some few short bristles. Tibial spurs yellow, outer spurs about  $5\times$  tibial diameter at apex, outer spur over  $1.5\times$  longer than inner spur. Tarsal claw with a small proximal tooth and a large, blunt medial tooth. **Wing** (Fig. C22B). Membrane without macrotrichia, translucent, with a very light brownish-yellow tinge. C ending at apex of  $R_5$ . Sc complete, ending at C in wing basal fourth, weakly sclerotized distally; sc-r not sclerotized.  $R_1$  short,  $0.88\times r\text{-}m$  length, reaching C at mesal third of wing; first sector of Rs nearly transverse, short;  $R_5$  short, reaching C before level of tip of  $M_2$ , straight except very distally;  $r\text{-}m$  curved on basal third, more than  $6\times$  length of first sector of Rs.  $M_{1+2}$  shorter than length of  $r\text{-}m$ ;  $M_1$  and  $M_2$  more than  $5\times$  length of  $M_{1+2}$ ;  $M_1$  gently curved posteriorly on distal half,  $M_2$  curved anteriorly on distal half, fading on distal fourth, line of setae reaching margin.  $M_4$  gradually curved posteriorly, interrupted at its very base, not connecting to CuA. CuA gently sinuous midway to apex. Veins bR,  $R_1$ ,  $R_1$  and  $R_5$  with ventral and dorsal setae,  $M_{1+2}$ ,  $M_1$ ,  $M_2$ ,  $M_4$  and CuA with dorsal setulae; Sc, first sector of Rs and CuP bare. **Abdomen.** Tergites 1–4 brown, tergite 5 yellowish laterally, brown medially, tergites 6–7 brown; sternites 1–2 brownish, sternite 3–5 cream-yellow with brown lateral margins (extension of brown area varying between individuals), sternites 6–7 brown. Sternite 1 strongly modified, U-shaped, displaced posteriorly, fit into a large incision on anterior half of sternite 2. **Terminalia** (Figs. C22C–D). Terminalia brownish. Sternite 8 wide, with a pair of overlapped lobes at each side, widely covered with microtrichia, setae restricted to lobes and posterior margin. Sternite 9 complex, with two pairs of weakly sclerotized elongated lobes, curved sclerotized bands beneath posterior lobe, median anterior apodeme of vaginal furca not visible. Tergite 8 large, with a pair of projections on each side of posterior margin, mostly covered only by microtrichia, setation restricted to latero-posterior lobes. No evidence of tergites 9 and 10, possibly fused indistinctly to tergite 8. Cerci very modified into a pair of lobes connected to each other medially on anterior end, entirely devoid of microtrichia, short, strong spine-like setae at apex of each lobe. A pair of long apodemes extending anteriorly from each side of anus may correspond to a modified sternum 10.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000801>)

**Material examined.** **Holotype:** female, ZRC\_BDP0137106 (slide-mounted). **Paratype:** female, ZRC\_BDP0047849, Nee Soon (NS1), swamp forest, 20-26.June.2013, MIP leg. (website photo specimen, slide-mounted). **Additional sequenced specimens:** ZRC\_BDP0138569.

**Etymology.** The species epithet of this species refers to Sri Tri Buana, the official title of the Srivijayan (a Buddhist thalassocratic empire in Southeast Asia during the 7th to 12th century) prince Sang Nila Utama. He is the founder of the Kingdom of Singapura (Kerajaan Singapura; est. 1299). Sang Nila Utama is said to have landed on Temasek (the island of Singapore) on a hunting trip, seeing an animal supposed to be a lion. Taken as an auspicious sign, he founded the Kingdom based on the settlement hence called Singapura, in one of the standing interpretations considered to come from the Sanskrit “Lion City”. The noun is used in apposition.

**Remarks.** This species clearly differs in the color pattern from the other two species of *Clastobasis* described here. Most species of *Clastobasis* fit in the yellowish color pattern seen in *C. bugis*, sp.nov. and *C. oranglaut*, sp.nov., but there are some species of *Clastobasis* in Japan that share this brown color pattern of *C. sritribuana*, sp.nov. (O. Kurina, pers.comm.).

#### *Clastobasis bugis* Amorim & Oliveira, sp.nov.

(Figs. C23A–F)

**Diagnosis.** Most of thorax ochreous-yellow, some parts of pleura with a light greyish-brown tinge. Abdomen cream-yellow, tergites 1–5 with brownish triangular wide marks on posterior half, sternites 3–5 with slender diagonal greyish-brown marks. Male terminalia with a pair of strongly sclerotized structures in aedeagus, long rounded setose projections of gonocoxites with a short ventral digitiform projection bearing spines at apex, gonostylus wider at base, with a long distal flattened projection, slightly widening towards apex.

**Description. Male.** Wing length, 2.14; width, 0.82. **Head.** Vertex light ochre-yellowish, except for blackish-brown area around ocelli, occiput dark ochre-yellowish. Frons, face and clypeus light ochre-yellowish. Scape and pedicel yellowish, flagellomeres with yellowish basal half, brown on distal half. Maxillary palpus whitish-yellow, darker on basal three palpomeres. Labella yellow. **Thorax.** Scutum and scutellum ochre-yellowish, lighter laterally.

Anepisternum, katepisternum and mediotergite light ochre-yellowish with some areas with brownish tinge; mesepimeron ochre-yellowish on ventral half, light brownish on dorsal half; laterotergite ochre-yellowish with brownish ventral border. Laterotergite with about 18 setae of different sizes, other pleural sclerites bare except for antepronotum and proepisternum. **Legs.** Coxae and femora whitish-yellow, coxae with brown marks at tip, hind femur light ochre-brown on distal half and a brown mark distally; trochanters with a brown mark; tibiae and tarsi with light brown tinge. **Wing** (Fig. C23B). Sc complete, ending at C in basal fourth of wing. R<sub>1</sub> short,  $0.78 \times$  r-m length; R<sub>5</sub> reaching C more basally than level of tip of M<sub>1</sub>, straight except distally, gently curved. M<sub>2</sub> not reaching wing margin. Veins bR, R<sub>1</sub> and second sector of Rs with dorsal and ventral setae; M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub>, second sector of CuA and CuP with setulae dorsally, distal fifth of M<sub>2</sub> with no setulae. **Abdomen.** Tergites 1–6 cream-yellow with a greyish-brown triangle pointed anteriorly, tergite 7 cream-yellow; sternites 1–2 cream-yellow, sternite 3–5 yellow with a pair of slender diagonal brownish bands, light brown medio-posteriorly; sternite 6 yellowish with a faint brownish diagonal band; sternite 7 yellow with brown antero-lateral corners. **Terminalia** (Fig. C23C). Terminalia light yellowish-brown. Gonocoxites well developed, largely fused to each other ventrally, a pair of posterior incisions on posterior border isolating a medial lobe that does not project beyond level of base of gonostylus, a pair of spines at posterior margin externally to incisions, dorsally a pair of large, flat, oval projections densely covered with strong, curved spine-like setae on ventral face and a sub-basal digitiform projection with a group of distal spines; an additional short digitiform lobe on gonocoxite dorsad to insertion of gonostylus. Gonostylus well sclerotized, simple, basal third wider, entirely bare of setae. Aedeagal-parameral sclerite complex, with a pair of hardly sclerotized small sclerites close to each other. Tergite 9 apparently fused indistinctly to gonocoxites. Cerci small, inconspicuous.

**Female** (Fig. C23A). Wing length, 2.73; width, 0.94. **Terminalia** (Figs. C23D–F). Sternite 8 large, with a pair of short lobes with a short medial posterior incision, most of tergite with only microtrichia, setation restricted to posterior margin. Sternite 9 present as a wide transversal plate with gonoducts reaching independently, two short groups of setae, anterior medial apodeme present, short, extending anteriorly. Tergite 8 wide, rectangular, no medio-posterior incision. Tergite 9+10 with a pair of short lateral lobes with a slender medial connection, entirely bare of setae. Cerci not cylindrical, flat and elongate, fused to each other medially, covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000808>)

**Material examined.** **Holotype:** male, ZRC\_BDP0048253, Pulau Semakau (SMN2), planted mangrove, 11-17.October.2013, MIP leg. (slide-mounted). **Paratypes:** 3 females, ZRC\_BDP0048242, Pulau Semakau (SMO2), old mangrove, 18-24.October.2013, MIP leg. (extracted, slide-mounted); ZRC\_BDP0048245, Pulau Semakau (SMO2), old mangrove, 18-24.October.2013, MIP leg. (website photo specimen); ZRC\_BDP0048306, Pulau Semakau (SMN1), planted mangrove, 03-9.May.2013, MIP leg. **Additional sequenced specimens:** ZRC\_BDP0278014, ZRC\_BDP0278015, ZRC\_BDP0278021, ZRC\_BDP0278024, ZRC\_BDP0278026, ZRC\_BDP0278030, ZRC\_BDP0278020.

**Etymology.** The species epithet of this species refers to the Bugis, an ethnic group from South Sulawesi (Indonesia) and one of the first groups of people to arrive in Singapore when the British established the colonial port-city of Singapore. The Bugis were leading maritime traders in the region at that point in time and made significant contributions to Singapore in its development as a trading port. The noun is used in apposition.

**Remarks.** *Clastobasis bugis, sp.nov.* and *C. oranglaut, sp.nov.* belong to a group in the genus clearly apart from *C. sritribuana sp.nov.*, as can be seen by the body color patterns. These two more yellowish species come out together in the mitogenome tree in a small clade separate from *C. sritribuana, sp.nov.*

### *Clastobasis oranglaut* Amorim & Oliveira, sp.nov.

(Figs. C24A–F)

**Diagnosis.** Most of thorax ochreous-yellow, some parts of the pleura with a light greyish-brown tinge. Abdomen cream-yellow, more yellowish towards apex of abdomen, tergites 1–5 with brownish transverse marks along posterior half, light brown lateral marks on sternites 3–6. Male terminalia with a single strongly sclerotized structure in the aedeagus, a pair of long rounded setose projections of gonocoxites, gonostylus slender, simple.

**Description. Male** (Fig. C24A). Wing length, 2.50; width, 0.87. **Head** (Fig. C24B). Vertex light yellowish-brown, except for dark brown area over ocellar line. Mid ocellus present, small. Occiput light brown. Frons, face and clypeus light yellowish-brown. Maxillary palpus first two palpomeres yellowish-brown, last two palpomeres whitish-yellow. Scape and pedicel light yellowish-brown, flagellomeres with a yellowish band on basal half and a brownish band on distal half. **Thorax** (Fig. C24C). Scutum and scutellum ochre-yellowish, some dark brown sclerites on wing articulation. Antepronotum and proepisternum ochre-yellowish, with a light brown mark at ventral end of proepisternum; anepisternum, katepisternum, mediotergite and

mesepimerom ochre-yellowish with areas with greyish-brown tinge; laterotergite ochre-yellowish with brownish ventral border. Two strong bristles and additional small setae aligned on scutellum; 2–3 larger setae and almost 30 small setae on laterotergite. Pleural membrane yellow. **Legs.** Legs whitish-yellow, with dark brown markings at tip; trochanters with a brown spot distally; femora light brownish-yellow with a dark brown mark at distal end; tibiae and tarsi light yellowish-brown. Front tibia slightly shorter than front femur, mid and hind tibiae slightly longer than femora. Front tibia with a wide antero-apical depressed area lined with setulae. **Wing** (Fig. C24D). Sc weakly sclerotized, complete, ending at C in basal fourth of wing.  $R_1$  short,  $0.87 \times r\text{-}m$  length;  $R_5$  reaching C more basally than level of tip of  $M_1$ , straight except distally, gently curved.  $M_2$  not reaching wing margin. Veins bR,  $R_1$  and second sector of Rs with dorsal and ventral setae;  $M_1$ ,  $M_2$ ,  $M_4$ , second sector of CuA and CuP with setulae dorsally, distal fifth of  $M_2$  with no setulae. **Abdomen.** Tergites 1–5 ochre-yellow with a triangular dorsal light brown mark, tergites 6–7 brownish-yellow; sternites 1–2 yellow; sternites 3–4 ochre-yellow with brownish bands laterally; sternites 5–6 yellow mesally and brown at lateral margins; sternite 7 ochre-yellow with dark brown on lateral margins. **Terminalia** (Figs. C24E–F). Terminalia yellowish, with a dark brown distal projection of gonocoxites and dark brown sclerites internally. Gonocoxites complex, fused along anterior third, a medial large conical distal projection bearing ventrally 4 long fine setae and a number of strong short setae directed outwards distally; a pair of short lateroposterior projections extending beyond level of base of gonostylus; a short lobe internally to base of gonostylus, bearing a group of short black setae; a short, round bare lobe on posterior margin on dorsal face of terminalia; and a pair of large, well-sclerotized rounded lobes extending beyond tip of gonostylus covered with regular setae on dorsal face and with dense, darker and stronger setae on ventral face on distal two-thirds, part of setae sinuous. Gonostylus simple, well-sclerotized, digitiform, slightly curved at tip, entirely bare. Gonocoxal bridge with long apodemes, extending anteriorly more or less close to each other. Aedeagal-parameral complex with two main components: ejaculatory apodeme at anterior end and a strongly sclerotized median structure bearing a pair of pointed lobes anteriorly, with some other smaller, well-sclerotized pieces; second element capsular, placed more dorsally with rounded anterior end, with a pair of sclerotized slender arms laterally and with a thin medial bifid projection at distal end. Area corresponding to tergite 9 medially with a medial incision on posterior margin. Cerci small, well-defined, placed between bases of large gonocoxite rounded dorsal lobes.

**Female.** As male, except for the following. **Wing.** Length, 2.86; width, 1.02. **Abdomen.** Tergites 1–6 yellowish with brown band on posterior margin, more rectangular on anterior

segments and more triangular on posterior segments, tergite 7 yellowish; sternites 1–2 whitish-yellow, sternites 3–6 yellowish with a pair of oblique brown bands, sternite 7 yellowish with brown marks at latero-anterior corners. Fine setae on all tergites and on sternites 1–6, sternite 7 with slightly stronger setae on posterior half. **Terminalia** (Figs. C24bA–B). Sternite 8 large, with two pairs of short lobes along posterior margin, a short medial posterior incision, most of tergite with only microtrichia, setation restricted to margins of posterior lobes. Sternite 9 present as a wide transversal plate, a pair of lateroposterior setose lobes, gonoduct sclerotized medially, sided by a pair of apodemes directed anteriorly. Tergite 8 wide, rectangular, no medio-posterior incision, long setae restricted to posterior margin. Tergite 9 with a pair of large lateral lobes separated by deep medial incision. Sternite 10 wide, weakly sclerotized but well-defined, with a pair of posterior lobes separated by a medial incision, covered with fine setae. Cerci apparently fused to tergite 10 to form a distal pair of large lobes covered with microtrichia and fine setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000829,-002108>)

**Material examined. Holotype:** male, ZRC\_BDP0047070, National University of Singapore (Uhall), 16-22.July.2015, MIP leg. (slide-mounted). **Paratypes:** 5 males, 14 females. **Males:** ZRC\_BDP0047071, National University of Singapore (Uhall), 16-22.July.2015, MIP leg.; ZRC\_BDP0048790, National University of Singapore (Utown), 02-08.April.2015, MIP leg.; ZRC\_BDP0049283, National University of Singapore (Utown), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0049312, National University of Singapore (Utown), 04-10.June.2015, MIP leg. (website photo); ZRC\_BDP0066825, Bukit Timah, primary forest (BT05), 22-28.September.2016, MIP leg. **Females:** ZRC\_BDP0047065, National University of Singapore (PGP), 25.June-01.July.2015, MIP leg.; ZRC\_BDP0048250, Sungei Buloh (SB1), mangrove, 12-18.September.2013, MIP leg.; ZRC\_BDP0048255, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.; ZRC\_BDP0048256, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.; ZRC\_BDP0048769, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0049074, National University of Singapore (PGP), 16-22.April.2015, MIP leg.; ZRC\_BDP0049138, National University of Singapore (Utown), 14-20.May.2015, MIP leg.; ZRC\_BDP0049139, National University of Singapore (Utown), 14-20.May.2015, MIP leg.; ZRC\_BDP0049140, National University of Singapore (Icube), 28.May-03.June.2015, MIP leg.; ZRC\_BDP0049303, National University of Singapore (Utown), 23-29.April.2015, MIP leg.; ZRC\_BDP0049304, National University of Singapore (Utown), 23-29.April.2015, MIP leg.; ZRC\_BDP0049311, National University of Singapore (Utown), 04-10.June.2015, MIP leg.; ZRC\_BDP0049319, National University of Singapore (Utown), 21-27.May.2015, MIP leg.; ZRC\_BDP0049336, National University of Singapore (PGP), 02-08.April.2015, MIP leg. (extracted, slide-mounted). **Additional sequenced specimens:** female, ZRC\_BDP0040844 (website photo specimen); ZRC\_BDP0278233; ZRC\_BDP0278261; ZRC\_BDP0278301; ZRC\_BDP0278305; ZRC\_BDP0278306; ZRC\_BDP0278307; ZRC\_BDP0278308; ZRC\_BDP0278312; ZRC\_BDP0278313; ZRC\_BDP0278327; ZRC\_BDP0278346; ZRC\_BDP0278471; ZRC\_BDP0278473; ZRC\_BDP0279148; ZRC\_BDP0279149; ZRC\_BDP0279164; ZRC\_BDP0279175; ZRC\_BDP0279185; ZRC\_BDP0279192; ZRC\_BDP0284181; ZRC\_BDP0284188; ZRC\_BDP0284203; ZRC\_BDP0284207; ZRC\_BDP0284257; ZRC\_BDP0284262; ZRC\_BDP0284265; ZRC\_BDP0284266; ZRC\_BDP0284267; ZRC\_BDP0284269; ZRC\_BDP0284270; ZRC\_BDP0284271; ZRC\_BDP0284272; ZRC\_BDP0284274; ZRC\_BDP0284275; ZRC\_BDP0284276; ZRC\_BDP0284277; ZRC\_BDP0284278; ZRC\_BDP0284280; ZRC\_BDP0284282; ZRC\_BDP0284283; ZRC\_BDP0314192; ZRC\_BDP0326310; ZRC\_BDP0326311; ZRC\_BDP0326312; ZRC\_BDP0326313; ZRC\_BDP0326314; ZRC\_BDP0326315; ZRC\_BDP0326316; ZRC\_BDP0326317; ZRC\_BDP0326318; ZRC\_BDP0326319; ZRC\_MIS0000001; ZRC\_MIS0000002; ZRC\_MIS0000003; ZRC\_MIS0000004; ZRC\_MIS0000005; ZRC\_MIS0000006; ZRC\_MIS0000007; ZRC\_MIS0000008; ZRC\_MIS0000009; ZRC\_MIS0000010; ZRC\_MIS0000011; ZRC\_MIS0000012; ZRC\_MIS0000013; ZRC\_MIS0000014;

ZRC\_MIS0000015; ZRC\_MIS0000016; ZRC\_MIS0000017; ZRC\_MIS0000018; ZRC\_MIS0000019; ZRC\_MIS0000020; ZRC\_MIS0000021; ZRC\_MIS0000022; ZRC\_MIS0000023; ZRC\_MIS0000025; ZRC\_MIS0000026; ZRC\_MIS0000027; ZRC\_MIS0000028; ZRC\_MIS0000029; ZRC\_MIS0000030; ZRC\_MIS0000031; ZRC\_MIS0000032; ZRC\_MIS0000034; ZRC\_MIS0000036; ZRC\_MIS0000037; ZRC\_MIS0000039; ZRC\_MIS0000040; ZRC\_MIS0000041; ZRC\_MIS0000042; ZRC\_MIS0000043; ZRC\_MIS0000044; ZRC\_MIS0000045; ZRC\_MIS0000046; ZRC\_MIS0000047; ZRC\_MIS0000049; ZRC\_MIS0000050; ZRC\_MIS0000051; ZRC\_MIS0000052; ZRC\_MIS0000054; ZRC\_MIS0000055; ZRC\_BDP0040847; ZRC\_BDP0066825; ZRC\_BDP0067281; ZRC\_BDP0069308; ZRC\_BDP0069310; ZRC\_BDP0069312; ZRC\_BDP0069313; ZRC\_BDP0069314; ZRC\_BDP0069315; ZRC\_BDP0069316; ZRC\_BDP0069317; ZRC\_BDP0069320; ZRC\_BDP0069321; ZRC\_BDP0069324; ZRC\_BDP0069326; ZRC\_BDP0070015; ZRC\_BDP0070016; ZRC\_BDP0070017; ZRC\_BDP0070018; ZRC\_BDP0070020; ZRC\_BDP0070021; ZRC\_BDP0070022; ZRC\_BDP0070023; ZRC\_BDP0070024; ZRC\_BDP0070030; ZRC\_BDP0070031; ZRC\_BDP0070032; ZRC\_BDP0070034; ZRC\_BDP0070037; ZRC\_BDP0070039; ZRC\_BDP0070040; ZRC\_BDP0070041; ZRC\_BDP0070042; ZRC\_BDP0070043; ZRC\_BDP0070044; ZRC\_BDP0070046; ZRC\_BDP0070048; ZRC\_BDP0070050; ZRC\_BDP0070051; ZRC\_BDP0070054; ZRC\_BDP0070058; ZRC\_BDP0070059; ZRC\_BDP0070060; ZRC\_BDP0070099; ZRC\_BDP0070100; ZRC\_BDP0070122; ZRC\_BDP0070442; ZRC\_BDP0070454; ZRC\_BDP0070455; ZRC\_BDP0070456; ZRC\_BDP0070457; ZRC\_BDP0070458; ZRC\_BDP0070459; ZRC\_BDP0070460; ZRC\_BDP0070476; ZRC\_BDP0070478; ZRC\_BDP0070479; ZRC\_BDP0070480; ZRC\_BDP0070481; ZRC\_BDP0070482; ZRC\_BDP0070484; ZRC\_BDP0070485; ZRC\_BDP0070486; ZRC\_BDP0070487; ZRC\_BDP0070488; ZRC\_BDP0070489; ZRC\_BDP0070550; ZRC\_BDP0070562; ZRC\_BDP0070563; ZRC\_BDP0070578; ZRC\_BDP0070579; ZRC\_BDP0070591; ZRC\_BDP0070593; ZRC\_BDP0070594; ZRC\_BDP0132854; ZRC\_BDP0132895; ZRC\_BDP0154877; ZRC\_BDP0154880; ZRC\_BDP0154889; ZRC\_BDP0154892.

**Etymology.** The species epithet of this species refers to the Orang [=people] Laut [=sea], a name that applies to several seafaring ethnic groups and tribes living around Singapore, Peninsular Malaysia and the Riau Islands. The name is used in apposition.

**Remarks.** This is the most abundant species of *Clastobasis*, collected mostly on urbanized areas.

## Gnoristinae

The system of the Gnoristinae constitutes a complex problem in mycetophilid systematics. The subfamily includes over 340 species in 28 genera worldwide. There is repeated evidence that, in its present composition, the subfamily does not correspond to a monophyletic group (Søli, 1996; Rindal et al., 2009; Kasprak et al., 2019; Oliveira & Amorim, 2021). The subfamily is basically defined by plesiomorphic features, as the long R<sub>1</sub>, tibiae and tarsi trichia not organized in regular rows, microtrichia on the wings not arranged in regular rows, absence of macrotrichia on the wing membrane etc.

The Singapore fauna of Gnoristinae is composed of only two genera, *Chalastonepsia* and *Metanepsia*, each with a single species. *Pectinepsia* and *Dziedzickia*, known from other tropical areas of Southeast Asia, may as well come to be founded in Singapore. Some additional gnoristine genera of Palearctic affinities are known to occur along the northern

range of the Oriental region (e.g., *Aglaomyia*, *Boletina*, *Coelosia*, *Deimyia*, *Hemisphaeronotus* etc.), but they hardly would reach Singapore.

Besides the problem of the monophyly of the Gnoristinae, there is an additional problem with the “tribe” Metanepsini, as discussed by Kallweit (1998). The Metanepsini were originally proposed by Matile (1971a) for *Metanepsia* Edwards as a tribe in the Sciophilinae s.l. Later, Vaisänen (1986) proposed a subfamily rank to the group, what was followed by Ševčík & Hippa (2010). There is no question that this group of genera composes a clade in the phylogeny of the family. The question is, as already posed by Søli (1996), whether the subfamily (or tribal) status for this group renders any other group paraphyletic. Actually, a number of Neotropical species of *Dziedzickia*—e.g., *D. intermedia* Lane and *D. laticornis* (Enderlein)—have reduced mouthparts and other features that are shared with *Metanepsia* and its two related genera. These Neotropical species of *Dziedzickia*, however, do not share the autapomorphies either of *Metanepsia*, *Chalastonepsia* or *Pectinepsia* that would allow them to fit into any of these genera. It is quite evident that the entire “Metanepsini” may be a subclade of the genus *Dziedzickia* in its current delimitation of the genus. The Neotropical genus *Schnusea* Edwards differs from *Dziedzickia* basically for r-m reaching M<sub>1</sub>, instead of reaching M<sub>1+2</sub>. Even *Hadroneura* Lundstrom, *Palaeodocosia* Meunier and *Syntemna* Winnertz may be subclades of *Dziedzickia*. In Ševčík et al. (2013), *Schnusea*, one species of *Metanepsia*, one species of *Dziedzickia*, *Syntemna*, *Palaeodocosia* and *Chalastonepsia* compose a clade within the Gnoristinae, but there is a second species of *Metanepsia* which is sister to *Paratinia* and a second species of *Dziedzickia* which is sister to (*Ectrepesthoneura* + *Metanepsia* + *Paratinia*).

As clearly discussed by Kallweit (1998) and by Ševčík et al. (2011), a thorough review of the Gnoristinae (or at least of *Dziedzickia*) is necessary before a proper solution can be found. It may be the case that the name Metanepsinae or Metanepsini come to be applied to a clade including *Metanepsia*, *Chalastonepsia*, and *Pectinepsia* and part of the genus *Dziedzickia*. We presently do not have a phylogeny for the subfamily and we keep both, *Metanepsia* and *Chalastonepsia* within a subfamily Gnoristinae without a tribal rank taxa.

### ***Chalastonepsia* Søli**

***Chalastonepsia*** Søli, 1996: 79. Type species. *Chalastonepsia orientalis* Søli (orig. des.).

**Diagnosis.** Palpus 1-segmented. Male flagellum bead-like, each flagellomere bulbous with a long stalk-like bare apical portion, basal part with numerous long setae. Sc ending in  $R_1$  via sc-r at tip; r-m reaching Rs well apart from  $R_1$ ; medial fork longer than  $M_{1+2}$ ;  $R_4$  absent;  $M_4$  originating slightly more basal than level of origin of  $M_{1+2}$ ; first sector of CuA at most slightly shorter than second sector.

There are no keys with all genera of gnoristines. In the Afrotropical manual (Søli 2017), they key does not include *Chalastonepsia* and our species runs into couplet 26, with part of the features of *Metanepsia* (e.g., reduced mouthparts) and part of the features of *Dziedzickia* (e.g., long r-m). All four species of the *Clalastonepsia* described so far included only on males—which have either a strongly pectinate flagellum or a flagellum with a bulbous base with a long distal neck. We have only females of the species found in Singapore, with laterally compressed flagellomeres, but no pectination or distal neck. The type-species of *Chalastonepsia*—*C. orientalis* Søli—is known from Pahang, Malaysia, while *C. nigricoxa* Ševčík & Papp is known from Thailand and *C. montana* Ševčík & Papp from the type-locality, in Sumatra, and from Pahang, Malaysia; *C. hokkaidensis* Kallweit is known from the island of Hokkaido, in southern Japan.

A barcode search of the sequence of the Singapore species of *Chalastonepsia* on Genbank has a 100% hit against “*Chalastonepsia* cf. *hokkaidensis*” (<https://www.gbif.org/species/10652424>). Our specimen is consistent with the photo of a damaged female of *Chalastonepsia* cf. *hokkaidensis* in the Gbif website for that sequence. The Genbank specimen of *Chalastonepsia*, however, was collected in Kuala Lumpur, Malaysia, in which is nowhere close to Japan, and it is our understanding Genbank specimen of *Chalastonepsia* is misidentified. Conspecificity between Singapore and Malay Peninsula populations is also seen, e.g., in *Eumanota racola*, but a Malay Peninsula population would hardly be conspecific with Hokkaido populations, except in the case of synanthropic species. The Singapore species may actually be conspecific with *C. orientalis* or with *C. montana*. Without males of the Singapore species of *Chalastonepsia* we are not be able to establish a diagnosis or check its conspecificity with other species of the genus.

***Chalastonepsia* sp.**

(Figs. D1A–D, D2–C)

**Description. Female** (Fig. D1A). Wing length, 2.32; width, 1.02. **Head** (Fig. D2A). Vertex and frons brown, occiput brown dorsally, lighter laterally towards ventral margin, with few scattered setae anteriorly. Face and clypeus greyish-brown. Mid ocellus present, lateral ocelli distant from eye margin, lateral ocelli large. Frontal furrow present. Frons bare, face with long setae, clypeus bare. Inter-ommatidial setulae on part of eye. Antenna ochre-yellowish, greyish towards apex of flagellum. Scape and pedicel of similar length, about as long as wide; pedicel flat on distal face, extended dorsally and with a group of elongate setae at dorsal tip. Flagellomeres in some degree laterally compressed, slightly projected ventrally, densely covered with setae, distal six flagellomeres less modified. Mouthparts reduced, maxillary palpus greyish-brown, 1-segmented, with setae and sensorial setulae; labella whitish, reduced. **Thorax** (Fig. D2B). Scutum and scutellum dark brown, strongly arched. Scutum with scattered short setae, about three rows of slightly stronger dorsocentrals at each side. Scutellum with an irregular row of setae along distal margin, four stronger scutellar bristles. Pleural sclerites brown, antepronotum lighter towards anterior end, metepisternum mostly yellowish, brownish-yellow on dorso-posterior corner. Pleural membrane whitish-yellow. Antepronotum with three longer and additional smaller setae; proepisternum with 6–7 regular, thin setae; proepimeron wide. Anepisternum, katepisternum, mesepimeron, metepisternum and mediotergite bare; laterotergite slightly bulging, with 9–11 thin setae medially. Mesepimeron reaching ventral margin of thoracic pleura. Mediotergite with a gentle fold medially. Haltere with pedicel whitish-yellow, knob mostly whitish-yellow, dark brown on proximal end, thin elongate setulae present. **Legs.** Coxae mostly cream-yellowish, brownish on distal end, hind coxa darker. Femora cream-yellowish with darker tinges on distal half, tibiae and tarsi greyish. Tibiae and tarsi with covered by irregularly distributed short setae, with some few longer dark setae on hind tibiae. Tibial spurs cream-yellowish, spurs short, slightly more than twice tibial diameter at apex. Tarsal claws with three small teeth on basal half. **Wing** (Fig. D1B). Membrane without macrotrichia, very light brown fumose. C ending beyond apex of  $R_5$ , at about a third of distance between  $R_5$  and  $M_1$ ; Sc fused to bR more basally than origin of  $M_4$ .  $R_1$  almost straight, reaching C at distal third of wing, more than  $4\times$  longer than r-m; first sector of Rs oblique, slightly longer than half r-m length;  $R_5$  reaching C before wing tip, slightly arched posteriorly close to margin; r-m oblique, distal tip directed towards wing base. Medial fork about  $2.9\times M_{1+2}$  length;  $M_1$  and  $M_2$  reaching wing margin. Base of  $M_4$  arched, originating at level of distal tip of r-m, clearly more basally than origin of medial fork. CuA gently curved towards posterior margin. Sc, r-m, first sector of Rs,  $M_{1+2}$ ,  $M_1$ ,  $M_2$ ,  $M_4$ , CuA and CuP devoid of macrotrichia; bR,  $R_1$  and  $R_5$  with dorsal setae; false cubital vein sclerotized; CuP present,

produced to slightly beyond origin of  $M_4$ . **Abdomen.** Tergite and sternite 1 cream-yellowish, tergite and sternites 2-7 greyish-brown, tergites and sternites covered with scattered brown setae. **Terminalia (Figs. D1C–D).** Brown. Sternite 8 with a sclerotized band along anterior margin, a weakly sclerotized area medially, and a pair of large, well-separated setose projections; sternite 9 (vaginal furca) more sclerotized medially on a tubular structure around base of spermathecal ducts; sternite 10 present as a thin blade with some few setulae along distal lateral margins. Tergite 8 wide, short; tergite 9 present as a slender band; tergite 10 divided into a pair of sclerites sustaining the cerci. Cercus with a short second cercomere, largely fused to first cercomere.

**Material examined. Holotype:** female, ZRC\_BDP0048536, Nee Soon (NS2), swamp forest, 10-16.January.2013, MIP leg. (website photo specimen, slide-mounted). **Paratype:** female, ZRC\_BDP0047804, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg. (slide-mounted). **Additional sequenced specimens:** female, ZRC\_BDP0143086 (website photo specimen).

**Remarks.** Only two females of this species have been collected, both in the Nee Soon swamp forest. There is a single haplotype in the CoI minibarcoding sequenced.

### *Metanepsia* Edwards

*Metanepsia* Edwards, 1927: 361. Type-species, *M. javana* Edwards (orig. des.).

**Diagnosis.** Mid ocellus present, smaller than lateral ocelli, lateral ocelli well separated from eye margin. Flagellomeres strongly enlarged, flattened, pedunculate. Mouthparts reduced, maxillary palpus very small, 1-segmented. Thorax strongly arched, thoracic bristles small. Laterotergite protruding, rather small, with some few setae. Tibiae with irregularly arranged microtrichia, devoid of larger tibial bristles. Front tibia distal comb reduced to a few undifferentiated setulae, no posterior tibial comb. Wing microtrichia irregularly arranged, macrotrichia only on veins C,  $R_1$  and  $R_5$ . Sc fairly long, free at the apex; sc-r missing (or weakly sclerotized); C extending to about half distance between  $R_5$  and  $M_1$ ; first sector of Rs very short, evanescent,  $R_1$  very close to Rs at its base;  $R_1$  relatively long, r-m short, almost longitudinal;  $R_5$  reaching wing margin before level of tip of  $M_1$ ; medial fork sub-equal to length of petiole; posterior fork short, wide open, origin of  $M_4$  well before medial fork. CuP short, not even reaching level of origin of  $M_4$ . Male terminalia simple, gonocoxites separated anteriorly, aedeagus reduced to a single more or less curved tube.

The genus *Metanepsia* was established by Edwards (1927) for a species from Java; in the same paper, a second species, from western Africa, was recognized to belong to the genus but not formally described. Matile (1971a,b, 1972, 1980a) added five Afrotropical species to the genus, while Kallweit (1998) added a second Oriental species.

*Metanepsia* has clearly derived features compared to other gnoristines. Some of them are shared with *Chalastonepsia* and *Pectinepsia* (e.g., the reduced mouthparts), while other features are exclusive of the genus, as the incomplete Sc, the displacement of the origin of Rs and of r-m towards the base of the wing, the shorter R<sub>1</sub> and R<sub>5</sub>, and the longer first sector of CuA, with a shorter posterior fork. Apparently, the pectinate antenna varies within the genus—the type-species, *M. javana* Edwards, has slightly modified flagellomeres, which are not pectinate.

### ***Metanepsia malaysiana* Kallweit**

*Metanepsia malaysiana* Kallweit, 1998: 350, fig. 2 (antenna), fig. 6 (wing), figs. 16–18 (male terminalia). Type locality: Malaysia, B. Camp. 5°30'07" N, 101°26'21" E.

(Figs. D3A–D, D4A–F)

**Diagnosis.** Flagellomeres with ventral half more extended than dorsal half, a naked neck present distally on flagellomeres. Maxillary palpus with a single, small palpomere. Sc incomplete, sc-r absent; first sector of Rs very short, almost missing, M<sub>1+2</sub> forking beyond level of tip of R<sub>1</sub>. Aedeagus elongated, heavily sclerotized, gonostylus rounded distally with a short row of curved spines along outer margin.

**Redescription. Male** (Fig. D3A). Wing length, 1.56 mm, width, 0.82 mm. **Head** (Fig. D3B). Shining blackish-brown, frons elongate, flat, occiput blackish-brown, slightly lighter towards ventral margin, frontal furrow complete. Eyes rounded, inter-ommatidial setulae present. Antenna light brownish-yellow, slightly pectinate, ventral half more developed and projected than dorsal half, densely pilose, each flagellomere with a distal neck almost as long as body of flagellomere. Scape elongate, pedicel very short. Mouthparts reduced, palpus with one visible palpomere, labella very small. **Thorax** (Fig. D3C). Mesonotum dark ochre-brown, slightly lighter laterally. No prescutum suture. Scutum covered by scattered, not too dense thin setae, a pair of clear lines of dorsocentrals, setae more dense over lateral margins. Scutellum dark brown, with a row of short setae along distal margin. Pleural sclerites ochre-

brown, laterotergite and mediotergite darker, metepisternum light ochre-yellowish. Antepronotum well-developed, almost bulging, with three thin setae, almost entirely fused to proepisternum; proepisternum with three thin setae, proepimeron triangular, not fusing to katepisternum. Prosternum produced, bare, connected to proepisternum. Anepisternum, katepisternum, mesepimeron, mediotergite, and metepisternum bare, laterotergite with 16 thin setae concentrated dorso-posteriorly. Mesepimeron slender, reaching ventral margin of thoracic pleura, mediotergite slightly curved. Haltere pedicel light ochre-yellowish, pedicel brown, with few thin setulae. **Wing** (Fig. D3D). Membrane only slightly fumose, unmarked, membrane only with microtrichia, without macrotrichia. C produced beyond tip of  $R_5$  to about half distance to tip of  $M_1$ . Sc long, incomplete, bare, ending well beyond first sector of Rs.  $R_1$  short, ending slightly over mid of wing.  $R_4$  absent,  $R_5$  ending before wing tip, at about level of tip of  $M_2$ . First sector of Rs barely sclerotized, perfectly transverse, very short,  $R_1$  and  $R_5$  almost in contact at anterior end. Crossvein r-m more than 3× as long as first sector of Rs. Medial fork weakly sclerotized, stem of  $M_{1+2}$  very long, longer than medial fork. First sector of CuA long, origin of  $M_4$  more basal than base of medial fork. CuP weak, visible only half way to wing margin. **Legs.** Coxae light ochre-yellowish, only very distal tip of coxae with a brown marking, fore and mid femora, tibiae, and tarsi rather whitish-yellow, hind femur, tibia, and tarsus slightly darker. Legs covered with small, irregularly distributed trichia, distinctive setae entirely absent. Tibial spurs short, spurs of fore and mid tibiae less than twice tibiae apex width, hind spurs slightly over twice tibia width at apex. **Abdomen.** Tergite and sternite 1, whitish ochre-yellow, tergites and sternites 2-8, light ochre-brown; posterior segments with tergite gradually wider than sternite. Setation on abdominal sclerites quite scattered and regularly distributed. **Terminalia** (Figs. D4A–B). Gonocoxites close to each other medially but in contact only at anterior fifth, not projected beyond base of gonostylus, each gonocoxite with a scale-like tooth at distal end of inner margin ventrally. Gonostylus curved, rather flattened, about half as long as gonocoxite, with five curved short spines at outer margin on distal half, with a distal rounded dorsal extension bearing a subdistal tooth. Gonocoxal bridge conspicuous, apodemes quite close to each other medially. Parameres medially fused to aedeagus ventrally, aedeagus elongate, curved ventralwards at distal end. Tergite 9 rectangular, length less than half width, no medial protuberance. Sternite 10 triangular, weakly sclerotized, with some thin distal setae. Tergite 10 basically produced laterally to cerci. Cerci longer than tergite 9, with scattered thin setae.  
**Female.** As males, except for the following. **Terminalia** (Figs. D4C–D). Sternite 8 with a pair of large lobes well separated by a deep medial incision, lobes densely covered by

microtrichia and some scattered fine setae. Tergite 8 larger than tergite 9+10, both weakly sclerotized. Cercomere 1 1.6× length of cercomere 2, cercomere 2 less sclerotized.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000760>)

**Material examined.** 28 males, 4 females. Males: ZRC\_BDP0047791, Pulau Ubin (PU4), mangrove, 14-20.April.2013, MIP leg.; ZRC\_BDP0047922, Nee Soon (NS1), swamp forest, 25-31.July.2013, MIP leg.; ZRC\_BDP0048545, Nee Soon (NS2), swamp forest, 19-25.April.2012, MIP leg.; ZRC\_BDP0048685, Nee Soon (NS2), swamp forest, 07-13.June.2012, MIP leg.; ZRC\_BDP0048944, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0047792, Pulau Ubin (PU4), mangrove, 14-20.April.2013, MIP leg.; ZRC\_BDP0047957, Nee Soon (NS2), swamp forest, 12-18.September.2013, MIP leg.; ZRC\_BDP0048532, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg.; ZRC\_BDP0048535, Nee Soon (NS2), swamp forest, 29.August-05.September.2012, MIP leg.; ZRC\_BDP0048537, Nee Soon (NS2), swamp forest, 15-21.November.2012, MIP leg.; ZRC\_BDP0048538, Nee Soon (NS2), swamp forest, 12-17.October.2012, leg.; ZRC\_BDP0048544, Nee Soon (NS2), swamp forest, 17-23.May.2012, MIP leg.; ZRC\_BDP0048546, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg.; ZRC\_BDP0048680, Nee Soon (NS1), swamp forest, 26.April-02.May.2012, MIP leg. (slide-mounted); ZRC\_BDP0048684, Nee Soon (NS2), swamp forest, 29.November-05.December.2012, MIP leg.; ZRC\_BDP0048995, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0047793, Pulau Ubin (PU4), mangrove, 14-20.April.2013, MIP leg.; ZRC\_BDP0047824, Nee Soon (NS1), swamp forest, 23-29.May.2013, MIP leg.; ZRC\_BDP0048070, Nee Soon (NS1), swamp forest, 06-12.June.2013, MIP leg.; ZRC\_BDP0048531, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048539, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg.; ZRC\_BDP0048540, Nee Soon (NS2), swamp forest, 29.November-05.December.2012, MIP leg.; ZRC\_BDP0048542, Nee Soon (NS2), swamp forest, 05-11.April.2012, MIP leg.; ZRC\_BDP0048547, Nee Soon (NS2), swamp forest, 12-18.April.2012, MIP leg.; ZRC\_BDP0048679, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048681, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048686, Nee Soon (NS2), swamp forest, 05-11.April.2012, MIP leg.; ZRC\_BDP0048690, Nee Soon (NS2), swamp forest, 12-18.April.2012, MIP leg. Females: ZRC\_BDP0048683, Nee Soon (NS1), swamp forest, 01-07.November.2012, MIP leg.; ZRC\_BDP0048687, Nee Soon (NS2), swamp forest, 03-09.May.2012, MIP leg.; ZRC\_BDP0048688, Nee Soon (NS2), swamp forest, 26.April-02.May.2012, MIP leg.; ZRC\_BDP0048689, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg. (slide-mounted).

**Remarks.** There are six haplotypes among the specimens collected in this project (Fig. D4E) and there is no conflict between different criteria to delimit the species. There are specimens from the Nee Soon swamp forest and from the Pulau Ubin mangrove. This species fits in Matile's (1971a, figs. 1-3) original description of *Metanepsia* in details of the antenna, mouthparts, wings and male terminalia, including details as the light colour of the tergite and sternite 1, the light color of the metepisternum, and the short pedicel. The gonostylus is more likely that of *M. africana* Matile. Edwards (1927) illustrated the male gonostylus of *M. javana* Edwards and it clearly differs from the species in Singapore. In all details except the antenna, our specimens fit *M. malaysiana* Kallweit (Kallweit, 1998, fig. 6) including a nearly identical male terminalia. The antenna of *M. malaysiana* in the original description, however, has a rather long pectination (Kallweit, 1998, fig. 2) while the antenna of the specimens from Singapore is almost identical to that attributed to *Chalastonepsia* sp. (Kallweit, 1998, fig. 3), a species with a very different wing venation (Kallweit, 1998, fig. 5). The male terminalia of

our Singapore specimens perfectly fits *M. malaysiana* and for the time being we accept them as conspecific with the holotype of *M. malaysiana*.

## Mycomyinae

The Mycomyinae are the second smallest subfamily of mycetophilid in terms of number of genera (merging Manotinae into the Leiinae and having the Tetragoneurinae as a separate subfamily), but the third most species-rich, with over 600 described species. The subfamily originally included the genera *Mycomya* and *Neoempheria*. *Mycomya* has a number of subgenera (see, e.g., Vaisänen, 1984). To these two genera were added more recently *Echinopodium* Freeman, with 36 species known from temperate South America (Freeman, 1951), *Viridivora* Matile, with two Afrotropical species (Matile 1972, 1973a), *Mycomyiella* Matile, with nine Afrotropical species (Matile, 1973a), *Moriniola* Matile, with one Afrotropical species (Matile, 1976b), *Dinempheria* Matile, with seven Afrotropical species (Matile, 1979b), *Parempheriella*, with 36 Afrotropical and two Oriental species (see, e.g., Matile, 1980a), *Syndocosia* Speiser, with nine species from Africa (see, e.g., Matile, 1976a), and *Vecella*, with one species from southeast China (Wu & Yang, 1986).

The status of these genera within the Mycomyinae is really not clear. *Echinopodium* seems to be a subclade of *Mycomya*—Väisanen (1984) already indicated that they would come together in a clade within the subfamily. *Vecella* is actually a species of *Parempheriella*, a genus overlooked when Wu & Yang (1986) originally published *Vecella*—as such, a formal synonymy is proposed here. *Viridivora* and *Dinempheria* are obviously associated to the *ferruginea*-group of *Neoempheria*. *Mycomyiella* and *Moriniola* are offshoots of *Neoempheria* with small cell r1, while *Parempheriella* and *Syndocosia* correspond to subclades of *Neoempheria* that lost R4. In our mitogenome tree, for example, *Parempheriella* is deeply nested within *Neoempheria*, a position that has morphological support.

A true solution for this situation, as discussed for *Dziedzickia*, is a global review of *Neoempheria*, a task hard to accomplish. A gradual solution would be to recognize smaller clades within *Neoempheria* and *Mycomya*, gradually displacing species from these genera to the other genera to which they are associated. This would restrict, at the end, *Neoempheria*, for example, to the “*ferruginea*-group” or part of it, to which *N. striata* (Meigen), the type-species of the genus, probably fits. Some of Edwards (1940) informal groups of species already have generic names available, as *Neurocompsa* Enderlein and *Pleonazoneura* Enderlein (Enderlein, 1910).

It was rather surprising that no species of *Mycomya* showed up in our samples. There are over 40 described species of *Mycomya* for the Oriental region, some of them known from India and Sri Lanka, Myanmar, Borneo and Sumatra, and Guangxi-Zhuang, in southern China. This is one of the genera that are expected still to be collected in Singapore. In our Singapore samples, we found four species of *Parempheriella* and 31 species of *Neoempheria*.

### ***Parempheriella* Matile**

*Parempheriella* Matile, 1974: 227. Type-species, *P. lobayensis* Matile (orig. des.).

*Vecella* Wu & Yang, 1986: 86. Type-species, *V. guadunana* Wu & Yang (orig. des.). **n.syn.**

**Diagnosis** (modified from Matile, 1974). Lateral ocelli large, close to small mid ocellus. Maxillary palpus with 3-palpomeres. Scutum with a pair of bare bands, setation sparse. Laterotergite and mediotergite bare. C extending beyond tip of  $R_5$ , Sc reaching C at level of origin of  $Rs$  or more basally, sc-r present;  $R_4$  absent, medial fold present, either sclerotized or not; basal end of r-m apart from origin of  $Rs$ ;  $M_1$  rather unsclerotized at basal end,  $M_4$  originating way more basal than origin of medial fork. Trichia regularly distributed on tibiae.

*Parempheriella* was originally described for the Afrotropical region and now has 36 known species. We know out of Africa, *P. septentrionalis* Matile, from South Korea (which corresponds to a northern extension of an Oriental distribution of the genus, not a typical Palearctic distribution), *P. guadunana* (Wu & Yang), **n.comb.**, from the Fujian Province, in southeast China, and *Parempheriella defectiva* (Edwards), from Sumatra. Matile (1999) refers to undescribed species he was aware of from Sulawesi and from Sri Lanka. We found in our samples in Singapore four species of *Parempheriella*. One of these species fits in great detail with the Edwards' (1931) description of *P. defectiva*, which has a reasonable illustration of the male terminalia. There are no delimitation conflicts for the haplotype network of the four species (Fig. E1I).

### ***Parempheriella defectiva* (Edwards)**

*Mycomya (Neoempheria) defectiva* Edwards, 1931: 266, figs. 4v, 4d (male terminalia, ventral and dorsal views). Type locality: Indonesia, Sumatra, Fort de Kock [=Bukittinggi] (920 m). Matile, 1974:611 (new combination).

(Figs. E1A–H)

**Diagnosis.** Scutum dark brown, thoracic pleura greyish brown, head and abdominal sternites ochre-brown, hind femur entirely cream-yellow with a greyish tinge, tergites 1–6 dark brown, tergite and sternite 7 in males and females dark ochre-yellowish. Gonostylus with a basal peduncle, clavate distally, inner face distally with a regular row of six elongate setae directed inwards.

**Description. Male** (Fig. E1A). Wing length, 2.04–2.45; width, 0.84–0.99 (n=2). **Head.** Occiput and frons light brown. Two ocelli in contact with each other medially. Antennae brownish, scape and pedicel light brown; scape and pedicel with a crown of setulae around distal margin, pedicel with a strong dorsal seta; flagellomeres slightly wider than long, except first and last, longer than wide. Eyes densely covered by inter-ommatidial setulae. Face and clypeus slightly bulging, yellowish-brown, palpi dirty-yellow, palpomeres darker towards tip, proboscis dirty-yellow. Maxillary palpus 3-segmented (palpomeres 1 and 2 largely membranous, not really forming a complete segment), palpomere 3 wider, with a sensorial pit, palpomere 4 longer than 3, projecting slightly beyond insertion of palpomere 5, last palpomere almost twice as long as second, with setulae on distal half. Labella small. **Thorax** (Fig. E1C). Scutum and scutellum shining blackish-brown, lighter areas over sutures and laterally on scutellum. Scattered smaller setae on scutum, long supra-alars; a more or less regular row of dorsocentrals and acrostichals; scutellum with two long, diverging latero-apical bristles and additional pair of smaller setae. Pleural sclerites brown, mesepimeron lighter dorsally, metepisternum lighter anteriorly, laterotergite and mediotergite dark brown. Dorso-lateral branches of basisternite 1 wide, not fused to proepisternum. Antepronotum wide, three stronger and some additional smaller setae, proepisternum reduced, devoid of any setae or setulae; all other pleural sclerites bare. **Legs.** Anterior coxae cream-yellow, more yellowish towards tip, mid and posterior coxae light cream-yellow. Femora cream-yellowish, tibiae and tarsi greyish-yellow, with regularly distributed setulae, a row of stronger setae along tibiae laterally and dorsally. Fore coxa covered with fine setae on anterior and external faces, mid coxa with fine setae restricted to distal half of external face, hind coxa with a regular line of fine setae along its length. Femora slightly enlarged medially, especially hind femur. Front tibia long and slender, with trichia arranged in more or less regular rows, only some few setae dorsally and laterally along its length and some distal setae; antero-apical depressed area at internal face small, with a more or less irregular comb of setae. Mid tibia with two dorsolateral rows with few setae. Hind tibia with two long dorsolateral rows of setae

and a long regular comb of setulae distally. Tibial spurs greyish-brown, mid and hind spurs subequal. Tarsi with few setae, besides rows of trichia, tarsal claw with two minute teeth. Haltere light brown, darker at base of knob. **Wings** (Fig. E1D). Membrane light greyish. C extending beyond apex of Rs about a fourth of distance to tip of M<sub>1</sub>. Humeral vein strongly inclinate. Sc bare, long, ending at C before level of basal end of r-m; sc-r weak but present. First section of Rs strictly transverse, straight, both R<sub>1</sub> and R<sub>5</sub> mostly straight; r-m oblique, very slightly curved. Medial fork longer than M<sub>1+2</sub>; M<sub>4</sub> originating at level of anterior end of M<sub>1+2</sub>. M<sub>4</sub> gently sinuous on distal half. CuP weakly sclerotised; R<sub>1</sub>, R<sub>5</sub>, distal four-fifth of M<sub>1</sub>, distal half of M<sub>2</sub> and M<sub>4</sub>, and distal two-thirds of CuA setose dorsally. **Abdomen**. Tergites 1–6 shining brown, sternites 1–6 ochre-yellowish with a brownish tinge, tergite and sternite 7 yellowish. **Terminalia** (Figs. E1E–F). Yellowish-brown. Gonocoxites fused medially on anterior fifth of terminalia, suture of fusion evident, a sclerotized membranous area between medial projections; ventral face of gonocoxite with three posterior lobes: more medial lobe long, blade-like, bare; second lobe long, digitiform, with a pair of long, fine, curved setae; third lobe short, digitiform, with a long subapical seta and two fine apical setae. Gonocoxite dorsally with a short lateral projection with setae, from which a long falciform blade projects at apex. Gonostylus club-shaped, a wider base bearing a strong seta, a long neck with a strong seta directed inwards and a widened, truncate distal end covered with a group of setulae, with a row of fine setae on distal margin and a modified area with some setulae and a strong seta. Aedeagal-parameral complex large, present as a wide plate with sclerotized lateral margins and a medial sclerotized axis, ventrally with a pair of short digitiform projections with short denticles on distal end, and projected into a trapezoid membrane distally, between the gonostylus; anteriorly with a pair of slender apodemes. Gonocoaxal bridge wide, without evident apodemes. Tergite 9 with a pair of very long projections with setae on basal half, extending way beyond rest of terminalia into a pair of digitiform projections, each bearing a group of five short, curved setulae. Sternite 10 trapezoid, weakly sclerotized, cerci quite elongate, weakly sclerotized medio-distally.

**Female** (Fig. E1B). As male, except for the following. **Abdomen**. Tergites 1–6 light brown, sternites lighter, tergite and sternite 7 yellowish-brown. **Terminalia** (Figs. E1G–H). Sternite 8 trapezoid, with a medio-posterior incision separating a pair of distal setose lobes. Sternite 9 wide, with a short medial apodeme directed anteriorly. Tergite 8 rectangular, wide and short, with a single row of setae, tergite 9 with a sclerotized band along anterior border and a pair of long setae on dorso-posterior corners, tergite 10 partially fused to tergite 9, setose. Cerci elongate, cercomere 1.2.5× length of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000763>)

**Material examined.** *Parempheriella defectiva* (Edwards), syntype male, “Sumatra, Fort de Kock, 2005” (NHM). **Sequenced specimens:** 17 males, 2 females. **Males:** ZRC\_BDP0047858, Nee Soon (NS1), swamp forest, 04-10.July.2013, MIP leg.; ZRC\_BDP0047865, Nee Soon (NS2), swamp forest, 26.September-02.October.2013, MIP leg.; ZRC\_BDP0048717, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048818, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048828, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted); ZRC\_BDP0048843, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048914, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049009, Nee Soon (NS2), 11-17.December.2014, MIP leg. (extracted; ZRC\_BDP0049025, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049029, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049030, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049040, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049041, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049048, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049049, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0155005, Singapore, NSM,14-Jan-15, MIP leg. **Females:** ZRC\_BDP0048556, Nee Soon (NS1), swamp forest, 03-09.May.2012, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0049054, Nee Soon (NS2), 01-07.January.2015, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0154761 (slide-mounted).

**Remarks.** The type locality of *P. defectiva* is “Fort De Kock” (now Bukittinggi), in West Sumatra. The minimum width of the Strait of Malacca, separating Sumatra from the Malay Peninsula, is 2.8 Km, with a minimum depth of 25 m. It is highly probable that part of the Singapore fauna of mycetophilids is shared with Sumatra at the species level, with less than 3% divergence. The only disagreement between our specimens and Edwards’ (1931) original description is on the color of tergite 4. While in his description the tergite 4 is referred to as yellowish (like in our other species of *Parempheriella*), our specimens of *P. defectiva* have tergite 4 concolor with the remaining tergites. We assume that our specimens are conspecific with the holotype. Specimens of *P. defectiva* from Sumatra that can be sequenced would allow a better understanding of the genetic divergence between the populations on both sides. All but one of the specimens of *P. defectiva* in our samples come from the Nee Soon swamp forest, with a single specimen from Bukit Timah. There are two different haplotypes. We have examined and photographed one of the syntypes of *P. defectiva* (NHM).

### *Parempheriella mait Amorim & Oliveira, sp.nov.*

(Figs. E2A–D, E3A–D)

**Diagnosis.** Head brown, yellowish dorso-laterally, scutum and scutellum shining brown, lighter along laterals, pleural sclerites brown, antepronotum, laterotergite and mediotergite darker, femora yellowish-brown. Tergites 1-3 and 5-6 uniformly brown, tergite 4 cream-yellow with a slender brown band along anterior margin, tergite 7 yellowish-brown.

Syngonocoxite with a pair of long, digitiform ventral lobes and a pair of well-developed setose lateral lobes with an inner small digitiform lobe; gonostylus small, digitiform.

**Description. Male. Head** (Fig. E3A). Occiput and frons brown, more yellowish dorso-laterally. Antennae uniformly light brown. Face and clypeus light brown, palpus and labella dirty whitish-yellow. **Thorax** (Fig. E3B). Scutum and scutellum shining brown, lighter areas along lateral margins. Scutellum with two very long, diverging latero-apical bristles, no additional small setae. Pleural sclerites brown, antepronotum, laterotergite and mediotergite darker. Halter pedicel light brown, knob slightly darker. **Legs**. Coxae whitish-yellow, fore coxa brownish on basal fifth; femora yellowish-brown, tibiae and tarsi light brownish, with regularly distributed setulae, a row of stronger and regularly distributed setae along tibiae laterally and dorsally. **Wings**. Membrane light greyish. C extending very shortly beyond tip of R<sub>5</sub>. **Abdomen**. Tergites 1-3 and 5-6 uniformly brown, tergite 4 cream-yellow with a slender brown band along anterior margin, tergite 7 yellowish-brown; sternites 1-4 and 7 brownish-yellow, sternites 5–6 darker. **Terminalia** (Figs. E3C–D). Gonocoxites fused medially on anterior fifth of terminalia, an evident suture between them, with only some few setae; syngonocoxite ventrally with a pair of long, digitiform lobes extending beyond tip of gonostylus and a pair of well-developed setose lateral lobes truncate distally, bearing an inner small digitiform lobe. Gonostylus small, digitiform, with sub-basal seta and a group of small distal setae. Aedeagal-parameral plate well-defined, with a pair of hook-like laterodistal projections. Gonocoxal bridge evident. Tergite 9 with a pair of lateral projections distally, with fine setae along most length. Cerci present as a pair of setose lobes medially.

**Female** (Fig. E2A). As males, except for the following. **Wing** (Fig. E2A). Length, 2.07; width, 0.79. **Terminalia** (Figs. E2C–D). Brownish-yellow, cerci more yellowish. Sternite 8 wide, trapezoid, with a pair of short projections on posterior margin with a few dark short setae medially. Sternite 9 (vaginal furca) wide, with a short anterior medial apodeme, distal part of ducts leading to gonopore composing a sclerotized slender cone. Tergite 8 wide, with a single row of setae along posterior margin. Tergite 9 slender, bare. Tergite 10 slender, with a row of setae along posterior margin. Cercomere 1 almost 3× longer than cercomere 2.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000764>)

**Etymology**. The specific epithet of this species refer to Ma’it, a 9<sup>th</sup> century Arab description of an island fitting Singapore. The noun is used in aposition.

**Material examined.** **Holotype:** male, ZRC\_BDP0048925, Nee Soon (NS1), 25-31.December.2014, MIP leg.  
**Paratypes:** 2 females, ZRC\_BDP0048557, Nee Soon (NS1), swamp forest, 05-11.April.2012, MIP leg.;  
ZRC\_BDP0048559, Nee Soon (NS2), swamp forest, 05-11.July.2012, MIP leg. (slide-mounted).

**Remarks.** The color pattern of this species similar to that of *Parempheriella longyamen*, sp.nov.

***Parempheriella longyamen* Amorim & Oliveira, sp.nov.**

(Figs. E4A–G)

**Diagnosis.** Head dark greyish-brown, scutum and thoracic pleura dark brown, hind femur ochre-yellowish, abdominal sternites light brownish-yellow, tergites 1–3 and 5–6 brown, tergite 4 cream-yellow with a small medial mark along anterior margin, tergite and sternite 7 cream-yellow. Gonostylus strongly sclerotized, falciform.

**Description. Male** (Fig. E4A). Wing length, 2.37–2.55; width, 0.92–0.99. **Head** (Fig. E4B). Occiput and frons brown. Antennae uniformly light brown; flagellomeres slightly longer than wide. Face and clypeus light brown, palpus and labella whitish. **Thorax** (Fig. E4C). Scutum and scutellum shining brown, lighter areas along lateral margin. Scutellum with two very long diverging latero-apical bristles, in addition to row of four long fine setae slightly more dorsally. Pleural sclerites brown, antepronotum, laterotergite and mediotergite darker. **Legs.** Coxae whitish-yellow, darkened on distal fourth of wing; femora yellowish-brown, hind femur darkened towards tip, tibiae and tarsi light brownish, with regularly distributed setulae and a row of stronger and regularly distributed setae along tibiae laterally and dorsally. Halter light brown, pedicel lighter. **Wings** (Fig. E4D). Membrane almost translucent. C extending only shortly beyond tip of R<sub>5</sub>. Sc reaching C at level of anterior end of r-m. **Abdomen.** Tergites 1-3 and 5-6 uniformly dark brown, tergite 4 mostly yellow, with a brown mark along anterior margin medially; sternites 1-5 whitish-yellow, darker towards apex. Tergite 7 light yellowish-brown, sternites 6-7 light yellowish-brown. **Terminalia** (Fig. E4E). Light brown on basal half, gonostylus dark brown with strong black setae. Gonocoxites fused medially on anterior fifth of terminalia, with an evident suture between them, bearing few setae; syngonocoxite ventrally with a pair of long, well sclerotized digitiform projections latero-distally, bare of setae, extending beyond tip of gonostylus; a pair of posterior extensions of gonocoxites supporting basally tergite 9 and a pair of posterior extensions dorsally to

insertion of gonostylus. Gonostylus with a basal elongate branch extending ventrally to main branch, both well-sclerotized, main branch with some fine, long setae on distal third.

Aedeagal-parameral plate well-defined, wide with a posterior V-shaped extension.

Gonocoxal bridge evident, apodeme closer to each other medially. Tergite 9 with a pair of lateral projections barely in contact medially, lateral projections with long, fine setae, extending to level of tip of gonostylus. Tergite 10 well-defined, lateral projections with a slender medial connection, each side with two digitiform projections, medial one slightly stronger, with three well developed setae on middle third, three additional strong setae and one spine, not reaching level of tip of gonostylus, outer digitiform projection longer, reaching level of tip of gonostylus, with a conspicuous distal seta. Sternite 10 visible, slightly elongate, rectangular. Cerci weakly sclerotized, fused to each other, lobose distally.

**Female.** As male, except as following. **Wing.** Length, 2.53; width, 0.97. **Terminalia** (Figs. E4F–G). Sternite 10 well developed, laterally with a band with microtrichia and setae, medially with a transparent area. Tergite 9 more sclerotized, tergite 10 reduced to a band fused to tergite 9, with a row of three pairs of longer and some smaller setae. Cercomere 1 more than 3× longer than wide, 2.4× longer than cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000790>)

**Material examined.** **Holotype:** male, ZRC\_BDP0049091, Nee Soon (NS1), 18-24.December.2014, MIP leg. (extracted, slide-mounted). **Paratypes:** male, ZRC\_BDP0278299, Singapore, 10-May-18, MIP leg. (slide-mounted); male, ZRC\_BDP0134029; male, ZRC\_BDP0278300; male, ZRC\_BDP0278309; female, ZRC\_BDP0072675 (slide-mounted).

**Etymology.** The specific epithet of this species refers to Long Ya Men [=龍牙門], or “Dragon’s Teeth Gate”, the Mandarin name of a place reached in 1320 by a Mongol Yuan Empire trade mission. It is believed to be the present Keppel Harbour, at the southern part of Singapore. The noun is used in apposition.

**Remarks.** The specimens of the type-series were come from Nee Soon swamp forest samples and from Bukit Timah primary forest samples.

### *Parempheriella peranakan* Amorim & Oliveira, sp.nov.

(Figs. E5A–G)

**Diagnosis.** Scutum dark brown, head greyish-brown, thoracic pleura concolor with head, hind femur whitish with brown distal third, abdominal sternites very light brown, tergites 1–3 and 5–6 greyish-brown, tergite 4 greyish-brown with a pair of cream-yellow marks on lateroposterior corners, tergite and sternite 7 cream-yellow. Gonostylus elongate, with two distal spines, more ventral one long and curved inwards.

**Description. Male.** Wing length, 2.04; width, 0.82. **Head.** Occiput and frons light greyish-brown. Antennae light brownish, scape light ochre-yellow, pedicel light brown; flagellomeres only slightly longer than wide, except first and last, about 1.5 longer than wide. Face, clypeus, palpus and proboscis whitish. **Thorax.** Scutum and scutellum shining blackish-brown, lighter areas over sutures and laterally on scutellum. Scattered smaller setae on scutum, longer supra-alars; a more or less regular row of dorsocentrals and acrostichals. Scutellum with two long, diverging latero-apical bristles and additional pair of small setae. Pleural sclerites brown, mesepimeron lighter dorsally and metepisternum anteriorly, laterotergite and mediotergite dark brown. Dorso-lateral branches of prosternum wide but not fused to proepisternum. Antepronotum wide, with three stronger and some additional smaller setae, proepisternum reduced, devoid of any setae or setulae; all other pleural sclerites bare. **Legs.** Coxae whitish, anterior coxa brownish on anterior fifth. Femora creamy yellowish, mid and hind femora brownish at distal fourth; tibiae and tarsi greyish, with regularly distributed setulae and a row of stronger and regularly distributed setae along tibiae laterally and dorsally. **Wing** (Fig. E5B). Membrane light greyish. C extending beyond apex of Rs for about one fourth distance to tip of  $M_1$ . Humeral vein strongly inclinate. Sc bare, ending at R before anterior end of r-m; sc-r weak but present. First section of Rs almost transverse, straight, both  $R_1$  and  $R_5$  mostly straight, slightly curved distally; r-m oblique, only slightly curved. Medial fork longer than  $M_{1+2}$ ;  $M_4$  originating slightly more basal than anterior end of  $M_{1+2}$ .  $M_4$  slightly depressed on distal half, gently sinuous, posterior fork not too open. CuP weakly sclerotized, ending at level of origin of  $M_4$ . Veins  $R_1$ , second sector of Rs, most of extension of  $M_1$ , distal half of  $M_2$ , distal four-fifth of  $M_4$ , distal two-thirds of CuA with dorsal setation. Haltere greyish. **Abdomen.** Tergites 1–6 shining brown, sternites 1–6 ochre-yellowish with brownish tinge, tergite and sternite 7 yellowish. **Terminalia** (Figs. E5C–D). Yellowish-brown. Terminalia slightly asymmetric. Gonocoxites fused medially on anterior fifth of terminalia, with an evident suture between them, with very few setae; syngonocoxite ventrally with a pair of long digitiform projections at posterior margin bearing a strong seta basally at external face, and a strong seta, some setulae and a sclerotized tooth at internal

margin midway to apex, with a long apical spine. Gonostylus elongate, articulated at limit between gonocoxite and tergite 9, bearing one fine seta at external face on distal third and two sclerotized distal spines, inner one straight and pointed, outer one long and curved. Aedeagal-parameral complex large, present as a wide plate with three sclerotized curved laterodistal teeth and a pair of blade-like extensions laterally, a pair of apodemes at anterior end. Tergite 9 fused to tergite 10, asymmetric, complex, mostly devoid of setation, a wide and deep incision separating two extensions; right extension with a short digitiform projection bearing a long spine, a long and slender digitiform projection with a small group of long and short setae only distally, and a laterodistal extension with some few long setae, to which articulates the gonostylus; left projection with a short digitiform projection with a long distal spine, a stronger digitiform projection with setulae along its length and three strong curved spines distally, no laterodistal extension. Cerci weakly sclerotized fused to each other, lobose distally.

**Female** (Fig. E5A). As male, except for the following. **Wing**. Length, 2.14–2.22; width, 0.87–0.92. **Terminalia** (Fig. E5E). Sternite 8 trapezoid, with a short medial incision on posterior margin separating small setose lobes, stronger setae along posterior margin. Sternite 9 wide, with a short medial apodeme anteriorly directed. Tergite 8 rectangular, wide and short, with a single row of setae, tergite 9 with a sclerotized band along anterior border and a pair of long setae on dorso-posterior corners, tergite 10 partially fused to tergite 9, setose. Cerci elongate, cercomere 1 2.5× length of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000819, and -002062>)

**Material examined. Holotype:** male, ZRC\_BDP0047777, Nee Soon (NS1), swamp forest, 22-28.August.2013, MIP leg. **Paratypes:** 8 males, 3 females. **Males:** ZRC\_BDP0048733, Nee Soon (NS2), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0048924, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048931, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048952, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0048975, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048977, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0049196, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0049222, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Females:** ZRC\_BDP0049227, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0133974, Singapore, NA, (date range 2012-2018), MIP leg. (slide-mounted); ZRC\_BDP0072705, Bukit Timah Forest (BT05, 1-Dec-16, MIP leg. (slide-mounted)).

**Additional sequenced specimens:** male, ZRC\_BDP0154881.

**Etymology.** The specific epithet refers to the Peranakans [= a Malay/Indonesian grammatical inflection roughly translating to ‘descendants’], an ethnic group of descendants from early 19th century Chinese settlers in the Malay Archipelago who intermarried with the indigenous populations of Malay, Javanese or Thai and produced a hybrid culture distinctive in the Malay Peninsula and Indonesian Archipelago.. The noun is used in apposition.

**Remarks.** We found only one haplotype of *Parempheriella peranakan*, sp.nov. The specimens collected came from the Nee Soon swamp forest samples and in the Bukit Timah samples.

### ***Neoempheria* Osten-Sacken**

*Neoempheria* Osten Sacken, 1878: 9 (*nom.nov.* for *Empheria* Winnertz). Type-species, *Sciophila striata* Meigen (auct.).

**Diagnosis.** Mid ocellus missing, lateral ocelli close together on vertex. Scutellum with bristles, laterotergite and mediotergite bare. Trichia regularly arranged along entire length of tibiae and tarsi, tibiae with bristles. Wing membrane with brownish marks; microtrichia on wing membrane not arranged regular longitudinal lines; C produced or not beyond tip of R<sub>5</sub>; R<sub>4</sub> most usually present; false vein present between R<sub>5</sub> and M<sub>1</sub>.

*Neoempheria* is one of the largest genera of Mycetophilidae, with over 130 described species worldwide. *Neoempheria* is the genus with the largest number of species in our samples (31), slightly over *Epicypta* (30), though not as abundant. The rarefaction curves (Figure XXX) project a high number of species in the Singaporean fauna—over 60 species. This number of congeneric species in sympatry is particularly impressive. It suggests *Neoempheria* may be an “open taxon” nightmare even worse than *Manota*—with maybe over 2,000 species worldwide—except for the fact that *Neoempheria* species are large and quite colorful, while *Manota* species are small and more homogeneous in the general color patterns.

As mentioned above, it is likely that *Viridivora*, *Dinempheria*, *Mycomyiella*, *Moriniola*, *Syndocosia* and *Parempheriella* correspond to offshoots within *Neoempheria* to which generic status was given. This is consistent with the mitogenome tree about the position of *Parempheriella*, nested within *Neoempheria*. The mitogenome tree also shows that most species with large cell r1 (referred to here as the *ferruginea*-group) belong to a clade deeply nested within the phylogeny of the genus (with a single exception). Considering the condition of cell r1 in most species of *Mycomya*, this suggests that the large cell r1 should be a secondary feature within the genus, not a retained plesiomorphy. There is a species that typically fits *Neoempheria* that misses R<sub>4</sub>.

There are 25 species of *Neoempheria* described from the Oriental region—14 of these species from China, three from India, two from Sri Lanka and India, three from Java and three from Sumatra. As seen above, one of Edwards's (1931) *Neoempheria* species from Sumatra was transferred by Matile (1999) to *Parempheriella*. The other three *Neoempheria* species described by Edwards (1931) from Sumatra have small cell r1, with Sc ending beyond origin of Rs—all with male terminalia illustrated. Two of his species do not fit any of the species of *Neoempheria* in our Singapore samples, while *N. zonalis* Edwards is present in our material from Singapore. Colless (1966) described *Neoempheria vicina* Colless, from Micronesia, a species that also fits in the *ferruginea* species-group,

Of the 31 species of *Neoempheria* in our samples, seven are known only from females. There are not enough features on color patterns and wing venation to differentiate these females from other species in the genus, even with female terminalia in most species being particularly complex (with lobes and digitiform projections on sternite 7, sternite 8, sternite 9, tergite 10 etc.). As happens with the genus *Manota*, we describe these species of *Neoempheria* known only from females, but we do not formally name them here. The haplotype network for the genus (Fig. E06\_0) has six species that have specimens split in smaller units, discussed below under the species descriptions.

The mitogenome tree shows four higher clades for the genus (in addition to *Parempheriella*, that nests inside *Neoempheria*), besides *Neoempheria sachmatich*, sp.nov., which stands as sister to the rest of the genus in the tree. One clade largely corresponds to the group-*ferruginea*, with five dark stripes on the scutum and large cell r1 (with the single exception of *N. riataiae*, sp.nov.). Another clade has the gonostylus dorsoventrally flattened, sc-r displaced basally (as in *Parempheriella*) and in most cases brown sternite 6. A third, large clade also has species with brown sternite 6, in most cases with sc-r at a more basal position than the level of origin of Rs and very small cell r1. There are some cases of species delimitation conflicts, in some cases breaking morphological species in separate clusters or joining morphologically distinct species in larger units (Fig. E01).

Edwards (1940), as referred to above, discriminated the Neotropical species of *Neoempheria* in eight informal groups. Most his Neotropical groups in the genus have species with large cell r1, with some few species with a small cell r1—as *N. neivai* Edwards. The Nearctic species *N. indulgens* Johannsen fits in the groups with small cell r1, while the Palearctic *N. lineola* Meigen and the Nearctic *N. balioptera* Loew fit in the groups with a large cell r1. It is interesting to note that most species of *Neoempheria* from the Singapore samples have a small cell r1 and do not fit into the *ferruginea*-group, differently from what is

seen in most other biogeographical regions. We use the mitogenome tree to gather the species of *Neoempheria* in smaller informal taxonomic groups. Four main clades can be seen and we use the name *ferruginea* for one of them; the others are group *dizonalis*, group *merlio*, group *puluochong* and the group *sachmatich*, this later with a single species. This allows better visualizing similarities and patterns in the wing venation and in the male terminalia morphology between the species.

#### Group *sachmatich*

This group has a single species, which in the mitogenome tree is sister to a clade with all remaining species *Neoempheria* and *Parempheriella*. The wing has a medium-sized cell r4, a pair of longitudinal dark bands on the scutum and a male terminalia that does not properly correspond to the patterns of the other group.

#### ***Neoempheria sachmatich* Amorim & Oliveira, sp.nov.**

(Figs. E6A–D)

**Diagnosis.** Head whitish-yellow, scutum yellowish with a pair of slender brown bands on posterior half, scutellum yellowish-brown; pleural sclerites whitish with an orange tinge. Tergites 1–7 brown with a cream-yellow longitudinal band on anterior half extending posteriorly on laterals. Wing with a brown mark at level of cell r1, not extending beyond M<sub>1+2</sub>, and a mild brownish tinge transverse band at level of distal half of R<sub>1</sub>, not extending beyond M<sub>1</sub>. Cell r1 slightly elongate, anterior margin of cell r1 4.0× length of R<sub>4</sub>; sc-r present at distal half of cell r1, tip of Sc not produced, Sc ending in R<sub>1</sub> (through sc-r). Syngonocoxite with a medio-posterior short extension towards aedeagus, gonocoxites entirely bare ventrally, a long laterodistal lobe extending to level of tip of gonostylus with a dorsal short basal lobe bearing a pair of elongated spines directed inwards; gonostylus long, pedunculate, wider at apex, with a pair of short, curved spines; parameres with a pair of strongly sclerotized ventral extensions crossing each other medially; tergite 9 with a pair of elongate projections covered with microtrichia and setae.

**Description. Male** (Fig. E6A). Wing length, 2.43; width, 0.98. **Head.** Cream-yellow, lighter at frons and ventrally at occiput. Some scattered short setae over frons and occiput, some slightly longer setae around eye on occiput. Two ocelli placed medially on vertex over a blackish background. Face whitish, clypeus light brown. Antennal scape and pedicel light

ochre-yellow, flagellum light yellowish with some light greyish tinge. Maxillary palpomeres light brown, last palpomere lighter. Frons with no setae anteriorly to line of ocelli, ocellar setae absent. Scape 1.2× longer than pedicel, flagellomere 1 1.3× longer than flagellomere 4, flagellomere 4 1.0× longer than wide. Palpomere 4 1.3× palpomere 3 length, palpomere 5 1.9× palpomere 4 length. **Thorax.** Scutum background light yellowish, an even lighter area laterally, a pair of brown bands externally to dorsocentral line on posterior half of scutum; scutellum yellowish-brown. Pleural sclerites cream-yellow with an orangish tinge except for brownish tinge on laterotergite, mediotergite with a yellowish-brown mark medially. Scutum with a pair of prescutellar bristles at dorsocentral lines and two pairs of prescutellar bristles at lateroposterior corners; scutellum with two pairs of scutellar bristles, no additional setae.

Antepronotum with 2–3 bristles and some additional smaller setae, proepisternum bare. **Legs.** Coxae whitish, front coxa with a yellowish tinge, femora whitish-yellow, tibiae and tarsi slightly more greyish. Mid tibial inner spur 3.0× longer than tibia width at apex [both hind leg femora, tibiae and tarsi missing]. Fore leg tarsomere 1 0.8 tibia length, 1.6× tarsomere 2 length. **Wing** (Fig. E6B). Membrane background light greyish, with a dark greyish-brown mark on membrane at level of tip of Sc. C barely produced beyond tip of R<sub>5</sub>; Sc reaching but not produced beyond sc-r (not visible even under phase contrast), sc-r regularly sclerotized, as if Sc ended at R<sub>1</sub>; sc-r placed at distal half of cell r1; first sector of Rs short, R<sub>4</sub> apart from base of r-m, anterior margin of cell r1 2.5× length of R<sub>4</sub>; first sector of Rs 0.67× r-m length; r-m oblique. False medial vein weak, not sclerotized. M<sub>1+2</sub> 6.0× r-m length; bM 9.0× length of first sector of Rs. First sector of CuA 0.9× longer than second sector. M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> gently curved. Cubital pseudovein sclerotized to distal third of second sector of CuA, CuP sclerotized to level of origin of M<sub>4</sub>, faint more distally. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, second sector of Rs; Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM and all posterior wing veins entirely devoid of setation; no macrotrichia on wing membrane. **Abdomen.** Tergites 1–7 with a cream-yellow band anteriorly and a light brownish band posteriorly, tergites 2–7 with wider cream-yellow band, tergite 7 rectangular, no ornamentation. Sternites 1–7 cream-yellow.

**Terminalia** (Fig. E6C). Cream-yellow. Gonocoxites large, fused mesally without a suture, entirely bare ventrally, a large medial, weakly sclerotized plate connecting gonocoxites, with a medio-posterior short extension towards aedeagus, latero-distally a large setose projection extending to level of tip of gonostylus, inner margin, posteriorly to level of insertion of gonostylus, a pair of spines directed obliquely towards distal end. Gonostylus insertion displaced more dorsally, elongate, capitate, bare at basal three-fourth, with a pair of short,

curved spines on a small lateral projection, distal enlarged area covered with setae. Gonocoxal bridge wide, weakly sclerotized. Aedeagus with a pair of slender, elongate blades projecting almost to level of tip of gonostylus. Parameres with a pair of strongly sclerotized ventral extensions crossing each other medially, latero-anteriorly a pair of apodemes with a concentrate group of small setae, connected medially behind aedeagus. Tergite 9 with a pair of elongate projections covered with microtrichia and setae. Cerci small, with setae directed ventrally.

**Female** (Fig. E6A). As male, except for the following. **Wing**. Length, 2.52; width, 0.98.

**Terminalia** (Fig. E6D). Sternite 8 as a pair of triangular, elongate lobes not fused together medially, deep posterior incision almost reaching anterior end of sclerite, entirely covered with microtrichia, setae on distal half of each lobe, stronger setae at tip. Sternite 9 weakly sclerotized, anterior apodeme extending towards mid of anterior margin of sternite 8. Tergite 8 with a pair of lateral lobes with a slender medial connection, lateral end of anterior margin extending to ventral face of terminalia, covered only with microtrichia. Tergite 9+10 with a pair of lateral lobes with microtrichia and setae, with a slender medial connection, lateral extensions with longer setae. Sternite 10 with a long medial transparent area. Cercomeres dorsoventrally compressed, densely covered with microtrichia and short setae, cercomere 1 2.2× length of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000745>)

**Material examined. Holotype:** male, ZRC\_BDP0048490, Nee Soon (NS1), swamp forest, 03-09.May.2012, MIP leg. (slide-mounted). **Paratypes:** 2 males, 3 females. Males: ZRC\_BDP0048721, Nee Soon (NS2), 22-28.January.2015, MIP leg.; male, ZRC\_BDP0155050, Singapore, (date range 2012-2018), MIP leg. Females: ZRC\_BDP0047837, Nee Soon (NS2), swamp forest, 23-29.May.2013, MIP leg.; ZRC\_BDP0047952, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048498, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The specific epithet of this species refers to the 14th century Vietnamese transcription of Temasek, what is now Singapore. The noun is used in apposition.

**Remarks.** This species of *Neoempheria* in some extension diverges from the general pattern of the genus. It has a pair of brown bands over a yellow background on scutum, whitish mediotergite, a quite unique feature for the genus. Sc ends in R<sub>1</sub> through sc-r, which is very unusual for *Neoempheria*, and there is an elongate cell r1 (although not as large as in the *ferruginea* group), with C ending at the tip of R<sub>5</sub>. The abdominal color pattern is quite distinctive. In the mitogenome tree it stands as sister of all other species of the genus. There

are two haplotypes for this species, but there is no question about the species delimitation. It is present only in the swamp forest samples.

#### Group *merlio*

This group includes seven of the species of *Neoempheria* described here from Singapore, all of which with small cell r4 and a sclerotized medio-posterior process of the syngonocoxite in the male terminalia.

#### *Neoempheria merlio* Amorim & Oliveira, sp.nov.

(Figs. E7A–C)

**Diagnosis.** Head, scutum and scutellum ochre-yellowish with a brownish tinge; pleural sclerites whitish-yellow, mediotergite light brown, dorso-posterior end of laterotergite with a light brown tinge. Tergites 1 light brown, tergites 2 and 4 with a brown medial longitudinal band, ochre-yellow laterally; tergites 3, 5–6 brown with a slender yellow band along anterior margin; tergite 7 yellowish; sternite 6–7 with brown lateral marks. Wing with a brown band distally across wing and a brown band more basally, from level of cell r1 to posterior margin on cell cua. Cell r1 small, anterior margin of cell r1  $1.6 \times$  length of R<sub>4</sub>; sc-r not sclerotized; Sc reaching C before mid of cell r1. Syngonocoxite with medial-posterior process extending towards aedeagus dorsally, gonocoxite with a long latero-dorsal lobe, capitate distally, with a long spine directed inwards. Gonostylus long, slender, dorsoventrally compressed. Parameres with a pair of digitiform extension laterally directed inwards.

**Description. Male** (Fig. E7A). Wing. Length, 1.93; width, 0.72. **Head.** Light ochre, slightly darker at vertex. Antennal scape and pedicel dirty whitish, flagellum light ochre-yellowish. Face and clypeus light brown. Maxillary palpomeres brown, last palpomere lighter. Labella whitish-yellow. Ocellar setae absent, some setae on frons ahead of ocelli. Scape  $1.5 \times$  pedicel length, flagellomere 1  $2.3 \times$  longer than flagellomere 2; flagellomere 4 length  $1.1 \times$  width. Clypeus projected beyond level of ventral margin of eye, a short proboscis present.

Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $1.5 \times$  palpomere 4 length. **Thorax.** Scutum ochre-yellowish, slightly darker close to posterior end, no brown stripes, scutellum ochre-yellowish. Pleural sclerites whitish. Halter whitish with light brown tinge, base of knob light brown. Scutum with irregular rows of long dorsocentrals, a pair of elongate bristles

above level of anepisternum. Two pairs of prescutellars, one pair medially, one pair at lateroposterior corner; scutellum with one pair of scutellar bristles and one additional pair of fine setae placed more anteriorly. Two bristles on antepronotum. **Legs.** Coxae whitish, femora ochre-yellow, tibiae and tarsi light greyish-brown. Front tibia with a small antero-apical depression lined with few setulae. Fore leg tarsomere 1  $0.9 \times$  tibial length, 1.9× tarsomere 2 length. **Wing** (Fig. E7B). Membrane background light greyish, a dark brown band across wing at level of cell r<sub>1</sub> and a lighter apical band beginning beyond basal end of medial fork. Sc weak, ending slightly beyond level of origin of Rs, sc-r absent; R<sub>4</sub> weakly sclerotized, anterior margin of cell r<sub>1</sub> 1.7× length of R<sub>4</sub>. M<sub>1+2</sub> 2.6× r-m length; bM 5.0× r-m length. False medial vein conspicuous, slightly sclerotized, almost reaching r-m. Medial fork wide open. M<sub>4</sub> gently sinuous, first sector of CuA 0.70× length of second sector. Among posterior wing veins, only M<sub>1</sub> with macrotrichia on dorsal face, at distal fourth. **Abdomen.** Tergites 1–6 light brown, tergite 7 ochre-yellowish with a medial light brown mark along posterior margin. Sternites 1–7 light ochre-yellowish. **Terminalia** (Fig. E7C). Whitish-yellow. Gonocoxites fused medially, no suture of fusion, medial-posterior process of syngonocoxite extending towards aedeagus dorsally, a pair of very long latero-dorsal lobes, capitate distally, extending beyond tip of gonostylus, with setae on outer face, a long spine directed inwards and some strong setae at distal end. Gonostylus long, slender, dorsoventrally compressed, with setae mostly on outer face, long setae at distal end. Aedeagus with a hardly sclerotized structure with a pair of lateral winglets, a short anterior medial apodeme and a long pair of weakly sclerotized distal extensions. Parameres composed of a pair of long digitiform extensions laterally, almost as long as gonostylus, each with one subdistal seta and a pair of short and strong distal setae, a pair of lateral slender blades almost as long and a pair of valve-like, weakly sclerotized blades in touch medially. Dorsally a subtriangular elongate membranous area that may correspond to tergite 9, with a pair of elongate lobes distally with microtrichia and setae.

**Female.** As male, except for the following. **Wing.** Length, 2.03; width, 0.66. **Abdomen.** Abdominal tergite 3 with medial brown band extending laterally until margin, tergite 7 light brown. **Terminalia.** Light brown. Sternite 8 trapezoid, with a medial U-shaped incision on posterior margin reaching posterior third of terminalia, lobes entire sclerite with microtrichia and setae, long setae along tip of lobes. Sternite 9 with a sclerotized area around genital chamber, with a pair of anterior lobes close together directed anterior and a pair of lateral sclerotized extensions projecting dorsally bearing three strong setae. Tergite 8 wide, anterior margin laterally with sclerotized arms extending ventrally, posteriorly with a pair of lobes

bearing a deep incision, strong setae on medio-posterior end of lobes. A pair of long digitiform extensions extending latero-distally, emerging from tergite 9+10. [Cerci broken].  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000741>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047889, Nee Soon (NS2), swamp forest, 17-23.October.2013, MIP leg. (slide-mounted). **Paratypes:** 7 males, 3 females. **Males:** ZRC\_BDP0048483, Nee Soon (NS1), swamp forest, 10-16.May.2012, MIP leg.; ZRC\_BDP0048726, Nee Soon (NS2), 09-15.April.2015, MIP leg.; ZRC\_BDP0048732, Nee Soon (NS2), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0048854, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0049184, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0049199, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0072731, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg. **Females:** ZRC\_BDP0048481, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0049192, Nee Soon (NS2), 07-13.May.2015, MIP leg. (slide-mounted); ZRC\_BDP0072702, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0078969; male, ZRC\_BDP0155067.

**Etymology.** The specific epithet of this species refers to “merlion”, the official mascot of Singapore (designed by the Singapore Tourism Board in 1964), corresponding to a mythical creature with the body of a fish and the head of a lion. The merlion is a prominent symbol of the nature of Singapore and of Singaporeans. In 2002 the statue and its ‘cub’ were relocated to its current position in the Merlion Park, that fronts Marina Bay, where it stands on a newly reclaimed promontory, just in front the historic The Fullerton Hotel. The noun is used in apposition.

**Remarks.** There are five haplotypes for *Neoempheria merlio*, sp.nov., but no conflict between the different delimitation approaches. The species was collected from the swamp forest, the Bukit Timah tropical forest and from the mangrove.

***Neoempheria sabana* Amorim & Oliveira, sp.nov.**  
**(Figs. E8A–D)**

**Diagnosis.** Head ochre-brownish with some whitish-yellow areas, scutum dark ochre-yellowish some areas with a light brown tinge, scutellum brownish; pleural sclerites whitish-yellow, mediotergite light brown on dorsal half, laterotergite dorso-posterior end brown. Wing with a brown band distally across wing and a brown band more basally, from level of tip of R<sub>1</sub> to posterior margin on cell cua; cell r1 small, anterior margin of cell r1 1.2× length of R<sub>4</sub>; sc-r not sclerotized; Sc reaching C basal to origin of Rs. Tergites 1–2 brown medially

with large cream-yellowish lateral bands, tergite 3–4 brown with a slender cream-yellow band on lateral margin, tergite 5–6 brown, tergite 7 yellowish. Syngonocoxite with a medio-posterior projection bearing a pair of strongly sclerotized arms, bare, with rounded, short lateral lobes; gonostylus displaced medially, long, dorsoventrally compressed, slender towards apex; parameres with a pair of short digitiform distal projections; tergite 9 with a pair of long slightly curved projections widening towards apex as a valve.

**Description. Male.** Wing length, 2.30, width, 0.85. **Head.** Light ochre-brown at vertex, more ochre-yellow towards frons and ventral margin of occiput, ocelli a blackish background. Antennal scape and pedicel cream-yellow, flagellum whitish-yellow. Face cream-yellow, clypeus light brown. Maxillary palpus dark greyish-brown, labella small, ochre-yellowish. Setae anterior to ocelli on frons. Antennal scape as long as pedicel, flagellomere 1 2.0× longer than flagellomere 2, flagellomere 4 1.2 wider than long. Palpomere 4 0.8× palpomere 3 length, palpomere 5 2.0× palpomere 4 length. **Thorax.** Scutum dark ochre-yellow, more brownish towards posterior end; scutellum brownish. Pleural sclerites cream-yellow with an orangish tinge, laterotergite brown on dorso-posterior corner, mediotergite brownish dorsally, more yellowish-brown on ventral half. Scutum with one pair of medial pre-scutellar bristles and one pair on lateroposterior corner; one pair of scutellar bristles. Antepronotum with two strong bristles and some additional smaller setae, proepisternum with one bristle and three smaller setae. **Legs.** Coxae whitish with orangish tinge; femora ochre-yellow, hind femur darker; tibiae and tarsi light greyish-brown. Hind leg tibial inner spurs 3.0× tibia width at apex. Fore leg tarsomere 1 0.81× tibia length, 1.7× tarsomere 2 length. **Wing** (Fig. E8B). Membrane background light greyish, with a dark brown mark across distal third of wing (lighter on cell m<sub>2</sub>) and a dark brown band at level of tip of Sc to level of distal end cubital pseudovein. Sc complete, reaching C slightly basal to origin of Rs, sc-r not clear (even under phase contrast); anterior margin of cell r<sub>1</sub> 1.2× length of first sector of Rs. False medial vein conspicuous, slightly sclerotized. Medial fork not wide open, M<sub>2</sub> short. Origin of M<sub>4</sub> before level of base of M<sub>1+2</sub>, M<sub>4</sub> slightly sinuous on distal half. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, second sector of Rs, anterior end of r-m and on distal fourth of M<sub>1</sub>; Sc, sc-r, first sector of Rs, R<sub>4</sub>, anterior half of r-m, bM, M<sub>1+2</sub>, M<sub>2</sub>, M<sub>4</sub>, distal half of first sector and CuA entirely devoid of setation; no macrotrichia on wing membrane. **Abdomen.** Tergites 1–2 brown medially with large cream-yellow lateral bands, tergite 3 brown with a slender cream-yellow band on lateral margin, tergite 4 brown laterally and along posterior margin with a large cream-yellow area, tergites 5–6 brown, tergite 7

yellowish. Sternites 1–7 cream-yellow, sternite 6 and in some individuals sternite 5 with brown latero-anterior corner. **Terminalia** (Fig. E8C). Mostly ochre-yellow. Gonocoxites fused medially on anterior end of terminalia, entirely bare, a pair of elongate, strongly sclerotized medio-posterior projections connected to aedeagus, and a pair of short laterodistal lobes curved along to distal margin, ventrally to tergite 9 lateral projections, lobes extending to almost mid of gonostylus. Gonostylus displaced to a more medial position, elongate, slender towards apex, covered ventrally with microtrichia and long setae. Gonocoxal bridge wide, no clear apodemes. Aedeagus with a strongly sclerotized anterior portion, with a medial ejaculatory apodeme directed anteriorly, weakly sclerotized on distal two-thirds, a pair of valves touching medially with a medial sclerotized suture, extending to level of tip of gonostylus, curved at distal end. Parameres with a pair of well-developed anterior apodemes, latero-distally with a pair of short digitiform projections with setae, medially with a membrane projection distally curved reaching slightly beyond tip of aedeagus. Tergite 9 with a slender median sclerite extending latero-posteriorly into a pair of long projections widening to apex and slightly curved as a valve, with setae along entire external face, distally bifid, dorsal end at apex with a hook-like projection, ventral end slightly capitate. Sternite 10 just dorsally to paramere, with a pair of short lobes densely covered with microtrichia and with setae close to tip. Cerci lobo-se, slightly elongate, not reaching level of tip of sternite 10, with microtrichia and fine setae, longer setae distally.

**Female** (Fig. E8A). As male, except for the following. **Wing**. Length, 2.20–2.43; width, 0.82–0.85 (n=2). **Abdomen**. Tergites 1–6 entirely brown, anterior segments lighter.

**Terminalia** (Fig. E8D). Sternite 8 longer than wide, posterior margin with a V-shaped medial incision separating a pair of pointed lobes, anterior three-fourths of sclerite only with macrotrichia, setae on distal fourth, lobes with longer and stronger setae, laterally midway to apex a short projection with 3–4 long setae directed dorsally. Sternite 9 wide, well sclerotized, anterior end with a pair of rounded lobes separated by a short medial incision, laterally with a pair of large arms, medially well sclerotized with a pair of winglets directed dorsally, distally with a pair of pointed, slender valves that open to a weakly sclerotized genital chamber with a rounded opening distally. Tergite 8 more slender on anterior end, wider medially, bare, with a wide and shallow medial depression along posterior margin. Tergite 9 wide, each lateral end with a pair long of digitiform projections, medially with two separate lobes close to each other, each with two short digitiform distal projections bearing a long seta at tip. Tergite 10 weakly sclerotized, U-shaped, densely covered with macrotrichia and setae, subapically on lateroventral extension a group of 3–4 long setae directed ventrally.

Cercomere 1 elongate, wide at base and slender distally; cercomere 2 small, slender at base and widening to apex, rounded distally, both densely covered with microtrichia and short setae, cercomere 1 about twice cercomere 2 length.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000747>)

**Material examined.** **Holotype:** male, ZRC\_BDP0048987, Nee Soon (NS2), 11-17.December.2014, MIP leg. (slide-mounted). **Paratypes:** 7 females, ZRC\_BDP0047068, National University of Singapore (Icube), 25.June-01.July.2015, MIP leg. (slide-mounted); ZRC\_BDP0048495, Nee Soon (NS1), swamp forest, 06-12.December.2012, MIP leg. (slide-mounted); ZRC\_BDP0048883, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048949, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0048989, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049105, Nee Soon (NS1), 18-24.December.2014, MIP leg. ZRC\_BDP0072724, Bukit Timah, old secondary forest (BT01), 02-08.December.2016, MIP leg. (slide-mounted).

**Etymology.** The specific epithet of this species refers to the name given in the second century by Ptolemy [90–168 A.D.] to a place at the Southern tip of the Golden Chersonese [= the Malay Peninsula], assumed to be Singapore. The noun is used in apposition.

**Remarks.** Females have darker abdomen, nearly without any cream-yellow areas. Two of the females have the sclerotized areas of sternite 9 have slightly different shape. They both belong to the same cluster and they diverge only on 1.6%. We have specimens sequenced from the Bukit Timah tropical forest and the Nee Soon swamp forest, as well as from the campus of the National University of Singapore.

### *Neoempheria* sp. A (= *Neoempheria* sp.nov. 8)

(Figs. E9A–D)

**Description. Female** (Fig. E9A). Wing length, 2.23; width, 0.79. **Head** (Fig. E9B). Ochre-brown at vertex, cream-yellow towards frons and ventral margin of occiput. Face and clypeus cream-yellow. Antennal scape and pedicel cream-yellow, flagellum whitish-yellow. Palpomeres dark greyish-brown, last palpomere lighter. Labella whitish-yellowish. Scape 1.0× pedicel length, flagellomere 1 1.4× flagellomere 2 length, flagellomere 4 1.0× longer than wide. Palpomere 4 1.0× palpomere 3 length, palpomere 5 1.8× palpomere 4 length.

**Thorax.** Scutum ochre-yellow, more brownish towards posterior end, scutellum ochre-yellow. Pleural sclerites cream-yellow except for brown laterotergite and dark brown mediotergite on dorsal half and yellowish-brown ventral half. Scutum with one pair of

prescutellar bristles on dorsocentral line, two pairs on lateroposterior corner; scutellum with two pairs of bristles and smaller setae spread over disc. Antepronotum with three larger bristles and one small bristle, besides smaller setae, proepisternum bare. **Legs.** Coxae whitish, anterior coxa with a yellowish tinge, femora ochre-yellow, hind femur more greyish-brown; tibiae and tarsi light greyish-brown. First tarsomeres of hind leg with a row of longer setae ventrally, all tarsomeres with a pair of distal ventral setae. Hind tibia inner spur  $3.1 \times$  tibia width at apex. Fore leg tarsomere 1  $0.9 \times$  tibia length,  $1.6 \times$  tarsomere 2 length. **Wing** (Fig. E9C). Membrane background light greyish, a dark brown mark across most of wing at level of R<sub>4</sub> to level of cubital pseudovein and a dark brown mark at distal third of wing, beginning at level of base of medial fork. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to tip of M<sub>1</sub>; Sc scarcely visible (with phase contrast), reaching C slightly beyond level of origin of Rs; sc-r very faint, separated from tip of Sc by about length of r-m; R<sub>4</sub> close to origin of Rs, anterior margin of cell r1  $1.2 \times$  length of first sector of Rs; first sector of Rs  $1.1 \times$  r-m length. False medial vein conspicuous, sclerotized, anterior end across r-m. M<sub>1+2</sub>  $3.5 \times$  r-m length; bM  $5.3 \times$  length of first sector of Rs. First sector of CuA  $1.3 \times$  longer than second sector. Medial fork not wide open, M<sub>2</sub> short. M<sub>4</sub> barely depressed on distal half. Cubital pseudovein sclerotized to level of origin of M<sub>4</sub>. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, second sector of Rs, anterior end of r-m and on distal third of M<sub>1</sub>, M<sub>4</sub>, distal half of first sector and entire second sector of CuA; Sc, sc-r, first sector of Rs, R<sub>4</sub>, anterior half of r-m, bM, M<sub>1+2</sub>, M<sub>2</sub>, basal half of first sector of CuA entirely devoid of setation; no macrotrichia on wing membrane. **Abdomen.** Tergite 1 whitish, tergites 2–6 brown, tergite 4 with cream-yellow lateroposterior corners, tergite 7 cream-yellow; tergite 7 rectangular, no digitiform lateral projections. Sternites 1–5 and 7 cream-yellow, sternites 6 cream-yellow with light brown lateral marks. **Terminalia** (Fig. E9D). Mostly cream-yellow, cerci slightly more brownish. Sternite 8 trapezoid, wide at base, medially at distal end a short medial incision separating a pair of pointed lobes, microtrichia and fine setae all over sclerite, lobes with stronger setae at tip, on inner face of lobes a group of spines directed dorsally. Sternite 9 wide at base, short, sclerotized genital chamber short, not reaching level of tip of sternite 8, genital opening largely developed, elongate, projecting well beyond tip of sternite 8 lobes, basally at each side with a lateral projection densely covered with teeth. Tergite 8 wide at anterior end, projecting ventrally at lateral ends, apparently bare and medially separated into two plates. Tergite 9 wider at posterior margin, covered with microtrichia but no setae. Tergite 10 slender, with three pairs of short digitiform projections along posterior

margin, each with a long fine seta. Cercomere 1 elongate, slender, tip on dorsal face projected beyond insertion of cercomere 2,  $3.0\times$  longer than cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000748>)

**Male.** Unknown.

**Material examined. Holotype:** female, ZRC\_BDP0048497, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg. (slide-mounted).

***Neoempheria sangabo* Amorim & Oliveira, sp.nov.**

(Figs. E10A–D)

**Diagnosis.** Head light brown, scutum ochre-yellowish, some areas with a light brown tinge; pleural sclerites whitish-yellow, mediotergite light brown, dorso-posterior end of laterotergite with a very light brown tinge. Tergites 1 brown, tergites 2 and 4 brown with a cream-yellow lateral band; tergites 3, 5–6 brown; tergite 7 yellowish; sternite 6 with brownish-yellow.

Wing with a brown band distally across wing and a brown band more basally, from level of cell r1 to posterior margin on cell cua. Cell r1 small, anterior margin of cell r1  $1.3\times$  length of R<sub>4</sub>; sc-r well before level of origin of Rs; Sc reaching C before mid of cell r1. Syngonocoxite with a medial sclerotized projection, gonocoxite with a blade-like lobe extending beyond insertion of gonostylus; gonostylus large, slender basally, dorsoventrally compressed, displaced medially; tergite 9 with a pair of long lateroposterior projections, distally trifid.

**Description. Male** (Fig. E10A). Wing length, 2.30; width, 0.85. **Head.** Light-brown at vertex, lighter towards frons and ventral margin of occiput. Antennal scape and pedicel ochre-yellow, flagellum light ochre-yellow. Face light brown, clypeus yellowish-brown. Maxillary palpus light brown, last palpomere lighter; labella yellowish-brown. Setae on frons anteriorly to line of ocelli and on occiput. Scape  $1.2\times$  longer than pedicel, flagellomere 1  $1.8\times$  longer than flagellomere 4, flagellomere 4  $1.1\times$  longer than wide. Palpomere 4  $0.8\times$  palpomere 3 length, palpomere 5  $1.8\times$  palpomere 4 length. **Thorax.** Scutum mostly ochre-yellow, light brown on anterior end, a pair of light brown bands outside dc on posterior half of scutum, scutellum ochre-yellow. Scutum with one pair of long prescutellar setae at dorsocentral line and one pair of small bristles on lateroposterior corners. Pleural sclerites whitish with an orangish tinge, antepronotum light brownish medially, laterotergite with a

diffuse brown area on dorso-posterior end, mediotergite light brown. Antepronotum with two bristles and additional smaller setae. **Legs.** Coxae whitish, mid and hind coxae with a light brown ring at tip; femora ochre-yellow, hind femur slightly darker; tibiae and tarsi light brown. Mid tibial inner spur  $3.3 \times$  longer than tibia width at apex [both hind leg femora, tibiae and tarsi missing]. Fore leg tarsomere 1 0.8 tibia length,  $1.8 \times$  tarsomere 2 length. **Wing** (Fig. E10B). Membrane background light greyish fumose, a dark brown band across wing from tip of Sc to base of second sector of CuA and a dark brown mark at distal third of wing, beginning at level of tip of R<sub>1</sub> extending to M<sub>2</sub>. C produced beyond tip of R<sub>5</sub> for about a third of distance to M<sub>1</sub>; Sc complete, reaching C at level of origin of Rs, sc-r not produced; first sector of Rs oblique, R<sub>4</sub> not far from base of r-m, also oblique, anterior margin of cell r1  $1.3 \times$  length of first sector of Rs; first sector of Rs  $1.0 \times$  r-m length. False medial vein conspicuous, sclerotized. M<sub>1+2</sub>  $4.5 \times$  r-m length; bM  $6.5 \times$  length of first sector of Rs. First sector of CuA  $1.5 \times$  longer than second sector. M<sub>4</sub> sinuous on distal half. Cubital pseudovein sclerotized to level of origin of M<sub>4</sub>, CuP barely sclerotized close to wing base. Wing margin not emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, second sector of Rs, and distal fifth of M<sub>1</sub> and M<sub>2</sub>; Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM, M<sub>4</sub>, CuA and CuP devoid of macrotrichia. **Abdomen.** Tergite 1 light brown, tergites 2–4 light brown medially with cream-yellow lateral bands, slender on tergites 3–4, tergite 5–6 light brown with a slender ochre-yellow band along anterior margin, tergite 7 ochre-yellowish. Sternites 1–7 cream-yellow, sternites 5–6 with a brownish tinge.

**Terminalia** (Figs. E10C–D). Cream-yellow, gonocoxal lateroposterior extensions light brownish. Gonocoxites fused medially, bare, syngonocoxite with a pair of lateral rounded lobes extending to level of middle of gonostylus. Gonostylus large, slender basally, dorsoventrally compressed, insertion displaced slightly towards middle, a short rounded lobe on dorsal face with two long distal setae, ventral face and margin covered with microtrichia and fine, elongate setae. Gonocoxal bridge wide, sub-medial apodeme directed anteriorly. Aedeagus and parameres hard to identify, weakly sclerotized. Tergite 9 with a slender medial stripe connecting a pair of long lateroposterior projections, with fine setae along external margin, distally trifid, outer projection shorter, ventral projection long and curved, dorsal projection digitiform, setose. Tergite 10 large, bare medially, extending latero-posteriorly into a pair of setose lobes. Cerci weakly sclerotized, lobose, covered with microtrichia and fine setae.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000796>)

**Etymology.** The specific epithet of this species refers to the Cantonese dialect transcription of Singapore, Xin Jia Po (新加坡). Cantonese is one of the largest Chinese dialect groups in Singapore. The noun is used in apposition.

**Material examined. Holotype:** male, ZRC\_BDP0047815, Nee Soon (NS1), swamp forest, 12–18.December.2013, MIP leg. (slide-mounted).

**Remarks.** This is one of the singletons in the genus, the holotype being collected in the swamp forest.

***Neoempheria shicheng* Amorim & Oliveira, sp.nov.**

(Figs. E11A–D)

**Diagnosis.** Head, scutum and scutellum light brown, yellowish area above wing; pleural sclerites whitish, mediotergite light brown, dorso-posterior end of laterotergite light brown. Tergites 1 light brown, tergites 2 and 4 with a brown medial longitudinal band, ochre-yellow laterally; tergites 3, 5–6 brown with a slender yellow band along anterior margin; tergite 7 yellowish; sternite 6–7 with brown lateral marks. Wing with a brown band distally across wing and a brown band more basally, from level of cell r1 to posterior margin on cell cu1. Cell r1 small, anterior margin of cell r1 1.6× length of R<sub>4</sub>; sc-r well before level of origin of Rs; Sc reaching C before mid of cell r1. Syngonocoxite with medio-posterior area strongly sclerotized; gonostylus dorsoventrally compressed; tergite 9 with a pair of long lateroposterior bifid projections, more ventral one extending beyond tip of cerci, a short digitiform lobe distally projected backwards bearing a long fine seta at tip.

**Description. Male** (Fig. E11A). Wing length, 2.26; width, 0.85. **Head.** Light-brown at vertex, with ochre-yellowish areas above antennae and on ventral half of occiput. Face whitish-yellow, clypeus ochre with dark brown mark laterally. Antennal scape and pedicel light ochre-yellow, flagellum dark ochre-yellow. Maxillary palpus light brown, last palpomere lighter. Labella light brown. Scape 1.0× pedicel length; flagellomere 1.7× longer than flagellomere 2, flagellomere 4 1.4× longer than wide. Palpomere 4 0.81× palpomere 3 length, palpomere 5 1.6× palpomere 4 length. **Thorax.** Scutum mostly light brown, an ochre-

yellowish band laterally on posterior half of scutum, medially brown; scutellum ochre-yellowish. Pleural sclerites whitish with an orangish tinge, antepronotum with a brown mark anteriorly, laterotergite with a light brown area at dorso-posterior end, mediotergite brown. Scutum with a pair of prescutellar bristles medially on dc and a pair of prescutellar bristles on lateroposterior corner, scutellum with one pair of bristles and one additional pair of small setae. Antepronotum with two bristles and additional small setae, proepisternum with one small bristle and some few setae. **Legs.** Coxae whitish; femora light ochre-yellow; tibiae and tarsi light brown. Mid tibia inner spur  $3.1 \times$  tibia width at apex [front and hind femora, tibiae and tarsi missing]. **Wing** (Fig. E11B). Membrane background light brown fumose, a dark brown band across wing from tip of Sc to base of second sector of CuA and a dark brown mark at tip of wing beginning at level of tip of  $R_1$  to  $M_2$ . C extending beyond tip of  $R_5$  for a third of distance to  $M_1$ . Sc complete, reaching C slightly beyond level of origin of Rs, sc-r barely sclerotized; first sector of Rs oblique,  $R_4$  not far from base of r-m, cell r1 short, anterior margin  $1.6 \times$  length of  $R_4$ ; first sector of Rs  $1.1 \times$  r-m length. False medial vein conspicuous, sclerotized.  $M_{1+2}$   $4.6 \times$  r-m length; bM  $6.5 \times$  length of first sector of Rs. First sector of CuA  $1.3 \times$  longer than second sector.  $M_4$  only gently depressed on distal half. Cubital pseudovein sclerotized to level of origin of  $M_4$ , CuP sclerotized only close to wing base. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR,  $R_1$ , second sector of Rs, and distal fourth of  $M_1$ ; Sc, sc-r, first sector of Rs,  $R_4$ , r-m, bM,  $M_2$ ,  $M_4$ , CuA and CuP devoid of macrotrichia. **Abdomen.** Tergite 1 brown, slender cream-yellow band laterally; tergites 2 and 4 brown medially with wide cream-yellow lateral bands, tergites 3, 5 and 6 brown, tergite 6 with a slender yellowish band along posterior margin, tergite 7 ochre-yellowish. Sternites 1–4 whitish-yellow, sternites 5–6 light brown with a yellowish band along posterior margin, sternite 7 ochre-yellowish. **Terminalia** (Fig. E11C). Ochre-yellow, with some more brownish sclerites. Gonocoxites fused medially, no suture of fusion, entirely bare, syngonocoxite with a strongly sclerotized medio-posterior projection bearing a pair of lateral arms. Gonostylus insertion displaced medially, dorsoventrally compressed, with microtrichia and long fine setae on ventral face. Gonocoxal bridge at an anterior, with a pair of large, triangular apodemes. Aedeagus not visible, no distal tubular extension. Parameres with two pairs of digitiform projections laterally on anterior half, each with some elongate setae distally, posteriorly with a wide rounded projection, a median sclerotized line. Tergite 9 with a slender medial connection between a pair of long lateroposterior projections extending beyond tip of cerci, on external face covered with elongate fine setae, distally bifid, dorsal branch shorter,

ventral branch elongate, curved inwards, distal end directed anteriorly with a seta at tip. Cerci in a quite posterior position, elongate, close to each other along medial line, densely covered with microtrichia and short setae.

**Female.** As male, except for the following. **Wing.** Length, 2.10; width, 0.79. **Terminalia** (Fig. E11D). Sternite 8 trapezoid, elongate, slender posteriorly, a medial incision separating two distal lobes entirely covered by microtrichia, fine setae on posterior third, lobes densely setose distally, a short projection with a distal seta on posterior third of lateral margin. Sternite 9 wide, no anterior medial apodeme, an incision instead separating a pair of lobes, two gonoducts. Sternite 10 with a large, transparent area between lateral bands with microtrichia and setae. Tergite 9 large, reaching base of cercomere 1, devoid of setae, only with microtrichia, a pair of sub-medial projections, each distally with three digitiform short extensions with a terminal seta. Tergite 10 slender, with a pair of lateral digitiform projections with a terminal seta. Cercome 1 with a wide base, tapering distally end, covered with microtrichia and fine setae, cercomere 2 elongate, about 0.5 length of cercomere 1.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000796>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047883, Nee Soon (NS2), swamp forest, 17-23.October.2013, MIP leg. (slide-mounted). **Paratypes:** 2 females, ZRC\_BDP0047906, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg. (slide-mounted); ZRC\_BDP0048257, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.

**Etymology.** The specific epithet of this species refers to Shi Cheng (獅城), a Mandarin local colloquial nickname for Singapore, meaning ‘Lion City’. The noun is used in apposition.

### *Neoempheria ujong* Amorim & Oliveira, sp.nov.

(Figs. E12A-D)

**Diagnosis.** Head and scutum ochre-yellowish, scutellum light brown; pleural sclerites whitish-yellow, mediotergite light brown, dorso-posterior end of laterotergite with a light brown tinge. Wing with a brown band across distal third of wing and a brown band more basally, from level of cell r1 to posterior margin on cell cua. Cell r1 small, anterior margin of cell r1  $1.4 \times$  length of R<sub>4</sub>; sc-r slightly before level of origin of Rs; Sc reaching C before mid of cell r1. Tergites 1 brown, tergites 2 and 4 brown with a cream-yellow lateral band; tergites 3, 5-6 brown; tergite 7 yellowish; sternite 6 with brownish-yellow. Gonocoxites entirely

bare, with a short rounded lobe extending to level of basal third of gonostylus, a medio-posterior extension; gonostylus displaced medially, large, ovoid, dorsoventrally compressed; parameres with a pair of digitiform lateral extensions posteriorly with some 3–4 fine setae at distal end. Tergite 9 with a pair of large bifid lobes, separated midway to apex, dorsal branch with tip curved inward.

**Description. Male** (Fig. E12A). Wing length, 2.10, width, 0.79. **Head.** Light ochre-brown. Antennal scape and pedicel whitish, flagellum whitish ochre-yellow. Face light brown, clypeus light brown. Maxillary palpus greyish-brown, last palpomere lighter, labella light brown. Two ocelli placed medially on vertex. Frons covered with microtrichia and setae. Scape  $1.0 \times$  pedicel length, flagellomere 1  $1.9 \times$  flagellomere 2 length, flagellomere 4  $1.3 \times$  longer than wide. Palpomere 4  $1.1 \times$  palpomere 3 length, palpomere 5  $1.5 \times$  palpomere 4 length. **Thorax.** Scutum ochre-yellowish, some areas slightly darker, scutellum light brown. Pleural sclerites light cream-yellow, a brown mark on antepronotum lobe anteriorly, laterotergite light brown at dorso-posterior end, mediotergite brown, lighter laterally. Halter light brown. Scutum with a prescutellar bristle medially on dorsocentral line, two pairs of prescutellar bristles on lateroposterior corners; scutellum with one pair of bristles, no additional small setae. Antepronotum with two bristles and some small setae, proepisternum with some small setae. **Legs.** Coxae whitish, femora ochre-yellow, hind femur darker, tibiae and tarsi light greyish-brown, light brown towards tip of tarsi. Fore leg tarsomere 1  $0.90 \times$  tibia length,  $1.9 \times$  tarsomere 2 length. Hind tibia inner spur  $2.9 \times$  tibia width at apex. **Wing** (Fig. E12B). Membrane with a brown band across wing at level of cell  $r_1$  and another band at distal third of wing beginning slightly beyond basal end of medial fork. C extending beyond tip of  $R_5$  for a fourth of distance to  $M_1$ ; Sc reaching C slightly beyond origin of  $Rs$ ,  $sc-r$  hardly visible (even under phase contrast),  $R_4$  present, inclined, cell  $r_1$  short, trapezoid, anterior margin of cell  $r_1$   $1.4 \times$  longer than length of  $R_4$ ; first sector of  $Rs$  as long as  $r-m$ . False medial vein present, sclerotized, slightly curved.  $M_{1+2}$   $3.5 \times$   $r-m$  length;  $bM$   $5.6 \times$  length of first sector of  $Rs$ . First sector of  $CuA$   $1.8 \times$  longer than second sector.  $M_4$  gently depressed on distal half. Cubital pseudovein sclerotized barely beyond level of origin of  $M_4$ ;  $CuP$  sclerotized only at very base of wing. No sign of anal fold. Wing margin gently emarginated at tip of  $CuA$ . No ventral macrotrichia on veins, dorsal macrotrichia on entire length of  $bR$ ,  $R_1$  and second sector of  $Rs$  and distal fourth of  $M_1$ ;  $Sc$ ,  $sc-r$ , first sector of  $Rs$ ,  $R_4$ ,  $r-m$ ,  $bM$ ,  $M_2$ ,  $M_4$  and  $CuP$  entirely devoid of macrotrichia. **Abdomen.** Tergites 1, 3, 5–6 light brown, tergite 3 with a slender cream-yellow band at laterals, tergites 2 and 4 light brown with a

wide cream-yellow mark laterally, tergite 7 brownish ochre-yellow. Sternites 1–3 whitish, sternites 4–5 cream-yellow, sternites 6–7 ochre-yellow with light brownish tinge. **Terminalia** (Figs. E12C–D). Light ochre-yellow. Gonocoxites fused, suture present medially on anterior half of syngonocoxite, entirely bare, laterally a short rounded posterior lobe, extending to level of basal third of gonostylus, medially extending into aedeagal sclerite. Gonostylus displaced medially, large, obovoid, compressed dorsoventrally, slightly pointed distally, covered with scattered microtrichia and fine setae on ventral face, a concentrated row of long setae along distal half of internal margin and some long setae on external margin on basal half. Gonocoxal bridge weakly sclerotized. Aedeagus with a strongly sclerotized sclerite medially, with a short anterior extension and a pair of lateral extensions and a distal extension. Parameres wide, a pair of digitiform lateral extensions posteriorly with some 3–4 fine setae at distal end. Tergite 9 with a pair of large lobes connected medially through a slender, weakly sclerotized band, each lobe bifid, separation midway to apex, dorsal branch an inverted L-shape with tip curved inward, more sclerotized, with some few fine setae, ventral branch longer, reaching level of tip of gonostylus, with a digitiform dorsal extension with a seta at tip directed inwards and a digitiform ventral extension with some setae at distal end. Sternite 10 wide, with a pair of short lobes laterally on distal margin bearing microtrichia and setae on both, ventral and dorsal faces. Tergite 10 membranous. Cerci weakly sclerotized, slightly elongate, with microtrichia and short setae

**Female.** Wing. Length, 2.07; width, 0.79. **Terminalia.** Sternite 8 weakly along anterior band, with latero-anterior extensions directed dorso-anteriorly articulating with latero-anterior arms of tergite 8, a subquadrate medial sclerite distally with a median short medial incision, covered with microtrichia, setae on distal third, especially along posterior margin. Sternite 9 wide, with a pair of plates laterally to genital chamber. Tergite 8 wide, bare. Tergite 9+10 rectangular, posterior margin with three pairs of elongate digitiform projections with a seta at tip, median pair close to middle, lateral two pairs extending laterally to cerci. Sternite 10 slender, with median transparent window, with microtrichia and setae along posterior margin. Cercomere 1 large, entirely covered with microtrichia, setae restricted to distal third of inner border, with a regular row of 9–10 elongate setae directed inwards, cercomere 2 slender basally, rounded distally.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000797>)

**Material examined. Holotype:** male, ZRC\_BDP0048904, Nee Soon (NS1), 25–31 December 2014, MIP leg. (slide-mounted). **Paratypes:** 1 male, 2 females. Male: ZRC\_BDP0049228, Nee Soon (NS1), 04–10 December 2014, MIP leg. Females: ZRC\_BDP0048978, Nee Soon (NS1), 07–13 May 2015, MIP leg. (slide-

mounted); ZRC\_BDP0049258, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0072698. Male, ZRC\_BDP0136953.

**Etymology.** The species epithet refers to Ujong (in Malay, “at the end”), used in Pulau Ujong. It is the indigenous Malay name for pre-colonial Singapore, meaning the island at the end [of the Malay Peninsula]. The noun is used in apposition.

**Remarks.** This species includes specimens from the swamp forest and from the Bukit Timah tropical forest. There are two haplotypes and no conflicts between delimitation approaches, despite considerable variation observed between male and female on abdominal tergite color.

***Neoempheria subaraji* Amorim & Oliveira, sp.nov.**

(Figs. E13A–D)

**Diagnosis.** Head, scutum and scutellum dark brown; pleural sclerites whitish, mediotergite dark brown, laterotergite with a light brown tinge at dorso-posterior end. Wing with a brown band on distal third of wing and a brown band more basally, from level of cell r1 to slightly over CuA. Cell r1 very small, R<sub>4</sub> originating at level of insertion of r-m, cell r1 triangular, anterior margin  $0.83 \times$  length of R<sub>4</sub>; sc-r reaching bR well basal to origin of Rs. Tergites 1–2 and 4 largely dark brown, with yellow marks laterally, larger on tergite 4; tergites 3, 5–6 dark brown with a slender yellow band along anterior margin; tergite 7 yellowish; sternite 6–7 with brown lateral marks. Gonocoxites bare, no lateroposterior projection beyond base of gonostylus, no medio-posterior process; gonostylus long, slender at base, dorsoventrally compressed; tergite 9 with a slender, bare band connecting a pair of long lateral projections gently curved inwards, with a group of 6–7 elongate spines.

**Description. Male** (Fig. E13A). Wing length, 2.33; width, 0.85. **Head.** Vertex, face, and clypeus brown. Antennal scape and pedicel ochre-yellowish, flagellum light ochre-yellow, brownish towards apex. Maxillary palpus brown, last palpomere lighter, labella brown. Ocellar setae present, well-developed, frons with setae. Scape  $1.1 \times$  pedicel length, flagellomere 1  $1.6 \times$  flagellomere 2 length, flagellomere 4  $1.2 \times$  longer than wide. Palpomere 4  $1.0 \times$  palpomere 3 length, palpomere 5  $1.4 \times$  palpomere 4 length. **Thorax.** Scutum dark ochre-yellow, brown on posterior half; scutellum brown. Pleural sclerites whitish except for a light

brown mark on dorso-posterior end of laterotergite, mediotergite brown. Halter light brown, knob darker. Scutum with a prescutellar bristle medially on dorsocentral line, one pair of prescutellar bristles on lateroposterior corner; scutellum with one pair of bristles, no additional small setae. Antepronotum with three bristles and some additional larger and smaller setae. **Legs.** Coxae whitish, hind coxa dark at tip; femora ochre-yellow, hind femur with a brown diffuse mark internally at basal half; tibia and tarsus light greyish-brown. Tarsomere 1 of front leg  $0.58 \times$  tibia length,  $1.9 \times$  tarsomere 2 length. Hind tibia inner spur  $2.9 \times$  longer than tibia width at apex. **Wing** (Fig. E13B). Membrane with a dark brown band across wing at level of tip of Sc and a wide band on distal third of wing, beginning slightly beyond basal end of medial fork. C extending beyond tip of  $R_5$  for a fourth of distance to  $M_1$ ; Sc complete, reaching C at level of origin of Rs, sc-r basally to origin of Rs for a distance smaller than length of anterior margin of cell r1,  $R_4$  present, more or less transverse, originating at level of r-m, anterior margin of cell r1 very small,  $2.1 \times$  length of  $R_4$ ; first sector of Rs  $1.4 \times$  r-m length. False medial vein present, slightly arched, not strongly sclerotized.  $M_{1+2}$   $5.2 \times$  r-m length; bM  $7.5 \times$  length of first sector of Rs. First sector of CuA  $1.5 \times$  longer than second sector.  $M_4$  not strongly diverging from CuA, straight on distal half. Cubital pseudovein weakly sclerotized, ending before level of origin of  $M_4$ ; CuP not sclerotized. Anal fold very faint. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR,  $R_1$  and second sector of Rs, distal fourth of  $M_1$  and tip of  $M_2$ . Sc, sc-r, first sector of Rs,  $R_4$ , r-m, bM,  $M_4$ , CuA and CuP entirely devoid of macrotrichia. **Abdomen.** Tergite 1 dark brown medially with whitish lateral bands, tergites 2 and 4 with a dark brown medial band, slender medially at posterior margin and yellowish lateral bands, tergites 3, 5–6 dark brown with a slender yellowish band along anterior margin, tergite 3 with additional small diffuse yellowish marks, tergite 7 yellow. Sternites 1–2 whitish, sternites 3–7 ochre-yellow. Tergite 7 with no projections on lateroposterior corners. **Terminalia** (Figs. E13C–D). Brownish-yellow. Gonocoxites fused medially, bare, no medial suture, no lateroposterior projection beyond base of gonostylus, no medio-posterior process. Gonostylus long, slender at base, dorsoventrally compressed, with setae on both faces. Gonocoaxal bridge with a pair of wide antero-lateral apodemes. Aedeagal plate wide with a median suture, gently rounded on posterior margin, not reaching level of tip of cerci. Parameres wide, posterior margin at level of tip of tergite 9, weakly sclerotized, a pair of digitiform projections laterally with 1–2 elongate setae at tip, reaching level of mid of gonostylus. Tergite 9 with a slender, bare band connecting a pair of long lateral projections almost reaching level of tip of gonostylus, gently curved inwards on distal half, with setae on

lateral face and a group of 6–7 elongate spines at distal end. Sternite 10 trapezoid, with more or less rounded posterior margin, reaching beyond tip of aedeagus, with microtrichia and fine setae. Cerci close to each other medially, slightly elongate, with microtrichia and fine setae.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000774>)

**Material examined. Holotype:** male, ZRC\_BDP0049198, Nee Soon (NS2), 07-13.May.2015, MIP leg. (slide-mounted).

**Etymology.** The species epithet honors Subraj Rajathurai (1963-2019), Veteran wildlife consultant and conservationist, who had a key role in drafting the masterplan for conservation of nature in Singapore.

***Neoempheria kokoyeae* Amorim & Oliveira, sp.nov.**

(Figs. E14A–D)

**Diagnosis.** Head ochre-yellowish with brownish tinge, scutum dark ochre-yellowish, scutellum light brown; pleural sclerites whitish-yellow, mediotergite brown, laterotergite dorso-posterior end light brown. Wing with a brown band on distal third across wing and a brown band more basally, from level of cell r1 to posterior margin on cell cua. Cell r1 small, anterior margin of cell r1  $1.2 \times$  length of R4; sc-r not sclerotized; Sc reaching C at level of origin of Rs. Tergite 1 dark brown medially, with large cream-yellow lateral band, tergite 2 dark brown with large cream-yellow latero-anterior marks, tergites 3–6 dark brown, tergite 7 ochre-yellowish with a brown band along posterior margin. Syngonocoxite with a short medio-posterior process, gonocoxite with a lateroventral projection extending beyond tip of gonostylus and a lateroposterior projection; gonostylus short, digitiform; tergite 9 with a pair of long projections with a hook-shaped distal end.

**Description. Male.** Wing length, 2.49; width, 0.95. **Head.** Light ochre-brown at vertex, lighter towards frons and on ventral half of occiput. Some few scattered short setae over frons and occiput. Ocellar setae present. Face light brown. Antennal scape and pedicel whitish-yellow, scape  $1.3 \times$  longer than pedicel, flagellum light ochre-yellow except for flagellomere 1 cream-yellow, flagellomere 1  $1.9 \times$  longer than flagellomere 2, flagellomere 4  $1.1 \times$  longer

than wide. Clypeus yellowish-brown, triangular, with scattered setae. Palpomeres brown, last palpomere light brown, palpomere 4 about as long as palpomere 3, a short distal projection over base of distal palpomere, palpomere 5  $1.4 \times$  palpomere 4 length. Labella small, brownish. **Thorax.** Scutum ochre-yellowish; a row of longer dc setae, some long supra-alars, two pairs of pre-scutellar bristles on lateroposterior corners of scutum, one pair of prescutellars medially on dorsocentral line. Scutellum light brown, with one pair of longer setae, no smaller setae on disc. Pleural sclerites whitish with an orangish tinge, antepronotum with a brown mark anteriorly, laterotergite with a light brown mark at dorsal margin, mediotergite brown. Antepronotum with one strong bristle and smaller setae of different sizes. Halter light brown. **Legs.** Coxae whitish, mid and hind coxae with a light brown ring at tip; femora ochre-yellow, fore coxa lighter; tibiae and tarsi light greyish-brown. **Wing** (Fig. E14B). Membrane background light greyish fumose, a dark brown band across wing at level of origin of Rs and a dark brown band across distal third of wing beginning slightly beyond level of base of medial fork. Sc complete, reaching C at level of origin of Rs, sc-r not distinguishable; cell r1 short, anterior margin  $1.2 \times$  length of first sector of Rs. False medial vein conspicuous, sclerotized, with a bend on basal third. Medial fork wide open, M<sub>2</sub> short. M<sub>1+2</sub>  $4.0 \times$  r-m length; bM  $6.4 \times$  length of first sector of Rs. First sector of CuA  $1.8 \times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein sclerotized, ending at first third of second sector of CuA; CuP short, limited to level of first third of first sector of CuA. Anal fold faint. Wing margin slightly emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, and second sector of Rs, and on distal third of M<sub>1</sub>. **Abdomen.** Tergite 1–2 and 4 cream-yellow with a medial brown band, tergite 3 and 5–6 brown, tergite 7 ochre-yellowish. Sternites 1–6 cream-yellow, sternite 5–6 with a slender lateral light brown band, sternite 7 ochre-yellow. **Terminalia** (Figs. E14C–D). Ochre-yellow, cerci lighter. Gonocoxites fused medially, a short medio-posterior sclerotized process, a pair of lateroventral projections extending beyond tip of gonostylus, no setae on ventral face, lateroposterior projections with microtrichia and elongate setae. Gonostylus short, digitiform, mostly bare except for four fine setae distally. Aedeagus subquadrate, wide, posterior margin reaching almost level of tip of gonocoxite lobes. Parameres weakly sclerotized. Tergite 9 with a slender anterior blade medially connecting a pair of long projections bearing a hook-shaped distal curve. Sternite 10 weakly sclerotized, subquadrate, with a pair of short laterodistal lobes, covered with microtrichia and fine setae. Cerci small, close together, weakly sclerotized lobes, with microtrichia and fine setae.

**Female** (Fig. E14A). As male, except for the following. **Wing.** Length, 2.62; width, 0.98.

**Terminalia.** Ochre-yellowish, cerci lighter. Sternite 8 wide anteriorly, with a pair of weakly sclerotized distal lobes with a medial incision. Sternite 9 wide, complex, without a furca at anterior end. Tergite 8 wide, slightly projected medially covered with microtrichia, but no setae. Tergite 9 wide, short, with a row of elongate setae. Tergite 10 slender, a group of short protuberances each with a seta at tip, a pair of digitiform lobes, inner pair each with two setae, outer pair each with a single seta. Sternite 10 with a pair of short lateral lobes on posterior margin, transparent window wide midway to apex. Cerci laterally compressed, cercomere 1 1.4× longer than cercomere 2, both covered with microtrichia and short setae, distal cercomere clavate.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000770>)

**Material examined.** **Holotype:** male, ZRC\_BDP0048489, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg. (slide-mounted). **Paratypes:** 2 females, ZRC\_BDP0049205, Nee Soon (NS1), 04-10.December.2014, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0049263, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Additional sequenced specimens.** ZRC\_BDP0154818.

**Etymology.** The species epithet honors Mdm KOK Oi Yee (1942-), a veteran naturalist who was one of Singapore's first women nature guides and first female biology lab technician in the National University of Singapore. She is also an Honorary Museum Associate of the Lee Kong Chian Natural History Museum.

**Remarks.** This species has specimens known from both, Bukit Timah and Nee Soon forests.

### ***Neoempheria* sp. G (= *Neoempheria* sp.nov. 34)**

(Figs. E15A–D)

**Description. Female.** Wing length, 2.36; width, 0.72. **Head** (Fig. E15A). Brown, lighter on occiput, face and clypeus light brown. Face and clypeus with scattered small setae and microtrichia, some setae laterally on frons anteriorly to ocelli. Post-ocellar setae present. Antennal scape and pedicel yellowish-brown, scape as long as pedicel, flagellum ochre-yellow, flagellomere 1 2.0× longer than flagellomere 2, flagellomere 4 1.3× longer than wide. Palpomeres dark brown, last palpomere lighter, palpomere 4 about 0.85× palpomere 3 length, a short distal projection over base of palpomere 5, distal palpomere 2.0× palpomere 4 length.

Labella small, brownish. **Thorax.** Scutum homogenously brown; a row of longer dc setae, some long supra-alars, two pairs of pre-scutellar bristles on lateroposterior corners of scutum, one pair of prescutellars medially on dorsocentral line. Scutellum brown, with one pair of longer setae, no smaller setae on disc. Antepronotum, proepisternum, proepimeron, anepisternum, katepisternum, mesepimeron and metepisternum whitish, katepisternum, mesepimeron, laterotergite and mediotergite light brown. Antepronotum with two stronger bristles and smaller setae of different sizes. Halter yellowish-brown. **Legs.** Coxa whitish, mid and hind coxae with a brownish mark distally; anterior and mid femora ochre-yellowish, hind femur brownish-yellow; tibiae and tarsi yellowish-brown, anterior tarsus lighter. Hind tibial spurs  $2.7\times$  length of tibia at apex. **Wing** (Figs. E15B–C). Membrane with light greyish-brown background, a brown band across wing at level of tip of Sc and a large brown mark at distal third of the wing, beginning at level of  $M_{1+2}$  fork. C extending beyond tip of  $R_5$  for a fifth of distance to  $M_1$ . Sc complete, reaching C slightly beyond level of origin of Rs; sc-r present, reaching bR slightly more basally than level of origin of Rs; cell r1 short, anterior margin  $1.4\times$  length of R<sub>4</sub>. False medial vein present, not strongly sclerotized, gently sinuose on basal fourth. Medial fork not wide open.  $M_{1+2}$   $4.9\times$  r-m length; bM  $6.8\times$  r-m length. First sector of CuA  $1.6\times$  longer than second sector. M<sub>4</sub> very gently depressed on distal half. Cubital pseudovein weakly sclerotized, not even reaching level of origin of M<sub>4</sub>; CuP barely sclerotized. Anal fold faint. Wing margin slightly emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub>, and second sector of Rs, and distal fifth of M<sub>1</sub>. **Abdomen.** Tergites 1–7 light brown. Sternites 1–4 and 7 ochre-yellow, sternites 5–6 light brown. **Terminalia** (Fig. E15D). Ochre-yellow. Sternite 8 wide, with a pair of triangular distal projections separated by a wide V-shaped incision, a pair of smaller sub-lobes on external margin of lobes, sclerite mostly bare on anterior two-thirds, microtrichia and setation on posterior lobes, distal setae stronger. Sternite 9 wide, with median projection on anterior end. Tergite 8 rectangular, bare. Tergite 9+10 slender, with three pairs of long digitiform projections each with a distal long seta, inner pair with a second, subdistal seta. Sternite 10 with a transparent window midway to apex, a pair of short digitiform lateral projections more basally with two distal long setae and a pair of flat distal lateral lobes. Cercomere 1 wide at basal half,  $2.0\times$  longer than cercomere 2, both covered with microtrichia and short setae.

**Male.** Unknown.

**Material examined.** Female, ZRC\_BDP0137178, Bukit Timah Forest (BT06), 9-May-17, MIP leg. (partially broken). **Additional sequenced specimens:** ZRC\_BDP0120502.

*Group ferruginea*

This group includes all species with large cell r4 and the typical five-banded pattern of the scutum. There are more than one male terminalia pattern among the species. As mentioned above, there are different groups of species with large cell r4 in Edwards' (1940) study of the Neotropical species of the *Neoempheria*, so maybe a wide study of the genus worldwide would split this group of species in smaller units.

***Neoempheria mandai* Amorim & Oliveira, sp.nov.**

(Figs. E16A–D)

**Diagnosis.** Scutum with five longitudinal brown stripes, a greyish brown line over dorsal half of mediotergite extending over dorsal third of laterotergite. Wing with a brown mark across distal third of wing, with marks over sc-r, first section of Rs, R4, and basally on cell br. Vein sc-r at basal third of cell r1; anterior margin of cell r1 about  $5\times$  length of R4. Abdominal tergites and sternites ochre-yellow, dark brown marks over most of tergite 3 and 5, as well as medially and along posterior margin on tergites 1, 2, 4, 6 and 7. Gonostylus large, with a row of strong spines along distal third of inner margin directed inwards; parameres with a pair of small lobes projecting beyond tip of gonostylus with a group of short spines directed inwards.

**Description. Male.** Wing length, 3.02; width, 1.11. **Head.** Light greyish-brown, with a pair of ochre-yellow bands running from behind ocelli towards base of antenna. Face yellowish, clypeus light brown. Antennal scape and pedicel ochre-brown, flagellum brown. Maxillary palpus dark brown, last palpomere lighter. Labella light greyish-brown. No setae on frons beyond line of ocelli. Flagellomere 4 slightly longer than flagellomere 4, flagellomere 4 1.5 wider than long. Maxillary palpomere 4 1.2 $\times$  palpomere 3 length, palpomere 5 1.9 $\times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background and five brown longitudinal stripes, a slender additional light brown band at latero-anterior corner; scutellum ochre-yellow. Pleural sclerites whitish-yellow, except for a light brown band dorsally on laterotergite extending over dorsal half of mediotergite. Two pairs of prescutellars, one of which on dc band, another on lateroposterior corner. Scutellum with one pair of bristles and

smaller setae spread over disc. Fine setae and bristles over antepronotum, proepisternum bare. Halter pedicel ochre-yellow, knob light brown. **Legs.** Coxae whitish-yellow, femora dark ochre-yellow, tibiae and tarsi light greyish-brown. Front coxa with scattered setae on anterior face and some few longer brown setae at distal end, mid coxa with some longer brown setae at distal end, hind coxa with a long row of greyish setae along most of its length. Anterior tibia with two setae dorso-laterally, mid tibia with two irregular dorsolateral rows of 6–8 setae, two lateral setae and two long irregular ventrolateral rows of 15–19 small bristles, hind tibia with a long dorsolateral row of 12 small bristles on outer face and a dorsolateral row of five small bristles on inner face. Fore leg tarsomere 1  $0.9 \times$  tibia length,  $1.5 \times$  tarsomere 2 length. **Wing** (Fig. E16B). Membrane background light greyish-brown, a dark brown over sc-r, first sector of Rs, R<sub>4</sub> and base of M<sub>4</sub>, a greyish-brown large maculae on distal third of wing beginning at base of medial fork, light brown mark of origin of M<sub>4</sub> towards posterior margin. C extending beyond tip of R<sub>5</sub> for a fifth of distance to M<sub>1</sub>. Sc complete, reaching C on anterior third of cell r1, setose at distal third until base of sc-r; sc-r close to origin of Rs. R<sub>1</sub> reaching C at distal fifth of wing. First sector of Rs  $2.5 \times$  r-m length. R<sub>4</sub> present, transverse, length of cell r1 at anterior margin  $5.0 \times$  length of R<sub>4</sub>. R<sub>5</sub> reaching C at level of tip of M<sub>1</sub>, gently curved at distal half. False medial vein conspicuous, sclerotized. Length of M<sub>1+2</sub>  $5.4 \times$  r-m length; M<sub>1</sub> and M<sub>2</sub> gradually diverging; bM  $4.6 \times$  length of first sector of Rs. M<sub>4</sub> gently sinuous on distal half, origin basal to anterior end of M<sub>1+2</sub>. First sector of CuA only slightly longer than second sector. CuP produced to mid of second half of CuA, gentle sign of sclerotized anal fold. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc (except on tip), entire length of bR, R<sub>1</sub> and second sector of Rs, on entire length of M<sub>1</sub>, distal third of M<sub>2</sub> and M<sub>4</sub>, and distal half of first sector of CuA and entire second sector of CuA; sc-r, basal two-thirds of Sc, first sector of Rs, r-m, bM, M<sub>1+2</sub> and CuP devoid of setation; membrane entirely devoid of setae. **Abdomen.** Tergites with light ochre-yellow background color, tergites 1–2 with medial brown longitudinal mark, tergites 3–4 and 6–7 with medial brown mark and a slender lateral band, tergite 5 mostly brown with antero-lateral corners light ochre-yellow. Sternites 1–4 whitish-yellow, sternites 5–7 more yellowish.

**Terminalia** (Fig. E16C). Whitish-yellow. Gonocoxites fused extensively along medial line, suture of fusion evident, syngonocoxite entire ventral face bare, a short and wide medioventral projection of posterior margin that extends towards aedeagus, no laterodistal projection beyond base of gonostylus, dorsal border of gonocoxites separated from each other. Gonostylus large, longer than length of gonocoxites, setose on external face, a long sequence of spines along ventro-distal margin directed inwards, distal two spines much

stronger, a latero-dorsal setose sublobe. Gonocoxal bridge not visible. Aedeagus anteriorly with a median ejaculatory apodeme, medially a sclerotized inverted T, distally a medial plate with denticles. Parameres anteriorly with a pair of long lateral apodemes, latero-distally with a pair of triangular lobes with a concentration of strong spines distally on inner margin, a pointed triangle medially on distal margin. Tergite 9 apparently divided into a pair of rhomboid plates that touch each other medially, distal external margin with a sequence of setae, distal setae very long. Cerci not detected.

**Female** (Fig. E16A). As males, except for the following. **Wing**. Length, 3.70; width, 1.31.

**Terminalia** (Fig. E16D). Sternite 8 with a single medial posterior subquadrate lobe, mostly with microtrichia, with setae along lateral margins and on ventral and dorsal faces on distal third, three long strong setae on each laterodistal corner. Sternite 10 with setae along distal margin and some shorter setae directed ventrally on ventral face. Tergite 8 wide, entirely bare. Tergite 9+10 with microtrichia and setae along posterior margin, much longer on lateroposterior corners. Cercomere 1 wide, long, cercomere 2 more or less rounded, both with dense microtrichia and short setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-00771, and -000740>)

**Material examined. Holotype:** male, ZRC\_BDP0048968, Nee Soon (NS1), 09-15.April.2015, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 11 females, ZRC\_BDP0047780, Nee Soon (NS1), swamp forest, 22-28.August.2013, MIP leg.; ZRC\_BDP0047854, Nee Soon (NS1), swamp forest, 03-09.May.2013, MIP leg.; ZRC\_BDP0047911, Nee Soon (NS1), swamp forest, 15-21.August.2013, MIP leg.; ZRC\_BDP0047913, Nee Soon (NS1), swamp forest, 15-21.August.2013, MIP leg.; ZRC\_BDP0047914, Nee Soon (NS1), swamp forest, 15-21.August.2013, MIP leg.; ZRC\_BDP0047915, Nee Soon (NS1), swamp forest, 15-21.August.2013, MIP leg.; ZRC\_BDP0048069, Nee Soon (NS1), swamp forest, 06-12.June.2013, MIP leg.; ZRC\_BDP0048474, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048476, Nee Soon (NS1), swamp forest, 12-18.April.2012, MIP leg.; ZRC\_BDP0048478, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0048962, Nee Soon (NS1), 09-15.April.2015, MIP leg. (slide-mounted). **Additional sequenced specimens:** female, ZRC\_BDP0133973; female, ZRC\_BDP0134015; female, ZRC\_BDP0134058.

**Etymology.** The specific epithet of this species refers to a river (in the Franklin and Jackson's 1828 Plan of Singapore) as well as a hill (Bukit Mandai) in the northern part of Singapore. It is now a planning area in Singapore. The name is said to come from the Malay tree called pokok Mandai, but others suggest it might be a corruption of mandi (meaning "bathe" in Malay), as the river could have been used for this purpose. The noun is used in apposition.

**Remarks.** This species belongs to the group *ferruginea* of *Neoempheria*. There are eight haplotypes for *Neoempheria mandai*, sp.nov. The fusion point for ZRC\_BDP0047780 and ZRC\_BDP0048962, among the haplotypes, is at 4.15%, which is quite large. On the

mitogenome tree, however, they are in the same clade and the branch lengths between the two clusters are smaller than the case, e.g., of the *Allactoneura* clusters that we see as separate species. PTP would also put them into separate species. Morphology suggests that it correspond to another case of two genetic signatures.

***Neoempheria malacca* Amorim & Oliveira, sp.nov.**

(Figs. E18A–C, E19A-D)

**Diagnosis.** Scutum with five longitudinal brown stripes. Wing with diffuse brown marks, especially over distal end of radial sector—but no dark bands across the wing; sc-r at basal third of cell r1; cell r1 long, anterior margin of over  $6\times$  length of R<sub>4</sub>. Abdominal tergites 3–6 ochre-yellow, with dark brown longitudinal marks along lateral margins. Gonocoxite with a large dorsal lobe extending to beyond tip of gonostylus; gonostylus long, petiolate, slightly wider at distal end, setae present only at distal third; aedeagus wide, mostly cylindrical on distal half; tergite 9 with a pair of large lobes projecting posteriorly, close to each other, covered with strong setae on ventral face directed inwards.

**Description (Fig. E18A).** **Male.** Wing length, 4.59, width, 1.64. **Head.** Light ochre-yellow background, with a light brown band over vertex. Antennal scape and pedicel light brown, flagellum brown. Face light brown, clypeus light ochre-yellowish, triangular, with scattered setae. Maxillary palpus brown, labella light yellowish-brown. Head elongate antero-posteriorly. Eyes small, rounded, covered with inter-ommatidial setulae. Two ocelli placed medially on vertex at posterior end of frontal furrow, each ocellus over a black background; post-ocellar setae present. Frons bare, occiput with longer setae posteriorly to eye, small setae dorsally on occiput. Distal end of antennal scape ventrally with short lobe-like extension, setulae around distal margin ventrally, dorsally with elongate setae; pedicel with setulae around distal margin, some setae and one long seta dorsally; scape  $1.6\times$  pedicel length; flagellomere 4  $1.2\times$  wider than long. Face slender, bare, latero-dorsal ends slightly extended. Clypeus triangular, slightly bulging, projected ventrally beyond insertion of palpus, with scattered fine setae. Palpomere 1 not produced; palpomere 2 with small setae ventro-distally; palpomere 3 with conspicuous sensorial pit opening dorsally on proximal half, scattered setulae and dorso-apically with small setae; palpomere 4 with a short distal projection dorsally over base of palpomere 5, with some setulae and setae dorsally, palpomere 4  $1.4\times$

length of palpomere 3; palpomere 5 with annellation on most of its length, setulae and small setae on distal half, especially close to tip, palpomere 5  $1.3 \times$  palpomere 4 length. Labella small, extending backwards, with a pair of pseudotrachea, small setae along its length on distal half. **Thorax** (Fig. E19A). Scutum with ochre-yellow background and five brown longitudinal stripes; scutellum ochre-yellow with a couple of small brownish marks over separation with scutum. Pleural sclerites whitish-yellow, except for yellowish laterotergite, a light brown mark on antepronotum medially, cervical sclerite brown, a light brown medial mark over dorsal half of mediotergite. Haltere yellowish. Irregular rows of long brown setae on scutum along brown stripes, medial ochre-yellow stripes nearly bare, setae over ochre-yellow lateral bands, six fine bristles above anepisternum, a line of five brown supra-alar bristles; four pairs of prescutellars, two on dc rows, one sub-medially, one on lateroposterior corner. Scutellum short, one pair of bristles, smaller setae spread over disc. Bristles and smaller setae on antepronotum. Proepisternum subquadrate, bare, proepimeron elongate, directed almost ventrally. Anepisternum elongate from ventro-anterior to dorso-posterior ends, a large membranous area around anterior spiracle, anterior basalare bare, katepisternum subquadrate, rounded ventrally, bare. Mesepimeron wider dorso-posteriorly, ventral extension slender, reaching ventral margin of pleura. Laterotergite slightly bulging, placed obliquely, bare. Metepisternum slender, elongate antero-posteriorly, bare; metepimeron produced, small. Mediotergite gently curved on dorsal two-thirds. Haltere with small setae along pedicel and base of knob, extending distally at ventral face. **Legs.** Coxae yellowish, mid and hind coxae darker towards distal end. Femora dark ochre-yellowish; tibiae light greyish-brown, brown distally, tarsi brownish. Front coxa with setation on anterior face, some few longer, curved setae a distal end; mid coxa with an irregular row of setae medially along distal half and some larger setae on distal third of anterior face; hind coxa medially with a row of long setae and some smaller fine setae along most of length of lateral face. Femora with scattered short setae along entire length, a short row of longer brownish setae close to distal end ventrally. Tibiae and tarsi with regular lines of brownish trichia. Front tibia with additional scattered setae along most of its length, a stronger brown seta at tip; antero-apical depressed area on inner face of front tibia wide, lined with setulae. Mid and hind tibia with long rows of dorsal, lateral and ventral brown setae, a regular comb of elongate setae distally at inner face and some additional strong setae at tip. Tarsomeres 1–3 with regular rows of setae dorsally and at both lateral faces, all tarsomeres with a pair of distal ventral setae. Tibial spurs on mid and hind tibiae subequal in length, spur over  $2.9 \times$  longer than tibia width at apex. Tarsal claw with a strong ventral tooth medially and two additional small teeth more

basally. **Wing** (Fig. E18B). Membrane fumose light brown, lighter medially on distal wing cells, darker along most veins. C extending beyond tip of  $R_5$  for about a fifth of distance to  $M_1$ . Sc complete, reaching C before mid of cell r1, sc-r reaching  $R_1$  at basal third of cell r1, anterior margin of cell r1 over 5× longer than length of  $R_4$ . Origin of Rs before mid of wing, first sector of Rs oblique, long, twice length of r-m, bare;  $R_1$  reaching C on distal tenth of wing;  $R_4$  present, beyond level of medial fork, more or less transverse;  $R_5$  reaching C at level of tip of  $M_1$ . False medial vein inconspicuous, not sclerotized. Posterior veins sclerotized to slightly before wing margin.  $M_1$  and  $M_2$  gradually diverging,  $M_{1+2}$  about 5× r-m length; bM long, 6.5× length of first sector of Rs.  $M_4$  with a discrete sinuosity on distal half, first sector of CuA 1.0× second sector. Cubital pseudovein long, sclerotized, extending to distal fourth of second sector of CuA. CuP produced to mid of second sector of CuA. No anal pseudovein produced. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc (except at distal end), entire length of bR,  $R_1$  and second sector of Rs, on entire length of  $M_1$ ,  $M_2$ ,  $M_4$  and CuA, and on basal fifth of CuP;  $R_4$ , first sector of Rs, r-m, bM,  $M_{1+2}$  devoid of setation; membrane entirely devoid of setae. **Abdomen**. Tergites basically ochre-yellow, tergite 1 with a faint medial brownish mark, tergites 2–5 with a medial brown mark on anterior and posterior margins, tergites 3–6 with a slender brown band along lateral margins. Sternites 1–7 ochre-yellow. **Terminalia** (Figs. E19B–D). Ochre-yellow. Gonocoxites fused medially along anterior end of terminalia, syngonocoxite entire ventral face bare, medio-posterior margin ventrally extending towards aedeagus, a laterodistal large setose lobe on each side extending to almost level of tip of gonostylus. Gonostylus simple, digitiform, slender, slightly capitate distally, bare along proximal two-thirds, setose on distal third, setae close to tip longer, slightly curved. Gonocoxal bridge extending distally and connecting both gonocoxites almost at level of tip of laterodistal projections, gonocoxal apodemes directed medially on anterior end. Aedeagus long, apodeme elongate, reaching anterior end of terminalia, wide and strongly sclerotized medially, with two pairs of lateral expansions with tips curved anteriorly, distal end tubular, wide, with opening at level of tip of gonostylus. Parameres present in a posterior position, dorsad to tip of aedeagus, crown-shaped, anterior end straight, laterals projecting distally. Tergite 9 displaced posteriorly, present as a pair of long, sclerotized lobes connected medially at anterior end, closer to each other at tip than midway to apex, with setae on dorsal face, ventral face densely covered with strong setae. Cerci small, lobose, covered with microtrichia and setae, placed ventrally to base of tergite 9.

**Female.** As males, except for the following. **Wing.** Length, 4.95; width, 1.70. **Terminalia** (Fig. E18D). Sternite 8 composed of a wide slender anterior sclerotized band, with a medial

subquadrate projection, medially along anterior margin a spongy pair of short lobes, some elongate fine setae medially at anterior end, two pairs of slender spines medially at posterior margin, some additional setae directed inwards. Sternite 9 with a vaginal furca strongly sclerotized subquadrate medial plate. Sternite 10 as a pair of digitiform lobes with long setae emerging distally. Tergite 8 wide, short, as a transverse band covered with microtrichia and entirely devoid of setae. Tergite 9+10 rectangular, connecting laterally to sternite 9 laterodistal arms, covered with microtrichia, bearing long setae along postero-lateral margin. Cercomere 1 wide, elongate,  $2.5 \times$  length of cercomere 2, densely covered with microtrichia and with small setae, distal border slightly beyond insertion of cercomere 2; cercomere 2 subspherical, with microtrichia and small setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-00791, and -00742>)

**Material examined. Holotype:** male, ZRC\_BDP0048303, Sungei Buloh (SB1), mangrove, 10-16.October.2013, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** male, ZRC\_BDP0279172, Singapore, 31.May.2018, MIP leg; male, ZRC\_BDP0278314, Singapore, 31.May.2018, MIP leg.; ZRC\_BDP0070102, Pulau Ubin (PU01), mangrove, 27.Jul.16, MIP leg.; ZRC\_BDP0041023, Singapore Botanical Gardens (CUGE), 20.Oct.2017, MIP leg.; male, ZRC\_BDP0278001, Singapore Botanical Gardens (CUGE), 20.Oct.17, MIP leg.; male, ZRC\_BDP0278438, National University of Singapore (SDE), 20.Dec.2017, MIP leg.; male, ZRC\_BDP0284205, Pulau Ubin (PU20), no date, MIP leg.; ZRC\_BDP0314193, Sungei Buloh (SB1), mangrove, 20.Mar.2013, MIP leg.; male, ZRC\_BDP0278351, Singapore Botanical Gardens (CUGE), 24.Nov.2017, MIP leg.; male, ZRC\_BDP0284286, Singapore, 03.May.2018.

**Material from probably non-conspecific subcluster:** female, ZRC\_BDP0048482, Nee Soon (NS2), swamp forest, 12-18.April.2012, MIP leg. (website photo specimen, slide-mounted); female, ZRC\_BDP0048942, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; female, ZRC\_BDP0069309, Pulau Ubin (PU01), mangrove, 11.May.2016, MIP leg.; female, ZRC\_BDP0154957, Nee Soon (NS1), swamp forest, 04.Mar.2015, MIP leg.

**Etymology.** The specific epithet of this species refers to the Strait of Malacca, a narrow stretch of water of 930 km in length, between the Malay Peninsula—with Singapore at its southern end—and the Indonesian island of Sumatra. The Strait of Malacca is historically an important maritime trade route between India and China. The noun is used in apposition.

**Remarks.** The cluster with the holotype of *Neoempheria malacca*, **sp.nov.** has a fusion point at 3.88% with another subcluster of which we have only females. If we had both clusters within a single species, OC 4–5% would agree only with the delimitation by ABGD=0.060; all other delimitation methods would suggest two species. We cannot check conspecificity of this second cluster based on morphology. It seems likely that they would correspond to a separate species and we do not include these specimens as paratypes. This species belongs to the group *ferruginea* of *Neoempheria* (see Sueyoshi 2014) and the male terminalia is similar to *N. proxima* Zaitzev and *N. subproxima* Zaitzev (Zaitzev 2001).

***Neoempheria sinkapho* Amorim & Oliveira, sp.nov.**

(Figs. E20A-D)

**Diagnosis.** Scutum with five longitudinal brown stripes, a brownish line over dorsal half of mediotergite extending on dorsal third of laterotergite. Wing with a brown mark across tip of wing and a second, less dark mark across wing between level of sc-r and anal lobe through level of origin of  $M_4$ , with an additional dark brown mark over  $R_4$ . C extending beyond tip of  $R_5$  for a fourth of distance to  $M_1$ ; sc-r at basal third of cell r1; anterior margin of cell r1 slightly less than  $3\times$  length of  $R_4$ . Abdominal tergites 1–2 and 7 cream-yellow with a caramel-brown transverse mark along posterior margin; tergites 3–4 and 6 cream-yellow with brown mark extending medially to the anterior margin and a slender brown mark along lateral margin; tergite 5 mostly caramel-brown with a large cream-yellow mark on latero-anterior corners. Gonocoxites with a dorsal setose extension reaching beyond tip of gonostylus; gonostylus small, flat, with a short outer lobe near tip; aedeagus with a medial crest with a row of spines; parameres with a line of short spines medially at posterior margin; tergite 9 with a pair of posterior setose lobes.

**Description. Male** (Fig. E20A). Wing length, 3.34; width, 1.31. **Head.** Ochre background, with a brownish band running from dorsal end of eye towards mid of vertex and a dark brown medial band above base of antennae. Face brownish, clypeus light brown. Antennal scape and pedicel brown, flagellum dark brown (Fig. E20B). Maxillary palpus brown, last palpomere lighter, labella whitish. No post-ocellar setae, no setae on frons anteriorly to line of ocelli. Scape  $1.4\times$  length of pedicel, flagellomere 1  $1.5\times$  flagellomere 2 length, flagellomere 4  $0.7\times$  longer than wide. Palpomere 4  $1.1\times$  palpomere 3 length, palpomere 5  $1.7\times$  palpomere 4 length. **Thorax.** Scutum ochre-yellow with a pair of brown stripes along dorsocentral lines, a slender light brown medial band, a band with tinge of brown along laterals; scutellum ochre-yellow with a brownish tinge medially. Pleural sclerites whitish with an orangish tinge, except for a brown mark anteriorly on antepronotum lobes, a brown mark on laterotergite dorso-posterior end and a brown band along dorsal half of mediotergite. Scutum with a pair of strong prescutellar setae on dorsocentral line and two pairs of stronger prescutellar setae on lateroposterior corner; one pair of scutellar strong setae, besides an irregular row of small setae more anteriorly. Antepronotum with one bristle and some other large and some small

setae, proepisternum bare. Halter pedicel ochre-yellow, knob light brown. **Legs.** Coxae whitish, front femur whitish-yellow, mid and hind femur ochre-yellow, tibiae and tarsi light greyish-brown. Hind tibia inner spur  $3.5\times$  longer than tibia width at apex. **Wing** (Fig. E20C). Membrane background light greyish-brown, with brown marks over sc-r, over first sector of Rs, of R<sub>4</sub>, over base of M<sub>4</sub>, a greyish-brown large maculae on distal third of wing, beginning at base of medial fork, and distally to second sector of CuA. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to M<sub>1</sub>. Sc complete, reaching C almost at mid of cell r1; R<sub>4</sub> present, transverse, far from origin of Rs, anterior margin of cell r1  $3.2\times$  length of R<sub>4</sub>; first sector of Rs  $1.0\times$  r-m length. False medial vein present, hardly sclerotized. M<sub>1+2</sub>  $3.3\times$  r-m length; bM  $7.7\times$  length of first sector of Rs. First sector of CuA  $0.90\times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein sclerotized to distal fourth of CuA; CuA unsclerotized at very tip; CuP sclerotized to basal third of second sector of CuA. Wing margin gently emarginated at tip of CuA. No macrotrichia on wing membrane, no ventral macrotrichia on veins, dorsal macrotrichia on distal three-fourth of Sc, entire length of bR, R<sub>1</sub>, second sector of Rs, M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub>, CuA; sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM, M<sub>2</sub>, M<sub>4</sub>, and CuP devoid of macrotrichia. **Abdomen.** Tergites with light ochre-yellow background color, tergites 1–2 with medial brown longitudinal mark, tergites 3–7 with medial brown mark that extends laterally on posterior margin and a slender lateral band, tergite 5 mostly brown with medial and lateral brown bands connected, only antero-lateral corners light ochre-yellow. Sternites 1–4 whitish-yellow, sternites 5–7 more yellowish. **Terminalia** (Fig. E20D). Whitish-yellow. Gonocoxites fused along a slender medial connection, no suture of fusion, short medio-posterior projection that extends dorsally, connecting to aedeagal sclerite, latero-posteriorly projecting only slightly beyond insertion of gonostylus. Gonostylus laterally at terminalia, a straight, bare inner lobe projecting posteriorly and a bifid outer lobe, ventral branch directed obliquely inwards with some short setae on distal half, dorsal branch directed posteriorly covered with setae on external face. Gonocoaxal bridge with a pair of long arms that project towards anterior end, a pair of apodemes anteriorly close to each other. Aedeagal sclerite with anterior end slender, widening mid-way to apex, a pair of sub-medial short lobes, a pair of longer slender lobes projected obliquely inwards reaching level of insertion of gonostylus. Paramere widening to posteriorly third, then with a slender distal projection ending with a dorsoventral crest with a sequence of short teeth. Tergite 9 with a pair of long lobes connected medially, each lobe long, slandering towards apex, projecting way beyond tip of gonostylus, covered with long setae on dorsal face, a distal strong curved seta at tip of

inner margin directed anteriorly. Sternite 10 triangular, with a group of five spines directed ventrally on distal end. Cerci slender, elongate.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-00788>)

**Material examined. Holotype:** male, ZRC\_BDP0047884, Nee Soon (NS2), swamp forest, 17-23.October.2013, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 2 males: ZRC\_BDP0048809, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048955, Nee Soon (NS1), 09-15.April.2015, MIP leg.

**Etymology.** The specific epithet of this species refers to the Chinese Hokkien dialect transcription of Singapore, Xin Jia Po [新加坡]. Hokkien is one of the largest Chinese dialect groups in Singapore. The noun is used in apposition.

**Remarks.** This is another species of the group *ferruginea* of *Neoempheria*, with specimens from the swamp forest. There are two haplotypes for *Neoempheria sinkapho*, sp.nov. which are separated into two species by only one of the algorithms.

***Neoempheria singapura* Amorim & Oliveira, sp.nov.**

(Figs. E21A–F)

**Diagnosis.** Scutum with five longitudinal brown stripes, a brownish line over dorsal half of mediotergite extending on dorsal third of laterotergite. Wing with brown mark across tip of wing and a second, not as strong mark across wing from level of sc-r to anal lobe at level of origin of  $M_4$ . C extending beyond  $R_5$  for about a fourth of distance to  $M_1$ ; sc-r at basal third of cell r1; anterior margin of cell r1 slightly less than  $4 \times$  length of  $R_4$ . Abdominal tergites 1–2 cream-yellow, with a caramel-brown longitudinal mark medially; tergites 3–4 and 6 mostly caramel-brown, with cream-yellow marks close to latero-anterior corner, and slender lateral brown band; tergite 5 mostly caramel-brown, with a small cream-yellow mark on latero-anterior corners; tergite 7 mostly cream-yellow with a small caramel-brown mark medially along posterior margin. Gonostylus large with small ventral digitiform lobe; aedeagus with a medial crest with a row of spines; parameres with a group of short spines at distal end medially; tergite 9 with a pair of distal rounded lobes, with a subapical spine directed inwards.

**Description. Male.** Wing length, 2.79; width, 1.08. **Head.** Light ochre-brown, lighter towards base of antenna, whitish at ventral half of occiput. Face ochre. Antennal scape and pedicel light brown, clypeus light brown. Maxillary palpus 2–3 dark brown, last two palpomeres light brown, labella light brown. No setae on frons anteriorly to line of ocelli, post-ocellar setae absent. Scape  $1.4 \times$  pedicel length, flagellomere 1  $1.3 \times$  flagellomere 2 length, flagellomere 4 as long as wide. Palpomere 4  $1.3 \times$  palpomere 3 length, palpomere 5  $1.5 \times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background and five brown longitudinal stripes, besides a slender light brown band along anterior margin; scutellum ochre-yellow. Pleural sclerites whitish, except for a brown mark on antepronotum internal margin anteriorly, a light brown band dorsally on laterotergite and a brown band at dorsal half of mediotergite. Halter pedicel ochre-yellow, knob light brown. Scutum with a pair of prescutellar bristles on dorsocentral line and two pairs of bristles on lateroposterior corners; scutellum with one pair of bristles, no smaller setae. Antepronotum with two bristles, one strong seta and some additional small setae. **Legs.** Coxae whitish, femora ochre-yellow, mid and hind femora darker, tibiae light greyish-brown, brown at tip, tarsi brownish. Hind tibia inner spurs  $3.5 \times$  longer than tibia width at apex. **Wing** (Fig. E21B). Membrane background light greyish-brown, with dark brown marks over sc-r, first sector of Rs, R<sub>4</sub> and base of M<sub>4</sub> and a greyish-brown large macula on distal third of wing, beginning at base of medial fork and diffuse light brown mark distally to second sector of CuA. C produced beyond tip of R<sub>5</sub> for about a fourth of distance to M<sub>1</sub>; Sc complete, reaching C slightly before mid of cell r1, sc-r sclerotized, reaching bR beyond level of origin of Rs. R<sub>1</sub> reaching C at distal fourth of wing; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>; R<sub>4</sub> present, transverse, far from base of Rs, cell r1 long, anterior margin of cell r1  $3.8 \times$  longer than R<sub>4</sub> length; first sector of Rs  $2.3 \times$  r-m length. False medial vein conspicuous, sclerotized; M<sub>1+2</sub>  $5.5 \times$  r-m length; bM  $4.5 \times$  length of first sector of Rs. First sector of CuA  $1.2 \times$  longer than second sector. M<sub>4</sub> not sinuose on distal half. Cubital pseudovein sclerotized to mid of second sector of CuA; CuP sclerotized to mid of second sector of CuA. Anal fold present. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc, entire length of bR, R<sub>1</sub> and second sector of Rs, most of M<sub>1</sub>, distal third of M<sub>2</sub> and M<sub>4</sub>, and distal third of first sector and entire second sector of CuA; sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergites 1–2 cream-yellow with medial light brown mark, on tergite 2 extending laterally along posterior margin, tergites 3–4 and 6 with light brown medial mark extending outwards on posterior margin to reach or almost reaching slender longitudinal light brown mark along lateral margin, tergite 5 light brown with cream-yellow

antero-lateral corner, tergite 7 mostly ochre-yellow with a light brown mark along posterior margin. Sternites 1–5 whitish-yellow, sternites 6–7 more yellowish. **Terminalia** (Figs. E21D–F). Light ochre-brown, wide open, digitiform light brownish gonapophysis 8 well separated from cerci. Gonocoxites fused medially, no suture, entirely bare, a medial extension on posterior margin that connects to a strongly sclerotized aedeagal sclerite inwards, no lateroposterior extension beyond insertion of gonostylus. Gonostylus placed laterally on terminalia, with a short digitiform ventral process basally directed inwards bearing fine setae concentrated at distal end and a large additional dorsad branch, wider midway to apex, covered with setae on most of external face, strong and concentrated setae midway to apex, and fine setae on inner margin at distal fourth. Gonocoxal bridge large, connected medially on anterior end. Aedeagus with anterior apodeme weakly sclerotized, a sclerotized structure with a pair of winglets midway to apex close to posterior margin of syngonocoxite medially and a distal trapezoid plate posteriorly, with a sclerotized median ridge and a crest at tip with a sequence of short spines, laterally a pair of elongate pointed projections almost reaching level of medial crest, dorsally to genital opening a weakly sclerotized area with microtrichia and setae at posterior margin. Parameres with a large plate distally with a pair of lateroposterior short projections with setae, and a medial curved projection with 16 spines directed ventrally. Tergite 9 present as a pair of long projections barely connected medially, each lobe dorsally with no microtrichia and a sequence of 3 long setae, a rounded lobe midway to apex with a strong spine directed inwards and a ventral-posterior rounded lobe extending beyond tip of cerci, with a concentration of short setae on dorsal face. Cerci elongate, weakly sclerotized, partially covered by tergite 9 posterior projections, with microtrichia and setae.

**Female** (Fig. E21A). As male, except for the following. **Wing**. Length, 2.75; width, 1.02.

**Terminalia** (Fig. E21F). Sternite 8 small, subquadrate, slightly elongate, covered with microtrichia and fine setae, two pairs of long setae on posterior margin. Sternite 9 with short medial projection at anterior end, a pair of lateral arms rounded anteriorly meeting medially, with a slender genital chamber. Tergite 8 wide, lateral ends projecting ventrally to almost reach sternite 8 plate, covered only with microtrichia, bare of setae. Sternite 10 large, trapezoid, weakly sclerotized, medially with a circular area covered by a transparent area with two pairs of setae. Tergite 9+10 slender medially, with long setae along posterior margin, connected laterally to sternite 10. Cercomere 1 elongate,  $2.6 \times$  length of cercomere 2, both covered with microtrichia and short setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-00830>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047796, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg. (slide-mounted). **Paratypes:** 6 males, 12 females. **Males:** ZRC\_BDP0047807, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg.; ZRC\_BDP0047944, Nee Soon (NS2), swamp forest, 14-20.November.2013, MIP leg.; ZRC\_BDP0048734, Nee Soon (NS2), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0048901, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048993, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049107, Nee Soon (NS1), 18-24.December.2014, MIP leg. **Females:** ZRC\_BDP0047802, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg.; ZRC\_BDP0047844, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg. (slide-mounted); ZRC\_BDP0047928, Nee Soon (NS1), swamp forest, 11-17.July.2013, MIP leg.; ZRC\_BDP0047930, Nee Soon (NS1), swamp forest, 11-17.July.2013, MIP leg. (website photo specimen); ZRC\_BDP0047935, Nee Soon (NS1), swamp forest, 11-17.April.2013, MIP leg.; ZRC\_BDP0048479, Nee Soon (NS2), swamp forest, 12-18.July.2012, MIP leg.; ZRC\_BDP0048692, Nee Soon (NS2), swamp forest, 26.April-02.May.2012, MIP leg.; ZRC\_BDP0048872, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048890, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049089, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049177, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0154903, Singapore, (date range 2012-2018), MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0154950; female, ZRC\_BDP0133978.

**Etymology.** The specific epithet of this species comes from the Malay (as the official language) name for Singapore. The noun is used in aposition.

**Remarks.** *Neoempheria singapura*, sp.nov. is one of the species of the group *ferruginea* of *Neoempheria*, most of the specimens from the swamp forest.

### ***Neoempheria* sp. C**

(Figs. E22A–C)

**Description. Female** (Fig. E22A). Wing length, 2.79; width, 1.02. **Head.** Vertex and occiput light brown. Face light brown, Clypeus light ochre-yellowish, clypeus light ochre-yellowish. Antennal scape and pedicel light brown, flagellum brown. Maxillary palpus brown, labella light brown. Scape  $1.5 \times$  pedicel length, flagellomere 1  $1.4 \times$  flagellomere 2 length, flagellomere 4  $1.0 \times$  longer than wide. Palpomere 4  $1.1 \times$  palpomere 3 length, palpomere 5  $2.1 \times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background and five brown longitudinal stripes; scutellum ochre-yellow. Pleural sclerites whitish, except for a light brown wide mark on antepronotum anteriorly, a brown cervical sclerite and a light brown mark medially on dorsal half of mediotergite. Halter whitish with light brown tinge. Scutum with a pair of prescutellar bristles at dorsocentral line and two pairs of bristles at lateroposterior corner; scutellum with one pair of bristles, no additional smaller setae. Antepronotum with one larger bristle, one smaller bristle, five long setae and some smaller

setae, proepisternum bare. **Legs.** Coxae whitish-yellow, femora ochre-yellow, tibiae light greyish-brown with brown tips, tarsi brown. Hind tibia inner spur  $3.0\times$  longer than tibia width at apex. Tarsomere 1 of front leg  $1.0\times$  tibia length,  $1.9\times$  tarsomere 2 length. **Wing** (Fig. E22B). Membrane with dark brown separate marks over sc-r, first sector of Rs, R<sub>4</sub> and along bM, and a wide brown band on distal third of wing beginning at level of base of medial fork. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to M<sub>1</sub>; Sc complete, reaching C at first fourth of cell r1, sc-r sclerotized, reaching R<sub>1</sub> slightly beyond level of origin of Rs. R<sub>1</sub> reaching C at distal fourth of wing; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>; R<sub>4</sub> present, transverse, far from base of Rs, cell r1 long, anterior margin of cell r1  $4.0\times$  longer than length of R<sub>4</sub>; first sector of Rs  $2.2\times$  r-m length. False medial vein conspicuous, sclerotized, curved on basal third. M<sub>1+2</sub>  $6.0\times$  r-m length; bM  $4.9\times$  length of first sector of Rs. First sector of CuA  $1.5\times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein sclerotized to beyond mid of second sector of CuA; CuP sclerotized to slightly beyond base of M<sub>4</sub>. Anal fold faint. Wing margin not emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, distal third of M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub>, distal fourth of first sector and entire second sector of CuA; sc-r, Sc, base of bR, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergites 1–4 and 6–7 light cream-yellow with medial brown mark that extends laterally along posterior margin on segments 2–4 and 6–7, tergites 3–6 with a slender brown band along lateral margin, tergite 5 mostly brown with a ochre-yellow mark laterally along anterior three-fourth. Tergite 7 with no digitiform projections. Sternites 1–4 whitish, sternites 5–7 more ochre-yellow with brownish tinge. **Terminalia** (Fig. E22C). Ochre-yellow, tip of gonapophysis 8 and cerci brown. Sternite 8 with a wide weakly sclerotized anterior area covered with microtrichia and no setae, and a small, subquadrate, slightly elongate plate, with a short medial V-shaped incision distally separating short pointed lobes, covered with microtrichia and fine setae, two pairs of long setae on posterior margin. Sternite 9 wide, weakly sclerotized. Tergite 8 wide, lateral ends projecting ventrally, covered only with microtrichia, bare of setae, anterior margin with a sclerotized band all along. Sternite 10 trapezoid, weakly sclerotized, medially with a circular area covered by a transparent window with two pairs of setae laterally. Tergite 9+10 slender, with long setae along posterior margin, connected laterally to sternite 10. Cercomeres 1 elongate, close to each other medially,  $1.4\times$  length of cercomere 2, both strongly sclerotized, covered with microtrichia and short setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-00777>)

**Material examined. Holotype:** female, ZRC\_BDP0048477, Nee Soon (NS2), swamp forest, 03-09.May.2012, MIP leg. (slide-mounted).

**Remarks.** A species of the *Neoempheria ferruginea* species group, our specimens with a single haplotype.

***Neoempheria xinjiapo* Amorim & Oliveira, sp.nov.**

(Figs. E23A–D, E24A–B)

**Diagnosis.** Scutum with five longitudinal brown stripes, a brownish line over dorsal half of mediotergite extending on dorsal third of laterotergite. Wing with a subapical brown band and a second band across wing at level of sc-r/first section of Rs and anal lobe at level of origin of  $M_4$ , dark brown mark over R4; sc-r at basal third of cell r1; anterior margin of cell r1 long, more than  $4 \times$  length of R4. Abdominal tergites 1–2 and 7 whitish with a caramel-brown transverse mark along posterior margin; tergites 3–4 and 6 with similar pattern but with brown mark extending medially to anterior margin and a slender brown mark along lateral margin; tergite 5 mostly caramel-brown with a large cream-yellow mark on latero-anterior corners—tergites 5–7 more yellowish than whitish background. Gonocoxite with a short, hook-like projection extending beyond base of gonostylus. Gonostylus at lateroposterior end of gonocoxite, digitiform, with fine setae. Aedeagal plate with two pairs of sclerotized short projection directed inwards. Parameres with a short digitiform lobe directed outwards and a lobe directed inwards with a strongly sclerotized tooth. Tergite 9 with a pair of digitiform lobes latero-distally bearing fine setulae and two small and one strong spines distally.

**Description. Male (Fig. E23A). Head (Fig. E23B).** Light brown, ochre-yellow posteriorly to vertex, more whitish towards ventral margin of occiput. Face light brown, clypeus light brown. Antennal scape and pedicel light brown, flagellum dark brown. Maxillary palpus brown, distal palpomere lighter, labella light brown. Ocellar setae present. Scape  $1.2 \times$  pedicel length, flagellomere  $1.5 \times$  flagellomere 2 length, flagellomere 4  $1.2 \times$  longer than wide. Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $2.0 \times$  palpomere 4 length. **Thorax.**

Scutum with ochre-yellow background with five brown longitudinal stripes plus a pair of slender brown marks laterally, scutellum ochre-yellow. Pleural sclerites whitish, except for a brown mark on antepronotum anteriorly, a brown mark across laterotergite dorso-posterior end and a brown mark across mediotergite dorsal half. Halter light brown. Scutellum with a pair of prescutellar bristles on dorsocentral line, two pairs of prescutellars on lateroposterior corners. Antepronotum with two larger bristles, one smaller bristles and some additional setae, proepisternum bare. **Legs.** Coxae whitish-yellow, femora ochre-yellow, tibiae light greyish-brown with brown tips, tarsi brown. Fore leg tarsomere 1  $0.90 \times$  tibia length,  $1.9 \times$  tarsomere 2 length. Hind tibia inner spur  $3.9 \times$  tibia width at apex. **Wing** (Fig. E23C).

Membrane with a dark brown band across wing at level of sc-r, a brown mark over R<sub>4</sub> and a brown band across wing at level of tip of R<sub>1</sub> not occupying entire distal end of wing. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to M<sub>1</sub>; Sc reaching C at level of basal third of cell r1; sc-r reaching R<sub>1</sub> at level of anterior end of r-m. R<sub>1</sub> reaching C at distal fifth of wing; R<sub>5</sub> reaching C at level of tip of M<sub>1</sub>; R<sub>4</sub> present, gently inclined, far from base of Rs, cell r1 trapezoid, long, anterior margin of cell r1  $4.2 \times$  longer than length of R<sub>4</sub>; first sector of Rs  $2.4 \times$  r-m length. False medial vein present, gently sclerotized. M<sub>1+2</sub>  $6.1 \times$  r-m length; bM  $12.0 \times$  length of first sector of Rs. First sector of CuA  $1.3 \times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein sclerotized to distal third of second sector of CuA; CuP sclerotized to basal third of second sector of CuA. Anal fold faint. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on a short sector of Sc basally to sc-r, entire length of bR, R<sub>1</sub> and second sector of Rs, most of M<sub>1</sub>, distal third of M<sub>2</sub> and M<sub>4</sub>, distal third of first sector of CuA and entire second sector of CuA; most Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia.

**Abdomen.** Tergites 1–2 whitish with a dark brown medial mark, tergites 3–4 cream-yellow with a medial brown mark and a pair of brown marks along laterals, tergite 5 dark brown with a pair of ochre-yellow marks on antero-lateral corners, tergite 6 ochre-yellow, with anterior and posterior medial brown marks and a thin lateral brown mark along lateral margin, tergite 7 ochre-yellow with a brown mark along posterior margin; tergite 7 with no ornamentation.

Sternites 1–4 whitish, sternites 5–7 more ochre-yellow. **Terminalia** (Figs. E24A–B).

Gonocoxites mesally fused on anterior end of terminalia, a suture clearly present, a short, hook-like projection extending slightly beyond base of gonostylus. Gonostylus at lateroposterior end of gonocoxite, digitiform, with fine setae along most of its length.

Aedeagal plate wide, rectangular, with two pairs of sclerotized short projections directed inwards. Parameres large, projecting beyond tip of gonostylus, with a short digitiform lobe

directed outwards and a lobe directed inwards with a strong, sclerotized tooth. Tergite 9 with a pair of digitiform lobes latero-distally, bearing fine setulae along its entire length and with two small spines and one strong spine distally.

**Female.** As male, except for the following. **Wing** (Fig. E23C). Length, 2.95; width, 1.05.

**Terminalia** (Fig. E23D). Light ochre-yellow, with some brown sclerites. Sternite 8 with an anterior plate weakly sclerotized, only with microtrichia, lateroposterior corner with a short rounded lobe, a pair of latero-anterior long oblique extensions directed anteriorly to meet latero-anterior extensions of tergite 8, medially with an elongate plate covered with microtrichia and short setae, four stronger setae on posterior margin. Sternite 9 weakly sclerotized, especially on anterior end, a pair of winglets medially, laterally to an elongate genital chamber. Tergite 8 wide, medially on anterior margin a shallow U-shaped incision, laterally an extension towards ventral face of terminalia, covered only with microtrichia, no setae. Tergite 9+10 slender medially, lateral ends slightly projected on posterior corner, covered with microtrichia and a row of elongate setae along posterior margin. Sternite 10 with microtrichia and setae along posterior margin, medially an elongate transparent window. Cerci elongate, dorsoventrally compressed, cercomere 1 2.5× length of cercomere 2, covered with microtrichia and short setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000824>)

**Material examined. Holotype:** male, ZRC\_BDP0047820, Nee Soon (NS1), swamp forest, 15.May.13, MIP leg. (slide-mounted). Paratypes: 41 males, 11 females. **Males:** ZRC\_BDP0047953, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048475, Nee Soon (NS1), swamp forest, 10-16.May.2012, MIP leg.; ZRC\_BDP0048807, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048808, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048813, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048826, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048829, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048830, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted); ZRC\_BDP0048835, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048838, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048839, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048848, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048869, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048870, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048873, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048879, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048882, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048885, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048889, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048892, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048899, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048919, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048923, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0048930, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048934, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048959, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0048979, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048980, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0049027, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049033, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049092, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049095, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049111, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049207, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049218, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049219, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049235, Nee Soon (NS1),

04-10.December.2014, MIP leg.; ZRC\_BDP0049246, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049257, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0074027, Bukit Timah, maturing secondary forest (BT08), 22-28.December.2016, MIP leg.; ZRC\_BDP0074034, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg.; ZRC\_BDP0154998, Singapore, (date range 2012-2018), MIP leg.. **Females:** ZRC\_BDP0047794, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg.; ZRC\_BDP0047795, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg. (slide-mounted); ZRC\_BDP0047809, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg.; ZRC\_BDP0047845, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg.; ZRC\_BDP0047937, Nee Soon (NS1), swamp forest, 30.May-05.June.2013, MIP leg.; ZRC\_BDP0048473, Nee Soon (NS1), swamp forest, 24-30.May.2012, MIP leg.; ZRC\_BDP0049039, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0048878, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0066814, Bukit Timah, maturing secondary forest (BT09), 29.September-05.October.2016, MIP leg.; ZRC\_BDP0072689, Bukit Timah, maturing secondary forest (BT06), 22-28.December.2016, MIP leg.; ZRC\_BDP0072696, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0133907; male, ZRC\_BDP0133927.

**Etymology.** The species epithet refers to Xin Jia Po (新加坡), the Mandarin transcription of Singapore. The noun is used in aposition.

**Remarks.** This is a species of the *Neoempheria ferruginea* group, with specimens both from the Bukit Timah and the Nee Soon swamp forest. This is one of the most abundant *Neoempheria* species found in Singapore, with eight different haplotypes, all of which come together using any of the delimitation approaches.

### ***Neoempheria* sp. D**

(Figs. E25A–D)

**Description. Female** (Fig. E25A). Wing length, 3.61; width, 1.31. **Head.** Light brown, ochre-yellow posteriorly to vertex, cream-yellow on ventral half of occiput. Antennal scape and pedicel ochre with a light brown longitudinal band, flagellum dark brown. Face and clypeus light brown. Maxillary palpus brown, distal palpomere lighter, labella whitish. Post-ocellar setae present, no setae on frons beyond line of ocelli. Scape  $1.5 \times$  pedicel length, flagellomere 1  $1.3 \times$  flagellomere 2 length, flagellomere 4  $1.0 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $1.9 \times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background, five brown longitudinal stripes, an additional slender brown mark laterally above anepisternum. Pleural sclerites whitish with orangish tinge except for a brown mark on antepronotum anteriorly, brown cervical sclerite, a slender ochre-brown mark dorso-posteriorly on laterotergite and a brown mark across dorsal half of mediotergite. Halter light brown. Scutum with a prescutellar bristle medially on dorsocentral line and two prescutellar

bristles on lateroposterior corner; scutellum with one pair of bristles, no additional small setae. Antepronotum with two bristles and some additional smaller setae, proepisternum bare.

**Legs.** Coxae whitish with an orangish tinge, femora ochre-yellow with some longitudinal light brown marks, tibiae light greyish-brown with brown tips, tarsi brown [front tibiae and tarsi missing]. Hind tibia inner spur  $3.5\times$  longer than tibia width at apex. **Wing** (Figs. E25B-C). Membrane with a slender dark brown band across wing at level of sc-r, a brown mark over R<sub>4</sub> and a brown band across distal third of wing beginning at level of base of medial fork. C extending beyond tip of R<sub>5</sub> for a fifth of distance to M<sub>1</sub>; Sc reaching C almost at level of mid of cell r<sub>1</sub>; sc-r well sclerotized, at level of origin of Rs; R<sub>4</sub> present, anterior end slightly inclined towards base of wing, cell r<sub>1</sub> long, anterior margin of cell r<sub>1</sub>  $3.4\times$  longer than length of R<sub>4</sub>; first sector of Rs  $1.1\times$  r-m length. False medial vein present, weakly sclerotized. M<sub>1+2</sub>  $4.1\times$  r-m length; bM  $7.6\times$  length of first sector of Rs. First sector of CuA  $1.1\times$  longer than second sector. M<sub>4</sub> not depressed on distal half. Cubital pseudovein sclerotized almost to posterior margin; CuP sclerotized to level of basal third of second sector of CuA. Anal fold faint. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, distal two-thirds of M<sub>1</sub>, distal third of M<sub>2</sub>, distal half of M<sub>4</sub>, distal third of first sector of CuA and entire second sector of CuA. Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergites 1–6 ochre-yellow with dark brown medial marks, brown mark of tergite 5 extending towards lateral, tergites 3–5 with a light brown mark along lateral margin; tergite 7 ochre-yellow anteriorly with a diffuse light brown mark along posterior half; no lateral projections on tergite 7. Sternites 1–2 whitish, sternites 3–6 cream-yellow, sternite 7 ochre-yellow. **Terminalia** (Fig. E25B). Dark ochre-yellow, tip of gonaphyses 8 light brown, cerci dark brown. Sternite 8 anterior plate weakly sclerotized, wide, latero-anterior corners extending anteriorly to articulate with tergite 8, medio-posteriorly a wide medial subquadrate with a medial incision separating a pair of short elongate lateroposterior projections. Sternite 9 with a pair of slender lateral arms. Tergite 8 large, wide, with microtrichia and no setae, latero-anterior corners extending ventrally to meet sternite 8. Tergite 9+10 slender, with a sequence of short protuberance along posterior margin bearing an elongate seta at tip. Sternite 10 extending to level of tip of cercomere 1, with a medial transparent elongate window. Cercomere 1  $1.6\times$  longer than cercomere 2, both densely covered with microtrichia and short setae, laterally compressed.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000780>)

**Material examined.** female, ZRC\_BDP0049022, Nee Soon (NS2), 01-07.January.2015, MIP leg. (website photo specimen, slide-mounted); female, ZRC\_BDP0049255, Nee Soon (NS1), 04-10.December.2014, MIP leg.

**Remarks.** A species of the group-*ferruginea* of *Neoempheria*, our specimens with a single haplotype.

***Neoempheria* sp. E**

(Figs. E26A–C)

**Description. Female** (Fig. E26A). **Wing.** Length, 2.26; width, 0.89. **Head.** Light brown, including face and clypeus. Antennal scape and pedicel light brown, flagellum dark brown. Maxillary palpus brown, distal palpomere lighter, labella light brown. Two ocelli placed medially on vertex over black background. Post-ocellar setae present, well-developed, only some few setae on frons, laterally, close to eyes. Scape  $1.2 \times$  pedicel length, flagellomere 1  $1.5 \times$  flagellomere 2 length, flagellomere 4  $0.8 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $1.0 \times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background, five brown longitudinal stripes, plus a pair of slender brown bands laterally; scutellum brown above, light brown laterally and posteriorly. Halter light brown. Pleural sclerites whitish, except for a brown mark along antepronotum anteriorly, brown cervical sclerite, a light brown mark on laterotergite on dorso-posterior end and a light brown mark across mediotergite dorsally. Scutum with a prescutellar bristle medially on dorsocentral line and two prescutellar bristles on lateroposterior corner; scutellum with one pair of bristles and some few additional small setae. Antepronotum with four larger and smaller bristles, and additional small setae. **Legs.** Coxae whitish-yellow, femora ochre-yellow, tibiae light greyish-brown with brown tips, tarsi brown. Tarsomere 1 of front leg  $0.84 \times$  tibia length,  $1.8 \times$  tarsomere 2 length. Hind tibia inner spur  $3.3 \times$  longer than tibia width at apex. **Wing** (Fig. E26B). Membrane with dark brown marks over sc-r, first sector of Rs and R<sub>4</sub>, a light brown mark on distal end of anal lobe and a band across distal third of wing at level of base of M<sub>1+2</sub>, besides some brownish areas on cell bR and cell bM. C extending beyond tip of R<sub>5</sub> for a fifth of distance to M<sub>1</sub>; Sc complete, reaching C barely beyond origin of Rs, sc-r at level of origin of Rs, cell r1 large, over  $3.4 \times$  longer than wide; first sector of Rs  $1.2 \times$  r-m length. False medial vein present, slightly arched. M<sub>1+2</sub>  $4.1 \times$  r-m length; bM  $6.7 \times$

length of first sector of Rs. First sector of CuA 1.6× longer than second sector. M<sub>4</sub> with a strong basal curve, gently depressed on distal half. Cubital pseudovein sclerotized to level of distal third of CuA; CuP sclerotized to level of basal third of second sector of CuA. Anal fold faint. Wing margin very gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, distal third of M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> and entire second sector of CuA. Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM, first sector of CuA and CuP entirely devoid of macrotrichia. **Abdomen.** Tergites 1–2, 4 and 6 whitish with dark brown medial marks, tergite 3 and 5 cream-yellow with a brown mark medially and along posterior margin, tergites 3–5 with a pair of slender brown bands along laterals, tergite 5 brown with a pair of ochre-yellow marks on antero-lateral corners, tergite 7 ochre-yellow with a brown mark medially and along posterior margin; no ornamentation on tergite 7.

Sternites 1–6 whitish, sternite 7 ochre-yellow. **Terminalia** (Fig. E26C). Light ochre-yellow, with tip of gonapophysis 8 light brown, cerci dark brown. Sternite 8 anterior wide band with microtrichia but no setae, a pair of rounded lateroposterior lobes, medial posterior sclerite subquadrate, elongate, with a short incision medially separating a pair of pointed projections, latero-anterior end extending towards articulation with tergite 8. Sternite 9 with a wide genital chamber, short lateral arms. Tergite 8 wide, with elongate latero-anterior projections, covered with microtrichia but no setae. Tergite 9+10 slender, a group of short protuberances each with an elongate seta at tip. Sternite 10 with a pair of short lateral lobes on posterior margin, transparent window wide midway to apex. Cerci laterally compressed, cercomere 1 1.4× longer than cercomere 2, both covered with microtrichia and short setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000811>)

**Material examined. Holotype:** female, ZRC\_BDP0049180, Nee Soon (NS2), swamp forest, 07-13.May.2015, MIP leg. (slide-mounted).

**Remarks.** A species of the group-*ferruginea* of *Neoempheria*, our specimens with a single haplotype.

### *Neoempheria* sp. F

(Figs. E27A–D)

**Description. Female** (Fig. E27A). Wing length, 3.80; width, 1.44. **Head.** Light greyish-brown, ochre-yellowish on frons dorsally to base of antennae, cream-yellow along ventral margin of occiput. Face light brown, yellowish on ventral end, clypeus light brown, yellowish on dorsal end. Antennal scape and pedicel ochre with a light brown ventral longitudinal band, flagellum dark brown. Maxillary palpus brown, labella cream-yellow. Post-ocellar setae present, only some few setae on frons laterally. Scape  $1.2 \times$  pedicel length, flagellomere 1  $1.0 \times$  flagellomere 2 length, flagellomere 4  $1.5 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, dorsal tip projecting slightly beyond base of palpomere 5, palpomere 5  $2.1 \times$  palpomere 4 length. **Thorax.** Scutum with ochre-yellow background, two pairs of brown stripes, plus a slender brown medial band, scutellum brown, ochre-brown laterally. Pleural sclerites whitish with orangish tinge except for a brown mark on antepronotum anteriorly, brown cervical sclerite, and a slender ochre-brown band dorsally across mediotergite dorsally. Halter light brown. Scutum with a prescutellar bristle medially on dorsocentral line, one pair of prescutellar bristles on lateroposterior corner; scutellum with one pair of bristles and additional fine setae. Antepronotum with three larger bristles, additional larger and smaller setae. **Legs.** Coxae whitish with an orangish tinge, femora ochre-yellow with some longitudinal light brown marks, tibiae light greyish-brown with brown tips, tarsi brown. Fore leg tarsomere 1  $0.85 \times$  tibia length,  $2.1 \times$  tarsomere 2 length. Hind tibia inner spur  $3.8 \times$  longer than tibia width at apex. **Wing** (Figs. E27B–C). Membrane with dark brown marks over sc-r, first sector of Rs and R<sub>4</sub>, and with a greyish brown band across distal fourth of wing beyond level of base of medial fork and posteriorly to distal half of M<sub>4</sub>. C extending beyond tip of R<sub>5</sub> for a fifth of distance to M<sub>1</sub>; Sc reaching C slightly before level of mid of cell r1, sc-r reaching R<sub>1</sub> beyond origin of Rs for about half of length of first sector of Rs; R<sub>4</sub> present, almost transverse, far from base of Rs, cell r1 large, anterior margin  $4.2 \times$  length of R<sub>4</sub>; first sector of Rs  $1.6 \times$  r-m length. False medial vein present, slightly sinuose on basal third; M<sub>1+2</sub>  $5.6 \times$  r-m length; bM  $9.8 \times$  length of first sector of Rs. First sector of CuA  $1.1 \times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein weakly sclerotized, ending at level of distal third of second sector of CuA; CuP reaching level of mid of second sector of CuA. Anal fold faint. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal third of Sc, on entire length of bR, R<sub>1</sub> and second sector of Rs, distal two thirds of M<sub>1</sub>, distal fourth of M<sub>2</sub>, distal third of M<sub>4</sub>, distal third of first sector and entire second sector of CuA. First sector of Rs, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergites 1 light ochre-yellow, tergites 2–4 light ochre-yellow with brown short band medially

on posterior margin, tergite 5 dark ochre-yellow on anterior half and brown on posterior half, tergites 6 mostly dark ochre-yellow, brownish along posterior margin, tergite 7 light brown; no ornamentation on tergite 7. Sternites 1–4 cream-yellow, sternites 5–6 light ochre-yellow, tergite 7 light brownish ochre-yellow. **Terminalia** (Fig. E27D). Brownish ochre-yellow, distal end of sternite 8 darker, cerci light brown. Sternite 8 with a wide anterior sclerite and a slender medial sclerite, a deep medial posterior incision separating a pair of elongate lobes, small setae covering entire sclerite, some longer setae on lobes. Sternite 9 wide, with short anterior arm of furca. Tergite 8 wide, with long latero-anterior extensions covered with microtrichia, but no setae. Tergite 9+10 slender, a group of short protuberances with an elongate seta at tip. Sternite 10 with a pair of short lateral lobes on posterior margin, transparent window wide midway to apex. Cerci laterally compressed, cercomere 1 1.9× longer than cercomere 2, both covered with microtrichia and short setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000776>)

**Material examined.** female, ZRC\_BDP0047836, Nee Soon (NS2), swamp forest, 23-29.May.2013, MIP leg. (slide-mounted); female, ZRC\_BDP0047902, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg.; female, ZRC\_BDP0048480, Nee Soon (NS2), swamp forest, 05-11.April.2012, MIP leg.

**Remarks.** A species of the *Neoempheria ferruginea* species group, our specimens with a single haplotype.

#### ***Neoempheria chantek* Amorim & Oliveira, sp.nov.**

(Figs. E28A–D)

**Diagnosis.** Scutum with five longitudinal brown stripes, a brownish line over dorsal half of mediotergite extending on dorsal third of laterotergite. Abdominal tergites 1–2 and 7 whitish with a caramel-brown transverse mark along posterior margin extending medially to anterior margin; tergites 3–4 and 6 with similar pattern, but with an additional slender brown mark along lateral margin; tergite 5 mostly caramel-brown with a small cream-yellow mark on latero-anterior corners. Wing with a brown mark at distal third of wing and a second band across wing at level of sc-r and first section of Rs, dark brown mark over R4. C extending beyond tip of R<sub>5</sub> for about a fourth of distance to M<sub>1</sub>; sc-r at basal third of cell r1; anterior margin of cell r1 long, more than 4× length of R<sub>4</sub>. Gonocoxites with no extension beyond

base of gonostylus; gonostylus large, with a dorsal sub-basal digitiform lobe, a line of spines on inner edge along distal third, three apical strong spines; parameres with three short pointed projections distally; tergite 9 with a pair of distal lobes with a group of short spines directed inwards.

**Description. Male.** Wing length, 3.05; width, 1.15. **Head** (Fig. E29A). Brown, lighter on face and clypeus. No setae on frons anteriorly to ocelli. Ocellar setae present. Antennal scape and pedicel light brown, scape  $1.6 \times$  pedicel length, flagellum light ochre-yellow except for flagellomere 1 cream-yellow, flagellomere 1  $1.6 \times$  flagellomere 2 length, flagellomere 4  $1.6 \times$  wider than long. Palpomeres dark brown, last palpomere lighter, palpomere 4 about  $1.2 \times$  palpomere 3 length, a short distal projection over base of distal one, last palpomere  $2.0 \times$  length of penultimate palpomere. Labella small, brownish. **Thorax.** Scutum brown, darker along longitudinal lines; a row of longer dc setae, some long supra-alars, two pairs of prescutellar bristles on lateroposterior corners of scutum, one pair of prescutellars medially on dorsocentral line. Scutellum brown, with one pair of bristles and some smaller setae on disc. Pleural sclerites whitish with an orangish tinge, antepronotum with a brown mark anteriorly, laterotergite with a brown band along dorsal margin, mediotergite with a brown transverse band on dorsal third. Antepronotum with two strong bristles and smaller setae of different sizes. Halter light brown. **Legs.** Coxae whitish, mid and hind coxae with a light brown tinge, hind coxa slightly darker; femora yellowish-brown, fore femur lighter; tibiae and tarsi light greyish-brown. Hind tibial spurs  $3.5 \times$  tibia length at apex. **Wing** (Fig. E29B). Membrane background light greyish fumose, a brown band across wing at level of origin of Rs and a brown band at distal third of wing at level of base of medial fork, dark brown mark over first sector of Rs and over R<sub>4</sub>. Sc complete, reaching C at level of basal fourth of cell r<sub>1</sub>, sc-r just beyond level of origin of Rs; cell r<sub>1</sub> long, anterior margin  $4.4 \times$  length of R<sub>4</sub>. False medial vein conspicuous, sclerotized, sinuous on basal fourth. Medial fork not wide open. M<sub>1+2</sub>  $4.6 \times$  r-m length; bM  $8.7 \times$  length of first sector of Rs. First sector of CuA  $1.1 \times$  longer than second sector. M<sub>4</sub> not depressed on distal half. Cubital pseudovein sclerotized, long, ending at distal third of second sector of CuA; CuP weakly sclerotized but produced to level of mid of second sector of CuA. Anal fold faint. Wing margin slightly emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of Sc, bR, R<sub>1</sub>, and second sector of Rs, and on most of length of M<sub>1</sub>, on distal third of M<sub>2</sub>, distal half of M<sub>4</sub> and along distal half of first sector of CuA and entire length of second sector of CuA. **Abdomen** (Fig. E29C). Abdominal tergites 1–2 and 7 whitish with a caramel-brown transverse mark along posterior

margin extending medially to anterior margin; tergites 3–4 and 6 with similar pattern, but with an additional slender brown mark along lateral margin; tergite 5 mostly caramel-brown with a small cream-yellow mark on latero-anterior corners. Sternites 1–4 and sternites 6–7 cream-yellow, sternite 5 brown. **Terminalia** (Figs. E29D–E). Ochre-yellow, cerci lighter. Gonocoxites medially fused, with a short, weak medial suture, a weakly sclerotized medio-posterior process extending towards the aedeagus, no lateral projections extending beyond base of gonostylus, entirely devoid of setae, some scattered microtrichia laterally. Gonostylus placed laterally, wide at base, with a dorsal digitiform branch bearing elongate setae distally, a large, elongate ventral branch with fine setae on outer face and a row of strong setae and fine spines distally on ventro-distal margin. Aedeagus tubular anterior half, bearing a pair of short apodemes laterally on anterior end and a medial sub-rectangular plate extending posteriorly to slightly beyond level of mid of gonostylus. Parameres present as a pair of sub-medial weakly sclerotized laminar projections and a wide plate posteriorly to aedeagus with a medial short beak and a pair of short digitiform lobes on lateroposterior corners. Tergite 9 with a slender medial blade connecting a pair of long projections, each of which bearing a short row of long setae laterally and a group of setae and spines directed inwards at distal end. Sternite 10 weakly sclerotized, subquadrate, covered with microtrichia and fine setae. Cerci small, close together, with microtrichia and fine setae, laterally to sternite 10.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0066766, Bukit Timah, maturing secondary forest (BT09), 16–22 September 2016, MIP leg. (slide-mounted).

**Etymology.** The species epithet refers to the Malay term for beautiful. The noun is used in apposition.

**Remarks.** This is one of the species of the *ferruginea*-group of *Neoempheria*.

#### *Group puluochung*

This group includes only two species and is sister, in the mitogenome tree, of the clade including the group *merlio* and *Parempheriella*. *Neoempheria puluochung*, sp.nov. has a more standard male terminalia pattern and a medium size cell r4, while *N. merdeka*, sp.nov. has a large cell r4 and a scutum with five dark bands, similar to that seen in the group

*ferruginea*, and a very unusual male terminalia. It is hard to say if the position of the species in the tree is due to a limitation of the analysis.

***Neoempheria puluochung* Amorim & Oliveira, sp.nov.**

(Figs. E29A–F, E30A–B)

**Diagnosis.** Head ochre with a brownish tinge; scutum brownish-ochre, darker on posterior margin, scutellum brown; mediotergite brown, with a brown band running across laterotergite and reaching ventral margin of thorax. Abdominal tergites 1–2 and 4 with cream-yellow background, a brown mark medially along tergites 1–2 and on anterior half medially on tergite 4; tergite 3 and 5 mostly brownish, tergite 3 with a yellowish tinge on latero-anterior corner; tergite 7 mostly yellowish, with a brown median tinge. Wing with oblique brown mark across distal third of wing, on anterior margin beginning before tip of  $R_1$  and ending on posterior margin more basally than tip of  $M_4$ , and an irregular marks more basally, over tip of Sc, cell  $r_1$  and base of cell  $m_1+2$ , and on anal lobe close to CuA. Cell  $r_1$  small, length of anterior margin  $2.2 \times$  length of  $R_4$ ; sc-r reaching  $R_1$  at level of origin of Rs. Male gonocoxite entirely bare; gonostylus bifid from base, both branches long, slightly widened at apex, inner lobe with a group of slender spines directed inwards; parameres with a pair of distal blade-like extensions turned inwards midway to apex; tergite 9 with a couple of long, digitiform branches with some short, blunt spines at apex. Female tergite 7 with a pair of digitiform lateroposterior projections reaching level of base of cerci. Female terminalia elongated, sternite 8 with a median short crest between distal lobes.

**Description. Male.** Wing length, 2.95; width, 1.11. **Head.** Light ochre-brown at vertex, more ochre-yellow towards frons and on occiput towards ventral margin. Face cream-yellow, clypeus light brown. Antennal scape and pedicel dark ochre-yellow, flagellum brown, flagellomere 1 with ochre base. Maxillary palpus greyish-brown. Labella ochre-brownish. No post-ocellar setae, frons with only two pairs of setae at level of anterior end of ocelli. Scape as long as pedicel, flagellomere 1  $1.5 \times$  flagellomere 2, flagellomere 4  $1.1 \times$  longer than wide. Palpomere 4  $1.6 \times$  palpomere 3 length, palpomere 5  $1.7 \times$  palpomere 4 length. **Thorax.** Scutum dark ochre-yellow, more brownish towards posterior end, scutellum ochre-yellowish with a small a brownish mark at limit with scutum. Pleural sclerites cream-yellow with an orangish tinge, except for laterotergite light greyish-brown, darker dorso-posteriorly, and mediotergite brownish on dorsal third. Three pairs of prescutellars, one pair medially, two

pairs on lateroposterior corner; one pair of scutellars and some few additional fine setae. Antepronotum with two bristles and some additional long and short setae, proepisternum with one bristle and some few additional setae. **Legs.** Coxae whitish with orangish tinge, anterior face of front coxa with a brownish tinge on basal half. Femora ochre-yellow, front and mid femora darker; tibiae and tarsi light greyish-brown. Tibiae with some few dorsal and lateral setae. Hind tibia inner spur  $3.0 \times$  longer than tibia width at apex. Fore leg tarsomere 1  $0.9 \times$  tibia length,  $1.0 \times$  tarsomere 2 length. **Wing** (Fig. E29B). Membrane background light greyish, with dark greyish-brown marks over tip of Sc and sc-r, over first sector of Rs, over R<sub>4</sub>, from base of M<sub>4</sub> to posterior margin and across distal third of wing, beginning at level of base of medial fork. C extending beyond tip of R<sub>5</sub> for a third of distance to M<sub>1</sub>. Sc complete, reaching C slightly beyond origin of Rs, sc-r at level of origin of Rs, cell r1 medium-sized, anterior margin of cell r1  $1.4 \times$  longer than length of first sector of Rs. First sector of Rs  $2.0 \times$  r-m length; R<sub>4</sub> transverse. False medial vein conspicuous, sclerotized. M<sub>1+2</sub>  $2.7 \times$  r-m length; M<sub>2</sub> slightly curved towards M<sub>1</sub> close to tip; bM  $5.6 \times$  length of first sector of Rs; M<sub>2</sub> relatively weak on distal third. Cubital pseudovein extending to level of mid of second sector of CuA. M<sub>4</sub> gently sinuous medially, curved towards posterior margin at tip. First sector of CuA  $1.2 \times$  length of second sector. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, on distal fifth of M<sub>1</sub> and at tip of M<sub>4</sub> and distal fourth of second sector of CuA; Sc, sc-r, first sector of Rs, R<sub>4</sub>, r-m, bM, M<sub>1+2</sub>, M<sub>2</sub> and CuP entirely devoid of setation; some few macrotrichia on membrane of cell sc before tip of R<sub>1</sub>. **Abdomen.** Tergite 1–2 light brown medially with cream-yellow lateral bands, tergite 3 light brown with cream-yellow marks on antero-lateral corners, tergite 4 largely cream-yellow with a slender light brown medial band, tergite 5 light brown, with cream-yellow anterior band, tergite 6 cream-yellow with a pair of light brown marks sub-medially, tergite 7 highly modified, cream-yellow on anterior half, posterior half light brown. Sternites 1–7 cream-yellow. **Terminalia** (Figs. E29C–D). Gonocoxites fused along anterior margin, entirely devoid of setae ventrally, a wide medial, weakly sclerotized triangular plate projecting to level of insertion of gonostylus, a pair of long lateroposterior projections slightly widening to apex, bearing small setae on inner face and large scales on ventral face. Gonostylus long, deeply bifid, outer branch curved at base, slightly clavate, bare on proximal three-fourth, with three long setae along inner margin distally and a dense group of elongate setulae on dorsal face, inner branch more sclerotized, also clavate, with a number of long setae at outer margin and a concentrated group of setae on inner margin close to apex. Gonocoxal apodemes projected posteriorly, aedeagus with a pair of short apodemes on anterior end, elongate,

weakly sclerotized distally. Parameres with a pair of L-shaped digitiform lateroposterior projections, distal part directed inwards, with some setulae. Tergite 9 latero-anterior ends articulating to gonocoxites dorsally to insertion of gonostyli, medially along anterior margin with a wide, inverted V-shaped incision, extending posteriorly to almost tip of outer branch of gonostylus, along lateral margin close to base at each side with a straight long seta and one very long, curved seta, ventral face of lateroposterior corner extending into a digitiform process almost reaching level of tip of cerci, bearing some long setae on distal half directed ventrally and three short spines directed dorsally. Sternite 10 weakly sclerotized, bare, with a medial rounded posterior incision separating a pair of short lobes. Tergite 10 wider than base of both cerci, bare, with a medial deep incision on posterior margin. Cerci slender, in contact with each other, placed very distally, elongate, entirely covered with dense microtrichia, short setae on dorsal face, setae on distal end longer.

**Female** (Fig. E29A). As male, except for the following. Tergite 7 highly modified, short medially, with a pair of digitiform expansions laterally reaching level of base of cerci. Sternites 1–8 ochre-yellow. **Terminalia** (Figs. E30A–B). Mostly ochre-yellow, tergite 8 light brown. Sternite 8 trapezoid, slender distal end with a medial incision separating a pair of slender lobes, microtrichia scattered over entire sclerite, setae restricted to tip of lobes. Sternite 9 with a wide anterior end, a pair of sclerotized arms medially. Sternite 10 rectangular, with a large transparent window. Tergite 8 bare, wide, more sclerotized laterally; tergite 9+10 wide, slender, with a row of setae along posterior margin, some few short digitiform projections laterally with a distal seta. Cerci elongate, dorso-ventrally compressed, covered with short setae and microtrichia, cercomere 1 wider midway to apex,  $3.2 \times$  cercomere 2 length, cercomere 2 slightly ovoid.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000746>)

**Material examined. Holotype:** male, ZRC\_BDP0047867, Nee Soon (NS2), swamp forest, 26.September-02.October.2013, MIP leg. (slide-mounted). **Paratypes:** 3 females, ZRC\_BDP0048493, Nee Soon (NS1), swamp forest, 05-11.April.2012, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0048494, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0049005, Nee Soon (NS2), 11-17.December.2014, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0155063.

**Etymology.** The species epithet refers to the name Pu Luo Chung, the Mandarin transcription [蒲罗中] of Pulau Ujong—in the oldest known written document referring to Singapore, from the third century. The Malay name “Pulau Ujong” means literally “island at the end”. The noun is used in apposition.

**Remarks.** There are three haplotypes for *Neoempheria puluochung*, sp.nov., which are gathered together by most of delimitation algorithms, but split into two separate species by PTP.

***Neoempheria merdeka* Amorim & Oliveira, sp.nov.**

(Figs. E31A–F, E32A–B)

**Diagnosis.** Head ochre-yellowish with a brownish tinge; scutum brownish, with ochre-yellow longitudinal stripes, scutellum brown; mediotergite dark brown, a brown band extending over laterotergite, mesepimeron and katepisternum. Abdominal tergite 1 brown medially, cream-yellowish on laterals; tergites 2–3 brown with cream-yellow latero-anterior corners; tergite 4 background ochre-yellowish with a wide medial brown band along posterior margin and a large brown mark on lateroposterior corner; tergites 5–7 basically brownish with an ochre-yellowish band along anterior half. Wing with a complex color pattern, an N-shaped brown mark over posterior two-thirds of wing (extending over R<sub>4</sub>) and a basal band from wing margin to cubital pseudovein; cell r1 large, anterior margin of cell r1  $3.6 \times$  R<sub>4</sub> length; sc-r reaching R<sub>1</sub> at basal third of cell r1. Male terminalia complex, gonocoxites largely reduced, bare; gonostylus bifid from base, both extending into long, sigmoid projections; parameres wide distally, projected beyond tip of cerci; tergite 9 with a pair of long, sigmoid branches.

**Description. Male.** Wing length, 3.87; width, 1.38. **Head.** Brown vertex, lighter on occiput, face and clypeus light brown, face with macrotrichia but no setae, clypeus setose. No setae on frons anteriorly to ocelli. Ocellar setae present. Antennal scape light brown, pedicel yellowish-brown, scape  $1.7 \times$  pedicel length, flagellum light ochre-yellow except for flagellomere 1 cream-yellow, flagellomere 1  $1.5 \times$  longer than flagellomere 2, flagellomere 4 as long as long wide. Palpomeres dark brown, last palpomere lighter, palpomere 4 about  $0.85 \times$  palpomere 3 length, a short distal projection over base of distal palpomere, last palpomere  $2.2 \times$  palpomere 4 length. Labella small, brownish. **Thorax.** Scutum ochre-yellowish, a brown band laterally on posterior fourth and a pair of light brown bands along dorsocentral line; a row of longer dc setae, some long supra-alars, two pairs of pre-scutellar bristles on lateroposterior corners of scutum, one pair of prescutellars medially on dorsocentral line. Scutellum ochre-yellowish, light brownish along anterior margin, with one pair of longer setae and some smaller setae on disc. Antepronotum, proepisternum,

proepimeron, anepisternum and metepisternum cream-yellow with an orangish tinge, a brown band across katepisternum, mesepimeron, laterotergite and dorsal half of mediotergite; ventral half of mediotergite ochre-brown. Antepronotum with four stronger bristles and smaller setae of different sizes. Halter yellowish-brown. **Legs.** Anterior coxa with a brown band on dorsal half (in continuation of brown band on pleura), brownish-yellow ventrally, with a brownish tinge on distal end, mid and hind coxae whitish, with a brown mark on distal end; anterior femur ochre-yellowish, mid and hind femora brownish-yellow; tibiae and tarsi yellowish-brown, anterior tarsus lighter. Hind tibial spurs  $3.8 \times$  length of tibia at apex. **Wing** (Fig. E31B). Membrane with light greyish-brown background with a brown mark close to base of wing and a pair of large brown connected marks, one from tip of Sc to posterior margin across sc-r, origin of Rs, M<sub>1+2</sub> and origin of M<sub>4</sub>, and another from distal end of R<sub>1</sub> to posterior margin, with a light area over distal fourth of R<sub>5</sub>. Sc complete, reaching C close to level of origin of Rs; sc-r present, reaching R<sub>1</sub> almost at same level than tip of Sc; anterior margin of cell r1 long, anterior margin  $3.6 \times$  length of R<sub>4</sub>. False medial vein present, not strongly sclerotized, gently sinuose on basal fifth. Medial fork not wide open. M<sub>1+2</sub>  $5.0 \times$  r-m length; bM  $8.8 \times$  r-m length. First sector of CuA  $1.3 \times$  longer than second sector. M<sub>4</sub> not depressed on distal half. Cubital pseudovein sclerotized, long, ending at distal third of second sector of CuA; CuP sclerotized, produced to level of mid of second sector of CuA. Anal fold faint. Wing margin slightly emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc, on entire length of bR, R<sub>1</sub>, and second sector of Rs, and on most of length of M<sub>1</sub> and of M<sub>2</sub>, distal three-fourth of M<sub>4</sub> and along entire length of CuA. **Abdomen.** Tergite 1 ochre-yellow, tergites 2–5 ochre-yellow on anterior half and brown on posterior half, tergite 6 ochre-yellow with a brown mark on lateroposterior corners, tergite 7 ochre-yellow on anterior half and brown on posterior half. Sternites 1–3 and 7 ochre-yellow, sternites 4–6 cream-yellow with brown bands laterally. **Terminalia** (Figs. E31C–D). Ochre-yellow, cerci lighter. Gonocoxites largely modified, medially fused, with a conspicuous suture, anterior margin of syngonocoxite with a medial anterior incision, posterior margin also with a medial incision, a short digitiform lateral projection slightly beyond base of gonostylus, no setation or microtrichia at all. Gonostylus slightly displaced medially, bifid, with a pair of long, sinuous, digitiform sclerotized extensions, inner one almost reaching level of distal margin of parameres, outer one longer, extending beyond level of tergite 10 lateral projections, no setae at all except for a terminal short seta on outer branch. Gonocoxal bridge conspicuous, with an anterior medial acute extension. Aedeagus sclerite complex, with a pair of short sclerotized arms. Parameres present as a pair of weakly

sclerotized laminar blades posteriorly to aedeagus. Tergite 9 with a blade medially connecting a pair of long sinuose projections widening distally, bifid at apex, with some long fine setae along inner face of distal half. Sternite 10 weakly sclerotized, with a pair of lateral lobes covered with microtrichia and fine setae. Cerci small, close together, with microtrichia and fine setae, laterally to sternite 10.

**Female** (Fig. E31A). As male, except as follows. **Terminalia** (Figs. E32A–B). Sternite 8 trapezoid with slender distal end, a medial incision on posterior margin, small setae scattered over entire sclerite, slightly stronger distally. Sternite 9 with a wide anterior end, a pair of sclerotized arms on posterior margin. Sternite 10 rectangular, elongate. Tergite 8 bare, wide, tergite 9+10 slender, with a row of setae along posterior margin, some at tip of short digitiform projections. Cerci elongate, dorso-ventrally compressed, covered with short setae and microtrichia, cercomere 1 3.0× cercomere 2 length, cercomere 2 rounded, slightly ovoid.

**Material examined. Holotype:** male, ZRC\_BDP0066818, Bukit Timah, maturing secondary forest (BT09), 29.September-05.October.2016, MIP leg. (slide-mounted). **Paratypes:** 2 females, ZRC\_BDP0120496, Bukit Timah Forest (BTNR, (date range 2012-2018), MIP leg., (date range 2012-2018), MIP leg.; ZRC\_BDP0074035, Singapore, (date range 2012-2018), MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0133981; female, ZRC\_BDP0155081.

**Etymology.** The species epithet refers to the Malay word merdeka [=independence/freedom], the name of the movement after the post-war period that resulted in the gradual increase of self-governance for Singapore and a separate Legislative Council, elected in March 1948. The noun is used in apposition.

**Remarks.** There are two haplotypes for this species, both with specimens from Bukit Timah, mPTP separating them in two species at level of 2%, the other approaches suggesting a single species. This is a very unusual species of *Neoempheria*. The large r1 cell and the longitudinal stripes in the wing suggest that it belongs in the *ferruginea*-group. This is the only species with large cell r1 that in the mitogenome tree does not join the other species of the *ferruginea*-group, fitting in a large clade that includes the species of *Parempheriella* and other *Neoempheria* species with a small cell r1. The male terminalia structure is rather unique.

#### Group *dizonalis*

The group *dizonalis* in the mitogenome tree is sister to *Parempheriella* and includes seven species. All species have small cell r4, a quite similar pattern of abdomen color with tergite 4

mostly or entirely yellow and male terminalia with well-developed tergite 9, often with a distal spine. This is the clade in which *Neoempheria dizonalis* (Edwards) fits and some of the additional Oriental species of *Neoempheria* probably belong here.

### ***Neoempheria dizonalis* (Edwards)**

*Mycomya (Neoempheria) dizonalis* Edwards, 1931: 265 (fig. 2v, d, male terminalia). Type locality: Indonesia, Sumatra, Fort de Kock [= Bukittinggi]. Colless & Liepa, 1973: 458), new combination.

(Figs. E33A–D)

**Diagnosis.** Head light ochre-yellow; scutum light ochre-yellow, no stripes; pleural sclerites whitish, mediotergite and laterotergite brown. Wing with brown band distally across wing and a brown band more basally, from level of cell  $r_1$  to posterior margin; cell  $r_1$  small, anterior margin  $1.1 \times$  length of  $R_4$ ;  $sc-r$  reaching  $bR$  well basal to origin of  $Rs$ . Tergite 1 cream-yellowish; tergite 2 cream-yellow with a dark brown medial mark on posterior half medially; tergites 3, 5–6 mostly dark brown with slender cream-yellow lateroposterior bands; tergite 4 cream-yellow; tergite 6 dark brown; tergite 7 ochre-yellowish; sternite 6 with a large brown mark laterally. Gonocoxites with no lateroposterior extensions beyond insertion of gonostylus; gonostylus with three branches, more ventral branch digitiform, long, extending beyond tip of cercus; tergite 9 large, with a pair of posterior strong arms, each with a distal spine directed inwards.

**Redescription. Male** (Fig. E33A). Wing length, 2.79; width, 1.05. **Head.** Dark ochre-yellow at vertex, lighter above antennae and on ventral half of occiput. Face whitish-yellow, clypeus whitish-yellow. Antennal scape and pedicel light ochre-yellow, flagellum ochre-yellow, slightly darker toward apex. Maxillary palpus light brown, last palpomere lighter, labella light ochre-yellowish. Ocellar setae present, no setae on frons anteriorly to line of ocelli. Scape  $1.2 \times$  pedicel length, flagellomere 1  $1.3 \times$  flagellomere 2 length, flagellomere 4  $1.1 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $2.0 \times$  palpomere 4 length. **Thorax.** Scutum mostly ochre-yellow, slightly darker medio-posteriorly; scutellum ochre-yellow. Pleural sclerites whitish with an orangish tinge, laterotergite light brown, ventro-anterior end lighter, mediotergite brown, ochreous laterally. Halteres whitish-yellow, brownish at base of knob. Scutum with a pair of prescutellar bristles along dorsocentral line

and two pairs of prescutellar bristles on lateroposterior corners; scutellum with one pair of strong setae and some additional small setae. Antepronotum with two bristles, one strong seta and some smaller setae, proepisternum with one bristle and one long seta. **Legs.** Coxae whitish, front coxa with some orangish tinge; front femur whitish-yellow, mid and hind femora darker; tibiae and tarsi light greyish-brown. Hind tibia inner spur  $4.7 \times$  longer than tibia width at apex. Fore leg tarsomere 1  $0.86 \times$  tibia length,  $1.9 \times$  tarsomere 2 length. **Wing** (Fig. E33B). Membrane background light brown fumose, a dark brown band across wing at level of cell  $r_1$  reaching posterior margin and a brown mark across distal third of wing beginning slightly beyond basal end of medial fork. C produced beyond tip of  $R_5$  for about a third of distance to  $M_1$ ; Sc complete, reaching C slightly beyond level of origin of Rs, sc-r weakly sclerotized, reaching bR before level of origin of Rs.  $R_1$  reaching C at distal fourth of wing;  $R_5$  reaching C slightly before level of tip of  $M_1$ ;  $R_4$  present, close to base of Rs, cell  $r_1$  short, trapezoid, anterior margin of cell  $r_1$   $1.1 \times$  longer than  $R_4$ ; first sector of Rs  $0.83 \times r\text{-}m$  length. False medial vein conspicuous, sclerotized.  $M_{1+2}$   $3.6 \times r\text{-}m$  length; bM  $7.0 \times$  length of first sector of Rs. First sector of CuA  $1.1 \times$  longer than second sector.  $M_4$  gently depressed on distal half. Cubital pseudovein sclerotized to distal fourth of CuA; CuP sclerotized to basal fourth of second sector of CuA. Anal fold present. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR,  $R_1$ , second sector of Rs, most of  $M_1$ ,  $M_2$ ,  $M_4$  and CuA; Sc, sc-r, first sector of Rs,  $R_4$ ,  $r\text{-}m$ , bM,  $M_2$ ,  $M_4$ , and CuP devoid of macrotrichia. **Abdomen.** Tergite 1 whitish, tergite 2 brown medially on posterior half, cream-yellow on anterior half and laterally; tergites 3, 5–6 brown, tergites 5–6 with a slender cream-yellow band on lateroposterior corner, tergite 4 and 7 with a slender yellowish band along anterior margin. Sternites 1–5 whitish-yellow, sternite 6 light brown with a yellowish medial area posteriorly, sternite 7 ochre-yellowish. **Terminalia** (Figs. E33C–D). Ochre-yellow, with some more brownish sclerites. Gonocoxites fused along anterior margin, a slender connection medially, an inverted deep U-shape incision on anterior margin with sclerotized border, no lateroposterior extensions beyond insertion of gonostylus, entirely bare. Gonostylus with three branches, a more ventral, long digitiform branch extending beyond tip of cercus, with long and short fine setae along entire length of external face, a medial, short digitiform process with a single setula at tip, and a dorsal, shorter ovoid branch with a concentration of fine setae and setulae at tip, base lobose with setae and setulae. Gonocoxal apodeme large, lateral arms extending anteriorly, medial connection beyond anterior end of terminalia. Aedeagus wide on anterior end, not strongly sclerotized, distal end with a wide opening. Parameres more anteriorly with a pair of lateral digitiform

projections almost reaching level of tip of aedeagus, latero-distally with a pair of slightly more sclerotized blades. Sternite 10 weakly sclerotized, with a pair of short lobes sub-medially with microtrichia and small setae. Tergite 9 large, with a pair of latero-anterior weakly sclerotized extensions that reach margin of gonocoxites, a medial wide incision on anterior margin, posterior margin rounded, with a row of longer setae, and a pair of posterior strong projections with a spine at tip directed inwards. Tergite 10 with a pair of long, large lobes with a slender medial connection, each lobe with a short ventral sublobe on ventral face with fine setae and a long dorsal, well sclerotized sublobe extending beyond tip of gonostylus, densely covered with long setae on dorsal face and a spine at tip directed inwards. Cerci large, elongate, almost reaching tip of tergite 10 projections, covered with microtrichia and setae.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000798>)

**Material examined.** Holotype, *Mycomya (Neoempheria) dizonalis* Edwards, 1925, male, “Sumatra, Fort de Kock, 1925” (NHM). **Sequenced specimens:** 3 males, ZRC\_BDP0047800, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg. (slide-mounted); ZRC\_BDP0047918, Nee Soon (NS2), swamp forest, 23-27.November.2013, MIP leg. (website photo specimen); ZRC\_BDP0049043, Nee Soon (NS2), 01-07.January.2015, MIP leg.

**Remarks.** We examined the type of *Neoempheria dizonalis* at the NHM and it largely agrees with our specimen. There is a single haplotype in our material, all specimens coming from the swamp forest samples.

### ***Neoempheria neesoon* Amorim & Oliveira, sp.nov.**

(Figs. E34A–D)

**Diagnosis.** Head and scutum dark brown, no stripes; pleural sclerites ochre-yellowish, mediotergite light brown, laterotergite with a light greyish brown tinge on dorso-posterior third. Tergite 1 ochre-yellowish; tergite 2 brownish medially; tergite 3 brownish with a slender anterior ochre-yellowish band; tergites 2–4 ochre-yellowish with a brown medial mark along posterior margin; tergites 5–6 brownish with an ochre-yellowish slender band at latero-anterior corner. Wing with brown band distally across wing and a couple of brown marks more basally, one over cell r1, r-m and cell m1+2 close to injunction of bM and M<sub>1+2</sub>, and another one at same level on cell cup; cell r1 short, anterior margin 0.94× length of R4;

sc-r reaching bR well basal to origin of Rs. Female tergite 7 with a lateroposterior projection; terminalia sternite 8 with a pair of distal large posterior lobes widening to apex, sternite 10 with transparent medial “window”.

**Description. Male.** Wing length, 2.43–3.02, width, 0.85–1.08 (n=3). **Head.** Cream-yellow, lighter at frons and ventrally at occiput. Some scattered short setae over frons and occiput, some slightly longer setae around eye on occiput. Two ocelli placed medially on vertex over a blackish background. Ocellar setae absent. Face whitish. Antennal scape and pedicel cream-yellow, scape with setulae around distal margin, pedicel with one longer seta besides crown of short setae distally. Flagellum light ochre-yellowish, flagellomere 1 slightly longer than flagellomere 4, flagellomere 4 1.1 wider than long. Mouthparts short. Clypeus light brown, triangular, with scattered setae. Four light brown palpomeres, last palpomere lighter on distal half, palpomere 4 not projected beyond base of distal one, last palpomere  $2.1 \times$  length of penultimate palpomere. **Thorax.** Scutum ochre-yellow, an irregular row of longer dc and acr setae, as well as some long supra-alars. Scutellum with one pair of longer setae and few smaller setae. Pleural sclerites cream-yellow with an orangish tinge except for light greyish-brown on most laterotergite and a greyish-brown mediotergite. One strong seta on proepisternum, besides smaller setae on both sclerites. **Legs.** Coxae whitish, femora ochre-yellow, tibiae and tarsi light greyish-brown. Front coxa with scattered setae on anterior face, with some additional longer ones more laterally and ventrally, mid coxa with some longer greyish setae at distal end, hind coxa with a long row of grey setae along most of its length. Femora with scattered brownish short setae all over and some additional ventral longer setae close to distal end. Tibiae with some slightly longer setae dorsally, laterally and ventrally; tibiae and tarsi with dark setulae arranged in regular rows. Tibial spurs subequal, spur over  $3 \times$  longer than tibia width at apex. First tarsomeres of hind leg with a row of longer setae ventrally, all tarsomeres with a pair of distal ventral setae. Tarsomere 1 of front leg 0.8 length of tibia and twice tarsomere 2 length. **Wing.** Membrane background light greyish, with a dark greyish-brown band across wing at level of tip of R<sub>1</sub> and a dark greyish-brown mark at tip of wing beginning to level of medial fork. Sc complete, reaching C at level of origin of Rs, sc-r well basal to origin of M<sub>1+2</sub>, cell r1 short, anterior margin  $0.94 \times$  length of R4. False medial vein conspicuous, slightly sclerotized. Medial fork wide open. Origin of M<sub>4</sub> at level of base of M<sub>1+2</sub>. **Abdomen.** Tergite 1 cream-yellow, tergites 2, 5 and 6 with a cream-yellow band anteriorly (wider on tergite 2), tergite 4 and 7–8 cream-yellow mostly cream-yellowish, tergite 4 with a median brown mark at posterior margin. Sternites cream-yellowish. Sternite 7

with a pair of short lateroposterior projections. **Terminalia.** Cream-yellow, with slightly darker sclerites. Posterior lobes of sternite 8 widening towards apex, a fringe of setae along posterior margin, a short incision medially. Sternite 9 with a pair of well sclerotized apodemes at anterior end. Sternite 10 with transparent window. Tergite 8 wide, with a pair of short lateroposterior projections. Tergite 9+10 short, slender, with a pair of small lateral lobes. Cercus elongate, cercomere 1 almost twice as long as cercomere 2.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000744>, and 000793)

**Material examined.** **Holotype:** ZRC\_BDP0047823, Nee Soon (NS1), swamp forest, 08-14.August.2013, MIP leg. (slide-mounted). **Paratypes:** 7 females. ZRC\_BDP0047955, Nee Soon (NS2), swamp forest, 12-18.September.2013, MIP leg. (slide-mounted); ZRC\_BDP0048486, Nee Soon (NS1), swamp forest, 12-18.April.2012, MIP leg. (website photo, slide-mounted); ZRC\_BDP0048906, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0049171, Nee Soon (NS2), 07-13.May.2015, MIP leg. (slide-mounted); ZRC\_BDP0049176, Nee Soon (NS2), 07-13.May.2015, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0049243, Nee Soon (NS1), 04-10.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0066792, Singapore, SMN1,11-Apr-13, MIP leg. **Additional sequenced specimens.** Female, ZRC\_BDP0154986 (website photo).

**Etymology.** The specific epithet for this species refers to the Nee Soon Freshwater Swamp Forest – named after Lim Nee Soon (1879-1936), a prominent Chinese businessman and respected community leader in Singapore. Freshwater swamp forests (or flooded forests) are forests permanently or seasonally inundated with freshwater. They are known from different parts of the globe—not only in tropical areas—and are an important component of the forests in Southeast Asia. There was loss of the original areas of swamp forest in Singapore since the early 1800s due to land conversion for cultivation, e.g., of pepper, pineapple and rubber. Canalization, residential and industrial development wiped out fragments left from the previous use of these areas for agriculture. The Nee Soon Freshwater Swamp Forest is one of the most important protected fragments of this kind of habitat in Singapore. The noun is used in apposition.

**Remarks.** There are seven haplotypes for *Neoempheria neesoon*, sp.nov. The fusion point of specimens ZRC\_BDP0047823 and ZRC\_BDP0047955 is at 2.88%, while the clade on the mitogenome tree shows small branch lengths. Morphology agrees with the mitogenome trees suggesting two genetic signatures, although within the limits of one species. There are specimens from the swamp forest and from the Bukit Timah forests.

*Neoempheria pulau* Amorim & Oliveira, sp.nov.

(Figs. E35A–F)

**Diagnosis.** Head light ochre-yellow, with a light brown diffuse mark over vertex; scutum light ochre-yellow, no stripes; pleural sclerites whitish, mediotergite light brown, laterotergite with a small light brown mark at dorso-posterior end. Tergites 1–2 and 4 cream-yellow; tergites 3, 5–6 dark brown with a slender cream-yellow lateroposterior band; tergite 7 whitish-yellow; sternite 6 with a large brown mark laterally. Wing with brown band distally across wing and a brown band more basally, from level of cell  $r_1$  to posterior margin. Cell  $r_1$  small, anterior margin  $0.86 \times R_4$  length;  $sc-r$  reaching  $bR$  well basal to origin of  $Rs$ . Gonocoxites with no laterodistal projections; gonostylus large, with a basal peduncle expanding distally into a large conch-like structure partially folded; tergite 9 with a pair of long, sclerotized bottle-like structures latero-distally, longer than gonostylus.

**Description. Male** (Fig. E35A). Wing length, 2.92; width, 1.11. **Head** (Fig. E35C). Light brown at vertex, more cream-yellow on occiput towards ventral margin. Antennal scape and pedicel cream-yellow, flagellum light ochre-yellowish. Face and clypeus whitish-yellow. Maxillary palpomeres 2–4 brown, palpomere 5 light brown. Labella whitish-yellow. Scape as long as pedicel, flagellomere 1  $1.2 \times$  flagellomere 2 length, flagellomere 4 only slightly longer than wide. Palpomere 4  $1.6 \times$  palpomere 3 length, palpomere 5  $1.8 \times$  palpomere 4 length.

**Thorax.** Scutum and scutellum dark ochre-yellow. Pleural sclerites dark cream-yellow except for light greyish-brown laterotergite dorsally and a greyish-brown mediotergite. Two pairs of prescutellars, one pair medially, one pair on lateroposterior corner; one pair of scutellars and some few additional fine setae. Antepronotum with three bristles and scattered smaller setae, proepisternum bare. **Legs.** Coxae whitish with orangish tinge, femora ochre-yellow, tibiae and tarsi light greyish-brown. Hind tibia inner spur  $3.9 \times$  longer than tibia width at apex. Fore leg tarsomere 1  $1.0 \times$  tibia length,  $1.2 \times$  tarsomere 2 length. **Wing** (Fig. E35D). Membrane light greyish with a greyish-brown band across distal third of wing beginning before  $R_1$  and band across wing at level of tip of  $Sc$ .  $C$  extending beyond tip of  $R_5$  for about a fourth of distance to tip of  $M_1$ .  $Sc$  weakly sclerotized at very tip, slightly beyond level of  $R_4$ ,  $sc-r$  way before level of origin of  $Rs$ .  $R_1$  reaching  $C$  at distal fifth of wing;  $R_5$  reaching  $C$  before level of tip of  $M_1$ ; cell  $r_1$  short, length of anterior margin  $0.8 \times$  length of first sector of  $Rs$ , posterior end even shorter, cell almost triangular; first sector of  $Rs$  short,  $0.76 \times r-m$  length. False medial vein conspicuous, slightly sclerotized. Medial fork wide open,  $M_{1+2} 3.4 \times r-m$  length;

bM  $8.2 \times$  length of first sector of Rs; M<sub>4</sub> gently sinuous on distal half. First sector of CuA  $1.1 \times$  length of second sector. Cubital pseudovein well sclerotized, ending close to posterior wing margin. CuP long, reaching level of almost of second sector of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, most length of M<sub>1</sub>, distal half of M<sub>2</sub> and distal two-thirds of M<sub>4</sub>, and distal half of first sector of CuA and entire second sector of CuA; sc-r, Sc, R<sub>4</sub>, first sector of Rs, r-m, bM, M<sub>1+2</sub> and CuP devoid of setation; membrane entirely devoid of setae. **Abdomen.** Tergite 1 cream-yellow, tergites 2–3 and 5–6 with a cream-yellow band anteriorly, a brown band posteriorly, and a slender cream-yellow band along posterior margin, wider cream-yellow band on tergite 2, bands more slender on tergites 5–6, tergite 4 and 7–8 cream-yellow with a median brown mark at posterior margin. Sternites 1–8 cream-yellow, darker towards distal segments.

**Terminalia** (Figs. E35E–F). Dark cream-yellow, tip of some sclerites dark brown. Gonocoxites short, fused medially with no medial suture, bare ventrally, no laterodistal projections, a large rounded incision medially on anterior margin of syngonocoxite. Gonostylus large, complex, with a basal, slender neck expanding distally into a large conch-like, partially folded structure, with some few long setae on ventral and dorsal faces, internal area with a short peduncular projection densely surrounded by setulae, distally with a corona, apparently with a dorsal digitiform additional projection. Gonocoxal bridge wide, weakly sclerotized, with short apodemes directed obliquely inwards. Aedeagus composed by a large, weakly sclerotized rectangular plate, with a pair of semicircular lobes on anterior margin touching each other medially, at posterior margin with a pair of weakly sclerotized elongate valves laterally and a tubular structure medially. Parameres with more or less digitiform structures anteriorly, distally with a pair of subapical setae and a pair of apical setae. Tergite 9 with a pair of long, sclerotized bottle-like structures latero-distally that extend to beyond tip of gonostylus, connected medially by a slender bare stripe, lateral projections with setae on dorsal and lateral faces, and with a long, curved digitiform branch originating on ventral face midway to apex bearing some few setulae along its length. Sternite 10 weakly sclerotized, with microtrichia and small setae, between the aedeagus and the cerci. Cerci small, lobose, covered with microtrichia and small setae.

**Female** (Fig. E35B). As male, except as follows. **Terminalia** (Figs. E35G–H). Sternite 8 trapezoid, a pair of short distal lobes, small setae restricted to lobes, slightly stronger at tip. Sternite 10 elongate, with elongate transparent window. Tergite 8 large, bare, tergite 9+10 slender, with a row of elongate setae on posterior margin. Cerci elongate, covered with short setae and microtrichia, cercomere 1  $2.2 \times$  cercomere 2 length.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000743>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047805, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg. (slide-mounted). **Paratypes:** 7 males, 6 females. **Males:** ZRC\_BDP0047909, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg.; ZRC\_BDP0048484, Singapore, NS01, 16-May-12, MIP leg., Nee Soon (NS1), swamp forest, 10-16.May.2012, MIP leg.; ZRC\_BDP0048491, Nee Soon (NS1), swamp forest, 19-25.July.2012, MIP leg. (website photo specimen); ZRC\_BDP0048492, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg.; ZRC\_BDP0048812, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048880, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049172, Nee Soon (NS2), 07-13.May.2015, MIP leg. **Females:** ZRC\_BDP0048485, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (slide-mounted); ZRC\_BDP0047932, Nee Soon (NS1), swamp forest, 11-17.April.2013, MIP leg.; ZRC\_BDP0047945, Nee Soon (NS2), swamp forest, 14-20.November.2013, MIP leg.; ZRC\_BDP0048974, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0049082, Nee Soon (NS1), 18-24.December.2014, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0155089; ZRC\_BDP0133979 (abdomen missing); ZRC\_BDP0140761.

**Etymology.** The specific epithet of this species, *pulau*, means island in Malay, as a reference to the island of Singapore. The noun is used in aposition.

**Remarks.** There are three haplotypes for *Neoempheria pulau*, sp.nov., but there are no conflict between the different delimitation approaches used.

### ***Neoempheria cinkappur* Amorim & Oliveira, sp.nov.**

(Figs. E36A–D)

**Diagnosis.** Head dark brown; scutum dark ochre-yellow, no stripes; pleural sclerites whitish, mediotergite and dorso-posterior end of laterotergite dark brown. Wing with brown band distally across wing and a couple of brown marks more basally, anterior one over cell r1, r-m and cell m1+2 close to injunction of bM and M<sub>1+2</sub> and posterior one at same level on cell cup. Cell r1 small, anterior margin 0.94× length of R<sub>4</sub>; sc-r reaching bR well basal to origin of Rs. Tergite 1 cream-yellowish; tergite 2 cream-yellowish on anterior half, brown on posterior half; tergites 3, 5–6 dark brown with an antero-lateral cream-yellowish mark; tergite 4 cream-yellowish with a slender brown band medially along posterior margin; tergite 7 ochre-yellowish. Female tergite 7 with lateroposterior digitiform extension; sternite 8 with a pair of distal large posterior lobes covered with microtrichia and a number of setae, sternite 10 with transparent medial “window”; tergite 8 large and devoid of setation.

**Description. Female** (Fig. E36A). Wing length, 2.82; width, 1.11. **Head.** Light brown, slightly darker at vertex, ochre-brownish towards frons. Face brown, clypeus brown. Antennal scape and pedicel ochre-yellowish, flagellum light ochre-brown, brownish towards apex. Maxillary palpus brown, last palpomere lighter, labella light brown. Ocellar setae absent, no setae on frons anteriorly to line of ocelli. Scape  $1.1 \times$  pedicel length, flagellomere 1  $1.2 \times$  flagellomere 2 length, flagellomere 4  $1.2 \times$  longer than wide. Palpomere 4  $1.0 \times$  palpomere 3 length, palpomere 5  $2.1 \times$  palpomere 4 length. **Thorax** (Fig. E36B). Scutum dark ochre, with ochre-yellow areas laterally; scutellum dark ochre. Pleural sclerites whitish with an orangish tinge, except for a brown mark on antepronotum anteriorly, a brown mark dorsally on laterotergite, mediotergite brown. Halter light brown, knob darker. Scutum with one pair of prescutellars medially along dorsocentral line and two pairs of prescutellars on lateroposterior corners. Antepronotum with two long bristles and some additional long and short setae, proepisternum bare. **Legs.** Fore coxa light brown anteriorly and whitish posteriorly, mid coxa whitish with a brownish tinge antero-distally, hind coxa whitish; hind femur ochre-yellow, tibia and tarsus light greyish-brown, tarsomeres darker towards tip [holotype front and mid femora, tibiae and tarsi missing]. Hind tibia inner spur  $3.6 \times$  longer than tibia width at apex. **Wing** (Fig. E36C). Membrane with dark brown marks over sc-r, first sector of Rs, R<sub>4</sub> and along bM, yellowish along anterior margin. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to M<sub>1</sub>; Sc complete (visible on phase contrast), reaching C slightly before level of origin of Rs, sc-r present, reaching bR before of origin of Rs for a distance as length of first sector of Rs. R<sub>1</sub> reaching C at distal fourth of wing; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>; R<sub>4</sub> present, slightly oblique, very close to base of Rs, cell r1 trapezoid, short, anterior margin of cell r1  $1.1 \times$  longer than length of R<sub>4</sub>; first sector of Rs  $0.70 \times$  r-m length. False medial vein conspicuous, sclerotized. M<sub>1+2</sub>  $3.7 \times$  r-m length; bM  $6.2 \times$  length of first sector of Rs. First sector of CuA  $1.1 \times$  longer than second sector. M<sub>4</sub> almost straight on distal half. Cubital pseudovein sclerotized to mid of second sector of CuA; CuP faint, not even reaching origin of M<sub>4</sub>. Anal fold faint. Wing margin gently emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal third of Sc before sc-r, entire length of bR, R<sub>1</sub> and second sector of Rs, most of M<sub>1</sub> and M<sub>4</sub>, distal two-thirds of M<sub>4</sub>, and entire length of CuA; sc-r, most of Sc, base of bR, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergite 1 light brown, tergites 2–3 and 5–6 with a dark brown medial band, a cream-yellow anterior band extending posteriorly along laterals on tergites 2–3 and with a cream-yellow mark on antero-lateral corner, tergite 4 cream-yellow with a small median brown mark ochre-yellow. Sternites 1–2 whitish, sternites

3–5 cream-yellow, sternites 6–7 ochre-yellow. Tergite 7 with a digitiform projection on lateroposterior corners. **Terminalia** (Fig. E36D). Ochre-yellow, tergite 8 light brown. Sternite 8 trapezoid, latero-anterior corners extended dorsally, a wide incision on anterior margin, distally with a deep slender incision separating two pointed lobes, microtrichia on entire sclerite, setae restricted to lobes. Sternite 9 with anterior apodeme considerably wide, genital chamber elongate, a pair of lateral winglets. Sternite 10 trapezoid, elongate, with a long transparent window with microtrichia and setae. Tergite 8 large, trapezoid, latero-anterior corners extending ventrally to articulate with sternite 8, distally more sclerotized, with a pair of small pointed projections laterally to base of tergite 9+10. Tergite 9+10 with a slender medial connection between a pair of short lateral lobes with microtrichia and setae, laterally a pair of short digitiform projections, each with a long seta at tip. Cercomere 1 relatively short, widening to apex, 1.2× longer than cercomere 2, both covered with microtrichia and short setae.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000804>)

**Material examined. Holotype:** female, ZRC\_BDP0048487, Nee Soon (NS2), swamp forest, 07-13.June.2012, MIP leg. (slide-mounted).

**Etymology.** The species epithet refers to Ciñkappūr (சிங்கப்பூர்), the Tamil transcription for Singapore. The noun is used in apposition.

**Remarks.** There are features in the females of this species that allow the presentation of a diagnosis, despite the species presently being known only from a female. This includes the color pattern of the head and thorax, the small size of cell r4 and the wing markings, and even the shape of the terminalia sclerites.

### ***Neoempheria temasek* Amorim & Oliveira, sp.nov.**

(Figs. E37A–D)

**Diagnosis.** Head light ochre-yellow; scutum light ochre-yellow, no stripes; pleural sclerites whitish, mediotergite and laterotergite brown. Wing with brown band distally across wing and a brown band across wing more basally, over cell r1, r-m and cell m1+2 close to

injunction of bM and  $M_{1+2}$ . Cell r1 small, anterior margin  $0.94 \times$  length of R<sub>4</sub>; sc-r reaching bR well basal to origin of Rs. Tergite 1 cream-yellowish; tergite 2 cream-yellowish on anterior half, brown on posterior half; tergites 3, 5–6 dark brown with an antero-lateral cream-yellowish mark; tergite 4 cream-yellowish with a slender brown medial band; tergite 7 ochre-yellowish. Gonocoxites with a ventral projection directed obliquely inwards; gonostylus small, displaced latero-distally, bifid from base, external branch capitate, slightly more dorsal in position; tergite 9 with a pair of large lobes more or less compressed dorsoventrally, extending much beyond tip of gonostylus.

**Description. Male** (Fig. E37A). Wing length, 3.15; width, 1.21. **Head.** Ochre-yellow, darker on vertex. Face whitish-yellow, clypeus whitish-yellow, with scattered setae. Antennal scape and pedicel light ochre-yellow, flagellum ochre-yellow. Maxillary palpus light brown, last palpomere lighter, labella light ochre-yellowish. Scape  $1.4 \times$  pedicel length, flagellomere 1  $1.3 \times$  flagellomere 2 length, flagellomere 4 as long as wide. Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $2.4 \times$  palpomere 4 length. **Thorax.** Scutum mostly ochre-yellow, lighter above wing; scutellum light ochre-yellow. Pleural sclerites whitish with an orangish tinge, antepronotum slightly darker anteriorly, laterotergite light brown except for lighter ventral end, mediotergite brown with ochreous areas laterally. Halter whitish with brown tinge, base of knob slightly darker. Scutellum with a pair of prescutellar bristles on dorsocentral line, two pairs of prescutellars on lateroposterior corners. Antepronotum with three bristles and some additional smaller setae, proepisternum bare. **Legs.** Coxae whitish, front coxa with some orangish tinge; femora light ochre-yellow; tibiae and tarsi light greyish-brown. Fore leg tarsomere 1  $0.85 \times$  tibia length,  $2.1 \times$  tarsomere 2 length. Hind tibia inner spur  $4.2 \times$  tibia width at apex. **Wing** (Fig. E37B). Membrane with a light yellowish-brown background, with a dark brown band across distal third of wing, beginning at level of base of medial fork and a more basal band across wing from level of Sc to posterior margin. C produced beyond tip of R<sub>5</sub> for about a fifth of distance to M<sub>1</sub>; Sc weakly sclerotized beyond sc-r (barely visible even on phase contrast), sc-r present, reaching bR well before origin of Rs. R<sub>1</sub> reaching C at distal third of wing; R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>; R<sub>4</sub> present, slightly oblique, close to base of Rs, cell r1 trapezoid, short, anterior margin of cell r1  $0.94 \times$  longer than length of R<sub>4</sub>; first sector of Rs  $0.89 \times$  r-m length. False medial vein conspicuous, sclerotized. M<sub>1+2</sub>  $4.0 \times$  r-m length; bM  $8.5 \times$  length of first sector of Rs; base of M<sub>1</sub> weakly sclerotized. First sector of CuA  $1.1 \times$  longer than second sector. M<sub>4</sub> straight on distal half. Cubital pseudovein sclerotized to distal third of second sector of CuA; CuP sclerotized to basal third

of second sector of CuA. Anal fold faint. Wing margin emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, most of M<sub>1</sub> and of M<sub>4</sub>, distal two-thirds of M<sub>2</sub>, and entire length of CuA; sc-r, Sc, base of bR, first sector of Rs, R<sub>4</sub>, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergite 1 cream-yellow, tergites 2–3 brown with a cream-yellow band on anterior third, tergite 4 mostly ochre-yellow, with a median slender longitudinal brown band; tergites 5–6 brown with slender ochre-yellow slender bands anteriorly and posteriorly, tergite 7 light ochre-yellow. Sternites 1–5 whitish, sternite 6 brown with a whitish-yellow band medially, brown laterally, sternite 7 ochre-yellowish. **Terminalia** (Figs. E37C–D). Ochre-yellow, with some more brownish sclerites. Gonocoxites fused medially along a short extension, no medio-posterior process, an oblique projection inwards ventrally, with some few elongate fine setulae. Gonostylus placed latero-distally, bifid from base, external branch capitate, thin, slightly more dorsally, directed outwards, with a concentration of elongate setulae distally, inner branch more sclerotized, projected inwards, with long, strong setae along posterior margin, distal setae curved. Gonocoaxal apodeme wide, with a pair of short latero-anterior apodemes. Aedeagus wide, with a pair of short anterior apodemes, a pair of lateral winglets on basal third, a subquadrate distal plate with a U-shaped medial incision between a pair of lateral extensions distally. Parameres weakly sclerotized, wide, blade-like. Tergite 9 wide medially, bare, with a pair of large lobes more or less compressed dorsoventrally, extending to much beyond tip of gonostylus, densely covered with long setae on dorsal face, with some fine, long setae on ventral face. Sternite 10 small, trapezoid, slender at distal end, covered with microtrichia, setae along posterior margin. Cerci small, lobose, covered with microtrichia and small setae.

**Female.** As male, except for the following. **Wing.** Length, 2.52; width, 0.95. **Terminalia.** Sternite 9 with a pair of elongated lobes barely in contact medially, no microtrichia, covered with elongate setae, distal setae on each lobe more concentrated and longer. Tergite 8 wide, covered with elongate setae, lateroposterior end at each side with a concentrated group of setae on each side. Sternite 9 weakly sclerotized. Tergite 9+10 slender, with microtrichia and a sequence of elongate setae along posterior margin, lateroposterior corner with a short extension and a longer seta apically. Sternite 10 elongate, slightly arched, with transparent “window” between lateral margins. Cercomere 1 2.5× cercomere 2 length, both densely covered by microtrichia and short setae, distal tip on dorsal face of cercomere 1 slightly projected beyond insertion of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000823>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047801, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg. (slide-mounted). **Paratypes:** 16 males, 8 females. **Males:** ZRC\_BDP0047851, Nee Soon (NS1), swamp forest, 03-09.May.2013, MIP leg.; ZRC\_BDP0048695, Nee Soon (NS1), swamp forest, 12-18.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048704, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048810, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048850, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048891, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048947, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0049240, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0066789, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg.; ZRC\_BDP0072465, Bukit Timah, maturing secondary forest (BT08), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072695, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072704, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072707, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072710, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072711, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072712, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg. **Females:** ZRC\_BDP0048840, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted); ZRC\_BDP0048876, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0048960, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0072457, Bukit Timah, old secondary forest (BT07), 02-08.December.2016, MIP leg. (slide-mounted); ZRC\_BDP0066783, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg.; ZRC\_BDP0066802, Bukit Timah, primary forest (BT05), 17-23.August.2016, MIP leg.; ZRC\_BDP0066816, Bukit Timah, maturing secondary forest (BT09), 29.September-05.October.2016, MIP leg.; ZRC\_BDP0072464, Bukit Timah, maturing secondary forest (BT08), 25.November-01.December.2016, MIP leg. male, ZRC\_BDP0072465, Bukit Timah, maturing secondary forest (BT08), 01.Dec.2016, MIP leg.

**Additional sequenced specimens:** male, ZRC\_BDP0078950; male, ZRC\_BDP0078994; male, ZRC\_BDP0078995; male, ZRC\_BDP0134034; male, ZRC\_BDP0078999; male, ZRC\_BDP0079009; female; ZRC\_BDP0078952; female, ZRC\_BDP0078950; female, ZRC\_BDP0078954; ZRC\_BDP0079000; missing abdomen, ZRC\_BDP0078949.

**Etymology.** The species epithet refers to the early recorded, likely Malay/Javanese, name for pre-colonial Singapore. The noun is used in aposition.

**Remarks.** With a large number of specimens, this species was collected in different kinds of environment in Singapore and shows three haplotypes, which came together using different algorithms.

### *Neoempheria polunini* Amorim & Oliveira, sp.nov.

(Figs. E38A-D)

**Diagnosis.** Head light ochre-yellow, with a light brown diffuse mark over vertex; scutum light ochre-yellow, no stripes; pleural sclerites whitish, mediotergite light brown, laterotergite with a small light brown mark at dorso-posterior end. Wing with brown band across distal third of wing and a brown band more basally, from level of cell r1 to posterior margin; R<sub>4</sub>

absent; sc-r reaching bR well basal to origin of Rs. Tergites 1–2 and 4 cream-yellow; tergites 3, 5–6 dark brown, tergite 3 with slender cream-yellow lateroposterior band; tergite 7 whitish-yellow; sternite 6 with a large brown mark laterally. Syngonocoxite with a wide medio-posterior sclerotized process bearing short lateroposterior projections, a pair of sub-medial, bifid long blade-like projections internally to insertion of gonostylus; gonostylus long, digitiform, curved inwards distally; tergite 9 with a slender blade medially connecting a pair of long lateral setose projections with a group of 5–6 spines apically.

**Description. Male** (Fig. E38A). Wing length, 2.49; width, 0.95. **Head.** Brownish ochre-yellow at vertex, lighter above antennae and laterally on occiput. Antennal scape and pedicel light ochre-yellow, flagellum ochre-yellow with brownish tinge. Face whitish-yellow, clypeus whitish-yellow. Palpomeres brown, last palpomere lighter; labella light brownish. Ocellar setae present, small, only some few setae on frons laterally. Scape  $1.2 \times$  pedicel length, flagellomere 1  $1.76 \times$  flagellomere 2 length, flagellomere 4  $1.4 \times$  longer than wide. Palpomere 4  $1.0 \times$  palpomere 3 length, palpomere 5  $2.0 \times$  palpomere 4 length. **Thorax.** Scutum mostly ochre-yellow, scutellum light brown. Pleural sclerites whitish with an orangish tinge, laterotergite light brown on dorso-posterior end, mediotergite light brown, ochreous laterally. Scutum with a prescutellar bristle medially on dorsocentral line, one pair of prescutellar bristles on lateroposterior corner; scutellum with one pair of bristles and additional fine setae. Antepronotum with three bristles and additional larger and smaller setae. **Legs.** Coxae whitish, front coxa with some orangish tinge; front femur light ochre-yellow; tibiae and tarsi light greyish-brown. Hind tibia inner spur  $3.6 \times$  longer than tibia width at apex. **Wing** (Fig. E38B). Membrane with a dark brown band across wing at level of origin of Rs and a brown mark before wing tip beginning slightly beyond basal end of medial fork, both marks connected briefly along posterior margin. C extending beyond tip of R<sub>5</sub> for a fifth of distance to M<sub>1</sub>; Sc not sclerotized apically (not observable even under phase contrast), sc-r absent; R<sub>4</sub> absent; first sector of Rs  $1.3 \times$  r-m length. False medial vein present, curved along entire length. M<sub>1+2</sub>  $3.8 \times$  r-m length; bM  $7.1 \times$  length of first sector of Rs. First sector of CuA  $1.2 \times$  longer than second sector. M<sub>4</sub> depressed on distal half. Cubital pseudovein weakly sclerotized, ending at level of distal fourth of second sector of CuA; CuP reaching level of basal third of second sector of CuA. Anal fold very faint. Wing margin emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR, R<sub>1</sub> and second sector of Rs, most M<sub>1</sub>, distal half of M<sub>2</sub>, most M<sub>4</sub>, almost entire CuA. Sc, first sector of Rs, r-m, bM and CuP entirely devoid of macrotrichia. **Abdomen.** Tergite 1 whitish, tergite

2 cream-yellow with a slender light brown medial band; tergites 3, 5–6 brown, tergite 3 with a slender cream-yellow band along anterior margin, tergite 4 and 7 ochre-yellow. Sternites 1–2 whitish, sternites 3–5 whitish-yellow, sternite 6 light brown laterally, light ochre-yellow medially, sternite 7 ochre-yellowish. **Terminalia** (Figs. E38C–D). Ochre-yellow, tip of gonostylus brownish. Gonocoxites fused medially for a short distance, gonocoxite with a wide medio-posterior sclerotized process bearing a pair short projections latero-posteriorly, sub-medially a pair of bifid blade-like projections internally to insertion of gonostylus, ventral branch capitate extending almost to level of tip of gonostylus, curved inwards on distal half, some few short setulae at caput, dorsal branch flat, bare projection reaching slightly beyond base of gonostylus. Gonostylus placed latero-distally, long, digitiform, setose on outer face, curved inwards distally, reaching beyond tip of tergite 9 projections, with a group of fine setae directed inwards distally. Aedeagus subquadrate, wide, posterior margin almost reaching tip of ventral lobe of gonocoxite. Parameres weakly sclerotized, with a pair of wide blades close together medially extending slightly beyond posterior margin of aedeagus. Tergite 9 with a slender blade medially connecting a pair of long lateral setose projections, a sub-medial projection branching inwards and a group of 5–6 spines apically. Sternite 10 weakly sclerotized, with a pair of short lobes, bearing microtrichia and fine setae. Cerci small, close together, weakly sclerotized lobes, with microtrichia and fine setae.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000812>)

**Material examined. Holotype:** male, ZRC\_BDP0049204, Nee Soon (NS1), 04-10.December.2014, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 4 males: ZRC\_BDP0048849, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0049214, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049231, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049045, Nee Soon (NS2), 01-07.January.2015, MIP leg. **Additional sequenced specimens.** ZRC\_BDP0154867.

**Etymology.** The species epithet honors Ivan Polunin (1920–2010), a medical doctor and enthusiastic naturalist, who documented wildlife in Singapore using color films during the 1950s. He has as well documented lampyrid light synchronization.

**Remarks.** All specimens come from the Nee Soon swamp forests. There are four haplotypes and all delimitation approaches point to one species. This is the only species of *Neoempheria* we know of without R<sub>4</sub> and in Søli's (2017) key for the Afrotropical genera of mycetophilids, this species runs into *Parempheriella*. As mentioned above, *Neoempheria* is paraphyletic in relation to *Parempheriella* and this species has other regular features of *Neoempheria*: wing

with maculae, a conspicuous false medial vein etc. There are some additional details: in the wing of *Parempheriella* species, r-m is almost longitudinal in such a way that the origin of  $M_{1+2}$  is much more basal than the origin of r-m in Rs. In the *Neoempheria polunini*, sp.nov., r-m is almost transverse, as in all other *Neoempheria* species, in such a way that the origin of  $M_{1+2}$  is almost below the origin of r-m. In the mitogenome tree, *N. polunini*, sp.nov. fits in a clade also including *N. dizonalis* (Edwards), *N. temasek*, sp.nov., *N. neesoon*, sp.nov. and *N. cinkappur*, sp.nov., all of which have a very small cell r4. Evidence strongly suggests that this is an independent case of loss of R<sub>4</sub> in the evolution of the genus and that for the time being this species should be kept in *Neoempheria*.

### ***Neoempheria fajar Amorim & Oliveira, sp.nov.***

(Figs. E39A–D)

**Diagnosis.** Head brown, scutum dark brown, no stripes, scutellum ochre-yellowish; pleural sclerites whitish-yellow, laterotergite and mediotergite brown, mediotergite lighter on ventral fourth. Wing with a single, wide brown band across wing, at level of tip of Sc to tip of R<sub>1</sub> on anterior margin; cell r1 small, length of anterior margin 1.7× R<sub>4</sub> length; sc-r reaching R<sub>1</sub> on distal half of cell r1. Tergite 1 cream-yellow, tergites 2–6 brown with cream-yellow anterior band on tergites 2–4, cream-yellow latero-anterior corners on tergites 5–6; tergite 7 entirely cream-yellow. Female terminalia with unique pattern, wide, sternite 8 with a pair of distal setose lobes largely separate.

**Description. Female.** Wing length, 4.33; width, 1.64. **Head.** Brown, lighter ventrally on occiput, face and clypeus light brown, face with scattered small setae and macrotrichia, clypeus bare. No setae on frons anteriorly to ocelli. Post-ocellar setae present. Antennal scape and pedicel yellowish-brown, scape 1.4× pedicel length, flagellum light brown, flagellomere 1 2.0× flagellomere 2 length, flagellomere 4 1.4 longer than wide. Palpomeres light brown, last palpomere brownish-yellow, palpomere 4 about 1.2× palpomere 3 length, a short distal projection over base of distal palpomere, palpomere 5 2.1× palpomere 4 length. Labella small, brownish. **Thorax.** Scutum homogenously dark brown; a row of longer dc setae, some long supra-alars, two pairs of prescutellar bristles on lateroposterior corners of scutum, one pair of prescutellars medially on dorsocentral line. Scutellum ochre-yellow, with one pair of bristles and some smaller setae on disc. Pleural sclerites whitish-yellow, antepronotum light

brown anteriorly, laterotergite and mediotergite brown, mediotergite lighter on ventral fourth. Antepronotum with one stronger bristle and smaller setae of different sizes. Halter light brown. **Legs.** Coxa whitish; anterior and mid femora ochre-yellowish, hind femur brownish-yellow; tibiae and tarsi yellowish-brown, anterior tarsus lighter. Hind tibial spurs  $2.7 \times$  length of tibia at apex. **Wing** (Fig. E39A). Membrane with light greyish-brown with a single wide brown band across wing, at anterior margin between tip of Sc and tip of R<sub>1</sub>. Sc complete, reaching C slightly beyond level of tip of R<sub>4</sub>; sc-r present, reaching R<sub>1</sub> slightly beyond mid of cell r<sub>1</sub>; cell r<sub>1</sub> relatively short, anterior margin  $1.7 \times$  length of R<sub>4</sub>. False medial vein present, very gently sinuose on basal fourth. Medial fork not wide open. M<sub>1+2</sub>  $2.4 \times$  r-m length; bM  $6.5 \times$  r-m length. First sector of CuA  $1.2 \times$  longer than second sector. M<sub>4</sub> very gently depressed on distal half. Cubital pseudovein reaching level of distal third of second sector of CuA; CuP present to level of mid of second sector of CuA. Anal fold faint. Wing margin emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc, entire length of bR, R<sub>1</sub>, and second sector of Rs, on most of M<sub>1</sub>, on distal two-thirds of M<sub>2</sub>, on entire M<sub>4</sub> and on entire CuA. **Abdomen** (Fig. E39B). Tergite 1 cream-yellow, tergites 2–6 brown with cream-yellow anterior band on tergites 2–4 (extending more posteriorly along lateral margin on tergite 4) and with cream-yellow latero-anterior corners on tergites 5–6, tergite 7 cream-yellow. Sternites 1–5 and 7 cream-yellow, sternite 6 light brown. **Terminalia** (Fig. E39C). Ochre-yellow. Sternite 8 large, with a pair of large lobes densely covered by setation, each bearing on ventral face a subdistal dorsal protuberance, a pair of setose digitiform projections on lateral ends of sclerite. Sternite 9 wide, with short median anterior projection of vaginal furca and a well-sclerotized triangular area distally to genital opening. Tergite 8 wide, with a pair of rounded lobes widely separated medially projecting outwards distally, sclerite mostly bare on anterior third, lobes covered with microtrichia and setation. Tergite 9+10 slender, with three pairs of long digitiform projections, each with a distal long seta, inner pair with a second, subdistal seta. Sternite 10 small, weakly sclerotized, covered with microtrichia and fine setae. Cerci small, weakly sclerotized.

**Male.** Unknown.

**Material examined.** Holotype: female, ZRC\_BDP0284230, Singapore, Freshwater swamp (KM03), no date (slide-mounted). **Additional sequenced specimen:** ZRC\_BDP0040971.

**Etymology.** The species epithet refers to a magazine named Fajar [=dawn in Arabic], published by the University Socialist Club in Singapore in the early 1950s. The Club played an important role in the politics of colonial Malaya and post-colonial Malaysia and Singapore. The editorial board members were arrested, went to trial and were released three days after the trial. The Club's victory stands as a landmark in the progress of decolonisation of this part of the world. The noun is used in apposition.

*Unplaced species of Neoempheria*

***Neoempheria riatanae* Amorim & Oliveira, sp.nov.**

(Figs. E40A–D)

**Diagnosis.** Head and scutum dark brown, no stripes, mediotergite dark brown, laterotergite only with a tinge of brown along posterior margin. Wing with oblique brown mark across tip of wing, on anterior margin beginning slightly before tip of  $R_1$ , on posterior margin ending more basally than tip of CuA; a second oblique band more basally on the wing, beginning at tip of Sc and ending on basal lobe; anterior margin of cell  $r_1$  small, length of anterior margin 1.4  $R_4$  length; sc-r reaching  $R_1$  on basal third of cell  $r_1$ . Abdominal tergites 1–6 dark brown, tergites 1–4 with laterals yellowish, tergite 7 brownish-yellow. Sternite 8 yellowish, cerci whitish. Gonocoxites fused, bare, with a short suture on anterior end ventrally, a long dorsal setose projection. Gonostylus short, ear-like displaced laterally. Gonocoxal apodemes long, parallel on anterior end. Aedeagal plate not visualized. Parameres with a pair of setose lobes posteriorly. Tergite 9 with a short medial connection, with a pair of separate projections bearing some few denticles distally. Cerci small, elongate, separate from each. Female terminalia elongated, sternite 8 with a median short crest between the distal lobes.

**Description. Female** (Fig. E40A). Wing length, 2.59–2.75; width, 0.95 (n=2). **Head.** Brown, lighter at ventral half of occiput. No setae on frons anteriorly to ocelli. Ocellar setae present. Face light brown, clypeus yellowish-brown. Antennal scape light brown, pedicel dark ochre-yellow, flagellum light brown. Palpomeres brown, last palpomere lighter, labella short, light brown. Scape 1.0× pedicel length, flagellomere 1 1.6× flagellomere 2 length, flagellomere 4 1.5× wider than long. Palpomere 4 1.0× palpomere 3 length, dorsally tip slightly projecting beyond base of palpomere 5, palpomere 5 1.7× palpomere 4 length. **Thorax.** Scutum light

brown, with ochre-brown areas laterally and along anterior margin; scutellum light brown. Pleural sclerites mostly whitish, antepronotum ochre-brown, cervical sclerite dark brown, mediotergite brown. Scutum with some strong supra-alars, one pair of prescutellar bristles medially on dorsocentral line, one pair of prescutellar bristles on lateroposterior corner; scutellum with one pair of bristles and additional fine setae. Antepronotum with two strong bristles and additional smaller setae. Halter light brown, knob darker. Halter light brown.

**Legs.** Coxae ochre-yellowish, front coxa darker, hind coxa lighter; femora ochre-yellow; tibia and tarsus light greyish-brown, tarsomeres darker towards tip. Fore leg tarsomere 1  $0.8 \times$  tibia length,  $1.8 \times$  tarsomere 2 length. Hind tibia inner spur  $3.0 \times$  longer than tibia width at apex.

**Wing** (Fig. E40B). Membrane with a dark brown band across wing at level of base of Rs and a wide band distally at wing, beginning slightly beyond base of medial fork. Sc reaching C beyond level of base of second sector of Rs, sc-r complete, reaching R<sub>1</sub> beyond origin of R<sub>1</sub>, anterior margin of cell r1 short, about as wide as long; first sector of Rs  $0.8 \times$  r-m length. False medial vein present, slightly sclerotized. Medial fork wide open. M<sub>1+2</sub>  $3.3 \times$  r-m length; bM  $5.2 \times$  length of first sector of Rs. First sector of CuA  $0.90 \times$  longer than second sector. M<sub>4</sub> gently depressed on distal half. Cubital pseudovein weakly sclerotized, ending at level of second third of second sector of CuA; CuP reaching level of mid of second sector of CuA. Anal fold faint. Wing margin not emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on distal half of Sc, on entire length of bR, R<sub>1</sub>, and second sector of Rs, and on distal fourth of M<sub>1</sub> and M<sub>2</sub>, distal fourth of M<sub>2</sub>. **Abdomen.** Tergite 1–2 and 4 dark brown medially, wide cream-yellow bands laterally, tergite 3 mostly dark brown, lighter along lateral margins, tergites 5–6 brown, tergite 7 with a light brownish-yellow medial band and an ochre-yellow band laterally. Sternites 1–4 whitish to light ochre-yellow, sternites 5–6 brown, sternites 7 ochre-yellow. Tergite 7 with no projection on lateroposterior corner.

**Terminalia** (Fig. E40D). Ochre-yellow, cerci lighter. Sternite 8 wide anteriorly, extending posteriorly with a subtriangular shape, bearing a medio-distal short keel sided by a pair of subdistal lateral lobes. Sternite 9 wide, complex, without a furca at anterior end. Tergite 8 wide, slightly projected medially covered with microtrichia, but no setae. Tergite 9 wide, short, with a row of elongate setae. Tergite 10 slender, two pairs of short protuberances each with an elongate seta at tip, a pair of more developed lobes at lateral ends. Sternite 10 with a pair of short lateral lobes on posterior margin, transparent window wide midway to apex. Cerci laterally compressed, cercomere 1  $2.0 \times$  longer than cercomere 2, both covered with microtrichia and short setae.

**Male.** As female, except as following. **Terminalia** (Fig. E40C). Gonocoxites fused, bare, with a short suture on anterior end ventrally, dorsally a long, flat projection covered with setae. Gonostylus short, ear-like displaced laterally. Gonocoxal apodemes long, parallel on anterior end. Aedeagal plate not visualized. Parameres with a pair of setose lobes posteriorly. Tergite 9 with a short medial connection, with a pair of separate projections bearing some few denticles distally. Cerci small, elongate, separate from each.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000802>)

**Material examined. Holotype:** 1 male, ZRC\_BDP0049212, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Paratypes.** 3 females. Females: ZRC\_BDP0047840, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg. (slide-mounted); ZRC\_BDP0047825, Nee Soon (NS1), swamp forest, 14-20.February.2013, MIP leg. (slide-mounted); ZRC\_BDP0049247, Nee Soon (NS1), 04-10.December.2014, MIP leg. (website photo specimen). **Additional sequenced specimens.** Male, ZRC\_BDP0133924; female, ZRC\_BDP0133969; female, ZRC\_BDP0134011.

**Etymology.** The species epithet honors Ms Ria Tan (1961-), prominent naturalist and conservationist, with a key role in raising awareness and protecting Singapore's littoral and mangrove habitats.

### *Neoempheria* sp.nov. B

(Figs. E41A–D)

**Description. Female** (Fig. E41A). Wing length, 2.20; width, 0.85. **Head.** Light-brown at vertex, lighter towards frons and ventral margin of occiput. Face light brown, clypeus yellowish-brown. Antennal scape and pedicel ochre-yellow, flagellum light ochre-yellow. Palpomeres brown, last palpomere lighter; labella yellowish-brown. Frons with some few scattered short setae anteriorly to line of ocelli. Scape  $1.0 \times$  pedicel length, flagellomere 1  $2.0 \times$  length of flagellomere 4, flagellomere 4  $1.2 \times$  longer than wide. Palpomere 4  $1.0 \times$  palpomere 3 length, palpomere 5  $1.7 \times$  palpomere 4 length. **Thorax.** Scutum mostly dark ochre-yellow, more brownish along anterior half of lateral margin and medially on distal half; scutellum light brown. Pleural sclerites cream-yellow with an orangish tinge, antepronotum with a dark brown mark at inner margin anteriorly, dorsoposterior end of laterotergite with a light brown mark, mediotergite light brown. Scutum with a pair of prescutellar bristles at dorsocentral lines and one pair of prescutellar bristles at lateroposterior corners; scutellum with one pair of scutellar bristles and one additional pair of small setae. Antepronotum and

proepisternum each with one strong bristle and some smaller setae. **Legs.** Coxae whitish, mid and hind coxae with a brown mark at tip; femora ochre-yellow; tibiae and tarsi light greyish-brown. Mid tibia inner spur  $3.3 \times$  tibia width at apex [both hind leg femora, tibiae and tarsi missing on holotype]. Fore leg tarsomere 1  $0.8 \times$  tibia length,  $1.6 \times$  tarsomere 2 length. **Wing** (Figs. E41B–C). Membrane background light greyish fumose, a dark brown band across wing at level of tip of Sc and a dark brown mark at distal two-fifths of wing, beginning at level of base of medial fork. C produced beyond tip of  $R_5$  for less than a fourth of distance to  $M_1$ ; Sc reaching C slightly beyond level of origin of Rs, sc-r not produced; first sector of Rs oblique,  $R_4$  not far from base of r-m, anterior margin of cell  $r_1$   $1.4 \times$  length of first sector of Rs; first sector of Rs  $1.0 \times$  r-m length. False medial vein conspicuous, sclerotized.  $M_{1+2}$   $3.3 \times$  r-m length; bM  $7.4 \times$  length of first sector of Rs. First sector of CuA  $1.3 \times$  longer than second sector.  $M_4$  gently curved on distal half. Cubital pseudovein sclerotized to beyond level of origin of  $M_4$ , CuP barely sclerotized, reduced to wing base, anal fold weakly sclerotized. Wing margin not emarginated at tip of CuA. No ventral macrotrichia on veins, dorsal macrotrichia on entire length of bR,  $R_1$ , anterior third of r-m, second sector of Rs, and distal third of  $M_1$ ; Sc, sc-r, first sector of Rs,  $R_4$ , r-m posteriorly, bM,  $M_2$ ,  $M_4$ , CuA and CuP devoid of macrotrichia. **Abdomen.** Tergite 1 light brown, tergite 2 light brown with wide cream-yellow lateral bands, tergites 3–4 with slender cream-yellow lateral bands, tergite 5–6 light brown, tergite 7 ochre-yellowish on anterior half, light brownish on posterior half; tergite 7 wider on distal margin, no other lateroposterior projections. Sternite 1 whitish, sternites 2–4 cream-yellow, sternites 5–6 light brownish-yellow, sternite 7 whitish-yellow. **Terminalia** (Fig. E41D). Cream-yellow, tip of sternite 8, sternite 10, tergite 9+10 and base of cerci light yellowish-brown. Sternite 8 trapezoid, a pair of short lobes medially on posterior end with a shallow incision between them, microtrichia covering entire sclerite, setae on distal third. Sternite 9 wide, two gonoducts reaching genital opening, distally with a ventral slender medial blade apically bifid, genital chamber elongate, weakly sclerotized. Sternite 10 with wide medial transparent window. Tergite 8 slender medially. Tergite 9 medially slender, a pair of digitiform projections on each side each with a distal seta, and a number of short digitiform projections more medially along posterior margin. Cercomere 1 long, with a group of 3–4 large setae laterally near base and a group of three strong, short subapical setae; cercomere 2 elongate, with microtrichia and some fine setae, three stronger setae along inner margin.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000834>)

**Material examined. Holotype:** female, ZRC\_BDP0047779, Nee Soon (NS1), swamp forest, 22-28.August.2013, MIP leg. (slide-mounted).

## Mycetophilinae

There are about 34 genera in the subfamily Mycetophilinae, about 20 in the Exechiini, with about 700 described species, and 14 in the Mycetophilini, with about 1,500 described species (Kjærandsen, 2005; Magnussen, 2020). The phylogeny of the subfamily has been addressed in different papers (Rindal and Søli 2006; Rindal et al. 2009; Burdíková et al. 2019), but there may be issues at least about the relationships among the Exechiini (Rindal et al. 2007; Burdíková et al. 2019).

The Exechiini are largely temperate in distribution—in both hemispheres—with a much larger number of species described when compared to tropical areas. In the Mycetophilini, *Mycetophila* and some of the small genera also have a typically temperate distribution, while especially *Epicypta* is largely speciose in tropical areas.

We found in Singapore five species of two genera of Exechiini—*Allodia* and *Exechia*—and 53 species of Mycetophilini. This study has the first records of the genera *Platyprosthiogyne* and *Aspidionia* for the Oriental region and we describe a new genus of Mycetophilini.

Our mitogenome tree begins to unveil the relationships among the Mycetophilini, including genera not sampled in previous phylogenetic studies of the tribe (Rindal and Søli 2006; Rindal et al. 2009), as *Platyprosthiogyne* and *Aspidionia*, in addition to the genus described here. The mitogenome tree corroborates previous inferences about the relationships between *Mycetophila*, *Platurocypta* and *Epicypta*. The small taxonomic sampling of species of *Mycetophila* in all analyses published so far, however, does not allow to properly answer the question of the monophyly of the genus in relation to the clade, considering Rindal & Søli's (2009) phylogeny, containing *Epicypta*, *Platurocypta*, *Zygomyia* Winnertz and *Sceptonia* Winnertz.

The overlap of the results of the mitogenome tree obtained here with the morphology of the group brings very interesting results. The group of genera with a “sharp incision in the lower border of the scutum” (Søli, 2017)—including *Epicypta*, *Platurocypta*, *Aspidionia* and *Integricypta*, **gen.nov.**—comes together as a clade. This is also the case of the group of genera that has the katepisternum strongly compressed (in some keys a distinctive feature to

separate *Epicypta* from *Mycetophila*), a largely developed mid coxa, the anterior end of the thorax modified to fit a compressed head, a largely reduced mediotergite and a compressed, reduced laterotergite. As discussed ahead, we are not sure about *Platyprosthiogyne* being monophyletic—a results seen in the mitogenome tree. The species of *Platyprosthiogyne* are plesiomorphic for all these features and its position of *Platyprosthiogyne* as sister of *Mycetophila* makes sense from the point of view of the head and thorax morphology.

We made our best to consistently apply here the nomenclature used by Magnussen et al. (2018, 2019)—respectively for Afrotropical and southern Oriental species of *Allodia*—for the branches of the gonostylus and the lobes of the mycetophilines in general. We use Kurina's (1992) term “medioventral process” for a median extension at the posterior margin between the gonocoxites, assumed to be an extension of sternite 9, even though a similar structure may have originated independently more than once in the evolution of the family. It is worth clarifying that we call “vertex” in the Mycetophilinae the entire frontal area of the head capsule dorsally to the line connecting lateral ocelli. In most flies, the entire head behind eyes and the line of ocelli corresponds to the original “occiput” and faces posteriorly. The head of the mycetophilines, however, is rather strongly compressed antero-posteriorly (especially in the Mycetophilini) and part of the head capsule posteriorly to the ocelli line extends dorsally and faces anteriorly.

## Exechiini

We have only exechiine species of *Allodia* and *Exechia* in our samples. As mentioned above, both these genera have the bulk of their distribution in the Holarctic regions and they are relatively scarce in tropical areas. The Australasian region and Oceania fauna of the tribe also includes *Brevicornu* and *Synplasta* Skuse—maybe only *Brevicornu* would also be found in Singapore.

### *Allodia* Winnertz

*Allodia* Winnertz, 1863: 826. Type species: *Mycetophila ornaticollis* Meigen, 1818 [= *Mycetophila lugens* Wiedemann, 1817], des. Johannsen, 1909: 104.

**Diagnosis** (modified from Tuomikoski, 1966). Antennae not thickened or shortened. Discal bristles of scutum in two dorsocentral rows (sometimes an additional median row present), in some cases all discal bristles at least on anterior half of scutum reduced or absent.

Proepisternum with two bristles directed downwards; anepisternum, mesepimeron and

mediotergite bare. Sc very short, ending free or in bR; R<sub>1</sub> not much longer than bR; R<sub>5</sub> nearly straight, diverging from M<sub>1</sub> at apex; r-m oblique or almost longitudinal, about as long as M<sub>1+2</sub>, bare; origin of M<sub>4</sub> before or under basal end of r-m; fork veins without macrotrichia; CuP faint; anal fold weak. Hind coxa with a single basal bristle; hind tibiae without posterior bristles. First abdominal sternite with or without a pair of longer marginal bristles. Tergite 9 with one or two pairs of longer bristles. Female cerci most often 2-segmented.

*Allodia* Winnertz has presently over 100 species described worldwide, the diversity of the genus being predominantly a Holarctic (Magnussen et al. 2019b). *Allodia* Winnertz and *Brachycampta* were originally proposed as separate genera, but they have been kept together in one genus by most authors (see a synthesis of the taxonomic history in Magnussen 2020). Kjærandsen (2007) and Magnussen (2020) discussed that they should be hold again as separate genera, but a comprehensive discussion is still not published.

Nine species of *Allodia* have been described so far from the Oriental region and nine other species were added recently from the Himalayas (Nepal and Buthan) (Magnussen et al., 2019), which connections are basically Palaearctic. There are seven species known from the Afrotropical region (Magnussen et al. 2019a) and three from the Australasian-Oceanian region (Colless 1966). The Oriental species include seven species from China (Wu et al. 2003), one species from Sri Lanka (Senior-White, 1922) and a single species from Gunong [=Mountain] Tahan, Malaya (Edwards 1928). There are clear differences in the color patterns between our species and *A. micans* Edwards, from Malaya, and we consider all our species of the genus to be new.

Our study formally describes four species of *Allodia*—they fit the diagnosis and run into the genus in all identification keys. In terms of species delimitation approaches, the only conflict is with mPTP, bringing together all four species, pretty surprising considering the impressive differences between all four (Fig. F01G). Morphology and the other approaches clearly separate four species.

From the point of view of the delimitation of the genus, however, there are issues. Magnussen (2020) leaves no doubt the need to separate *Allodia* and *Brachycampta* in separate genera. Our mitogenome tree, interestingly, has *Allodia teopohlengi*, sp.nov. as sister of *Exechia*—indeed, the wing pattern of *Allodia teopohlengi*, sp.nov. clearly differs from the other three, especially the shape of the medial fork and the shape of the posterior fork. The position of *Allodia teopohlengi*, sp.nov. in the mitogenome tree could be only noise due to a limited taxonomic sampling of these genera. Tuomikoski (1966, p. 183) viewed

*Allodia* as monophyletic, but he specifically mentioned that the reduction of the anal fold was possibly the only apomorphic in the diagnosis of the genus (p. 181). All species of *Allodia* from Singapore described here fit into the genus using any of the keys available and have most of the diagnostic features of the genus. But *Allodia teopohlengi*, sp.nov. has an evident, long and sclerotized anal fold and a male terminalia that disagrees in some extension from the general pattern of the genus. This stresses again that non-Holarctic species often do not fit into the usual Holarctic-based diagnoses. It could be the case, pending on additional more careful studies, that, besides the question of generic status for *Brachycampta* Winnertz (Magnussen, 2020), *Allodia* in its present definition is not monophyletic.

The male terminalia of *Allodia* is particularly complex, with many different branches of the gonostylus and homology of the branches or lobes not easy. We did our best to interpret the branches of the gonostylus of the Singapore species to the system proposed by Magnussen (2020).

#### ***Allodia glorialimae* Amorim & Oliveira, sp.nov.**

(Figs. F01A–G, F02A–B)

**Diagnosis.** Scutum light brown, yellowish along lateral margins, some few small bristles scattered on anterior half of scutum; pleural sclerites brownish, with lighter areas on anepisternum, katepisternum and mesepimeron. Sc short, fused to bR; r-m about as long as M<sub>1+2</sub>; R<sub>5</sub> mostly straight on distal half; medial fork with a slight constriction midway to apex; anal fold short, more or less straight, weakly sclerotized. Abdominal tergites 2–6 dark brown with cream-yellow anterior areas on antero-lateral corners, in more posterior segments extending inwards. Internal margin of ventral face of gonocoxites with a fringe of elongate setae; all gonostylus lobes slender, dorsal lobe with two branches, one digitiform directed posteriorly and one triangular directed inwards, widening towards tip; medial lobe digitiform, directed posteriorly; ventral lobe digitiform, curved, directed posteriorly on distal half; aedeagus strongly sclerotized, widening before apex.

**Description. Male** (Fig. F01A). Wing length, 1.92; width, 0.74. **Head** (Fig. F01B). Light brown, yellowish-brown at anterior margin of front, face greyish-brown. Head much higher than long, occiput flattened, head partially fit under anterior tip of scutum. Eyes densely covered with inter-ommatidal setulae. Antenna light brown, darker toward apex, pedicel

longer than scape, both with setae on distal half, stronger setae along distal border, a strong seta dorsally; flagellum 1 twice pedicel length, flagellomeres cylindrical, flagellomeres 2–13 about 1.4 longer than wide, covered only with setulae. Maxillary palpus light brown, whitish-yellow towards tip of distal palpomere, palpomere 1 missing, palpomere bare, weakly sclerotized, palpomere 3 wider and longer, with modified dorsal face bearing a band of sensillae, laterally and ventrally with small setae, palpomere 4 longer than palpomere 3, with scattered small setae on dorsal half, palpomere 5 inserted subapically on previous palpomere, more than twice length of palpomere 4, slender except at apex, with scattered setulae.

Occiput with about eight dark setae around eye, vertex densely covered with brownish small setae. Mid ocellus minute, lateral ocelli surrounded by dark brown marking, displaced laterally, in contact with eye margin. Labella yellowish, long. **Thorax** (Fig. F01C). Scutum mostly brownish, light along margins and along dorsocentral line, scutellum brownish. Scutum clothed with short black setae, a line of stronger bristles along margin, two regular rows of strong dorsocentrals, including prescutellars. Scutellum large, with two strong scutellar bristles on posterior margin and a number of small setae covering scutellar disc. Antepronotum and proepisternum light whitish-brown, katepisternum and mesepimeron whitish-brown, darker on ventral half, anepisternum brown on anterior half, light brownish-yellow on posterior half, laterotergite light brown, darker along posterior margin, mediotergite dark brown, metepisternum whitish. A row of 4–5 antepronotal bristles and some additional small setae, proepisternum with two bristles and some small setae.

Proepimeron small, rectangular, directed towards antero-dorsal corner of anepisternum, bare. Anepisternum, katepisternum, mesepimeron and mediotergite bare. Laterotergite with four longer setae medially and about 20 small setae; metepisternum with 15–18 fine setae, one slightly stronger. Haltere light brown. **Legs.** Coxae whitish-yellow, femora yellowish-brown, tibiae and tarsi light brown, darker towards apex. Front coxa covered with setae on anterior and internal face, setae larger towards tip; mid coxa entirely devoid of setae except on distal fifth, with some smaller and larger setae at distal margin; hind coxa with an isolate strong basal black bristle and a line of fine setae along its length, distally with setae on external and posterior faces. Femora evenly covered with small setae, some slightly longer setae along ventral margin close to tip. Tibiae and tarsi with regular rows of trichia. Front tibia with few stronger short setae dorsally on distal fifth, a regular comb of setae on a small crest on external face at tip, antero-apical depressed area wide, densely lined with setulae. Mid tibia with stronger short setae on distal three-fourth dorsally and laterally, external margin at tip also with a small crest bearing a regular comb of short setae; hind tibia with long

irregular rows of dorsal, lateral and ventral short stronger setae, external margin at tip with a small crest bearing a regular comb of short setae. Front leg tarsomere 1 slightly longer than tibia, some few stronger setae only at tip of tarsomeres, mid and hind tarsomeres with stronger setae ventrally and at tip. Tarsal claw with one long tooth coming out laterally from claw and two fine basal teeth. **Wing** (Fig. F01D). Membrane fumose brownish. C ending at tip of R<sub>5</sub>. Sc short, in contact with bR. R<sub>1</sub> long, almost straight, ending at C at level of tip of M<sub>4</sub>. First sector of Rs short, oblique, R<sub>5</sub> reaching margin before level of M<sub>2</sub>; r-m almost straight, oblique, slightly shorter than M<sub>1+2</sub>. M<sub>1+2</sub> short, fork with constriction midway to apex, M<sub>1</sub> and M<sub>2</sub> weak close to margin. M<sub>4</sub> originating more basally than anterior end of M<sub>1+2</sub>. Cubital pseudovein not produced, CuP clearly extending beyond origin of M<sub>4</sub>; anal fold weakly sclerotized, only gently curved, extending to close posterior margin of anal lobe. Dorsal setae on bR, R<sub>1</sub>, second sector of Rs (R<sub>5</sub>); ventral setae on R<sub>1</sub> and distal three-fourth of second sector of Rs. **Abdomen**. Tergite 1 entirely brown, tergites 2–6 mostly brown, with cream-yellowish marks at anterior corners extending towards mid along anterior margin. Sternites whitish-yellow. **Terminalia** (Figs. F02A–B). Brownish-yellow. Gonocoxites well developed, in contact with each other medially but not fused, suture evident, a row of conspicuous setae at along inner margin medially; no gonocoxite lobe dorsally or ventrally projecting beyond base of gonostylus, syngonocoxite medial projection heavily sclerotized, slender, extending to level of base of gonostylus; at internal face of posterior margin ventrally, a short, curved digitiform projection with a fine seta medially. Gonostylus complex, composed of: a main distal lobe with a basal setose lobe extending distally into a digitiform projection bearing setulae at distal third; a median well sclerotized lobe, entirely devoid of seta, right gonostylus bearing an additional digitiform bare extension towards dorsal end of terminalia; a ventral bifid lobe, more ventral branch straight with setulae along entire extension and a distal seta, and dorsal curved digitiform branch bearing a long basal seta directed inwards and a pair of curved setae distally; and a striated internal part, extending from base of gonostylus towards dorsal face, reaching level of gonocoxal bridge. Tergite 9 small, medially divided, each part covered with microtrichia and with one strong apical bristle, besides scattered fine setae. Tergite 10 divided into a pair of elongated lobes covered with microtrichia and a long apical fine bristle. Cercus 1-segmented, small, elongate, close to each other at anterior end, covered with fine trichia and scattered fine setae.

**Female.** As male, except for the following. **Wing** (Figs. F01E–F). Length, 1.95; width, 0.77. Sternite 8 slender, with median incision reaching anterior margin, a pair of elongate lobes laterodistal lobes, fine setae restricted to lobes. Tergite 8 large, setose, with a pair of distal

pointed lobose projections. Medial rhomboid extension beyond posterior margin of tergite 8. Cercus 2-segmented, cercomere 2 elongate.

**Material examined. Holotype:** male, ZRC\_BDP0049087, Nee Soon (NS1), 18-24.December.2014, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 1 female, ZRC\_BDP0049093, Nee Soon (NS1), 18-24.December.2014, MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Gloria LIM (1930–), a mycology expert (author of >140 papers and book chapters) and a first in many positions: first woman Dean of the Faculty of Science in 1973 at the National University of Singapore, first woman appointee of the Public Service Commission in 1982, and first Foundation Director at the National Institute of Education. She was awarded the Public Service Star for her contributions to public service in 1993, and inducted into the Singapore women's Hall of Fame in 2014.

| ***Allodia murphyi* Amorim & Oliveira, sp.nov.**

(Figs. F03A–G)

**Diagnosis.** Scutum light brown, ochre-yellowish along lateral margins, some few small bristles scattered on anterior half of scutum; pleural sclerites light ochre-yellowish, anepisternum light brown dorso-anteriorly. Sc short, fused to bR; r-m about as long as  $M_{1+2}$ ;  $R_5$  mostly straight on distal half; medial fork with a slight constriction midway to apex; anal fold short, straight, weakly sclerotized. Abdominal tergites 1–5 with a slender greyish-brown longitudinal mark medially, ochre-yellowish laterally, tergite 6 with a greyish-brown medial mark anteriorly, dark ochre-yellowish laterally and posteriorly. Gonocoxites strongly diverging, no stronger setae along inner margin at ventral face; gonostylus ventral lobe with a pointed branch directed inwards, medial lobe digitiform, directed posteriorly, dorsal lobe short, setose, well sclerotized; pair of aedeagus apodemes strongly sclerotized.

**Description. Male** (Fig. F03A). Wing length, 2.14; width, 0.80. **Head.** Yellowish-brown, occiput lighter towards ventral margin, face whitish-yellow. Occiput nearly flat, head much higher than long, partially fit under anterior end of scutum. Antennal scape and pedicel dirty whitish-yellow, flagellum light brown, darker towards apex, flagellomeres about as long as wide. Palpus light brown, labella whitish-yellow. **Thorax.** Scutum dark ochre-yellowish,

with a pair of ochre-yellow bands along margins, scutellum brownish-ochre. Scutum clothed with short dark setae, some few strong bristles along margins, small bristles along weakly defined dorsocentral rows, one pair of prescutellar bristles; one pair of strong scutellar bristles and many additional small setae on disk. Scutum above wing with a small bulging area with marginal bristles. Antepronotum, proepisternum, proepimeron katepisternum, mesepimeron and metepisternum whitish-yellow, anepisternum light brown on antero-dorsal corner, dirty whitish-yellow on ventro-posterior corner; laterotergite brownish-yellow, mediotergite light brown. Antepronotum with two strong bristles and many additional small setae; proepisternum with two bristles on ventral margin plus additional scattered small setae. Anepisternum, katepisternum, mesepimeron and mediotergite bare; laterotergite with longer and about 20 small setae. Metepisternum with 16–20 small, fine setae. Haltere yellow, with some few fine setae on pedicel and some setulae on knob. **Legs.** Coxae whitish-yellow, fore coxa yellowish on basal third; femora whitish-yellow, tibiae and tarsi light brown, darker towards tip. Hind coxa with one isolate strong basal black bristle. Mid tibia with long row of dorsal black setulae. Front leg tarsomere 1 slightly longer than tibia. Tibial spurs over 4× longer than tibia width at apex. **Wing** (Fig. F03B). Membrane fumose brownish. C ending at tip of R<sub>5</sub>. Sc short, in contact with bR. R<sub>1</sub> long, almost straight, ending at C at level of tip of M<sub>4</sub>. First sector of Rs short, oblique, R<sub>5</sub> reaching margin before level of M<sub>2</sub>; r-m almost straight, oblique, slightly shorter than M<sub>1+2</sub>. M<sub>1+2</sub> short, fork with constriction midway to apex, M<sub>1</sub> and M<sub>2</sub> weak close to margin. M<sub>4</sub> originating more basally than anterior end of M<sub>1+2</sub>. Cubital pseudovein ending at basal third of CuA, CuP inconspicuous; anal fold weakly sclerotized, curved only at distal fourth, extending to close to posterior margin of anal lobe. Dorsal setae on bR, R<sub>1</sub>, second sector of Rs (R<sub>5</sub>); ventral setae on R<sub>1</sub> and distal three-fourth of second sector of Rs. **Abdomen.** Tergite 1 light brown with yellowish laterals, tergites 2–5 cream-yellowish with a greyish-brown medial band, more dirty-yellowish at laterals, on more distal segments greyish-brown bands wider on posterior margin; tergite 6 greyish-brown medially on anterior margin, dirty-yellowish on posterior margin and along laterals. Sternites whitish-yellow. **Terminalia** (Figs. F03C–E). Ochre-yellowish with some darker sclerites. Gonocoxites well developed, setose, only in contact medially not fused to each other; no projections of gonocoxite posterior margin beyond base of gonostylus dorsally or ventrally, a trapezoid distal projection medially at ventral face; internal posterior corner of gonocoxite on dorsal face strongly sclerotized. Gonostylus complex, composed of: an elongate, regularly-sclerotized setose dorsal lobe with lateral blade-like lateral extensions and a distal comb of setulae; a medial lobe with a wider base bearing a pair of long setae and a digitiform

extension inwards with two long subapical setae and a slightly falciform apex; a digitiform ventral lobe, with a pair of long setae on internal face, some scattered small setae and a group of distal small and stronger setae; a striated, wide internal part. Gonocoxal bridge wide. Aedeagal-parameral complex including a medial well-sclerotized large sclerite with two pairs of short distal projections; an additional sclerite with an anterior medial area connecting a posterior membrane that ends slightly beyond insertion of gonostylus, posterior margin with a median shallow rounded incision. Tergite 9 present as a pair of elongate short lobes barely connecting anteriorly and ending with a strong apical bristle. Tergite 10 divided into a pair of elongate lobes covered with microtrichia and a long seta, ending close to level of base of gonostylus. Cerci small, elongate.

**Female.** As male, except for the following. **Wing.** Length, 2.24; width, 0.90. **Terminalia** (Figs. F03F–G). Sternite 8 slender, long, hypoginal valves long, separate medially by a deep incision, setulae restrict to valves. Tergite 8 short, wide, weakly sclerotized, entirely devoid of setae. Sternite 9 weakly sclerotized, oblong, with gonopore medially. Tergite 9, tergite 10 and cerci not recognizable as independent sclerites, a single trapezoid very elongate sclerite present, with a medial slender posterior incision, setulae on posterior half and a pair of long setae at posterior margin.

**Material examined. Holotype:** male, ZRC\_BDP0048670, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (slide-mounted). **Paratypes:** 2 females, ZRC\_BDP0048976, Nee Soon (NS1), 07-13.May.2015, MIP leg.; female, ZRC\_BDP0048669, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (slide-mounted). **Additional sequenced specimens.** Male, ZRC\_BDP0154890.

**Etymology.** The species epithet of this species honors Dennis Hugh “Paddy” Murphy (1931-2020). As a British citizen who moved to Singapore in the 1960s, his wealth of expertise in entomology made him an associate professor at then-University of Malaya in 1983, and later National University of Singapore (NUS). Murphy was recognized as one of the most prominent entomologists in the Southeast Asian Region, for his work on the Mangroves of Singapore, and has mentored a generation of zoologists in Singapore.

| ***Allodia limtsepengi* Amorim & Oliveira, sp.nov.**

(Figs. F4A–E)

**Diagnosis.** Scutum with light brown longitudinal bands connecting posteriorly over a dark ochre-yellowish background, scattered small bristles on anterior half of scutum; pleural sclerites light ochre-yellowish, anepisternum light brown dorso-anteriorly. Sc short, fused to bR; r-m about as long as M<sub>1+2</sub>; R<sub>5</sub> mostly straight on distal half; medial fork with a slight constriction midway to apex; anal fold mostly straight, weakly sclerotized. Abdominal tergites 1–5 with a slender light brown longitudinal mark medially, ochre-yellowish laterally, tergite 6 light brown on anterior half, ochre-yellowish on posterior half. Gonocoxites strongly diverging, no stronger setae along inner margin at ventral face; gonostylus ventral lobe with a pointed branch directed inwards, medial lobe digitiform, directed posteriorly, dorsal lobe short, setose, well sclerotized; pair of aedeagus apodemes strongly sclerotized.

**Description. Male** (Fig. F04A). Wing length, 2.05; width, 0.80. **Head.** Brownish-yellow, occiput lighter towards ventral margin, face whitish-yellow. Vertex elongate, head antero-posteriorly compressed. Antennal scape and pedicel dirty whitish-yellow, flagellum light brown, darker towards apex, flagellomeres 1.2 longer than wide. Palpus light brown, lighter towards apex. Labella yellowish. Six bristles on occiput dorsally around eye, vertex densely covered with brownish setulae, a row of dark setae along ventral margin of frons. **Thorax.** Scutum light ochre-brown, with a pair of slender yellowish bands over dorsocentral line connecting posteriorly and a band along lateral margins; scutellum light ochre-brown with a medial yellowish line. Scutum clothed with short dark setae, some few strong bristles along margins, and irregular rows of dorsocentrals, and some longer prescutellars; scutellum with a pair of strong scutellar bristles on posterior border and scattered setae on disc. Scutum above wing with a small bulging area with marginal bristles. Antepronotum, proepisternum, proepimeron katepisternum, mesepimeron and metepisternum whitish-yellow, anepisternum light brown on antero-dorsal corner, dirty whitish-yellow on ventro-posterior corner; laterotergite brownish-yellow, darker along posterior margin, mediotergite light brown. Antepronotum with two bristle and additional smaller setae; proepisternals with two bristles apart from ventral margin and some additional smaller setae. Anepisternum, katepisternum and mesepimeron bare, laterotergite with four longer setae and 12 smaller setae; metepisternum with six setulae and only one longer seta. Haltere light yellowish-brown, setulae on distal half of pedicel and on anterior face of knob. **Legs.** Coxae light yellowish-brown; femora light brownish-yellow, tibiae and tarsi light brown, darker towards tip. Front leg tarsomere 1 about as long as tibia. Tibial spurs over 4× longer than tibia width at apex. **Wing** (Fig. F04B). Membrane greyish-brown. **Abdomen.** Tergite 1 light brown, tergites 2–5

with a light brown medial band, dirty-yellowish at laterals; tergite 6 light brown on anterior margin, dirty-yellowish on posterior half. Sternites whitish-yellow, distal sternite slightly darker. **Terminalia** (Fig. F04C–D). Ochre-yellowish with some dark brown sclerites. Gonocoxites well developed, setose, only in contact medially not fused to each other; no projections of gonocoxite posterior margin beyond base of gonostylus dorsally or ventrally [medial projection of syngonocoxite not clear on slide-mounting]. Gonostylus complex, composed of: an elongate, dorsal lobe with valve-shape main body, setose externally, with a wide blade-like internal extension bearing a comb of setae along entire distal margin; a digitiform ventral lobe with a pair of basal long setae, a group of four long subapical setae directed inwards and a group of six smaller setae along distal margin; a curved, digitiform median lobe with three setae at apex; a large striated internal part that extends ventrally into a small digitiform projection with setulae at apex. Gonocoxal bridge wide. Aedeagal-parameral complex with a well-sclerotized sclerite, with an ejaculatory apodeme projected anteriorly, distally as a subtriangular membrane, rounded tip not reaching level of insertion of gonostylus. Tergite 9 present as a pair of elongate short lobes barely connecting anteriorly that end with a strong apical bristle. Tergite 10 divided into a pair of elongate lobes covered with microtrichia and a long seta, ending close to level of base of gonostylus. Cerci small elongate.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0047881, Nee Soon (NS1), swamp forest, 19-25.September.2013, MIP leg. (slide-mounted). **Paratypes:** 7 males, ZRC\_BDP0047943, Nee Soon (NS2), swamp forest, 14-20.November.2013, MIP leg.; ZRC\_BDP0048511, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048512, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg.; ZRC\_BDP0048709, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0049080, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049094, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049097, Nee Soon (NS1), 18-24.December.2014, MIP leg.

**Etymology.** The species epithet of this species honors Lim Tze Peng (1921–), one of the Singapore-born most significant artists and a living legend, renowned for Chinese ink drawings and paintings of post-independence Singapore, with masterpieces exhibited in the Singapore Art Museum and Nanyang Academy of Fine Arts. He has been bestowed several awards, including the Special Prize at the Commonwealth Art Exhibition in England (1977) and the prestigious Cultural Medallion in Singapore (2003).

| ***Allodia teopohlengi* Amorim & Oliveira, sp.nov.**

(Figs. F05A–E)

**Diagnosis.** Scutum brown, a whitish band along lateral margin, with a dark brown mark above wing, no bristles over entire scutum; pleural sclerites mostly brownish, lighter areas on anepisternum, katepisternum and mesepimeron, anepisternum mostly dark brown. Sc short, ending free; r-m  $0.76 \times M_{1+2}$  length; R<sub>5</sub> curved posteriorly on distal fourth of wing; no constriction on medial fork; anal fold long, gently curved, well-sclerotized. Abdominal tergites 2–5 with a slender yellowish-brown longitudinal mark extending laterally along posterior margin, a large ochre-yellowish mark on antero-lateral corners, tergite 6 yellowish-brown. Incision between gonocoxites at ventral face short; gonostylus ventral lobe digitiform, directed posteriorly, medial lobe pointed distally, directed inwards, dorsal lobe short; aedeagus spoon-shaped, flat, blade-like.

**Description. Male** (Fig. F05A). Wing length, 2.75; width, 0.90. **Head.** Vertex brownish, front darker, occiput light brown. Face and clypeus greyish-brown. Head quite compressed antero-posteriorly, much higher than long, partially fit under anterior tip of scutum. Maxillary palpus light brown, whitish-yellow towards tip of distal palpomere. Eyes densely covered with inter-ommatidal setulae. Antenna light brown, darker towards apex, pedicel longer than scape; pedicel with a group of concentrated small setae on dorsal half of internal face, one strong seta ventrally on posterior border; pedicel with two strong setae ventrally on posterior margin and one strong dorsal seta distally; flagellomeres cylindrical, flagellum  $1.15 \times$  flagellomere 2 length, flagellomeres 2–13 about  $1.4 \times$  longer than wide, covered only with setulae. Maxillary palpus light brown, whitish-yellow towards tip of distal palpomere, palpomere 2 bare, weakly sclerotized, palpomere 3 wider and longer, with a wide dorsal area lined with sensillae and small setae laterally and ventrally, palpomere 4 longer than palpomere 3, with scattered small setae, palpomere 5 inserted subapically on palpomere 4, more than twice its length, slender along most its length, widening at apex, with scattered setulae. Occiput with 8 dark setae posteriorly around eye, vertex densely covered with brownish small setae. Mid ocellus minute, lateral ocelli on a dark brown background, displaced laterally, in touch with eye margin. Labella yellowish, long. **Thorax** (Fig. F05B). Scutum light brown with a whitish-yellow marginal band that extends from level of anterior spiracle to level of scuto-scutellar suture, a dark brown macula above wing and along scutum-scutellar suture, scutellum brown. Scutum densely clothed with short setae, stronger setae only along margins posteriorly to level of anepisternum, scutum with a sclerotized lobe above wing. Scutellum large, one pair of strong scutellar bristles at posterior margin, large

number of small setae covering most of disk. Basisternum, antepronotum and proepisternum light brown, proepimeron brown, anepisternum dark brown except for whitish ventral fifth, katepisternum brown on ventral half, whitish at dorsal half, mesepimeron whitish, laterotergite light brown, darker along posterior margin, mediotergite and metepisternum light brown. Basisternum bare, dorso-posterior arms largely developed; two strong antepronotal bristles and scattered small fine setae, proepisternum with one strong bristle and additional fine setae. Anepisternum, katepisternum and mesepimeron bare; about 20 fine and three longer setae distributed along laterotergite length; metepisternum with a group of 16 to 18 small setae concentrated on posterior third. Mesepimeron reaching ventral margin of pleura. Haltere yellow, longer fine setae along pedicel, fine setae on basal half of knob. **Legs.** Coxae whitish-yellow, femora yellowish-brown, hind femur with a brownish tinge dorsally and ventrally, tibiae and tarsi light brown, progressively darker. Front coxa covered with setae on anterior and internal faces, setae larger towards tip; mid coxa entirely devoid of setae except on distal fifth, with some smaller and larger setae at distal margin; hind coxa with a strong isolate basal black seta and a line of fine setae along its length, distally with setae on external and posterior faces. Femora evenly covered with small setae, some slightly longer setae only ventrally close to tip. Tibiae and tarsi with regular rows of trichia. Front tibia with few stronger short setae dorsally on distal fifth, a regular comb of setae on a small crest on external face distally, anteroapical depressed area wide, densely lined with setulae. Mid tibia with stronger short setae on distal three-fourth dorsally and laterally, with a regular comb of short setae on a small crest distally on external face; hind tibia with long irregular rows of dorsal, lateral and ventral short stronger setae, a small crest with a regular comb of short setae at external face distally. Tibiae and tarsi with regular rows of trichia. Front tibia with short setae only at distal end, a regular comb of setae on a small distal crest on external face distally, anteroapical depressed area wide, densely lined with setulae. Mid tibia with stronger short setae on more or less irregular lines dorsally and laterally, a small crest with a regular comb of short setae at external margin distally; hind tibia with irregular rows of dorsal, lateral and ventral short stronger setae along entire length, a small crest with regular comb of short setae at external margin distally. Front leg tarsomere 1 longer than tibia. Tarsi with some few stronger setae on first and second tarsomeres; front tarsus tarsomeres 3–5 modified for grasping or hanging, tarsomere 3 with regular rows of trichia, some stronger setae on both sides and a row of short, blunt spines ventrally on distal half, tarsomere 4 with a row of blunt spines along entire length, regular rows of trichia absent, with scattered short erected setae instead, tarsomere 5 only with short erect setae; mid and hind tarsomeres 3–5 only with rows

of trichia and setae at distal end. Tibial spurs over 5× longer than tibia width at apex. Tarsal claw with one long tooth coming out dorso-laterally from claw and two fine basal teeth.

**Wing** (Fig. F05C). Membrane fumose brownish. C ending at tip of R<sub>5</sub>; Sc short, ending free, not close to R, humeral vein present. R<sub>1</sub> long, reaching C almost at level of tip of M<sub>2</sub>, gently curved posterior close to margin. First sector of Rs short, transverse, R<sub>5</sub> reaching C at level of M<sub>1</sub>, curved posteriorly at distally fifth; r-m almost straight, slightly oblique, 0.71× M<sub>1+2</sub> length. M<sub>1+2</sub> short, M<sub>1</sub> gently curved anteriorly close to apex, M<sub>1</sub> and M<sub>2</sub> weak distally. M<sub>4</sub> originating way more basally than anterior end of M<sub>1+2</sub>. Cubital pseudovein clearly produced, long; CuP clearly reaching over half of second sector of M<sub>4</sub>; anal fold well-developed, extending to close posterior margin of anal lobe. Dorsal setae on bR, R<sub>1</sub>, second sector of Rs (= R<sub>5</sub>), one single dorsal seta on Sc; ventral setae on distal half of R<sub>1</sub> and entire length of second sector of Rs. No macrotrichia on wing membrane. **Abdomen**. Tergite 1 entirely light brown, tergites 2–5 brown medially at anterior margin, expanding laterally towards posterior margin, yellowish at antero-lateral corners; tergite 6 almost entirely light brown. Sternites whitish-yellow. **Terminalia** (Fig. F05D). Light brownish-yellow, darker towards tip. Gonocoxites well-developed, setose, in contact with each other on anterior two-thirds, no median suture; no projections of gonocoxite posterior margin beyond base of gonostylus dorsally or ventrally; syngonocoxite medial projection with a basal neck and wider, distally blunt, barely reaching distally level of base of gonostylus. Gonostylus complex, composed of: a short, setose, basal lobe; a median, blade-like, flat lobe bifid distally, entirely devoid of setae; a ventral, strongly curved lobe extending distally beyond rest of terminalia, with setae along inner face of basal half and with setae all over on distal half; a non-striated internal part, composed of a small lobose and setose branch, a blade-like wide falciform branch and a wide, rather weakly sclerotized branch with a row of weak setae along margin bearing a digitiform distal projection with four strong, curved setae distally. Aedeagal-parameral complex with a pair of anterior apodemes diverging from each other, connected more distally, a medial elongate extension with a number of spinules on distal half. Tergite 9 wide, trapezoid, with a median shallow incision on posterior margin. Tergite 10 divided into a pair of elongate lobes covered with microtrichia and a long apical fine bristle. Cerci not detected.  
**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0049238, Nee Soon (NS1), 04-10.December.2014, MIP leg. (website photo specimen, slide-mounted). **Additional sequenced specimens:** ZRC\_BDP0133932; missing abdomen, ZRC\_BDP0133914.

**Etymology.** The specific epithet honors the first notable Singaporean poet to publish in English, Teo Poh Leng (1912-1942), Malayan poet and teacher who lived in the Crown Colony of Singapore—his modernist F.M.S.R. poem was published in 1937 in London, under the pseudonym of Francis P. Ng. He is accepted to be the first person from Singapore to have had the first book-length publication in English.

**Remarks.** There are two haplotypes for *Allodia teopohlengi*, sp.nov.; all delimitation approaches except mPTP keep them together. This species diverges from the other three species of *Allodia* in a number of ways: there is a rather unique thorax color pattern;  $R_5$  runs parallel to  $R_1$  on basal two-thirds;  $r-m$  is more longitudinal; no constriction of the medial fork midway to apex;  $M_4$  only gradually diverges from  $CuA$  basally, with a slender anterior end of the posterior fork. As mentioned above, in the mitogenome tree *Allodia teopohlengi*, sp.nov. stands as sister of *Exechia*. The species runs into *Allodia* in all keys to genera of Mycetophilinae (basically due to the position of the origin of  $M_4$  way more basal than the origin of  $M_{1+2}$ ), but is the only of the *Allodia* species from Singapore in which  $Sc$  does not run into  $bR$ .

### *Exechia* Winnertz

*Exechia* Winnertz, 1863: 879. Type species: *Tipula fungorum* De Geer, 1776 [= *Mycetophila fusca* Meigen, 1804], des. Johannsen, 1909: 106.

**Diagnosis** (modified from Tuomikoski, 1966). Flagellomeres somewhat longer than wide, no conspicuous macrotrichia. Palpomere 3 short, with ovate sensory pit. Scutum and scutellum covered with pale, decumbent setae directed backwards; ac and dc rows of bristles well developed, separated from marginal bristles by rather narrow areas (less often discal bristles reduced or absent); scutellum with two strong marginal bristles. Antepronotum and proepisternum each with two to four stronger bristles; anepisternum usually bare (in some larger species with minute setae). Wing membrane with microtrichia arranged regular rows; macrotrichia on anal lobe only in some species; median fork and posterior fork bare.  $Sc$  short, ending free;  $R_1$  about as long as or slightly longer than  $bR$ ;  $R_5$  almost straight, gently curved posteriorly close to tip;  $M_1$  clearly depressed on distal half, diverging from  $R_5$ ;  $r-m$  oblique, long, bare or with some macrotrichia at distal end, at least twice as long as  $M_{1+2}$ . Posterior fork short, origin of  $M_4$  distinctly beyond that of medial fork; second sector of  $CuA$  straight.

Front leg tarsomere 1 slightly usually longer or slightly shorter than tibia; hind leg tarsomere 1 about twice as long as outer hind tibial spur; hind coxa with a single strong basal bristle; hind tibia with row of posterior bristles towards tip. Abdomen with pale markings, if present, usually on anterior half of tergite. Male tergite 9 divided into two separate, somewhat pointed halves, each with one or two longer bristles at tip; sternite 9 usually inconspicuous, more or less fused with gonocoxites; gonostylus without a large blunt, dorsally striate inner lobe.

*Exechia* is a large genus, with almost 170 described species, over two-thirds of which from the Holarctic regions. There are no comprehensive revisions of the genus. The present delimitation of *Exechia* is largely due to Tuomikoski's (1966) effort to build a phylogenetic system for the Exechiini, describing *Pseudexechia* Tuomikoski and *Exechiopsis* Tuomikoski as separate genera. *Exechia* is basically characterized by a rather distal origin of M<sub>4</sub>, producing a short posterior fork. Tuomikoski (1966, p. 174) considered carefully the delimitation of *Exechia* and specifically mentions that "the possibility cannot be excluded that in *Exechia* the shortness of the posterior fork is to some extent a convergent rather than a true synapomorphic character, in which case the genus, in its traditional delimitation, cannot be maintained in a more natural and phylogenetic system." In synthesis, the short posterior fork is an apomorphic condition, but this may have originated more than once in the Exechiini. Indeed, Edwards (1925) already recognized two separate groups in the genus. *Exechia* may be, hence, polyphyletic (Tuomikoski, 1966) and the problem is still not settled: only a study with a large sampling of species of *Exechia* and other members of the tribe may properly answer the question.

There are 31 Oriental species of *Exechia*, 12 of which known from China and Nepal, and 16 from India and Sri Lanka. There are only three species described from Southeast Asia, two from the mountains in Gunong Tahan, Malaysia (Edwards, 1928), and one from Mount Dulit, Borneo (Edwards, 1926). Neither the descriptions nor the illustrations of the male terminalia of these species suggest conspecificity with the species we collected in Singapore.

The two species of *Exechia* described here differ significantly from each other. This includes color pattern and the male terminalia morphology, but also significant differences in wing venation, *Exechia tanswiehiani*, sp.nov. with a longer posterior fork and M<sub>1+2</sub> nearly absent, while *E. yangchangmanae*, sp.nov. has M<sub>4</sub> originating more distally and M<sub>1+2</sub> about half of r-m length. The mitogenome tree brings both species together in a small clade, which is sister of *Allodia teopohlengi*, sp.nov., as mentioned above. There are two haplotypes for *Exechia tanswiehiani*, sp.nov. and only one haplotype for *Exechia yangchangmanae*,

**sp.nov.**; mPTP indicates a single species, while all other criteria clearly separate two species (Fig. F08G).

***Exechia tanswiehiani* Amorim & Oliveira, sp.nov.**

(Figs. F06A–C, F07A–C)

**Diagnosis.** Head light brown, with ochreous-yellowish areas more ventrally. Scutum dark ochre-yellowish, lighter along lateral margins; a row of black elongate bristles along anterior margin of scutum; pleural sclerites light ochre-yellowish with lighter areas.  $R_5$  straight on basal third;  $M_{1+2}$  very short, medial fork with a constriction on distal third of wing;  $M_4$  originating almost at level of origin of  $Rs$ , posterior fork relatively long; anal fold well sclerotized. Abdominal tergites mostly ochre-yellow, a dark brown longitudinal mark medially on segments 1, 4–6; segment 7 elongate. Gonocoxites with a deep medial incision between them, no lobes projecting beyond insertion of gonostylus; gonostylus with a ventral short, triangular lobe pointed branch directed inwards and a medial short, well-sclerotized lobe directed medio-posteriorly with a long, distinctive seta.

**Description. Male.** Wing length, 3.20; width, 1.06. **Head.** Vertex dark brown, ventral end of occiput and face brown, clypeus light brown. Vertex with seven small bristles posteriorly around eye, frons with a line of setae along anterior margin. Face wide, covered with small setae, clypeus bulging, covered with small setae. Antennal scape and pedicel light brownish-yellow, basal flagellomeres light brown, distal flagellomeres brown, basal two flagellomeres yellowish; scape about twice pedicel length; scape with setulae dorsally and ventrally along distal two-thirds, some stronger setae ventrally and one stronger seta dorsally on distal margin; pedicel with setulae all around distal two-thirds, a group of ventral strong setae and one dorsal strong seta on distal margin; flagellomere 1 about  $1.4 \times$  flagellomere 2 length, flagellomeres 4 length  $1.4 \times$  width. Palpus yellowish-brown, lighter towards tip, five palpomeres; palpomeres 1 and 2 weakly sclerotized, palpomere 3 well-developed, with a conspicuous subapical sensory pit, dorsally and laterally covered with small setae, palpomere 4 elongate, slightly longer than length of palpomere 3, covered with setulae, dorsal setae slightly longer, palpomere 5  $2.5 \times$  palpomere 4 length, covered with setulae. Labellae brownish-yellow, largely developed backwards. **Thorax** (Fig. F07A). Scutum dark ochre-yellow with a pair of light brown marks along dorsocentral lines, posterior end of scutum

with dark markings, scutellum light brown. Scattered short setae over scutum, a regular row of stronger dorsocentrals and a line of bristles along lateral margin, a pair of prescutellar bristles medially and three prescutellar bristles at each lateroposterior corner; scutellum large, with a pair of strong bristles at posterior margin, two pairs of subterminal stronger setae and small setae covering most of scutellum disc. Pleural sclerites light brownish-yellow, except for brownish mark on proepisternum and for brownish dorsal third of mediotergite.

Antepronotum large, with two stronger bristles and many scattered setae; proepisternum with three strong bristles directed ventrally and many small setae; anepisternum, katepisternum, mesepimeron and mediotergite bare; laterotergite with a large number of setulae on ventral and dorsal third, nine long setae medially; metepisternum with 15–17 setulae on posterior half and two stronger setae close to posterior margin. **Legs.** Coxae light whitish-yellow, mid and hind coxae more yellowish, femora light brownish-yellow; tibiae and tarsi light brown. Front coxa covered with fine small setae on anterior and lateral faces, a row of strong setae along distal two-thirds of lateroposterior edge; mid coxa with small setae on distal third besides distal stronger setae anteriorly and one strong seta on posterior face at distal margin; hind coxa with one strong seta on lateral face dorsally, a row of small setae along almost entire length laterally and some few long setae and one bristle laterally on distal end. Tibiae with dorsal and lateral regular rows of trichia. Tibiae with irregular dorsal and lateral rows of setae, stronger on mid and hind tibiae, distally with a small crest with regular comb of short setae at external margin. Anteroapical depressed area on inner face of front tibia wide, lined with setulae. Tarsomeres 1 and 2 with irregular rows of dorsal and lateral setae, besides trichia and distal stronger setae ventrally, tarsomeres 3 and 4 with a single seta dorsally, besides trichia and distal stronger setae, tarsomere 5 only with trichia. Tarsal claw with a short blunt tooth and a long slender tooth almost as long as claw. Inner tibial spur over 5× tibia width at apex. **Wing** (Fig. F06B). Membrane light fumose, unmarked. C not extending beyond tip of R<sub>5</sub>, some few setulae dorsally on membrane of anal lobe. Humeral vein present, oblique, Sc short, ending free. First sector of Rs short, slightly oblique; R<sub>5</sub> gently curved posteriorly on distal fifth of wing; r-m over 4× longer than M<sub>1+2</sub>, oblique; M<sub>1+2</sub> very short, medial fork long, M<sub>1</sub> diverging from R<sub>5</sub> on distal half, slightly divergent from M<sub>2</sub> at apex; tip of M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> weakly sclerotized. M<sub>4</sub> originating slightly beyond level of origin of Rs. Cubital pseudovein barely extending beyond origin of M<sub>4</sub>; CuP nearly absent, anal fold clearly produced, gently curved. Distal third of R<sub>1</sub> and distal two-thirds of Rs with ventral setae, bR, R<sub>1</sub> and Rs with dorsal setae. **Abdomen.** Tergites 1–2 and tergite 4–7 ochre-yellowish with a dark brown medial mark, tergites 3 entirely ochre-yellowish. Sternites 1–7

cream-yellow. **Terminalia** (Figs. F07B–C). Yellowish with dark brown marking ventrally close to tip. Gonocoxites large, fused at anterior fifth of terminalia with suture, deep medial posterior incision, distal end of posterior margin internally slightly more projected, with acute oblique projection inwards, short rounded lateral lobe extending slightly beyond base of gonostylus. Gonostylus complex, with: a short basal lobe with one long fine seta; main distal lobe with a long seta on basal third, a subapical strong bristle and a sclerotized acute distal extension; ventral ovoid lobe pointed distally and a strong seta; medial, well sclerotized bifid lobe, ventral branch bare and secondarily bifurcated, dorsal branch digitiform, short with elongate fine setae on distal half; long dorsal lobe with long setulae along distal half of internal margin and an apical long setae. A wide gonocoxal bridge without apodemes. A long aedeagal-parameral complex, with an anterior ejaculatory apodeme and a pair of long parameral slender blades extending slightly beyond base of gonostylus, aedeagus bifid distally, extending to level of tip of gonostylus. Tergite 9 present as a pair of lobes connected only at anterior end, microtrichia and fine setae along distal half, a strong seta at tip of each lobe. No sign of a separate tergite 10. Cercus long, extending beyond posterior margin of gonocoxite dorsally, covered with microtrichia e setae, especially along internal margin, a longer seta at tip.

**Female** (Fig. F06A). As male, except for the following. **Wing**. Length, 3.30; width, 1.09.

**Abdomen**. Tergites cream-yellowish, tergites 1–2 darker medially, tergites 4–5 with dark brown medial mark. **Terminalia** (Fig. F06C). Terminalia conical, elongate. Sternite 8 slender, very long, no posterior incision or lobes. Tergite 8 large, with median incision at posterior end medially, lateral borders extending towards ventral face of terminalia. Tergite 9 composing a conical membranous structure projecting beyond distal end of tergite 8, entirely bare. Distally on ventral face, sternite 10 membranous, with a pair of rows elongate fine setae and a pair of small distal dark setae; cerci 1-segmented with microtrichia, scattered setulae, an internal row of elongate fine setae and a pair of distal longer setae.

**Material examined. Holotype**: male, ZRC\_BDP0047947, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg. (slide-mounted). **Paratypes**: 2 males, 10 females. **Males**: ZRC\_BDP0048945, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0049174, Nee Soon (NS2), 07-13.May.2015, MIP leg. **Females**: ZRC\_BDP0047798, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg.; ZRC\_BDP0047898, Nee Soon (NS2), swamp forest, 10-16.October.2013, MIP leg.; ZRC\_BDP0047899, Nee Soon (NS2), swamp forest, 10-16.October.2013, MIP leg.; ZRC\_BDP0048514, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. Female (website photo specimen); ZRC\_BDP0048668, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. (slide-mounted); ZRC\_BDP0048855, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048946, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0048972, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048985, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049179, Nee Soon (NS2), 07-13.May.2015, MIP leg. **Additional**

**sequenced specimens:** male, ZRC\_BDP0137051 (website photo specimen); female, ZRC\_BDP0072456; female, ZRC\_BDP0134053; female, ZRC\_BDP0134059.

**Etymology.** The species epithet of this species honors Tan Swie Hian (1943–), a Singaporean multidisciplinary artist known for his contemporary Chinese calligraphy, Chinese poetry and contemporary art sculptures, found in Singapore and many parts of the world.

| ***Exechia yangchangmae* Amorim & Oliveira, sp.nov.**

(Figs. F08A–G)

**Diagnosis.** Head dark brown, lighter more ventrally. Scutum dark ochre-yellowish, a pair of light brown marks along dorsocentral lines; a regular row of stronger dorsocentrals and a line of bristles along lateral margin; pleural sclerites light brownish-yellow, except for brownish mark on proepisternum and brownish dorsal third of mediotergite.  $R_5$  slightly sinuose on basal third;  $M_{1+2}$  half of r-m length, medial fork with a constriction on distal third of wing;  $M_4$  originating clearly beyond level of origin of  $Rs$ , posterior fork relatively short; anal fold weakly sclerotized. Tergite 1 ochre-yellowish with a light brown mark medially, tergites 2–3 entirely light brown, tergite 4–6 ochre-yellowish, dark brown medially, tergite 7 dark ochre-yellowish. Gonocoxites with a distinctive projection on posterior margin at ventral face bearing long setae; gonostylus bifid, both branches elongate, slender, outer lobe with setae along entire length, inner lobe with only an elongate seta at tip.

**Description. Male.** Wing length, 1.70; width, 0.67. **Head.** Vertex dark brown, face and clypeus light brown. Vertex with four small bristles around eye posteriorly to ocellus. Antenna light brownish-yellow; flagellomeres short, flagellomere 1  $1.6 \times$  flagellomere 2 length, flagellomere 4 length  $1.9 \times$  width (Fig. F08A). Palpus yellowish-brown. **Thorax.** Scutum ochre-yellowish, light brown towards posterior end, scutellum light brown. Pleural sclerites brownish. Scutum with two rows of dorsocentral bristles; scutellum with one pair of marginal bristles and a number of small setae spread over disc. Antepronotum with one strong bristle and many scattered setae; proepisternum with two strong bristles and some few setulae; anepisternum, katepisternum, mesepimeron and mediotergite bare; laterotergite with six setulae and five long setae medially; metepisternum with nine setulae on posterior half and one stronger setae close to posterior margin. **Legs.** Coxae light whitish-yellow; femora light brownish-yellow, mid femur light brown on distal fifth of wing; tibiae and tarsi light brown. Inner tibial spurs about  $3 \times$  tibia width at apex. **Wing** (Fig. F08B). Membrane light

fumose, unmarked.  $R_5$  slightly sinuose on basal third;  $M_{1+2}$  half of r-m length, medial fork with a constriction on distal third of wing;  $M_4$  originating clearly beyond level of origin of  $Rs$ , posterior fork relatively short; anal fold weakly sclerotized. **Abdomen.** Tergites 1–2 brown medially, yellowish laterally, tergite 3 yellowish, tergites 4–6 blackish-brown medially; tergite 7 brownish-yellow. Sternites 1–6 light yellowish-brown. **Terminalia** (Figs. F08C–F). Light yellowish-brown. Gonocoxites large, close to each other on anterior third of terminalia but not fused, no medial syngonocoxite projection, each gonocoxite with a slender posterior extension on ventral face of terminalia reaching much beyond base of gonostylus, bearing four strong setae at tip; lateral borders extending dorsally, not projected beyond insertion of gonostylus. Gonostylus nearly bare, with three main lobe, slightly asymmetric, a ventral lobe blade-like, weakly sclerotized, with a sub-basal seta and subapically with three setulae and one longer seta; left gonostylus with distal lobe bifid from nearly its base, dorsal branch digitiform with a single long seta at tip, ventral branch laminar, extending way beyond posterior extension of gonocoxite, falciform at apex, with a pair of subapical setulae, right gonostylus with two branches similarly to left gonostylus and an additional digitiform more dorsal branch with setulae all along its length and a distal seta, and a slender, digitiform basal part with a long seta at tip. Gonocoxal bridge wide, no apparent apodeme. Aedeagal-parameral complex with a pair of short lateral apodemes, a pair of pointed blade-like lateral arms extending beyond level of base of gonostylus and a medial plate ending distally on a fringe. Tergite 9 with a pair of lateral lobes connected medially at anterior end of terminalia, covered with microtrichia and one distal long seta, a pair of slightly smaller setae and some scattered small setae apically on lobe. A pair of additional elongate lobes covered with microtrichia, setulae and some slightly longer setae at distal end.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0140725, Singapore, no date, MIP leg. (slide-mounted).

**Etymology.** The specific epithet honors Madam Yang Chang Man (1944–), a former curator of the Zoological Reference Collection (ZRC). A biology graduate from Nanyang University (that would eventually become the National University of Singapore, NUS), she became a curator at the Department of Zoology in 1972 and had to immediately deal with the incoming Raffles Collection of some 126,000 natural history specimens, which was at that time ejected from the Singapore National Museum to give way to art and anthropology exhibits. She played a pivotal role in safeguarding this collection in the 1970s and 1980s, until it found a stable

home at the Raffles Museum of Biodiversity Research in NUS in 1998, and subsequently in the Lee Kong Chian Natural History Museum (LKCNHM) in 2015. Madam Yang is also a honorary research associate at the LKCNHM, and specializes in aquatic bugs, where she has discovered over 30 new species from the Oriental Region. For her contributions to Singapore's natural history heritage, she was inducted into the Singapore Women's Hall of Fame in 2018.

**Remarks.** The sequence attributed to the holotype originally clustered with a species of *Tetragoneura*, meaning that there was some kind of contamination. This is the only specimen corresponding to a separate species of *Exechia*, that diverges from *Exechia tanswiehiani*, **sp.nov.** on color pattern, wing venation and male terminalia morphology.

### Mycetophilini

The diversity of Mycetophilini in our samples was one of the surprises of the study. This tribe has 13 genera, with almost 1,200 described species worldwide. Four of the genera have each over 100 described species—*Mycetophila*, *Trichonta*, *Phronia* and *Epicypta*. The first three of these genera are especially diverse in temperate areas, while *Epicypta*, with about 120 described species, is species-rich in tropical areas.

The samples from Singapore have only three species of *Mycetophila* and 30 species of *Epicypta*, reflecting the distribution pattern of the genera. It has as well the first Oriental records for *Aspidionia* Colless—originally described from Micronesia (Colless, 1966), with an Afrotropical species added by Matile (1974) from the Comores Island—and for *Platyprosthiogyne* Enderlein, so far known from the Seychelles Islands, the Comores Islands and from continental Africa. Two species of *Platurocypta* Enderlein are described here from Singapore—a genus also known from 20 species from South America, Europe, New Zealand, Africa and the Oriental region. Finally, a new Mycetophilini genus is described here, with close affinities with *Aspidionia*, with five species described. The presence in Singapore of five species of *Platyprosthiogyne*, three species of *Aspidionia*, two species of *Platurocypta* and five species of the new genus connected to *Aspidionia* unveils an unexpected diversity of Mycetophilini in Singapore, basically reflecting a general distribution pattern largely involving areas around Indian Ocean.

### ***Mycetophila* Meigen**

*Mycetophila* Meigen, 1803: 263. Type-species, *Tipula agarici* Villers (Johannsen, 1909: 116).

**Diagnosis.** Lateral ocelli touching eye margins, third palpalomere not swollen. Border of scutum at anterior third straight or only slightly curved; katepisternum at most slightly compressed; anepisternum with strong bristles at dorsal margin; mesepimeron with bristles; laterotergite haired, well developed. Wing membrane with microtrichia arranged in more or less regular longitudinal lines; Sc ending free or in bR; R<sub>4</sub> absent; M<sub>4</sub> present, complete at basal end, slightly divergent from M<sub>2</sub>, parallel with or convergent toward CuA on distal half, tip of M<sub>4</sub> closer to tip of CuA than to tip of M<sub>2</sub>.

*Mycetophila* has over 600 described species, most of which known from temperate areas in South America, Australia, New Zealand, and the Holarctic regions. There are some clades of the genus in tropical areas, but they are poor in species and not abundant.

A total of 40 species of *Mycetophila* have been described for the Oriental region. Of this total, 30 are from China, three are from Nepal, three from India, and four are from Southeast Asia—*M. borneana* Edwards, from Mt. Kinabalu (Edwards, 1933), *M. lineicoxa* Edwards and *M. trimacula* Edwards from the mountains in Gunong Tahan, Malaysia (Edwards, 1928) and *M. reversa* Edwards, from Bukittinggi [= “Fort de Kock”] (Edwards, 1931). We found three species of *Mycetophila* in our samples in our Singapore samples, which, considering the diversity in the genus, might belong to the same group of species. All three species of *Mycetophila* already described from Southeast Asia are brownish—as *Mycetophila aishaae*, sp.nov.—, but they differ from the Singapore species in other details, including the male terminalia, in the case of *M. trimacula*.

The haplotype network for the genus does not have any conflicts between different approaches and clearly recognize the three species . Most specimens of *Mycetophila* in our samples come from the swamp forest and the rain forest, but *M. aishaae*, sp.nov. was collected only in an urban forest. There are no conflict between different delimitation approaches for the three species.

### ***Mycetophila chngseoktinae* Amorim & Oliveira, sp.nov.**

(Figs. G01A–E, G02A–F)

**Diagnosis.** Head ochre-yellowish. Scutum with an ochre-yellowish background, with a long light brown longitudinal band medially and a pair of shorter light brown bands more laterally; pleural sclerites basically ochre-yellowish, with a brownish antepronotum, dorsal and dorso-posterior margins of anepisternum, dorsal end of mesepimeron, posterior margin of laterotergite and metepisternum. C very short beyond tip of  $R_5$ ; bR devoid of setation at distal end. Tergite 1 brown, tergites 2–6 light yellowish with a medial brownish area of variable size between tergites, tergite 7 brownish-yellow. Male terminalia gonostylus with large posterior lobe, basal lobe short, not projected inwards.

**Description. Male.** Wing length, 1.95; width, 0.83. **Head** (Fig. G01B). Ochre-yellowish, face greyish-yellow. Mid ocellus absent, lateral ocelli nearly touching eyes dark brown. Three bristles along margin of eye posteriorly to lateral ocellus, a row of short bristles along anterior margin of frons, scattered small setae covering vertex. Antennal scape and pedicel greyish-yellow, flagellomere 1 greyish-yellow on basal half, light brown on distal half, flagellomeres light brown, distal two flagellomeres lighter. Scape long, about twice longer than pedicel. Scape with setae on inner face and two dorsal small bristles. Pedicel with setation on lateral face and around posterior margin, in addition to a long dorsal seta. Flagellomeres almost twice as long as wide, except for flagellomere 1, about 3× longer than wide. Face short, light greyish-brown, clypeus slightly bulging, light brown, setose. Maxillary palpus light brown, labella brownish-yellow. Maxillary palpus light brown, lighter toward apex, with five palpomeres; palpomere 1 only with microtrichia, palpomere 2 short, with some setae along posterior margin dorsally, palpomere 3 with a conspicuous sensorial pit opening on inner face of basal half, and setae dorsally and on inner face, palpomere 4 about as long as palpomere 3, with small setae dorsally and on external face, palpomere 5 1.5× palpomere 4 length. Labella large, light brownish-yellow. **Thorax** (Fig. G01B). Scutum ochre-yellow, with a medial ochre-brown band on anterior half and a pair of light brown maculae on posterior half that merge together posteriorly and continues into scutellum. Scutum densely covered by short brownish small setae and a row of supra-alars, one marginal prescutellar bristle and one median prescutellar bristle. Scutellum large, with two pairs of strong bristles on posterior margin and additional small setae on posterior half. Antepronotum and proepisternum light brown, prosternum and proepimeron brown; anepisternum whitish ochre, light brown along anterior and dorsal margins, and brown along posterior margins; katepisternum and mesepimeron brownish-yellow; metepisternum light brown; laterotergite

ochre-yellow, with ochre-brown posterior margin, mediotergite light brown with ochre-yellow laterals. Antepronotum with three bristles and additional larger and smaller setae; proepisternum with three bristles and additional small setae along dorsal margin; anepisternum with over 40 setae on dorsal three-fourth, and four bristles close to posterior margin; mesepimeron with three bristles along dorsal margin and some additional small setae; katepisternum and mediotergite bare; laterotergite with a group of three longer and six smaller setae; 5–6 metepisternal setae. Haltere light brown, setulae restricted to knob. **Legs.** Fore coxa light ochre-yellowish, mid and hind coxae whitish; fore femur light brownish-yellow, mid and hind femora whitish-yellow, yellowish-brown along dorsal edge; tibiae and tarsi light yellowish-brown. Hind femur considerably wide medially. Fore coxa densely covered with setae anteriorly and on internal face, some longer black setae anteriorly and close to tip; mid coxa with some fine small setae and some longer setae on distal fifth of wing; hind coxa with fine setae on basal four-fifth only on posterior face, a distinctive black subapical seta laterally, some few longer setae along distal end anteriorly. Femora densely covered with fine setae, mid femur with some longer setae only close to tip ventrally; hind femur with one long black seta ventrally midway to apex. Tibiae and tarsi with regular rows of trichia. Front tibia with few stronger setae only on distal fifth. Mid tibia with five dorsal bristles, one seta on inner face of basal half and two setae on inner face of distal half, one stronger seta on outer face of distal half; hind tibia with two rows of six dorsolateral bristles, area between rows flat and bare. Anteroapical depressed area on inner face of front tibia wide, densely lined with setulae. Inner spur of hind tibia about  $3 \times$  tibia width at apex. Fore leg tarsomeres with distal setae, only one ventral seta midway to apex; mid and hind tarsomeres 1–4 with two rows of ventrolateral setae in addition to those at apex. Tarsal claw with one proximal short tooth and one subproximal long tooth. **Wing** (Fig. G01C). Membrane light fumose, yellowish along anterior margin, no brown marks. Wing membrane microtrichia in regular rows, bare of macrotrichia except for four setulae dorsally on anal lobe posteriorly to anal fold. Sc short, ending free. C extending only shortly beyond tip of R<sub>5</sub>. R<sub>1</sub> long, almost straight, reaching C at distal fourth of wing. First sector of Rs oblique,  $1.4 \times$  r-m length; R<sub>5</sub> gently curved along its entire length, reaching C beyond level of tip of M<sub>2</sub>. Vein r-m short, oblique, less than half extension of M<sub>1+2</sub>. M<sub>1+2</sub>  $3.3 \times$  r-m length. Medial fork long, M<sub>1</sub> and M<sub>2</sub> straight, only slightly divergent along their course. M<sub>4</sub> very gently arched towards posterior margin, posterior fork slender, CuA straight. CuP not produced; anal fold long, arched. Dorsal setae present on Sc, bR, R<sub>1</sub>, second sector of Rs and r-m; ventral setae present on distal half of bR, R<sub>1</sub>, Rs and r-m. Wing posterior margin slightly emarginated at apex of

CuA. **Abdomen.** Tergite 1 brown, tergites 2–5 light ochre-yellowish, with a medial brownish area, tergite 6–7 dark ochre-yellowish. Sternites 1–7 light yellowish-brown. **Terminalia** (Figs. G02A–C). Yellowish-brown. Gonocoxites fused along their entire length ventrally, no medioventral process, posterior margin of syngonocoxite ventrally with a pair of arms extending laterally towards base of gonostylus, no projection of gonocoxite distal border beyond base of gonostylus; gonocoxite lateral margin extended dorsally, partially encapsulating terminalia. Gonostylus large, composed of: a large ventral lobe with fine setae and a short digitiform posterior extension with apical setulae; a small digitiform ventral lobe with a subapical seta; a large, elongate and setose dorsal lobe, projecting much beyond rest of terminalia; a median lobe, with a pair of long setae directed inwards and two other smaller setae. Gonocoxal bridge large. Aedeagal-parameral complex with a pair of elongate parameral blades and a medial subquadrate aedeagal sclerite more distally. A pair of large ovoid lobes dorsally representing tergite 9+10, cercus weakly sclerotized.

**Female** (Fig. G01A). As male, except for the following. **Wing.** Membrane slightly darker.

**Terminalia** (Figs. G01D–E). Sternite 8 elongate, no gonapophyses produced, setae closer to posterior margin longer, reaching level of posterior two-thirds of cercomere 1. Sternite 9 elongate, weakly sclerotized, gonopore at level of posterior fourth of sternite 8, anterior end wide, reaching posterior third of segment 7. Tergite 8 wide, reaching level of mid of sternite 8. Tergite 9+10 short, with a short medial incision of posterior margin. Cercomeres elongate, setose, cercomere 1 2.8× length of cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002129>)

**Material examined. Holotype:** male, ZRC\_BDP0048472, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. **Paratypes:** 15 males, 6 females. **Males:** ZRC\_BDP0048719, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048837, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048967, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0048992, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049001, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049012, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049014, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049015, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049016, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049188, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0049191, Nee Soon (NS2), 07-13.May.2015, MIP leg. (slide-mounted); ZRC\_BDP0049223, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0047921, Nee Soon (NS2), swamp forest, 03-09.October.2013, MIP leg.; ZRC\_BDP0154876, Singapore, (date range 2012-2018), MIP leg. **Females:** ZRC\_BDP0047896, Nee Soon (NS2), swamp forest, 11-17.April.2013, MIP leg.; ZRC\_BDP0048447, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048448, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg.; ZRC\_BDP0048674, Nee Soon (NS1), swamp forest, 05-11.April.2012, MIP leg. (slide-mounted); ZRC\_BDP0048703, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0049106, Nee Soon (NS1), 18-24.December.2014, MIP leg. **Additional sequenced specimens.** female, ZRC\_BDP0155111 (website photo specimen).

**Etymology.** This species epithet honors CHNG Seok Tin, a visually impaired sculptor and artist, whose work was often inspired by the i-Ching and Buddhism. Her work has been

shown internationally and she became the first Singaporean artist to exhibit her works at the Headquarters of the United Nations—Chng had over 26 solo shows and 100 group shows. She is a strong advocate for artists with disabilities and is a recipient of the Singapore Cultural Medallion. She was inducted into the Singapore Women's Hall of Fame in 2014.

***Mycetophila georgettechenae* Amorim & Oliveira, sp.nov.**

**Diagnosis.** Head dark ochre-yellowish. Scutum with an ochre-yellowish background and a long light brown longitudinal band medially and a pair of shorter light brown bands more laterally; pleural sclerites basically ochre-yellowish, with a brownish antepronotum, dorsal and dorso-posterior margins of anepisternum, dorsal end of mesepimeron, posterior margin of laterotergite and metepisternum. C slightly projected beyond tip of R<sub>5</sub>; bR with some few dorsal setae at distal end. Tergites 1 brown, tergites 2–4 and 6 light yellowish with a medial brown longitudinal band, tergite 5 light brown, tergite 7 brownish-yellow. Male gonostylus with posterior lobe projected, but not too wide, basal lobe with short, triangular projection inwards.

**Description. Male** (Fig. G02A). Wing length, 1.95; width, 0.77. **Head** (Fig. G02B). Ochre-yellowish, face greyish-yellow. Ocelli dark brown, lateral ocelli nearly touching eye margins. Antennal scape greyish-yellow, pedicel greyish-brown, flagellomere 1 whitish, flagellomeres light brown, lighter towards apex, flagellomeres more than twice longer than wide; scape and pedicel with a crown of setae around distal margin, but no dark, stronger setae. Maxillary palpus light brown, labella brownish-yellow. **Thorax** (Fig. G02C). Scutum ochre-yellow, with a medial ochre-brown band on anterior half and a pair of light brown maculae on posterior half. Scutellum light brown. Antepronotum ochre-brown, proepisternum brownish-yellow, prosternum light brown; proepimeron brownish-yellow; anepisternum ochre-yellow, light brown along anterior, dorsal and posterior margins, katepisternum and mesepimeron brownish-yellow; metepisternum light brown; laterotergite ochre-yellow, with ochre-brown posterior margin, mediotergite light brown with ochre-yellow laterals. **Legs.** Fore coxa light ochre-yellowish, mid and hind coxae whitish; fore femur light brownish-yellow, mid and hind femora whitish-yellow, mid femur with some yellowish tinge on basal half, hind femur brown on distal fourth along dorsal edge and a dark brown mark ventrally at tip; tibiae and tarsi light yellowish-brown. **Wing** (Fig. G02D). Membrane light brownish fumose.

Microtrichia in regular rows, no macrotrichia on membrane. Sc short, ending free. C extending only shortly beyond tip of R<sub>5</sub>. Vein bR curved; R<sub>1</sub> long, gently curved along its length, reaching C at distal fourth of wing. First sector of Rs oblique,  $2.3 \times$  r-m length; R<sub>5</sub> gently curved along its entire length, reaching C almost at level of tip of M<sub>2</sub>. Vein r-m very short, oblique, less than half extension of M<sub>1+2</sub>. M<sub>1+2</sub>  $3.2 \times$  r-m length. Medial fork long, M<sub>1</sub> and M<sub>2</sub> straight, only slightly divergent along their course. M<sub>4</sub> very gently arched towards posterior margin, posterior fork slender. Cubital pseudovein produced, short; CuP absent; anal fold long, arched. Dorsal setae present on bR, R<sub>1</sub>, second sector of Rs, r-m and distally on bM; ventral setae present on distal half of bR, R<sub>1</sub>, Rs and r-m. No macrotrichia on wing membrane. Wing posterior margin gently emarginated at apex of CuA. **Abdomen.** Tergites 1 brown, tergites 2–4 and 6 light yellowish with a medial brown longitudinal band, tergite 5 light brown, tergite 7 brownish-yellow. Sternites 1–6 light yellowish-brown. **Terminalia** (Figs. G02E–F). Yellowish-brown. Gonocoxites fused along their entire length ventrally, no suture of fusion, medioventrally syngonocoxite gently curved posteriorly, no ventral projection of gonocoxite posterior border beyond base of gonostylus, dorsally a short lobe extending slightly beyond base of gonostylus; gonocoxite lateral margins extended dorsally, partially encapsulating terminalia. Gonostylus weakly sclerotized, composed of: a posterior lobe extending distally, weakly sclerotized, more or less digitiform, with some setae; a basal short, slightly more sclerotized, subtriangular lobe projecting inwards; a medial short lobe projecting inwards. Gonocoxal bridge wide. Aedeagal-parameral complex with a pair of elongate parameral blades and a medial subquadrate aedeagal sclerite more distally. A pair of elongate ovoid lobes dorsally, representing tergite 9+10, cerci weakly sclerotized, placed more distally.

**Female.** As male, except for the following. Wing length, 1.92; width, 0.70. **Terminalia.** Sternite 8 elongate, rounded distally, no lobes or medial incision, setae along posterior margin longer, distal margin of sternite 8 at level of distal half of cercomere 1. Sternite 9 elongate, weakly sclerotized, anterior end wide, reaching posterior third of segment 7. Tergite 8 wide, reaching level of mid of sternite 8. Tergite 9+10 short, with a short medial incision of posterior margin. Cercomeres elongate, setose, cercomere 1  $2.5 \times$  length of cercomere 2.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002119, -000803>)

**Material examined. Holotype:** male, ZRC\_BDP0048061, Nee Soon (NS2), swamp forest, 21-27.March.2013, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 2 males, 1 female. **Males:** ZRC\_BDP0048745, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0154916, Singapore, (date range 2012-2018), MIP leg. **Females:** ZRC\_BDP0048450, Nee Soon (NS1), swamp forest, 05-11.April.2012, MIP leg. (slide-mounted).

**Additional sequenced specimens.** Male, ZRC\_BDP0154997 (website photo specimen).

**Etymology.** The species epithet of this species honors Georgette Liying Chendana CHEN (1906-1993), an acclaimed first-generation Singaporean oil-painter and one of the pioneers of the Nanyang style of art oil painter. A key figure in the development modern art in Singapore, Chen is known not only for her oil paintings, but also for her contributions to art education as a teacher at the Nanyang Academy of Fine Arts (NAFA) from 1954 to 1981. She was one of a group of artists who established the Nanyang Style of painting, which combines Western technique with Asian themes. She was inducted into the Singapore Women's Hall of Fame in 2014.

***Mycetophila aishaae* Amorim & Oliveira, sp.nov.**

(Figs. G04A–E)

**Diagnosis.** Head light brown. Scutum mostly light brown, with dark ochre-yellowish marks on shoulders, anteriorly over scutum; pleural sclerites light brown. C not projected beyond tip of R<sub>5</sub>; bR entirely bare. Abdominal tergites entirely brown, lighter at lateral ends. Male terminalia gonostylus with posterior lobe projected, but quite slender distally, basal lobe wide, with a short, sclerotized beak midway to apex projecting inwards.

**Description. Male** (Fig. G04A). Wing length, 2.08; width, 0.77. **Head** (Fig. G04B). Brown, face brownish-yellow. Lateral ocelli nearly touching eyes. Antennal scape and pedicel greyish-yellow, flagellum light brown, scape 1.4× longer than pedicel, flagellomere 1 1.2× longer than flagellomere 2, flagellomere 2.3× longer than wide; scape and pedicel with a crown of setae around distal margin, pedicel with a stronger seta dorsally. Maxillary palpus light brown, palpomere 3 with a well-developed sensory pit, palpomere 4 1.1× length of palpomere 3, palpomere 5 1.9× palpomere 4 length. Labella brownish-yellow. **Thorax** (Fig. G04B). Scutum light brown, with brownish-yellow anterior corners, scutellum light brown. Some large supra-alar setae, two pairs of prescutellar bristles, scutellum with two pairs of marginal bristles and a number of small additional setae. Antepronotum, proepisternum, prosternum, katepisternum and mesepimeron ochre-brown, anepisternum, metepisternum, laterotergite and mediotergite light brown. **Legs.** Coxa ochre-yellowish, front coxa slightly more brownish; femora light brownish-yellow, hind femur enlarged and flattened, with a

brown mark apically on dorsal and ventral margins; tibiae and tarsi light yellowish-brown.

**Wing** (Fig. G04C). Membrane light fumose brown. Wing membrane with microtrichia in regular rows. Sc ending free, barely visible. C not extending beyond tip of R<sub>5</sub>. R<sub>1</sub> long, gently curved, reaching C at distal fourth of wing. Vein bR curved, first sector of Rs oblique, 1.6× r-m length, R<sub>5</sub> gently curved, reaching C slightly beyond level of tip of M<sub>2</sub>. Vein r-m short, oblique. M<sub>1+2</sub> short, 2.6× longer than first sector of Rs. Medial fork long, M<sub>1</sub> and M<sub>2</sub> slightly convergent at distal end. M<sub>4</sub> gently arched towards posterior margin, posterior fork slender. CuA straight. Cubital pseudovein short, sclerotized to distal fourth of first sector of CuA, CuP not produced. Anal fold long, arched distally. Dorsal setae present on entire length of bR, R<sub>1</sub>, second sector of Rs and r-m, posterior veins bare; ventral setae present on distal half of bR, R<sub>1</sub>, second sector of Rs and r-m. Wing posterior margin gently emarginated at apex of CuA. **Abdomen**. Tergites 1–6 brown, slightly darker towards apex, sternites 1–6 light brown, sternites 5–6 darker; tergites and sternites 7–8 yellowish-brown. **Terminalia** (Figs. G04D–E). Small, yellowish-brown. Gonocoxites fused along their entire length ventrally, no medioventral posterior process. Gonostylus with an elongate posterior lobe with fine setae and a medial wide lobe with a short, sclerotized beak midway to apex. Aedeagal-parameral complex rectangular. Tergite 9+10 entirely divided into a pair of ovoid lobes dorsally. Cerci not visible.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-002078>)

**Material examined.** **Holotype:** male, ZRC\_BDP0279129, Singapore, 31-May-18, MIP leg. (slide-mounted). **Paratype:** male, ZRC\_BDP0284233, Singapore, PU13, (date range 2012-2018), MIP leg. **Additional sequenced specimens.** Male, ZRC\_BDP0133534 (website photo specimen).

**Etymology.** The species epithet of this species honors Aisha Akbar (1930–2015), Malay music teacher, songwriter, author and broadcaster. A Singapore Women’s Hall of Fame inductee, she was concerned that traditional Malay folk songs would get lost in the wash of time and spent years researching and documenting important local songs such as ‘Rasa Sayang’ and ‘Dayung Sampan’, ensuring that Singapore’s musical heritage would be preserved.

### *Platyprosthiogyne Enderlein*

*Platyprosthiogyne* Enderlein, 1910: 78. Type-species: *Platyprosthiogyne metameromelina* Enderlein, 1910 (orig. design.).

**Diagnosis.** Small flies, wing length between 1.6 and 2.4 mm. Lateral ocelli touching eye margins, mid ocellus usually present (absent in *Platyprosthiogyne gohsookhima*e, **sp.nov.**). Scutum with no incision at margin above level of antepronotum; anepisternum with scattered setae; mesepimeron and laterotergite setose. Wing membrane with microtrichia arranged in more or less regular longitudinal lines; Sc short, ending free; R<sub>4</sub> absent; M<sub>4</sub> absent, CuA running parallel to M<sub>2</sub>; anal fold well sclerotized, long, curved.

*Platyprosthiogyne* was erected by Enderlein (1910) for a species from the Seychelles Islands. It has been an obscure genus for a long while, until Matile (1974, 1979a) described one species from Cameroun and one species from the Comores Islands. It was quite a surprise to find six additional species in Singapore, the first record of the genus outside the Afrotropical region.

As discussed above, the species of *Platyprosthiogyne* came together in a clade which is sister to *Mycetophila*. All species from Singapore share diagnostic features of the genus, as the loss of M<sub>4</sub> (also originated elsewhere in mycetophilines), the scutum border with no keel above antepronotum (a plesiomorphic condition), and an incision on the posterior wing margin at the tip of CuA (in some degree present in other genera). They also share an arched R<sub>5</sub> running close to R<sub>1</sub> and an extension of C beyond the tip of R<sub>5</sub>.

Our *Platyprosthiogyne snehalethaae*, **sp.nov.** is relatively plesiomorphic for some of these features (especially the separation between R<sub>5</sub> and R<sub>1</sub>, and the extension of C beyond the tip of R<sub>5</sub>), but the mitogenome tree shows it as sister of one of the subclades in the genus. A careful phylogenetic study of the genus would have to be undertaken to confirm or not that the *Platyprosthiogyne snehalethaae*, **sp.nov.** is misplaced in the mitogenome tree and that these features evolved more than once in the evolution of *Platyprosthiogyne*. In the type-species of the genus, *P. metameromelina* Enderlein, the medial fork opens rather closer to the margin, as we see in the species *P. neilaae*, **sp.nov.** and *P. snehalethaae*, **sp.nov.**, from Singapore. Some strong setae along the posterior margin of the sygonocoxite are seen in our species *P. gohsookhima*e, **sp.nov.** and *P. neilaae*, **sp.nov.**, also present in *P. oresbia* Matile. Notwithstanding the position of *P. snehalethaae*, **sp.nov.**, there are two consistent smaller clades in the genus: one with *P. gohsookhima*e, **sp.nov.** and *P. neilaae*, **sp.nov.**, and the other with *P. rahimahae*, **sp.nov.**, *P. phanwaithongae*, **sp.nov.** and *P. lynetteseahae*, **sp.nov.**.

There are three conflicts regarding the haplotype network for *Platyprosthiogyne* (Fig. G05). In one case, there are two very clear separate species—*P. gohsookhima**e*, sp.nov. and *P. neilaae*, sp.nov.—brought together by mPTP. *P. gohsookhima**e*, sp.nov. 3 is split, on the other hand, in two separate species by ABGD in a divergence that may be in the grey zone. Finally, *P. rahimahae*, sp.nov., *P. lynetteseahae*, sp.nov. are brought together by mPTP, but there is molecular and morphological evidence that they are clearly separate species.

### *Platyprosthiogyne phanwaithongae* Amorim & Oliveira, sp.nov.

(Figs. G06A–G)

**Diagnosis.** Vertex brown, ochre-yellow around eye and on face. Scutum dark brown, with ochre-yellow anterior fifth. Antepronotum ochre-yellow, proepisternum ochre-yellow with a brownish area anteriorly, remaining pleural sclerites brown. Legs whitish, hind coxa with brownish transverse band on basal end, femora entirely whitish. Wing with a darker macula over area around distal half of cell br; Sc nearly absent, not fused to C or to bR; C produced shortly beyond tip of R<sub>5</sub>; first section of Rs strictly transverse, R<sub>5</sub> running very close to R<sub>1</sub> and C; M<sub>1+2</sub> slightly shorter than r-m; M<sub>4</sub> absent, CuA running parallel to M<sub>2</sub>; anal fold long, well sclerotized, arched on distal third of wing; wing posterior margin with a gentle incision at level of tip of CuA. Abdominal tergites 1–5 brown, tergite 6 brown with a yellow band along posterior margin. Sygonocoxite with no strong setae along posterior margin ventrally; gonostylus small, subquadrate, with a short digitiform basal projection directed inwards; paramere well sclerotized, present as an elongate, rectangular sclerite; tergite 9 wide, at anterior half of terminalia, with rounded lateroposterior corners, setose and with microtrichia; cerci large.

**Description. Male.** Wing length, 1.82; width, 0.70. **Head** (Fig. G06B). Brown medially on frons, brownish-yellow around eye, partially fit under anterior end of scutum. Face and clypeus dirty-yellowish. Lateral ocelli blackish-brown, nearly touching eye margin, no median ocellus, frontal furrow short. Antennal scape and pedicel light brown, flagellum brown. Maxillary palpus light brown, lighter toward apex. Labella light brownish-yellow. Dark brown small setae scattered over vertex, four slightly longer setae on occiput around dorsal margin of eye posteriorly to line of ocelli, a row of long setae close to anterior margin of frons. Antennal scape twice pedicel length, a crown of setae distally and on inner face of

scape; setulae on both lateral faces and on distal margin of pedicel, in addition to one strong seta dorsally. Face slender, with a transverse line of setulae. Clypeus with scattered setulae. Mid ocellus present, at posterior end of frontal furrow. Flagellomere 1 twice flagellomere 2 length; flagellomere 2  $1.7 \times$  longer than wide. Palpomere 1 twice as long as wide, covered only with microtrichia, palpomere 2 very short, with some setulae, palpomere 3 slightly longer than wide, sensorial pit conspicuous opening dorsally, setulae on external and dorsal faces, palpomere 4 almost twice flagellomere 3 length, with setulae on external and dorsal faces, palpomere 5 slender, about twice flagellomere 4 length, with scattered setulae. **Thorax** (Fig. G06C). Scutum shinning dark brown except for ochre-yellow anterior sixth, scutellum dark brown. Basisternum brown. Antepronotum ochre-yellow, proepisternum ochre-brown with ochre-yellow areas on distal half, anepisternum shining brown, katepisternum, mesepimeron, laterotergite and metepisternum ochre-brown, mediotergite dark brown. Scutum densely covered with scattered fine setae, no shiny median keel anteriorly, five longer setae at small bulging area on margin behind level of wing, four pairs of prescutellar bristles along posterior margin of scutum; scutellum large, trapezoid, two pairs of strong bristles and some additional smaller setae along posterior margin. Basisternum dorso-posterior arms with some few setulae. Antepronotum only with short fine setae, proepisternum with three bristles on dorsal half and scattered small setae. Anepisternum entirely covered with scattered setae, a line of long setae along posterior margin; katepisternum small, slightly less than half height of anepisternum. Mesepimeron reaching ventral margin of thorax, with two strong bristles along dorsal margin and 11 setulae. Laterotergite bulging, quite flattened, with three long setae along posterior margin and nine scattered small setae; mediotergite small, inclined, bare; metepisternum with 12 fine setae along its length. **Legs.** Coxae whitish, mid coxa with orangish antero-basal corner, hind coxa with a light brown transverse band at basal end; femora whitish-yellow; tibiae light yellowish-brown with an orangish tinge, tarsi very light ochre-brown. Front coxa entirely covered with setulae at anterior face, a row of brown bristles along posterior margin and around tip, and along margin on basal half of internal face; mid coxa largely developed, setation restricted to frontal face near distal end; hind coxa with some few small setae distally and one strong seta at external face on distal two-thirds. Femora covered with fine setae, a row 3–5 longer setae along ventral margin distally, stronger on hind femur. Tibiae and tarsi with regular rows of trichia. Front tibia with a wide antero-apical depressed area lined with setulae, a pair of rows densely covered with setae dorso-laterally, in addition to setae at distal end. Mid and hind tibiae with two rows of setae dorsally and some strong setae on

lateral faces, in addition to long setae at distal end. Front leg tarsomere 1 shorter than tibia, twice tarsomere 2 length. Front leg tarsomeres only with rows of trichia and a couple of distal setae; mid and hind tarsomeres 1–3 with some ventral setae besides rows of trichia. Tibial spurs light brown, subequal, spur of front tibia about twice tibia width at apex, spurs of mid leg about  $5 \times$  tibial apex, spurs of hind leg about  $3 \times$  tibial apex. Tarsal claws with an inconspicuous basal tooth. **Wing** (Fig. G06D). Wing membrane light brown fumose, slightly darker along anterior margin, dark area extending to origin of  $M_{1+2}$ . Membrane densely covered with regularly organized microtrichia on all cells, no macrotrichia on membrane; posterior margin gently emarginated at level of tip of CuP. Sc ending free, faint, barely recognizable.  $R_1$  relatively short, reaching C before distal third of wing;  $R_4$  absent;  $R_5$  short, reaching C before level of  $M_2$ , running close to C beyond  $R_1$ . C not extending beyond  $R_5$ . First sector of Rs slightly oblique; r-m almost longitudinal, half  $M_{1+2}$  length. Vein bM over  $7 \times$  r-m length;  $M_{1+2}$  short;  $M_1$  and  $M_2$  well sclerotized, running more or less parallel along most of their length;  $M_4$  absent; medial veins weakly sclerotized close to margin. CuA straight, long, reaching margin almost at level of tip of  $R_5$ . Cubital pseudovein and CuP not produced. Anal fold long, gently curved on distal third, not reaching wing margin. Dorsal macrotrichia on bR,  $R_1$  and on second sector of Rs, ventral macrotrichia on fourth of bR, distal three-fourth of  $R_1$  and on Rs. **Abdomen**. Tergite 1 white laterally with medial brown mark, tergites 2–6 brown; sternite 1 white, sternite 2–6 light brown, darker towards distal segments; tergite and sternite 7 yellowish. **Terminalia** (Fig. G06E). Small, yellowish, weakly sclerotized. Gonocoxites fused together medially, no suture, no incision on posterior margin of syngonocoxite medially, a short medial keel extending medially, posterior margins of gonocoxite not extending beyond base of gonostylus, setae restricted to lateroposterior corners ventrally. Gonostylus complex, composed of: ventral lobe, elongate towards mid of terminalia (almost touching medially tip of opposite gonocoxite ventral lobe), bearing distally a short digitiform projection with a distal seta, a short pointed lobe and a small sublobe with five fine setulae at tip; a median lobe wider at base and with a distal digitiform projection bearing two spines and a fine seta at tip; a dorsal wide digitiform lobe bearing fine setulae along distal half. Gonocoxal bridge present, weakly sclerotized, no apodemes visible. Aedeagal-parameral complex constituted of an elongate, subquadrate sclerite with a pair of rounded short lobes on disto-lateral corners and a small distal keel. Tergite 9 trapezoid, tapering towards posterior margin. A pair of long lobes dorsally bearing microtrichia and fine setae, possibly fusion between tergite 10 and cerci (or loss of tergite 10).

**Female** (Fig. G06A). As males, except for the following. **Wing.** Length, 1.95; width, 0.83. Mesepimeron with one strong seta and eight smaller setae. Laterotergite with three longer setae and seven smaller ones; metepisternum with 17 small setae. **Legs.** Tarsomeres 1–2 of front leg with a row of spines along entire length at external. **Abdomen.** Tergite 1 white, tergites 2–5 brown, tergite 6 brown with a cream-yellow transverse band at distal fourth; sternite 1 white, sternite 2–7 light brown, darker towards distal segments, sternite 7.

**Terminalia** (Fig. G06F). Yellowish. Sternite 8 elongate, extending distally to reach distal third of cercomere 1, with a posterior incision between them. Sternite 9 with wide anterior end, distal medial end of sternite 9 reaching level of tip of lobes. Tergite 9 short, weakly sclerotized, with microtrichia and a row of setulae on posterior half, laterally extending towards ventral face of terminalia, partially overlapping sternite 8 anteriorly. Tergite 9+10 short, slightly more sclerotized, with microtrichia, but no setae, fused to sternite 9 laterally. Cercomere 1 long, densely covered by microtrichia and fine setae, apparently with a sensorial area on inner face. Cercomere 2 about as long as cercomere 1.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000799>)

**Material examined.** **Holotype:** male, ZRC\_BDP0048140, Sungei Buloh (SB1), mangrove, 25.September-02.October.2013, MIP leg. (slide-mounted). **Paratypes:** 1 male, 3 females. **Males:** ZRC\_BDP0048149, Sungei Buloh (SB1), mangrove, 25.September-02.October.2013, MIP leg. **Females:** ZRC\_BDP0048144, Sungei Buloh (SB1), mangrove, 26.September-02.October.2013, MIP leg. (slide-mounted); ZRC\_BDP0048145, Sungei Buloh (SB1), mangrove, 25.September-02.October.2013, MIP leg. (website photo specimen); ZRC\_BDP0048148, Sungei Buloh (SB1), mangrove, 26.September-02.October.2013, MIP leg.

**Etymology.** The species epithet of this species honors Phan Wait Hong (1914-2016), called “grande dame of Beijing opera in Singapore”. Shanghai-born, she moved to Singapore at age 14 as part of an opera troupe. She performed regularly until the age of 82, with a limited number of performances for a decade afterwards. She received the Singapore Cultural Medallion for Chinese Opera in 1992 and was inducted to the Singapore Women’s Hall of Fame in 2014.

**Remarks.** There are no conflict between different delimitation approaches for this species.

#### *Platyprosthiogyné gohsookhimaæ Amorim & Oliveira, sp.nov.*

(Figs G07A–E)

**Diagnosis.** Head dark brown. Scutum dark brown, pleural sclerites dark brown, antepronotum slightly lighter. Coxae and femora mostly whitish, mid coxa with basal half brownish, mid coxa with basal three-fourth brown, mid and hind femora with distal two-thirds brown. Wing mostly brownish, a lighter band along most of CuA; Sc basically absent; C produced well beyond tip of  $R_5$ , over half way to tip of  $M_1$ ; first section of Rs almost transverse,  $R_5$  running very close to  $R_1$  and C;  $M_{1+2}$  slightly shorter than r-m;  $M_4$  absent, CuA running parallel to  $M_2$ , slightly curved, as  $M_2$ , at distal end; anal fold long, well sclerotized, arched on distal third of wing; wing posterior margin with a deep incision at level of tip of CuA. Abdominal tergites 1–7 brown. Syngonocoxite with a pair of short posterior projections at ventral face bearing a group of 2–3 strong setae slightly curved distally; gonostylus short, with a short ventral beak-like, bare projection directed inwards and a larger posterior, hairy projection; tergite 9 rectangular, wide; cerci well developed.

**Description. Male** (Fig. G07A). Wing length, 1.63; width, 0.75. **Head.** Dark brown, lighter on occiput along eye margin, face light brown, clypeus brown dorsally, lighter towards ventral margin. Antennal scape light brown, pedicel whitish-yellow, flagellomere 1 light brown, other flagellomeres brown. Palpus light brown, lighter toward apex. Labella light brownish-yellow. **Thorax.** Scutum and scutellum dark brown. Antepronotum ochre-brown, proepisternum brown. Anepisternum dark ochre-brown, katepisternum, mesepimeron, laterotergite, mediotergite and metepisternum brown. Antepronotum only with long, fine setae, proepisternum elongate, with short setae and four bristles along ventral margin. Mesepimeron with three bristles and four small setae. Laterotergite with four bristles on dorsal half; metepisternum with seven long, fine setae. **Legs.** Front coxa whitish with a yellowish-brown tinge posteriorly on basal half; mid and hind coxae brown at basal half, whitish distally. Fore femur light yellowish-brown, mid and hind femora whitish at basal third to fourth, dark brown at distal two-thirds or three-fourth. Tibiae and tarsi light brown, tibiae slightly darker basally, tarsi slightly darker towards tip. Haltere white. **Wing.** Wing membrane light brown fumose along axis of CuA, much darker along anterior margin, darker along radial and medial veins and posterior along anal lobe, a lighter band posteriorly to CuA along most of its length. C extending beyond tip of  $R_5$  to about two-thirds of distance to  $M_1$ . Sc extremely short, ending free. First sector of Rs nearly transverse;  $R_5$  running very close to C, curved along its length, reaching C before level of tip of CuA;  $M_{1+2}$  half of r-m length. Medial fork long,  $M_2$  diverging towards tip,  $M_1$  and  $M_2$  barely sclerotized at very tip;  $M_4$  absent, CuA basically parallel to  $M_2$ . Cubital pseudovein short, restricted to basal fifth of

CuA, CuP entirely absent; sclerotized anal fold present, long, gently curved on distal third. Dorsal setae present on bR, R<sub>1</sub>, R<sub>5</sub>, r-m and bM, ventral setae on R<sub>1</sub> and distal two-thirds of R<sub>5</sub>. Posterior margin strongly emarginated at level of tip of CuA. **Abdomen.** Tergites 1–6 brown, tergite 7 light brown; sternite 1–6 light greyish-brown, sternite 7 yellowish.

**Terminalia.** Light yellowish-brown. Gonocoxites fused on anterior half of their extension, no suture, a short medial projection on syngonocoxite that extends into aedeagal-parameral complex, some few long, fine setae close to posterior margin of gonocoxites ventrally, gonocoxite posterior margin not projected beyond base of gonostylus. Gonostylus complex, composed of: ventral, elongate lobe towards mid of terminalia (almost touching medially tip of other gonocoxite ventral lobe), bearing close to base a long, fine setae and at distal end a digitiform projection with 2–3 long strong setae; a distal lobe projecting inwards with a medial tooth and a short spine, distal end truncated; a large dorsal subtriangular lobe with a long seta projected anteriorly and setulae on posterior face. Gonocoxal bridge not visible. Aedeagal-parameral complex present as a rhomboid sclerite wider at distal end, with three small pointed projection and a medial short keel. Tergite 9 short, rectangular, weakly sclerotized, with microtrichia and some fine setae. A pair of large lobes possibly corresponding to the fusion between tergite 10 and cerci (or loss of tergite 10).

**Female** (Fig. G07B). As male, except for the following. **Wing.** Length, 1.76; width, 0.80. General coloration more reddish-brown, abdomen lighter. Sternite 8 trapezoid, elongate, extending distally to reach mid of cercomere 1, no posterior incision. Sternite 9 with slender anterior end, distal medial end of sternite 9 reaching level of tip of lobes of sternite 8, one seta at each side neat tip coming out of a small digitiform projection. Tergite 8 trapezoid, with microtrichia and setulae close to anterior margin and fine setae along posterior margin, extending laterally towards ventral face of terminalia, partially overlapping sternite 8 anteriorly, posterior margin projecting beyond posterior margin of tergite 9+10. Tergite 9+10 short, slightly more sclerotized, a pair of rounded laterodistal projections, covered with microtrichia and three fine setae on each side close to posterior margin, fused to sternite 9 laterally. Cercomere 1 slender, very long, almost 10× longer than wide, covered with microtrichia, some fine setulae on distal half. Cercomere 2 minute at tip of cercomere 1.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000806>)

**Material examined. Holotype:** male, ZRC\_BDP0048727, Nee Soon (NS2), 09-15.April.2015, MIP leg. (website photo specimen). **Paratypes:** 3 males, 1 female. **Males:** ZRC\_BDP0048764, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048965, Nee Soon (NS1), 09-15.April.2015, MIP leg. (slide-mounted);

ZRC\_BDP0049008, Nee Soon (NS2), 11-17.December.2014, MIP leg. Female: ZRC\_BDP0047897, Nee Soon (NS2), swamp forest, 10-16.October.2013, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors GOH Soo Khim (1944–), Singapore-born ballerina, instructor and principal dancer at the Singapore Ballet Academy. Credited for the development of ballet in Singapore and for nurturing many successful dancers under her tutelage who became successful dancers, soloists and even choreographers, she served as a co-director of the National Dance Company and co-founded the Singapore Dance Theatre. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** The fusion point for specimens ZRC\_BDP0047897, which is a female, and ZRC\_BDP0048718 of *Platyprosthiogyne gohsookhima*e, sp.nov. in the cluster dendrogram is at 4.18%. Most delimitation approaches indeed suggest two species among the specimens. It is possible that female ZRC\_BDP0047897, only specimen of this cluster, is not conspecific with the holotype and other specimens, but the male terminalia morphology cannot be checked.

***Platyprosthiogyne rahimahae Amorim & Oliveira, sp.nov.***

(Figs. G08A–D)

**Diagnosis.** Male vertex dark brown, dark ochre-yellowish around eye and on face, scutum dark brown; female head largely ochre-yellowish, light brown medially on vertex, a slender ochre-yellow band along anterior margin. Pleural sclerites brown, antepronotum slightly lighter. Legs whitish, mid coxa with slender brownish transverse band on basal end, mid coxa with basal third brownish, mid femur with brownish tip, hind femur with distal half brownish. Wing with a darker macula over area around distal half of cell br; Sc nearly absent, ending free; C produced beyond tip of R<sub>5</sub> a third of distance to tip of M<sub>1</sub>; first section of Rs almost transverse, R<sub>5</sub> running very close to R<sub>1</sub> and C; M<sub>1+2</sub> about as long as r-m; M<sub>4</sub> absent, CuA running parallel to M<sub>2</sub>; anal fold long, well sclerotized, curved on distal third of wing; wing posterior margin with a gentle incision at level of tip of CuA. Abdominal tergites 1–5 brown, tergite 6 brown with yellow band along posterior margin. Syngonocoxite with no strong setae along posterior margin ventrally, a short medial projection; gonostylus with a short digitiform

and a short posterior projection, ventral one with a distal slender spine; tergite 9 wide at anterior half of terminalia.

**Description. Male** (Fig. G08A). Wing length, 1.54–1.63; width, 0.62–0.70. **Head.** Vertex mostly ochre-brown, greyish-brown medially; face and clypeus whitish-yellowish. A line of four longer setae on occiput around dorsal margin of eye posteriorly to ocelli line. Antennal scape, pedicel and basal half of flagellomere 1 whitish-yellow, remaining antenna brown. Maxillary palpus light yellowish-brown, lighter to apex, labella whitish-yellow. Flagellomere 4 length  $1.9 \times$  width. **Thorax.** Scutum shinning dark brown, scutellum dark brown. All pleural sclerites dark brown, except for antepronotum slightly lighter. Proepisternum with three long setae close to dorsal margin, anepisternum with six long setae along posterior margin. Mesepimeron with two long setae and eight small setae, laterotergite with four long setae along posterior margin and nine small setae; metepisternum with 11 fine setae along its length. Haltere white. **Legs.** Fore coxa whitish with a light greyish tinge, mid and hind coxae whitish with a brown transverse band across basal end, wider brown area on hind coxa; fore femur whitish-yellow, light brown on dorsal and ventral border, darker dorso-distally; mid and hind femora whitish on anterior half, dark brown on distal half. Tibiae and tarsi light yellowish-brown. **Wing** (Fig. G08C). Wings fumose brown, darker along entire anterior margin, a dark mark on anterior third from margin to bM and along  $M_{1+2}$ . C extending beyond tip of  $R_5$  to about a third of distance to  $M_1$ . First sector of  $Rs$  slightly oblique;  $R_5$  curved along its entire length, running close to  $R_1$  and C; r-m short,  $M_{1+2}$  about  $1.5 \times$  r-m length. Medial fork long,  $M_1$  and  $M_2$  mostly parallel, almost straight, tip of  $M_1$ ,  $M_2$  and CuA barely sclerotized; CuA straight, parallel to  $M_2$ . Anal fold sclerotized, present, long, gently curved on distal third. Wing posterior margin emarginated at level of tip of CuA. **Abdomen.** Tergites 1–5 dark brown, tergite 6 brown with a yellowish transverse band along posterior margin, tergite 7 yellowish; sternite 1–7 light brown. **Terminalia** (Fig. G08D). Whitish-yellow. Gonocoxites fused medially along anterior half of terminalia, suture of fusion present, a short rhomboid medioventral process of syngonocoxite distally, distal margin of gonocoxite not extended beyond base of gonostylus, some few fine setae latero-distally. Gonostylus complex, composed of: ventral lobe, with two sublobes, one more dorsal branch, digitiform and slightly arched, with a distal tooth, a spine and some setulae, and one more ventral branch, elongate, curved inwards, almost touching medially tip of opposed gonostylus, with one strong seta and some setulae along posterior margin; a distal clavate lobe, with one spine and one setulae on ventral face and two setae on other face; and a dorsal

slender lobe extended ventro-dorsally, with four setulae at distal end. Gonocoxal bridge not visible. Aedeagal-parameral complex weakly sclerotized, not discernible. Tergite 9 rectangular, with lateroposterior corners slightly projected, with microtrichia and some fine setae. A pair of large lobes possibly corresponding to fusion between tergite 10 and cerci (or loss of tergite 10).

**Female** (Fig. G08B). As male, except for the following. **Wing.** Length, 1.63; width, 0.70. General coloration more lighter, more yellowish, especial head, mostly ochre-yellowish, with a brown mark on top of vertex, and along anterior margin of scutum. **Terminalia.** Sternite 8 trapezoid, elongate, extending distally, no posterior incision, microtrichia and few scattered setulae. Sternite 9 with wide anterior end extending anteriorly to distal end of segment 7, distal medial end of sternite 9 reaching level of tip of lobes. Tergite 8 short, extending laterally towards ventral face of terminalia, partially overlapping sternite 8 anteriorly, with microtrichia, fine setae along posterior margin. Tergite 9+10 short, lateroposterior corners slightly projected, covered with microtrichia and fine setae, fused to sternite 9 laterally. Cercomere 1 slender, very long [cercomeres 2 probably broken].

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000726,-002121>)

**Material examined. Holotype:** male, ZRC\_BDP0047098, National University of Singapore (PGP), 02-08.July.2015, MIP leg. (slide-mounted). **Paratypes:** 2 males, 2 females. **Males:** ZRC\_BDP0049342, National University of Singapore (PGP), 02-08.April.2015, MIP leg. (slide-mounted); ZRC\_BDP0072463, Bukit Timah, primary forest (BT04), 02-08.December.2016, MIP leg. **Females:** ZRC\_BDP0048428, Nee Soon (NS2), swamp forest, 26.December.2012-02.January.2013, MIP leg. (website photo specimen); female, ZRC\_BDP0048789, National University of Singapore (PGP), 03.Jun.2015, MIP leg. (slide-mounted). **Additional sequenced specimens:** female, ZRC\_BDP0155018 (website photo specimen); female, ZRC\_BDP0049075, National University of Singapore (PGP), 16-22.April.2015, MIP leg.

**Etymology.** The species epithet of this species honors Rahimah Rahim (1955–), Singapore-born singer and actress, known as Singapore’s first Lady of Song. She released her first album, Mana Ibumu, in 1972, when she was 17 and her albums Gadis Dan Bunga and Bebas went gold. She was inducted into the Singapore Women’s Hall of Fame in 2017.

*Platyprosthiogyne lynetteseahae Amorim & Oliveira, sp.nov.*

(Figs. G09A–B)

**Description.** [Abdomen broken on holotype, only known specimen]. Wing length, 2.05; width, 0.82. **Head.** Strongly compressed, mostly dark ochre-brown, lighter towards ventral

end of occiput; face and clypeus light brown. Mid ocellus present; four long setae on occiput around dorsal margin of eye. Antennal scape, pedicel and basal half of flagellomere 1 brownish-yellow, remaining flagellomeres brown; flagellomere 4 length 1.4 width. Palpus light yellowish-brown, lighter towards apex; labella whitish-yellow. **Thorax** (Fig. G09A). Scutum shinning dark brown except for ochre-yellow transverse band along anterior margin that projects posteriorly at laterals to level of anterior spiracle. Scutellum dark brown. Antepronotum ochre-yellow, proepisternum greyish-brown, anepisternum dark brown, katepisternum greyish-brown, mesepimeron, laterotergite and metepisternum brown, mediotergite dark brown. Antepronotum only covered with short setae, proepisternum with short setae and three bristles close to dorsal margin. Anepisternum with five long setae along posterior margin. Mesepimeron with two strong setae and five small setae, laterotergite with four long setae along posterior margin and 20 small setae; metepisternum with eight setulae along its length. **Legs.** Fore coxa whitish with a brownish tinge anteriorly, mid coxa whitish with a light tinge along basal end, hind coxa whitish with a brown transverse band across basal end [hind leg missing except for coxa]; front and mid femur whitish-yellow with brownish distal end; tibiae and tarsi yellowish-brown, tarsi darker towards apex. Haltere white. **Wing** (Fig. G09B). Wings fumose light brown, with a brown mark at anterior margin at level of origin of Rs. C extending beyond tip of R<sub>5</sub> one sixth of distance to tip of M<sub>1</sub>. First sector of Rs slightly oblique; R<sub>5</sub> curved, running close to R<sub>1</sub> and C; r-m about as long as M<sub>1+2</sub>. Medial fork long, M<sub>1</sub> and M<sub>2</sub> mostly parallel, tip of M<sub>1</sub>, M<sub>2</sub> and CuA barely sclerotized at very tip, CuA straight. Cubital pseudovein short reaching level of anterior end of r-m; CuP entirely absent; sclerotized anal fold present, long, gently arched on distal half. Wing margin emarginated at level of tip of CuA.

**Material examined. Holotype:** ZRC\_BDP0048297, Pulau Semakau (SMN1), planted mangrove, 04-10.October.2013, MIP leg. (unknown gender, abdomen missing) (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors violinist Lynnette SEAH Mei Tsing (1957–), a Singapore-born Cultural Medallion-winner (the highest award for the arts in Singapore) for Music in 2006. She was a founding member of the Singapore Symphony Orchestra, which she co-leads, and has performed for Emperor Akihito and Empress Michiko of Japan. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** We have a single specimen of this species, without abdomen. The color pattern of the head and of the abdomen clearly diverges from the remaining species of the genus. All delimitation approaches confirm it as a separate species, except OC at 5% and mPTP, which join it with *Platyprosthiogyne rahimahae*, sp.nov.

***Platyprosthiogyne neilaae* Amorim & Oliveira, sp.nov.**

(Figs. G11A–E)

**Diagnosis.** Head, scutum and pleural sclerites dark brown, some of pleural sclerites slightly lighter. Coxae and femora mostly whitish, mid coxa with basal half brownish, mid coxa with basal three-fourth brown, mid and hind femora with distal two-thirds brown. Wing mostly brownish, a lighter elongate area around most of CuA length; Sc basically absent; C produced over half way between R<sub>5</sub> and M<sub>1</sub>; first section of Rs almost transverse, R<sub>5</sub> running very close to R<sub>1</sub> and C; M<sub>1+2</sub> slightly shorter than r-m; M<sub>4</sub> absent, CuA running parallel to M<sub>2</sub>; anal fold long, well sclerotized, arched on distal third of wing; wing posterior margin with clear incision at level of tip of CuA. Abdominal tergites 1–7 brown. Syngonocoxite with a short medial posterior projection at ventral face bearing a group of 7–8 strong setae slightly curved distally; gonostylus small, with a short ventral digitiform projection directed inwards with a spine distally and a larger dorsal projection; tergite 9 rectangular, wide.

**Description. Male** (Fig. G11A). Wing length, 1.63–1.92; width, 0.70–0.80. **Head.** Dark brown, occiput lighter around eye, face and clypeus brown. Antennal scape, pedicel and first third of flagellomere 1 whitish-yellow, other flagellomeres brown; flagellomere length over 3× width. Palpus light brown, lighter towards apex; labella light brownish-yellow. **Thorax.** Scutum and scutellum dark brown. Antepronotum ochre-brown, proepisternum brown; anepisternum dark ochre-brown, katepisternum, mesepimeron and metepisternum brown, laterotergite and mediotergite dark brown. Antepronotum only with short setae, proepisternum with short setae and three longer setae along ventral margin. Anepisternum with six long setae along posterior margin. Mesepimeron with eight setae, laterotergite with three setae; metepisternum with 3–4 fine setae; other pleural sclerites bare. **Legs.** Front coxa whitish-yellow, mid and hind coxae brown on basal half, hind coxa darker; fore femur whitish-yellow with brown tinge, darker towards apex, mid femur light ochre-yellow on basal half, brownish at distal half, hind femur whitish on basal fourth, dark brown on distal three-

fourth; tibiae yellowish-brown, tarsi light brown, slightly darker towards tip. Haltere white.

**Wing** (Fig. G11B). Membrane light greyish-brown fumose, lighter around length of CuA. R<sub>5</sub> running very close to C, curved along its length, C extending beyond tip of R<sub>5</sub> to about half distance to M<sub>1</sub>; r-m short, M<sub>1+2</sub> short, as long as r-m. Medial fork long, M<sub>1</sub> and M<sub>2</sub> diverging on distal fifth, M<sub>1</sub> and M<sub>2</sub> barely sclerotized at very tip. CuA straight, reaching wing margin beyond level of tip of R<sub>5</sub>; only a stump of cubital pseudovein remaining; CuP entirely absent, sclerotized anal fold present, gently curved long. Wing margin strongly emarginate at level of tip of CuA. **Abdomen**. Tergites 1–6 brown, sternite 1–6 light greyish-brown, tergite 7 light brown, sternite 7 yellowish-brown. **Terminalia** (Figs. G11C–E). Yellowish-brown.

Gonocoxites fused medially along anterior half of terminalia, no evidence of suture, a short medioventral process of syngonocoxite distally bearing a row of seven long, strong setae on posterior margin, distal margin of gonocoxite not extended beyond base of gonostylus, some few fine setae latero-distally. Gonostylus relatively simple, composed of: ventral short digitiform lobe, with a subapical setula and an apical spine; a main distal or dorsal lobe with a short branch in a ventral position bearing three elongate setae a tip directed ventrally and a larger branch with a strong seta midway to apex directed inwards, bearing some fine setae on dorso-posterior end and a small laminar extension. Gonocoxal bridge present, no apodemes. Aedeagal-parameral complex with two elements, a ventral subrectangular plate slightly widened towards apex, distally with a pair of short, rounded lobes on lateroposterior corners and a large trapezoid plate extending posteriorly, with a pair of subapical long setae. Tergite 9 rectangular, lateroposterior corners slightly projected, with microtrichia and fine setae along posterior margin. A pair of large lobes possibly corresponding to the fusion between tergite 10 and cerci.

**Female.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000767>)

**Material examined. Holotype:** male, ZRC\_BDP0048565, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen). **Paratype:** male, ZRC\_BDP0140723, Singapore, (date range 2012-2018), MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Neila Sathyalingam (1938-2017). Sri Lankan-born and with Singapore citizenship in 1994, she was a leading classical Indian dancer, teacher and choreographer in Singapore. She was appointed the dance instructor and choreographer for the Indian Dance Group of the People's Association and was an artistic adviser to Singapore's National Arts Council. For her contributions to dance, Neila was

awarded the Singaporean Cultural Medallion in 1989. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** Among the delimitation approaches, only mPTP suggests merging *Platyprosthiogyne neilaae*, sp.nov. with *P. gohsookhima*e, sp.nov. They do belong to a small clade within the genus, as the medio-posterior syngonocoxite projection with elongate, curved setae suggest, but clearly correspond to separate species, what is corroborated by the other OC and ABGD.

***Platyprosthiogyne snehalethaae* Amorim & Oliveira, sp.nov.**

(Figs. G12A–D)

**Diagnosis.** Head light ochre-brown, frons dark brown. Scutum ochre-brown, darker on posterior half, scutellum dark brown. Pleural sclerite greyish-brown. Wing membrane light greyish fumose. Sc short, ending free. C extending less than a fourth distance to M<sub>1</sub>. R<sub>5</sub> gradually curved towards posterior margin; r-m short, oblique. M<sub>4</sub> missing; CuA straight; sclerotized anal fold long. Wing posterior margin conspicuously emarginated at apex of CuA. Abdominal tergites 1–7 dark greyish-brown, tergites 1 with cream-yellow anterior mark medially, tergite 2 with cream-yellow mark on antero-lateral corner. Gonocoxite elongate, no medial projection of posterior margin. Gonostylus ovoid in lateral view, dorsal half folded over ventral half. Tergite 9 wide, short.

**Description. Male.** Wing length, 2.27; width, 1.02. **Head.** Light ochre-brown, frons dark brown. Lateral ocelli blackish-brown, nearly touching eye margin, mid ocellus absent, frontal furrow present. Dark brown setae scattered on vertex, a short line of four slightly longer setae on occiput around dorsal margin of eye posteriorly to ocelli line. Long inter-ommatidial setulae over entire surface of eye. Antennal scape and pedicel light brown, flagellum brown. Scape long, about twice longer than pedicel. Scape with setae on inner face and dorsally. Pedicel with setation restricted to a crown of setae on posterior margin, in addition to a longer dorsal seta and some few additional smaller setae. Flagellomeres almost twice as long as wide, except for flagellomere 1, about 3× longer than wide. Face short, light greyish-brown, clypeus slightly bulging, light brown, setose. Maxillary palpus light brown, lighter toward apex, with five palpomeres; palpomere 1 only with microtrichia, palpomere 2 short, with

some setae along distal margin dorsally, palpomere 3 with a conspicuous sensorial pit opening on basal half of inner face and dorsal, and setae on inner face, palpomere 4 almost twice palpomere 3 length, slender, with setulae dorsally and on internal face, palpomere 5 over twice palpomere 4 length. Labella large, light brownish-yellow. **Thorax.** Scutum ochre-brown, darker on posterior half, densely covered with scattered long setae, two small bristles above wing and a pair of prescutellar bristles medially. Scutellum dark brown, large, with four long subapical bristles along posterior margin and some scattered long setae. Pleural sclerite greyish-brown. Antepronotum with a number of shorter setae and some fine bristles, proepisternum with some few short setae and two bristles. Anepisternum covered with scattered setae, some slightly longer setae along posterior margin. Mesepimeron with 12 setae on dorsal third; laterotergite strongly bulging, with 18 setae; metepisternum with four small setae on posterior fourth. Katepisternum and mediotergite bare. **Legs.** Coxae ochre-yellowish, front and hind coxae slightly darker; femora brownish-yellow, tip hind femur brownish. Tibiae light yellowish-brown, tarsi very light brown. Front coxa covered with small fine setae on anterior and lateral faces, a row of strong setae along distal two-thirds of lateroposterior edge; mid coxa with small setae on distal third besides distal stronger setae anteriorly and one strong seta posteriorly on distal margin; hind coxa with one strong seta on lateral face dorsally, a row of dark small setae along posterior half of posterior face and one bristle and some setae laterally on distal end. Femora densely covered with fine setae, some longer setae on distal end ventrally. Front tibia with scattered fine setae [mid tibia and tarsi missing]; hind tibia with scattered fine setae ventrally and laterally, and two latero-dorsal rows of seven long setae. Antero-apical depressed area on inner face of front tibia wide, densely lined with setulae. Tarsi with regular rows of trichia, setae only distally. Tarsal claw with a strong, large basal tooth. Tibial spurs about twice tibial width at apex. Haltere light brown. **Wing** (Fig. G12B). Wing membrane light greyish fumose, venation brownish, no markings, microtrichia exceptionally long. Sc short, ending free. C extending shortly beyond tip of R<sub>5</sub>, less than a fourth distance to M<sub>1</sub>. R<sub>1</sub> long, gently arched, reaching C at distal third of wing. First sector of Rs slightly oblique, R<sub>5</sub> gradually curved towards posterior margin; r-m short, oblique. M<sub>1+2</sub> short, about 2.5× r-m length. Medial fork long, M<sub>1</sub> and M<sub>2</sub> slightly divergent on distal fifth of wing; M<sub>4</sub> missing. CuA straight; CuP produced, not reaching level of origin of M<sub>1+2</sub>; sclerotized anal fold present, long. Dorsal setae present on bR, R<sub>1</sub>, second sector of Rs, r-m and bM; ventral setae present on distal half of bR, R<sub>1</sub>, second sector of Rs, r-m, and distal two-thirds of bM. Wing posterior margin conspicuously emarginated at apex of CuA. **Abdomen.** Tergites 1–7 dark greyish-brown, tergites 1 with cream-yellow anterior mark

medially, tergite 2 with cream-yellow mark on antero-lateral corner; sternite a light brown, sternites 2–6 cream-yellow, segment 7 light brown. **Terminalia** (Figs. G12C–D). Light brownish-yellow. Gonocoxite elongate, indistinguishably fused medially, no suture, no medial projection of posterior margin. Gonostylus ovoid-shape in lateral view, dorsal half folded over ventral half, marginal setae of both “valves” close to each other. Aedeagal-parameral complex long, more or less rectangular in ventral view, extending posteriorly beyond level of base of gonostylus. Tergite 9 wide, short, with long setae on posterior half. Tergite 10 present as a long trapezoid, weakly sclerotized plate, almost reaching level of tip of aedeagus. Cerci almost as long as tergite 10.

**Female** (Fig. G12A). As male, except for the following. **Wing**. Length, 2.37; width, 1.12. Sternite 8 slender, with no posterior lobes, wide at base, extending distally almost to level of tip of first cercomere, covered with fine setulae. Tergite 8 fused to tergite 9 and tergite 10. Sternite 9 with wide base, extending distally to level of tip of sternite 8. Cercomere 1 very long, over 3× longer than cercomere 2, both covered with microtrichia and setulae.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000768>)

**Material examined.** **Holotype**: male, ZRC\_BDP0049034, Nee Soon (NS2), 01-07.January.2015, MIP leg. (slide-mounted). **Paratypes**: 1 female, ZRC\_BDP0048566, Nee Soon (NS2), swamp forest, 03-09.May.2012, MIP leg. (website photo specimen). **Additional sequenced specimens**: female, ZRC\_BDP138568 (website photo specimen).

**Etymology.** The species epithet of this species honors Snehalatha Karunakaran. She was a student of D.H. Murphy and performed what was arguably the first extensive modern synthesis of the Chironomidae (Diptera) in Singapore. Her an unpublished PhD thesis (1969) accumulated a wealth of information on taxonomy and biomics of the group. She sadly died in a fire at home before she could be awarded her PhD.

### ***Platurocypta* Enderlein**

*Platurocypta* Enderlein, 1910b: 76. Type-species, *P. limbatifemur* Enderlein (orig. des.).

**Diagnosis.** Lateral ocelli touching eye margins, third palpalomere not swollen. Border of scutum at anterior third nearly straight or only slightly curved; katepisternum dorsoventrally compressed; laterotergite densely covered with small setae and a row of bristles along dorso-posterior margin; mesepimeron with bristles; laterotergite setose, compressed; mediotergite

strongly compressed. Wing membrane with microtrichia arranged in more or less regular longitudinal lines; C clearly extending beyond tip of  $R_5$ ; Sc ending free;  $R_4$  absent;  $M_{1+2}$  about as long as r-m;  $M_4$  present, parallel to  $M_2$  on distal half, originating slightly beyond level of anterior end of medial fork, tip of  $M_4$  about equidistant between tip of  $M_2$  and tip of CuA.

*Platurocypta* is a rather poorly known genus, presently with 20 species: two from Europe, one from South America, two from New Zealand, 13 from the Comores and Seychelles Islands and continental Africa, and two from the Oriental region. The fact that the genus has species known from Europe and from South America has in some extension veiled its rather typical Afro-Oriental-Australasian diversification. We should expect more Oriental and Australasian species to be described.

The genus stands in the mitogenome tree as sister of the set of *Epicypta* species. This agrees with the presence of a conspicuous incision on the margin of the scutum above the anterior spiracle, a long C beyond the tip of  $R_5$ , and a reduced laterotergite and mediotergite. These features are shared by the group of genera—sister to (*Mycetophila* + *Platyprosthiogyne*)—including *Epicypta*, *Aspidionia*, and *Integricypta* gen.n., besides *Platurocypta*.

In our Singapore samples we found two species of *Platurocypta* and none of them fit the species described by Edwards (1929, 1931). The Oriental species—*P. intermedia* (Edwards, 1929), *P. longiseta* (Edwards, 1931)—were described respectively from the Philippines and from Sumatra. There are no conflicts on species delimitation (Fig. G15G), and the species have clearly divergent male terminalia morphology. Specimens of both species were collected in the mangrove and in the swamp forest.

### ***Platurocypta adeleneweeae* Amorim & Oliveira, sp.nov.**

(Figs. G13A–F, G14A–C)

**Diagnosis.** Head dark brown; antenna yellow on basal half, greyish-brown on distal half, mouthparts brownish-yellow. Scutum blackish-brown; pleural sclerites dark brown, katepisternum, mesepimeron and laterotergite lighter. Fore coxa light brownish-yellow, mid and hind coxae light brown; femora yellowish-brown medially with dark brown ventral and dorsal border, tibiae greyish-brown; female front tarsomeres 2–5 flattened and slightly

swollen. Abdominal tergites 1–5 brown, tergite 6 brown with yellowish transverse band along posterior margin. Male terminalia yellowish; gonocoxites with no medial suture, posterior border of syngonocoxite with no medial incision; gonostylus with a digitiform ventral projection and a main lobe with a row of short spines on small projections at distal border; tergite 9 present as a pair of large ovoid lobes medially. Female terminalia slightly elongate, weakly sclerotized.

**Description. Male.** Wing length, 2.11 mm, width, 0.74 mm. **Head.** Vertex shining brown, two longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, 4–5 posteriorly to ocellus. Occiput dark brown, light brown towards ventral end. Scape and pedicel ochre-yellow; basal flagellomeres ochre-yellow, gradually becoming greyish-brown. Face brown, clypeus light brown, labella whitish-yellow; four developed palpomeres, palpomeres 1–2 brownish-yellow, palpomeres 3–5 whitish-yellow. Entire eye surface with inter-ommatidial short fine setae. Scape  $2.0 \times$  length of pedicel, flagellomere 4 length  $1.8 \times$  width. **Thorax.** Scutum shining blackish-brown, scutellum blackish-brown dirty-yellow at the sides anteriorly. Antepronotum and anepisternum shining blackish-brown, other pleural sclerites greyish-brown, mediotergite blackish-brown. Pleural membrane yellowish. Haltere with light brown pedicel and whitish knob. Scutum with seven supra-alar bristles and three pairs of prescutellar bristles, scutellum with two pairs of strong bristles. Antepronotum with three bristles at ventral margin directed ventrally. Anepisternum with six bristles along posterior margin. Mesepimeron with four bristles and 26 small setae and setulae, laterotergite with four bristles and 14 additional smaller setae. Metepisternum with three strong setae and seven additional small setae. **Legs.** Front coxa whitish-yellow, mid and hind coxae light brown; trochanters brownish; femora brownish-yellow with a brownish elongated mark along dorsal and ventral edges, hind femur with a wide brown area laterally on distal third of wing; tibiae and tarsi brownish-yellow. Forecoxa with a row of large brown setae latero-distally; mid coxa with some few strong setae on anterior face of distal margin; no setulae on proximal half of hind coxa, one lateral strong seta close to tip; femora only covered with setulae and very few apical larger setae ventrally. Tibiae and tarsi with trichia organized in regular rows. Front tibia with one large seta on inner face laterally at distal third in addition to rows of trichia; mid tibia with a pair of latero-dorsal rows of small bristles and a ventral row of bristles; hind tibia with two irregular latero-dorsal rows of 3–5 strong bristles. Fore leg tarsomere 1 about as long as tibia, more than  $2.5 \times$  tarsomere 2 length. Mid and hind tarsomeres with regular rows of setae ventrally in addition to regular rows of trichia. Tibial

spurs 1:2:2, hind spur about 6× tibia width at apex, inner spur slightly shorter than outer spur. Tarsal claws with a small acute ventral tooth close to base and a lateral mid tooth directed outwards. **Wing.** Membrane fumose light brown, cell c and area around tip of  $R_1$ , first sector of Rs and base medial fork slightly darker. Humeral vein present, oblique, Sc barely produced.  $R_1$  reaching C on distal fourth of wing;  $R_5$  relatively reaching C before level of tip of  $M_2$ ; C extending beyond apex of  $R_5$  for about a third of distance to  $M_1$ . First sector of Rs almost transverse, devoid of setae; r-m more or less oblique, well sclerotized, setose, slightly more than 2.0× length of first sector of Rs.  $M_{1+2}$  short, about as long as r-m; bM about 5× r-m length; first sector of CuA about as long as second sector. Cubital pseudovein extending to slightly beyond origin of  $M_4$ . Anal fold long, curved on posterior third. Posterior veins  $M_1$  on distal half,  $M_2$  on distal fifth and  $M_4$  on distal end with dorsal macrotrichia; anal lobe with macrotrichia dorsally. **Abdomen.** Abdominal tergites 1-6 light brown, distal fourth of tergite 6 and tergite 7 cream-yellowish; sternites 1-7 whitish-yellow, no bristles ventrally on sternite 2. **Terminalia** (Figs. G14A-C). Yellowish. Gonocoxites large, fused along anterior half of terminalia, no suture of fusion, no medial incision on posterior border of syngonocoxite. Gonostylus composed of a digitiform ventral lobe with two distal short spines, a short, sclerotized flat small inner lobe bare of setae and main lobe with a row of small setae along posterior margin arising from short projections. Parameres composed of a pair of small plates connected anteriorly. Tergite 9 present as a pair of large ovoid lobes with microtrichia and no setae. Cerci weakly sclerotized.

**Female** (Fig. G13A). As male, except for the following. Wing length, 2.27; width, 0.90.

**Head** (Fig. G13B). Occiput with three longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, 7 posteriorly to ocellus. **Thorax** (Fig. G13B). Eight supra-alar bristles. Proepisternum with one small and three strong bristles. Anepisternum with seven bristles along posterior margin. Mesepimeron with four bristles and 19 small setae and setulae, laterotergite with three bristles and four additional smaller setae. Metepisternum with four strong setae and six additional small setae. **Legs.** Fore leg tarsomere 1 about as long as tibia, more than 2.5× tarsomere 2 length; front tarsomeres 2-5 slightly swollen. **Wing** (Fig. G13D). No dorsal setae on veins  $M_1$  on distal half,  $M_2$  on distal fifth and  $M_4$ , membrane on anal lobe with macrotrichia. **Abdomen.** Abdominal tergites 1-6 dark caramel-brown, tergite 6 with a yellowish band along posterior margin; tergite 7 brownish-yellow; sternites 1-7 brownish-yellowish, no bristles ventrally on sternite 2; sternites 3-6 with three longitudinal weakly sclerotized bands along sternite. **Terminalia** (Figs. G13D-E). Brownish-yellow. Sternite 8 rectangular, elongate, with rounded posterior margin, no medio-posterior incision,

entirely covered with microtrichia and elongate setulae, no stronger setae along distal margin. Sternite 9 long and slender, anterior arm elongate, wide at tip, genital chamber slender, posterior end projected to level of tip of first cercomere. Tergite 8 short, with a medial weakly sclerotized area almost separating two lobes, extended latero-anteriorly at each side as apodemes. Tergite 9+10 reduced to a short, bare, sclerotized band. Cercomere 1 1.4× length of cercomere 2, both with microtrichia and setulae; cercomere 1 with a short projection distal to base of cercomere 2 ventrally, with a longer seta at tip; cercomere 2 with a longer seta at tip.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000723>)

**Material examined. Holotype:** male, ZRC\_BDP0048860, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted). **Paratypes:** 12 females, ZRC\_BDP0048323, Nee Soon (NS2), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048327, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048424, Nee Soon (NS1), swamp forest, 03-09.January.2013, MIP leg. (slide-mounted); ZRC\_BDP0048705, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048720, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048821, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048833, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048841, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048858, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048866, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0048943, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0049109, Nee Soon (NS1), 18-24.December.2014, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0134013; female, ZRC\_BDP0140737 (website photo specimen); female, ZRC\_BDP0078983; ZRC\_BDP0134031; ZRC\_BDP0134032; ZRC\_BDP0058586, ZRC\_BDP0071061, ZRC\_BDP0071062, ZRC\_BDP0082341, ZRC\_BDP0128611, ZRC\_BDP0132888, ZRC\_BDP0133400, ZRC\_BDP0140726, ZRC\_BDP0142313, ZRC\_BDP0143106, ZRC\_BDP0155094, ZRC\_BDP0155127.

**Etymology.** The species epithet of this species honors bowling champion Adelene WEE (1965–). She was the youngest gold medal winner of the Philippines Women’s Open Masters in 1981, broke the world record for six-game singles in ten-pin bowling at the Sukhumvit Open in 1982, and won the Singapore International Bowling Championships. In June 1985, she won three gold medals at the Asian FIQ youth championships. She became the nation’s first and the world’s youngest World Bowling Champion, with the 1985 World Games title at the age 19. She was inducted into the Singapore Women’s Hall of Fame in 2014.

### *Platurocypta tanhoweliangi* Amorim & Oliveira, sp.nov.

(Figs. G15A–F)

**Diagnosis.** Head blackish-brown; antenna yellow on basal half, greyish-brown on distal half, mouthparts brownish. Scutum blackish-brown; pleural sclerites blackish-brown. Fore coxa

light brownish-yellow, mid and hind coxae greyish brown, with a lighter medial area; femora greyish-brown, tibiae greyish-brown with yellowish basal and distal fifth; female front tarsomeres 2-5 flattened and slightly swollen. Abdominal tergites 1-5 dark brown, tergite 6 brown on anterior three-fourth, yellowish on posterior fourth. Male terminalia brownish-yellow, gonocoxites with medial suture present, posterior border of syngonocoxite with a U-shaped medial incision; gonostylus with a short, sclerotized palm-like projection with a row of short blunt spines and a large, median lobe; a pair of large ovoid lobes dorsally, cerci present as a pair of elongated lobes ventral to tergite 9. Female terminalia slightly elongate, cerci with a row of short spines along border.

**Description. Male.** Wing length, 2.11 mm, width, 0.74 mm. **Head.** Head dark caramel-brown, scattered setulae over entire vertex, a row of six dark brown slightly longer setae dorsally to eyes on occiput. Scape and pedicel yellowish, six proximal flagellomeres yellowish with a brownish tinge, eight more distal flagellomeres ochre-yellowish basally and greyish-brown distally, apical flagellomeres with more extensive greyish-brown area. Face and clypeus light brown. Maxillary palpus light brown. Labella whitish-yellow. **Thorax.** Scutum blackish-brown, yellowish-brown medially on anterior margin, scutellum blackish-brown. Pleural sclerites greyish-brown, proepisternum, most of anepisternum and dorsal half of mesepimeron darker. Pleural membrane dark ochre-yellow. Haltere pedicel whitish. Antepronotum with three long setae on ventral margin, proepisternum with three bristles. Mesepimeron with a row of six bristles and 13 smaller setae, laterotergite with four bristles and six additional smaller setae. Metepisternum with three long setae and ten setulae on posterior end. **Legs.** Front coxa dirty-yellowish-brown, mid and hind coxae mostly greyish-brown, mid coxa with a wide whitish-yellow area at ventral half. Femora greyish-brown, lighter on lateral face, darker along ventral and dorsal edges. Tibiae ochre-yellowish on both ends, darker medially, mid and hind tibiae darker. Tarsi light greyish-brown, hind tarsomere 1 with a basal dark mark. **Wing (G15B).** Membrane light fumose brown, slightly darker along anterior margin, some specimens with blackish-brown diffuse area around first sector of Rs and r-m. C extending beyond apex of R<sub>5</sub> for a third distance to M<sub>1</sub>. First sector of Rs transverse. Setae on veins as in *Platurocypta adeleneweae*, sp.nov., but bM with ventral and dorsal setae on distal half. Anal fold curved on distal third. **Abdomen.** Abdominal tergites 1-6 caramel-brown, tergite 1 darker, tergite 6 cream-yellow along posterior margin medially, tergite 7 cream-yellow. Sternites 1-7 light caramel-brown. **Terminalia (G15C-D).** Light ochre-yellow, cerci lighter. Gonocoxites large, fused along anterior half of terminalia, suture

of fusion present, posterior border of syngonocoxite with a U-shaped medial incision, some few setulae along posterior third, a small sub-medial projections inwards. Gonostylus composed of a ventral lobe, with setulae along posterior margin and a short, sclerotized palm-like projection with a row of five distal short blunt spines; a large, median lobe slightly widening distally, a pointed tooth directed ventrally on inner distal end, some fine setulae on distal margin and a group of small, fine setae on baso-internal corner. Gonocoxal bridge weakly sclerotized, apodemes projected inwards, almost touching each other. Aedeagal-parameral encapsulated, a pair of weakly sclerotized pair of blades ventrally close to each other medially, aedeagal plate elongate, subquadrate, slightly more sclerotized on distal margin. A pair of large ovoid lobes dorsally, bearing microtrichia and fine setae, representing tergite 9. Cerci present as a pair of elongated lobes ventrad to tergite 9, with setae and microtrichia.

**Female** (G15A). As male, except for the following. **Wing**. Length, 2.08 mm; width, 0.77 mm. **Head**. Occiput with four long setae around eyes posteriorly to line of ocelli. **Thorax**. Mesepimeron with five bristles in a line and 11 small setae, laterotergite with three bristles and eight additional smaller setae. Metepisternum with three longer setae on posterior end and 14 setulae along its length. **Abdomen**. Tergites 1–5 brown, tergite 6 mostly brown, with a medial yellowish mark medially along posterior margin, tergite 7 mostly yellowish.

**Terminalia** (G15E–F). Yellowish-brown. Sternite 8 wide, with a pair of lateroposterior projection and a wide medial incision, covered with setulae and microtrichia. Sternite 9 well-sclerotized, a pair of posterior arms, gonopore medially, anterior medial furca well-sclerotized. Tergite 9+10 mostly bare, with a pair of lateroposterior projections. Cercomeres 1 and 2 partially fused, two strong spines on laterodistal end of cercomere 1, four strong spines on cercomere 2.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000723,-02073>)

**Material examined. Holotype:** male, ZRC\_BDP0048063, Nee Soon (NS2), swamp forest, 21-27.March.2013, MIP leg. (slide-mounted). **Paratypes:** 1 male, 9 females. **Male:** ZRC\_BDP0048423, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg. **Females:** ZRC\_BDP0047827, Nee Soon (NS1), swamp forest, 28.February-6.March.2013, MIP leg.; ZRC\_BDP0047839, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg.; ZRC\_BDP0047891, Nee Soon (NS1), swamp forest, 14-20.March.2013, MIP leg.; ZRC\_BDP0047940, Nee Soon (NS1), swamp forest, 30.May-05.June.2013, MIP leg. (slide-mounted); ZRC\_BDP0047949, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048324, Nee Soon (NS2), swamp forest, 12-18.July.2012, MIP leg.; ZRC\_BDP0048325, Nee Soon (NS2), swamp forest, 03-09.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048326, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048425, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. **Additional sequenced specimens.** male, ZRC\_BDP0133407 (website photo specimen).

**Etymology.** The species epithet of this species honors Tan Howe Liang (1904–1999), Singapore’s first Olympic medalist, in weightlifting at the 1960 Rome games. Born in Swatow, China, Tan also broke the oldest-standing world record in the lightweight category in the clean and jerk in 1958. He was the only Singaporean Olympic medalist until the 2008 Summer Olympics.

### ***Epicypta* Winnertz**

*Epicypta* Winnertz, 1863: 909. Type-species, *Mycetophila scatophora* Perris (Johannsen, 1909: 110).

**Diagnosis.** Lateral ocelli touching eye margins, third palpomere not swollen. Border of scutum above anterior spiracle with a deep incision; katepisternum dorsoventrally compressed; separation between antepronotum and proepisternum barely recognizable, at most a short suture at anterior end; a row of bristles along dorso-posterior margin of anepisternum always present; mesepimeron with bristles; laterotergite and mediotergite strongly compressed. Mid coxa strongly developed. Wing membrane with microtrichia arranged in more or less regular longitudinal lines; C hardly extending beyond tip of  $R_5$  or not extending at all. Sc ending free, sometime barely recognizable;  $R_4$  absent;  $M_{1+2}$  about as long as r-m;  $M_4$  present, not interrupted at basal end, parallel to  $M_2$  on distal half, originating slightly at level of anterior end of medial fork or slightly beyond; tip of  $M_4$  about equidistant between tip of  $M_2$  and tip of CuA. Sternite 2 with a strong pair of bristles medially on distal half.

This is a large genus of Mycetophilidae, with almost 150 described species. The number of actual species of *Epicypta*, however, may be dreadfully higher. In some localities there are 15-30 described species of the genus *Manota* in sympatry—as, e.g., in Costa Rica (Jaschhof & Hippa, 2005), Peru (Hippa et al., 2917), southern Atlantic Forest (Kurina et al., 2018) or Malaysia (Hippa 2006)—while we consistently find 30 to 40 species of *Epicypta* in sympatry in different tropical areas in the world, often with a complete turnover between localities. So far, the most species-rich region for *Epicypta*, is the Neotropical, with 60 described species. There are certainly over one thousand undescribed species of *Epicypta* worldwide.

A total of 45 species of *Epicypta* have been described from the Oriental region, of which nine are from India or Sri Lanka, 28 from China and eight from Southeast Asia. The

Southeast Asian species are *Epicypta angusticollaris* (Edwards), *Epicypta boettcheri* (Edwards) and *Epicypta flavidula* (Edwards)—from Philippines (Edwards, 1929)—, *Epicypta pallida* (Edwards)—from Krakatau (Edwards, 1927)—, *Epicypta sartrix* (Meijere), *Epicypta flavicauda* (Edwards) and *Epicypta leefmansi* (Edwards)—from Java, respectively de Meijere (1924) and Edwards (1935)—, *Epicypta borneensis* (Edwards)—from Borneo (Edwards, 1933)—, and *Epicypta sumatrensis* (Edwards), from Sumatra (Edwards, 1931).

We carefully compared our species with the original descriptions of all Southeast Asian species and the species from Singapore do not fit any of them. We were particularly careful about the species from Sumatra, Java and Borneo, but there are significant differences in the color of the coxa, thorax and abdomen. In our samples, we obtained 40 different clusters so far, of which we formally describe and name 30 species.

The haplotype network for the genus (Figs. G16–G17) is complex and the species delimitation approach for the species of the genus (Table III) show conflicts for some of the species. For the 30 species described here, most conflicts are due to the separation of clusters into separate species by mPTP. There are four more complex cases—*Epicypta jennylauae*, sp.nov., *E. chezaharaae*, sp.nov., *E. constancesingamae*, sp.nov. and *E. janetyeeae*, sp.nov. that deserve attention, discussed under the remarks after each species description. The cases of species with larger known specimens and larger number of haplotypes are the most interesting in terms of species evolution. Fully exploring these cases at a populational level, however, is beyond the scope of this paper.

The mitogenome tree has 22 of the 30 species of *Epicypta* described here. The tree has some congruence with morphological evidence, but there are some apparent inconsistencies so we decided not to gather these species in groups. The sequence of species described below largely follows the mitogenome tree.

### Group *constancesingamae*

***Epicypta constancesingamae* Amorim & Oliveira, sp.nov. (=sp. 47)**  
(Figs. G18A–G)

**Diagnosis.** Head ochre-yellowish. Scutum with three connected dark brown longitudinal bands over ochre-yellow background, scutellum dark brown. Pleural sclerites ochre-yellowish except for a diffuse brown mark on antepronotum, dark brown paratergite, a dorsal

brown mark on mesepimeron, brown laterotergite and dark brown mediotergite. Hind coxa with a brown band across proximal end of hind coxa. Wing membrane light brownish, darker on cells c and br. C barely produced beyond tip of R<sub>5</sub>; M<sub>1+2</sub> 0.78× r-m length. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, M<sub>4</sub> and on CuA close to tip; macrotrichia on anal lobe. Abdominal tergites 1-2 dark-brown, tergite 3 light brown posteriorly, yellowish-brown at anterior fourth, tergite 4 yellowish anteriorly and laterally, a large medial brown mark posteriorly, tergite 5 dark brown with a slender yellowish band along anterior margin, tergite 6 dark brown, tergite 7 yellowish-brown. Male terminalia gonocoxite short, no lobes projecting beyond base of gonostylus, gonostylus digitiform, long; aedeagus with a pair of separate tubular extensions with independent gonopores; parameres with a pair of long lateral projections each with a pair of distal setae; tergite 9 with a pair of long, digitiform separate extensions. Female terminalia sternite 8 posterior margin with no incision, distal part of cercus short.

**Description. Male.** Wing length, 2.18 mm, width, 0.73 mm. **Head.** Head ochre-yellowish. Scape and pedicel dark ochre-yellowish, flagellomeres light brown. Face and clypeus yellowish-brown. Basal three palpomeres dark yellowish-brown, distal two palpomeres lighter, labella light ochre-yellowish. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, six posteriorly to ocellus. Scape 2.4× pedicel length; flagellomere 4 2.0× longer than wide. Maxillary palpomere 4 1.6× palpomere 3 length; palpomere 5 1.6× palpomere 4 length. **Thorax.** Scutum background color ochre-yellow, with three dark brown bands connected to each other; scutellum dark brown. Pleural sclerites ochre-yellowish except for a diffuse brown mark on antepronotum dorsally, dark brown paratergite, a dorsal brown mark on mesepimeron, brown laterotergite and dark brown metepisternum and mediotergite. Haltere with light brown pedicel, whitish knob with light brownish tinge. Pleural membrane yellowish. Scutum no bristles except for 9+2 supra-alars and three pairs of prescutellar bristles; three pairs of scutellar bristles. Proepisternum with two long bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 38 fine small setae, laterotergite with four bristles, one long seta and eight fine setae. Metepisternum with 11-15 small setae. **Legs.** Front coxa yellowish-brown, mid and hind coxae whitish with a brownish tinge, a brown band across proximal-posterior corner of hind coxa. Femora yellowish with a brownish tinge. Tibiae and tarsi brownish-yellow. Mid coxa with a band of fine setae across the basal fifth, hind coxa with fine setae on basal fourth. Front tibia with a single bristle medially on distal third of outer face, two dorsal and two

ventral rows of dark brown trichia; mid tibia with two irregular dorsolateral rows of 3–5 bristles and three bristles along ventral edge, trichia along dorsal and ventral edges dark brown; hind tibia with two irregular rows of 5–6 bristles dorso-laterally, dorsal and dorsolateral rows of trichia dark brown. Fore leg tarsomere 1 0.9× tibia, 1.4× tarsomere 2 length. **Wing** (Fig. G18B). Membrane fumose light brown, slightly darker along anterior margin. C extending slightly beyond apex of R<sub>5</sub>; R<sub>1</sub> reaching C on wing distal fourth; R<sub>5</sub> reaching slightly beyond level of M<sub>2</sub>. First sector of Rs slightly oblique, 0.34× r-m length; r-m more or less oblique. M<sub>1+2</sub> 0.78× r-m; bM 3.6× r-m length; first sector of CuA about 0.26× length of second sector of CuA. Cubital pseudovein absent, CuP extending to slightly beyond level of origin of M<sub>4</sub>. Anal fold gently curved along its length. Posterior wing veins M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia along most of their length, M<sub>4</sub> on distal half, and CuA at distal fourth; anal lobe with dorsal macrotrichia. **Abdomen**. Abdominal tergites 1–2 dark-brown, light brown laterally, tergite 3 light brown posteriorly, yellowish-brown at anterior fourth, tergite 4 yellowish anteriorly and laterally, with a large medial brown mark posteriorly, tergite 5 dark brown with a slender yellowish band along anterior margin, tergite 6 dark brown, tergite yellowish-brown; sternites 1–7 light yellowish-brown. Sternite 2 with a strong ventral pair of brown bristles, tergites 2–6 with long, darker setae medially. **Terminalia** (Figs. G18C–E). Yellowish. Gonocoxites fused medially, no suture present, bare ventrally, no dorsolateral lobes extending beyond insertion of gonostylus. Gonostylus long, inserted latero-distally on gonocoxite, digitiform, with fine setae on inner margin along basal third, setae on outer face along entire length, distal setae longer, extending beyond tip of tergite 9 digitiform projections. Aedeagus with a wide subquadrate plate articulating to gonocoxites laterally, bearing medially a pair of long digitiform laterodistal projections extending way beyond tip of aedeagus. Parameres triangular, in a more dorsal position, with a pair of sub-medial digitiform processes each with setulae and an elongate spine at tip and a digitiform short medial projection with some fine setae at tip. Gonocoaxal bridge with a pair of elongate apodemes directed inwards anteriorly. Tergite 9 present as a pair of long posterior digitiform extensions, wide and meeting each other at anterior half, covered with long setae, almost as long as gonostylus, with 4–5 long, curved setae distally. Cerci not visible.

**Female** (Fig. G18A). As male, except for the following. **Wing**. Length, 2.13–2.56; width, 0.82–0.93. **Terminalia** (Figs. G18F–G). Sternite 8 wide, rectangular, posterior margin straight, no medial incision, no latero-posterior projections, with scattered microtrichia and fine setae. Sternite 9 wide, anterior apodeme extending beyond anterior end of terminalia, genital chamber slender, well-sclerotized. Tergite 8 wide, covered with microtrichia and

setulae. T9+10 bare, slender. Cercomeres 1 and 2 probably fused, no sign of suture, basal two-thirds large, ovoid, slender on distal third, covered with microtrichia and fine setae.

**Material examined. Holotype:** male, ZRC\_BDP0137084, Bukit Timah Forest (BT05, 29-Mar-17, MIP leg. (slide-mounted). **Paratypes:** 6 females, ZRC\_BDP0074040, Pulau Ubin (PU18), mangrove, 10.May.2018, MIP leg.; ZRC\_BDP0136995, Bukit Timah, maturing secondary forest (BT06), 12-Jul-17, MIP leg. (extracted, slide-mounted), ZRC\_BDP0143114, Nee Soon (NSM1), 21-Jan-15, MIP leg.; ZRC\_BDP0278220, Pulau Ubin (PU19), 31-May-18, MIP leg. (slide-mounted); ZRC\_BDP0278248, Pulau Ubin (PU18), mangrove, 31-May-18, MIP leg. (slide-mounted); ZRC\_BDP0279215, Mandai Mangroves (MM05), 22-May-18, MIP leg. (slide-mounted). **Additional sequenced specimens:** ZRC\_BDP0040808; ZRC\_BDP0040813; ZRC\_BDP0040832; ZRC\_BDP0041086; ZRC\_BDP0041099; ZRC\_BDP0041101; ZRC\_BDP0041134; ZRC\_BDP0058630; ZRC\_BDP0067260; ZRC\_BDP0067277; ZRC\_BDP0074040.

**Etymology.** The species epithet of this species honors Constance Singam (née D'Cruz, 1936). Born in Singapore, she is a writer and activist for women's rights, migrant worker rights, and rape victims. She served as the president of Association of Women for Action and Research (AWARE) over three non-contiguous periods, and as president of the Singapore Council of Women's Organisations (SCWO) for two years. In 2015, Constance was inducted into the Singapore Women's Hall of Fame.

**Remarks.** There are three haplotypes for *Epicypta jennylauae*, sp.nov., all kept as a single species by all delimitation approaches.

***Epicypta jennylauae* Amorim & Oliveira, sp.nov. (= sp. 09)  
(Figs. G19A–G)**

**Diagnosis.** Head yellowish, antennal scape and pedicel whitish-yellow, first flagellomere ochre-yellow, flagellum distally light greyish-brown. Scutum blackish-brown with a light ochre-yellowish collar along anterior fifth; antepronotum and proepisternum ochre-yellowish, katepisternum, anepisternum and mesepimeron light ochre-brown; laterotergite, mediotergite and metepisternum brown. Coxae and femora whitish, yellowish tinge on anterior leg, hind coxa with a brown mark on basal end. Wing membrane light brownish, area along anterior margin slightly darker. C ending at tip of R<sub>5</sub>; M<sub>1+2</sub> shorter than r-m. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub> and distal end of CuA, anal lobe with macrotrichia. Abdominal tergite 1 brown, tergites 2–3 caramel-brown medially, with ochre-yellowish margins, tergites 4–7 mostly caramel-yellowish, terminalia whitish-yellow. Female terminalia sternite 8 quite straight along posterior margin, cercus slightly reniform.

**Description. Male.** Wing length, 1.98–2.18; width, 0.70–0.83 (n=2). **Head.** Head ochre-yellowish. Face and clypeus whitish-yellow. Scape and pedicel light ochre-yellowish, flagellomere 1 ochre-yellowish, remaining flagellomeres greyish-yellow. Basal palpomeres ochre-yellowish, distal two palpomeres whitish-yellow, labella light yellowish-brown. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, six posteriorly to ocellus. Scape 2.5× length of pedicel, flagellomere 4 1.4× longer than wide, covered with scattered setulae. Flagellomere 4 slightly longer than flagellomere 3, flagellomere 5 1.6× longer than flagellomere 4. **Thorax.** Scutum anterior fifth ochre-yellow, remaining dark brown, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum, proepisternum, proepimeron, katepisternum, anterior two-thirds of anepisternum and anterior half of mesepimeron ochre-yellow, other pleural sclerites greyish-brown, mediotergite dark greyish-brown, proepisternum with a diffuse greyish-brown area on dorsal half. Haltere whitish, no larger setae. Pleural membrane yellowish. Scutum with six long supra-alar setae, three pairs of prescutellar bristles; two pairs of scutellar bristles. Three bristles on proepisternum directed ventrally, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and seven small setae, laterotergite with two bristles and three smaller setae. Metepisternum with nine small setae. **Legs.** Coxae whitish, hind coxa with a brown band at dorsal sixth; femora, tibiae and tarsi light whitish-yellow, tarsi darker. Mid coxa with a band of small setae across basal fifth, hind coxae basal fourth with small setae. Front tibia with a single dorsal strong seta medially; mid tibia with a pair of dorsolateral rows of 4–5 bristles along entire length, distal ones curved, and two ventral bristles, besides bristles at tip, hind tibia with two rows of dorsolateral bristles, no bristles ventrally. Mid and hind tarsomeres 1–3 with rows ventrolateral longer setae, besides setae at tip. Fore leg tarsomere 1 1.2× tibia length, 1.6× tarsomere 2 length. Hind tibial outer spur almost 6× tibia width at apex. **Wing (Fig. G18B).** Membrane fumose light brown, slightly darker along anterior margin. Dorsal macrotrichia on anal lobe. Sc barely produced. C ending at tip of R<sub>5</sub>. R<sub>1</sub> long, reaching C on distal fifth of wing; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>. First sector of Rs slightly oblique, 0.92× r-m length; r-m almost longitudinal. M<sub>1+2</sub> about as long as r-m; bM 7× r-m length. First sector of CuA about 0.27× length of second sector. Cubital pseudovein absent, CuP extending slightly beyond level of origin of M<sub>4</sub>. Anal fold almost reaching wing margin, bare. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub> entire length, and on M<sub>4</sub> distal third and tip of CuA. Dorsal macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 brownish, tergite 2 greyish-brown lighter laterally, tergites 3–7 dark

ochre-yellow, tergites 3–5 ochre-brownish medially; sternites 1-7 whitish-yellow, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G18C–E). Yellowish.

Gonocoxites fused medially, suture absent, bare ventrally, no dorsolateral gonocoxite lobes extending beyond insertion of gonostylus. Gonostylus inserted latero-distally on gonocoxite, digitiform, reaching level of tip of aedeagus, setae on outer face along entire length, distal setae slightly longer. Aedeagus with a wide subquadrate plate medially, opening at tip of a pair of long, digitiform laterodistal projections distally. Paramere with a triangular plate in a more dorsal position, medially with a short digitiform projection with some fine setae at tip and a pair of spines. Tergite 9 present as a pair of long posterior elongate extensions with a wider anterior half, close to each other at tip, longer than gonostylus, covered with long setae, distal setae longer. Cerci not visible.

**Female** (Figs. G19A–B). As male, except for the following. **Wing** (Fig. G19B). Length, 1.82; width, 0.67 (n=2). **Terminalia** (Fig. G19D). Whitish-yellow. Sternite 8 rectangular, elongate, posterior margin straight, no lobes or incision, microtrichia and fine setae covering entire sclerite, longer setae at posterior margin, lateral ones curved inwards. Sternite 9 with wide genital chamber, lined with microtrichia, gonopore connected to two gonoducts, anterior arm weakly sclerotized. Tergite 8 trapezoid, wide at base and more slender towards posterior margin, latero-anterior sclerotized extensions. T9+10 bare, with a pair of short lateral lobes connected medially by a slender, sclerotized band. Cercomeres 1 and 2 probably fused, no sign of suture, laterally compressed, wider midway to apex than at base, covered with microtrichia and elongate setae, distally with two stronger setae.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000728>)

**Material examined. Holotype:** male, ZRC\_BDP0278324, Singapore, 03.May.2018, (slide-mounted). Paratypes: 1 male, 4 females. Male. ZRC\_BDP0284244, Singapore, no date, MIP leg. (slide-mounted). ZRC\_BDP0278161, Pulau Ubin (PU18), mangrove, 10.May.2018, MIP leg. (slide-mounted); ZRC\_BDP0067516, Singapore, 07.October.2015, MIP leg.; ZRC\_BDP0067307, Singapore, 07.October.2015, MIP leg.; ZRC\_BDP0067304, Singapore, 07.October.2015, MIP leg.

**Specimens from probably non-conspecific cluster.** 16 females and 44 additional specimens: ZRC\_BDP0047842, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg. (slide-mounted); ZRC\_BDP0048438, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048439, Nee Soon (NS2), swamp forest, 10-16.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048702, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048797, Nee Soon (NS1), 12-18.March.2015, MIP leg. (slide-mounted); ZRC\_BDP0048863, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0048865, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0048918, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0072746, Bukit Timah, old secondary forest (BT03), 16-22.December.2016, MIP leg.; ZRC\_BDP0072747, Bukit Timah, maturing secondary forest (BT06), 02-08.December.2016, MIP leg.; ZRC\_BDP0133449, Singapore, no date, MIP leg.; ZRC\_BDP0133905, Singapore, no date, MIP leg.; ZRC\_BDP0133954, Singapore, no date, MIP leg.; ZRC\_BDP0133976, Singapore, no date, MIP leg.; ZRC\_BDP0136997, maturing secondary forest (BT06), 12.July.2017, MIP leg. (imaged); ZRC\_BDP0047869; ZRC\_BDP0048433; ZRC\_BDP0048435; ZRC\_BDP0048437 (extracted); ZRC\_BDP0048437, extracted; ZRC\_BDP0048439; ZRC\_BDP0048702; ZRC\_BDP0048797; ZRC\_BDP0048863; ZRC\_BDP0048865; ZRC\_BDP0048867; ZRC\_BDP0048867; ZRC\_BDP0048918; ZRC\_BDP0058715; ZRC\_BDP0058715;

ZRC\_BDP0058772; ZRC\_BDP0058772; ZRC\_BDP0066768; ZRC\_BDP0066768; ZRC\_BDP0071041; ZRC\_BDP0071041; ZRC\_BDP0072746; ZRC\_BDP0072747; ZRC\_BDP0120533; ZRC\_BDP0120533; ZRC\_BDP0128617; ZRC\_BDP0128617; ZRC\_BDP0133449; ZRC\_BDP0134036; ZRC\_BDP0137297; ZRC\_BDP0137297; ZRC\_BDP0154887; ZRC\_BDP0154887; ZRC\_BDP0154915; ZRC\_BDP0154915; ZRC\_BDP0154956; ZRC\_BDP0154956; ZRC\_BDP0155011; ZRC\_BDP0155011; ZRC\_BDP0155013; ZRC\_BDP0155013; ZRC\_BDP0155079. ZRC\_BDP0047869; ZRC\_BDP0155079.

**Etymology.** The species epithet honors Jenny LAU Buong Bee (1932-2013). Born in British Malaya, she became in 1960 the first woman to serve as a magistrate in Malaya and in 1966, she was the first woman to be appointed a district judge in Singapore. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** Two clusters were initially brought together separated at 4.49%—a species delimitation at this level would find support only with OC5% and mPTP. We have only females however of the larger subcluster. These possibly correspond to two separate morphological species, but will not formally described or name the larger subcluster as a species without examining males. The specimens of the larger subcluster are not included as paratypes of *Epicypta jennylauae*, sp.nov.

### Group *kohkhenglianae*

#### *Epicypta limchiumiae* Amorim & Oliveira, sp.nov.

(Figs. G20A–E)

**Diagnosis.** Head yellowish, antennal scape, pedicel and first flagellomere ochre-yellowish, rest of flagellum light brownish. Anterior third of scutum yellowish, blackish-brown on posterior two-thirds, a slender yellowish transverse band at posterior end, scutellum mostly blackish brown; antepronotum and proepisternum yellowish, other pleural sclerites blackish-brown, katepisternum and mesepimeron more greyish. Fore coxa and femur cream-yellow, mid and hind coxae and femora whitish. Wing with a large brownish area along anterior margin. C extending shortly beyond tip of R<sub>5</sub>; M<sub>1+2</sub> about as long as r-m. Dorsal macrotrichia on M<sub>1</sub>, M<sub>2</sub> and distal half of M<sub>4</sub>, some few macrotrichia on anal lobe. Abdominal tergite 1 dark brown, tergites 2–5 dark brown medially, yellowish laterally, extension of yellowish band variable, larger on tergite 4; tergite 6 with a dark brown anterior band, yellowish on most of tergite; tergite 7 yellowish. Female terminalia cercus short, widened subapically.

**Description. Female** (Figs. G20A–C). Wing length, 2.11; width, 0.83 mm. **Head** (Fig. G20D). Length 1.9× width in lateral view. Vertex ochre-yellowish, occiput light ochre-yellow. Fine, short inter-ommatidial setae over entire eye surface. Scape and pedicel ochre, ochre-yellow flagellomeres, more brownish towards apex of flagellum. Frons, face and clypeus light ochre-yellow, palpomeres 1–3 yellowish-ochre, distal three flagellomeres whitish-yellow, labella whitish-yellow. Occiput dorsally to eye with a row of two stronger setae anteriorly to ocellus, one above ocellus and eight posteriorly to ocellus. Scape 1.6× pedicel length, flagellomere 4 1.7× width. Palpomere 4 1.6× palpomere 3, palpomere 5 1.4× palpomere 4 length, palpomeres 3 and 4 gently projected distally beyond base of next palpomere. **Thorax.** Scutum yellowish on anterior third, dark brown on posterior two-third, light ochre-yellow laterally along posterior margin, scutellum blackish-brown mesally, light ochre-yellow on anterior margin. Antepronotum, proepisternum and proepimeron ochre-yellow, anepisternum and katepisternum greyish-brown, lighter along anterior margin, mesepimeron, laterotergite, and metepisternum blackish-brown. Mediotergite dark brown. Haltere whitish. Pleural membrane yellowish on anterior third, brown on posterior two-thirds. Seven longer supra-alar setae on bulging margin, three pairs of prescutellar bristles. Antepronotum with two bristles directed ventrally along its supposed ventral end. Anepisternum two long setae medially and four brown bristles along posterior margin. Katepisternum strongly compressed, bare. Mesepimeron with two bristles and 17 fine setae along dorsal margin, laterotergite with four bristles and eight setulae or fine setae. Metepisternum with 12 fine, elongate setae. **Legs.** Coxae whitish, fore coxa with light brownish tinge. Fore femur and tibia light brownish-yellow, tarsomeres darker. Mid and hind femora and tibiae light brownish-yellow, and tarsi light ochre-yellow. Mid coxa with four long setulae near anterior end, hind coxa with a large band of long setulae on proximal third. Fore leg tarsomere 1 1.3× tibia length, 1.7× of tarsomere 2. Hind tibial spurs about 5× tibia width at apex. **Wing** (Fig. G20E). Membrane light brown fumose with a dark brown macula along anterior margin from anterior third of cell  $r_m$  to distal fifth of  $R_1$ , medially to  $M_2$ , a brownish isolated mark between CuA and anal fold. C extending slightly beyond tip of  $R_5$ ; Sc barely produced; cell  $r_m$  slightly wider midway to apex.  $R_1$  reaching C on distal sixth of wing;  $R_5$  reaching C slightly before tip of  $M_1$ . First sector of Rs slightly oblique, about half  $r_m$  length;  $r_m$  almost longitudinal.  $M_{1+2}$  slightly shorter than  $r_m$ ; bM over 6×  $r_m$  length; first sector of CuA about 0.34× length of second sector of CuA. cubital pseudovein not even reaching level of origin of  $M_4$ ; CuP barely reaching origin of  $M_4$ . Anal fold almost reaching

wing margin. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub> and distal half of M<sub>4</sub>; anal lobe with some few dorsal macrotrichia. **Abdomen.** Abdominal tergite 1 dark brown, tergites 2-6 blackish-brown, with different extension of yellow-ochre marks laterally, tergite 4 mostly yellowish, tergite 5 blackish-brown mark almost reaching lateral end along posterior margin, tergite 6 brown only on anterior fourth, tergite 7 yellow; sternites 1-7 whitish, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G20F). Yellowish. Sternite 8 large, with a pair of long lateroposterior lobes widely separated, rounded posterior incision deep, sclerite mostly covered with microtrichia and elongate setae, longer along posterior margin, anterior end ventral face less sclerotized and covered only with microtrichia. Sternite 9 with long anterior projection extending to anterior end of terminalia, genital chamber wide, laterodistal margin close to tip with some setae. Tergite 8 large, trapezoid, covered with setae and microtrichia, posterior margin straight. Tergite 9+10 short, slender, with sclerotized band along anterior margin extending anteriorly to lateral apodemes directed anteriorly, entirely bare of setae. Cercomeres 1 and 2 probably fused, cerci elongate, wider at base and slender towards apex, with a lobe elongated ventrally close to tip.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000721,-002099>)

**Material examined. Holotype:** female, ZRC\_BDP0047890, Nee Soon (NS1), swamp forest, 14-20.March.2013, MIP leg. (slide-mounted). **Paratypes:** 5 females, ZRC\_BDP0047958, Pulau Ubin (PU2), mangrove, 26.March-01.April.2013, MIP leg.; ZRC\_BDP0048320, Nee Soon (NS2), swamp forest, 22-28.November.2012, MIP leg. (website photo specimen); ZRC\_BDP0048321, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048701, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0049010, Nee Soon (NS2), 11-17.December.2014, MIP leg. **Additional sequenced specimens.** Female, ZRC\_BDP0140762 (website photo specimen).

**Etymology.** The species epithet honors Janet LIM Chiu Mei (1923-2014). Born in Hong Kong and having grew up in Guangdong, she became the first Asian hospital matron at the St Andrews Mission Hospital in 1954. Her autobiography, “Sold for Silver”, was the first English-language book by a Singaporean author, published in 1958. She was inducted into the Singapore Women’s Hall of Fame in 2014.

**Remarks.** This species in some extension is similar to three of the *Epicypta* species from Java, especially *Epicypta flavicauda* (Edwards, 1935). This includes, besides the wide anterior yellow band on the scutum, the transverse yellow band anteriorly to the scutellum and the wing dark mark along anterior margin medially. There are consistent differences,

however, in abdominal markings. *E. limchiumeiae*, sp.nov. is also similar to *E. sartrix* (de Meijere), but does not present the wing markings.

***Epicypta janetyeeae* Amorim & Oliveira, sp.nov.**

(Figs. G21A–F)

**Diagnosis.** Head, thorax and abdomen blackish-brown, antenna brownish, lighter on scape, pedicel and first flagellomere. Coxae whitish, except for brown band on proximal end of hind coxa; femora whitish, except for proximal and distal ends of mid femur and for a brown line along dorsal edge of hind femur. Wing membrane light brownish, area along anterior margin slightly darker. C extending shortly beyond tip of  $R_5$ ;  $M_{1+2}$  shorter than r-m. Dorsal macrotrichia on veins  $M_1$ ,  $M_2$ , posterior half of  $M_4$ , anal lobe with macrotrichia. Gonocoxites without posterior projections beyond base of gonostylus; gonostylus flat, weakly sclerotized; paramere with a pair of strong spines; tergite 9 with a pair of long parallel projections.

**Description. Male** (Fig. G21A). Wing length, 1.76–1.98; width, 0.67–0.72 (n=3). **Head.** Head compressed antero-posteriorly, 1.8× longer than wide, vertex large, facing anteriorly. Vertex dark brown. Occiput brown, lighter brown towards ventral margin. Frons, face, and clypeus light brown, maxillary palpus yellowish-brown, distal palpomeres lighter, labella whitish-yellow. Antennal scape and pedicel light brown, first two flagellomeres ochre-brown, remaining flagellomeres brown. Eye small, brownish. Mid ocellus absent, ocelli touching eye margin. Vertex and occiput densely covered of small setae ventrally to level of insertion of antenna, one bristle close to margin of foramen at level of dorsal end of eye, three strong setae at level of mid of eye. Scattered brownish setulae over entire vertex, two strong setae on occiput dorsally to eyes anteriorly to ocellus, two above the ocellus and five posteriorly to ocellus. Eye entirely covered with conspicuous inter-ommatidial setae. Frons with a long projection ventrally between antennae bare along ventral margin, frontal furrow extending from ventral margin to level of ocelli. Face short, with a medial transverse depression, posterior margin slightly projected, fine setae on ventral half, clypeus short, slightly budging, with scattered short fine setae on ventral three-fourth. Scape and pedicel with dorsal, inner and ventral faces, a crown of darker setae at distal margin, one strong and some slightly smaller setae at dorsal end; scape 1.5× pedicel length; 14 flagellomere, flagellomeres about 1.7× width, covered with scattered fine setulae. Maxillary palpomere 1 reduced to a small

lobe with one seta directed posteriorly, palpomere 2 weakly sclerotized with some setae, palpomere 3 with a conspicuous sensorial pit opening at internal face, no setae at internal face, palpomere 4  $1.1\times$  longer than palpomere 3, with a short distal projection beyond insertion of palpomere 5, no setae at internal face, palpomere 5  $1.25\times$  length of palpomere 4, setulae only at distal end. Labella developed backwards, with a pair of pseudotrachea and a row of seta dorsally. **Thorax** (Fig. G21B). Scutum and scutellum dark brown. Antepronotum and anepisternum brown, other pleural sclerites dark brown except for dorsal third of laterotergite, brownish-yellow. Mediotergite dark brown on dorsal half, light brown on ventral half. Pleural membrane yellowish. Scutum with deep latero-anterior incision into which antepronotum fits, no sign of parapsidal or transverse sutures. Scutum entirely covered only with short light brown setae except for five strong setae placed on a short bulging area above wing and two pairs of strong prescutellar bristles. Scutellum large, with rounded posterior border, with two pairs of scutellar bristles, in addition to small setae directed backwards covering almost entire surface of disc. Antepronotum lobes not connected to each other. Antepronotum lobe and proepisternum large, entirely fused sign of a suture only at anterior margin, basisternum dorso-posterior arm fused to proepisternum on ventral half, basisternum arm with a group of small setae ventrally on distal end. Antepronotum and proepisternum covered with small setae, proepisternum with no bristles directed ventrally. Anepisternum rectangular, entirely covered with light brown setulae, four strong bristles directed posteriorly on posterior margin, anapleural suture present only on distal fifth. Anterior and posterior basalare bare. Katepisternum strongly compressed, at most half of anepisternum height, entirely bare. Mesepimeron reaching ventral margin of pleura, dorsoventrally compressed, with two bristles and 26 small setae and setulae close to dorsal margin; laterotergite bulging, strongly compressed, with one isolated bristle. Metepisternum slender, with 10 small fine setae, metepimeron not discernible. Mediotergite short, “folded”, with ventral margin displaced anteriorly, entirely bare. Haltere whitish-yellow, two small setae on pedicel, knob with a number of small setae dorsally. **Legs.** Front coxa whitish-yellow with a light brown tinge, mid and hind coxae whitish, mid coxa with extreme dorsal end with a band of brownish tinge, hind coxa with a dark brown band at dorsal third and distally along posterior margin; femora whitish-yellow with a light brown tinge, mid and hind femora whitish, with a dark brown mark along dorsal edge, hind femur with basal fourth brown; tibiae and tarsi brownish-yellow, darker towards tip. Coxae largely developed, fore coxa strong, mid coxa wide at base, hind coxa wide on basal third. Forecoxa laterally compressed, entirely covered with small setae on anterior and external face, a row of brown

elongate strong setae along distal end of margin posteriorly; mid coxa with a band of fine setae across basal fifth, a group of fine setae along frontal face and a row of bristles along tip at anterior face; hind coxa with fine setae on anterior third, some fine setae near tip on anterior face, a row of strong setae along distal margin of anterior face, one isolated strong seta laterally near distal end. Femora covered with fine setae, a row of strong setae near apex on ventral edge. Tibiae and tarsi with regular rows of trichia, front tibia with a lateral seta externally midway to apex; mid tibia with two irregular rows of 4-5 bristles dorso-laterally, one external seta medially, a row of three setae ventrally and two long bristles and some setae at distal margin; hind tibia with two irregular rows of five bristles dorso-laterally and some setae at distal margin, besides a comb of fine setae on internal face at distal end. Antero-apical depressed area of front tibia covered with setulae. Tarsomere 1 of front leg as long as tibia,  $1.6 \times$  tarsomere 2 length. Hind tibial spurs about  $5 \times$  tibia width at apex, inner spur subequal to outer spur, mid and hind leg tarsomeres 1 and 2 with ventral setae in addition to rows of trichia. Tarsal claws on basal half with a short tooth with wide base. **Wing** (Fig. G21C). Membrane fumose light brown, slightly darker along anterior margin. Membrane densely covered with regularly organized microtrichia on all cells, three macrotrichia on anal lobe, margin gently emarginated at level of tip of CuA. Humeral vein present, oblique, Sc barely produced. C extending beyond tip of R<sub>5</sub> for about one fifth of distance to M<sub>1</sub>. R<sub>1</sub> long, reaching C on distal fifth of wing, R<sub>4</sub> absent, R<sub>5</sub> reaching C slightly beyond level of tip of M<sub>1</sub>. First sector of R<sub>s</sub> slightly oblique, about half of r-m length; r-m almost longitudinal, well sclerotized. M<sub>1+2</sub> short, slightly over half of r-m length; M<sub>1</sub> and M<sub>2</sub> well sclerotized, mostly parallel to each other, faint close to tip; bM long, over  $6 \times$  r-m length; M<sub>4</sub> running parallel to M<sub>2</sub> on distal two-thirds. First sector of CuA short, M<sub>4</sub> originating more basally than origin of M<sub>1+2</sub>, M<sub>4</sub> and CuA complete, well sclerotized, reaching wing margin. Cubital pseudovein barely produced, CuP very short, not reaching level of origin of M<sub>4</sub>, anal fold well sclerotized, long, gently curved along its entire length, not reaching margin. Macrotrichia dorsally on trunk of Sc, bR, R<sub>1</sub>, second sector of R<sub>s</sub>, r-m, distal end of M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub>; ventrally on distal end of bR, R<sub>1</sub>, R<sub>5</sub>, r-m and distal half of bM; anal lobe with macrotrichia. **Abdomen.** Abdominal tergites 1-7 dark brown; sternites 1-7 light yellowish-brown, sternite 2 with a strong pair of bristles medially on distal half. Tergites with some longer setae mixed with fine, smaller setae. **Terminalia** (Figs. G21D-F). Yellowish-brown. Gonocoxites relatively small, medially fused on anterior end of terminalia, suture of fusion conspicuous, no sign of sternite 9, latero-posteriorly with a weakly sclerotized extension rounded distally and a number of concentrated elongate setulae, medioventral process extending into the

terminalia towards aedeagus. Gonostylus reduced to a wide flat blade covering ventro-distal end of gonocoxite, with a large number elongate fine setae and a digitiform process distally on external end bearing a long fine setae, a strong long seta on ventral margin medially and one long seta on external face distally. Parameres largely developed, a subquadrate plate extending ventrally into a pair of falciform short lobes medial curved almost meeting along medial line and a pair of laterodistal digitiform projections with an elongate fine seta at tip, besides a pair of L-shaped sclerotized structures distally bearing a fine setae at dorsal end distally and one pointed strong subapical seta and a very strongly developed seta apically on ventro-distal arm, no tubular aedeagus evident. Gonocoxal apodeme not evident. Tergite 9 with a pair of long laterodistal projections, exceeding tip of parameres, external faces of lobes covered with long setae, connected medially only at anterior end, lobes slightly widening distally with curved posterior corners.

**Female.** Wing length, 2.02–2.05; width, 0.75–0.80 (n=2). **Head.** Antennal scape, pedicel and flagellomeres brown. **Thorax.** Mesepimeron with three bristles and 29 small setae and setulae close to dorsal margin. Metepisternum slender, with 13 fine setae. **Wing.** Membrane with 12 dorsal macrotrichia on anal lobe, two dorsal setae on anal fold. **Abdomen.** Abdominal tergites 1–7 dark brown; sternites 1-7 light yellowish-brown, sternite 2 with a strong pair of bristles medially on distal half. **Terminalia.** Yellowish-brown. Sternite 8 wide at base, trapezoid, distal end with a shallow medial incision, fine setae with wide distribution along anterior margin, restricted medially close to posterior margin, setae along posterior margin stronger, lateroposterior setae gently curved inwards, short labia projected medio-posteriorly. Sternite 9 anterior end of vaginal furca extending beyond anterior margin of sternite 8, distal medial end of sternite 9 reaching level of posterior three-fourth of cercomere 1, with short setae along margin. Tergite 8 with sclerotized anterior margin, laterally with a pair of long projections directed anteriorly almost as long as anterior extension of sternite 9, with a slender medial connection, setae restricted to lateroposterior end, some strong setae at lateroposterior corner curved inwards, ventrally to cercus. Tergite 9+10 reduced to a slender short band with microtrichia. Only one cercomere present, possibly as result of fusion of both cercomere, wider at base and longer at apex, about 4× longer than wide midway to apex, covered with microtrichia and fine setae, slightly longer at apex.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000816>)

**Material examined. Holotype:** male, ZRC\_BDP0048806, Nee Soon (NS1), 12-18.March.2015, MIP leg. (slide-mounted). **Paratypes:** 41 males, 30 females. **Males:** ZRC\_BDP0047063, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0047066, National University of Singapore (Uhall), 09-

15.July.2015, MIP leg.; ZRC\_BDP0047862, Nee Soon (NS2), swamp forest, 09-15.January.2014, MIP leg.; ZRC\_BDP0048771, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048909, Nee Soon (NS1), 25-31.December.2014, MIP leg. (website photo specimen); ZRC\_BDP0048912, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049136, National University of Singapore (PGP), 16-22.April.2015, MIP leg.; ZRC\_BDP0049267, National University of Singapore (PGP), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0049332, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0066780, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg. (slide-mounted); ZRC\_BDP0066786, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg.; ZRC\_BDP0066788, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg.; ZRC\_BDP0066791, Bukit Timah, primary forest (BT05), 10-16.August.2016, MIP leg.; ZRC\_BDP0066797, Bukit Timah, primary forest (BT05), 17-23.August.2016, MIP leg.; ZRC\_BDP0066798, Bukit Timah, primary forest (BT05), 17-23.August.2016, MIP leg.; ZRC\_BDP0066804, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0066810, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0066813, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0072666, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg. (slide-mounted); ZRC\_BDP0072727, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0072740, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0047787, Nee Soon (NS2), swamp forest, 30.January-05.February.2014, MIP leg.; ZRC\_BDP0047892, Nee Soon (NS1), swamp forest, 14-20.March.2013, MIP leg.; ZRC\_BDP0047948, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048462, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg.; ZRC\_BDP0048759, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048792, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048795, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048819, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048827, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048847, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048888, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048908, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048950, Nee Soon (NS2), 28.November-03.December.2014, MIP leg.; ZRC\_BDP0049006, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049021, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049037, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049253, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049261, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0072466, Bukit Timah, maturing secondary forest (BT08), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0137209 (clustered ZRC\_BDP0041037) (imaged, slide-mounted). **Females:** ZRC\_BDP0048430, Nee Soon (NS1), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048877, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049269, National University of Singapore (PGP), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0049329, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0066803, Bukit Timah, primary forest (BT05), 17-23.August.2016, MIP leg.; ZRC\_BDP0072739, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0072743, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0047778, Nee Soon (NS1), swamp forest, 22-28.August.2013, MIP leg.; ZRC\_BDP0047783, Pulau Semakau (SMN2), planted mangrove, 10-16.May.2013, MIP leg.; ZRC\_BDP0047861, Nee Soon (NS2), swamp forest, 25-31.December.2013, MIP leg.; ZRC\_BDP0047934, Nee Soon (NS1), swamp forest, 11-17.April.2013, MIP leg.; ZRC\_BDP0047950, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048461, Nee Soon (NS1), swamp forest, January-06.February.2013, MIP leg.; ZRC\_BDP0048464, Nee Soon (NS2), swamp forest, 26.December.2012-02.January.2013, MIP leg.; ZRC\_BDP0048766, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048791, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048811, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048814, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted); ZRC\_BDP0048831, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048834, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048856, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048897, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048905, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048921, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048922, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048983, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049100, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049127, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049220, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0137205, Bukit Timah Forest (BT05, 6-Mar-17, MIP leg. (imaged). **Sequence failure specimen:** male, ZRC\_BDP0066695, Bukit Timah, old secondary forest (BT07), 17-23.August.2016, MIP leg. (slide-mounted). **Additional sequenced specimens:** male, ZRC\_BDP0132892, Singapore, no date, MIP leg.; ZRC\_BDP0133471, Singapore, no date, MIP leg.; female, ZRC\_BDP0132812, Singapore, no date, MIP leg.; female, ZRC\_BDP0132845, Singapore, no date, MIP leg.; female, ZRC\_BDP0132872, Singapore, no date, MIP leg.; female, ZRC\_BDP0133153, Singapore, no date, MIP leg.; female, ZRC\_BDP0133479, Singapore, no date, MIP leg.; ZRC\_BDP0040822 (imaged); ZRC\_BDP0041037; ZRC\_BDP0041081; ZRC\_BDP0041090; ZRC\_BDP0041098;

ZRC\_BDP0041100; ZRC\_BDP0058625; ZRC\_BDP0058662; ZRC\_BDP0058668; ZRC\_BDP0058719; ZRC\_BDP0058721; ZRC\_BDP0058724; ZRC\_BDP0058725; ZRC\_BDP0058726; ZRC\_BDP0058734; ZRC\_BDP0058750; ZRC\_BDP0058767; ZRC\_BDP0058799; ZRC\_BDP0066707; ZRC\_BDP0066752; ZRC\_BDP0066779; ZRC\_BDP0073620; ZRC\_BDP0073631; ZRC\_BDP0073638; ZRC\_BDP0078965; ZRC\_BDP0078965; ZRC\_BDP0078966; ZRC\_BDP0078966; ZRC\_BDP0082342; ZRC\_BDP0120508; ZRC\_BDP0120515; ZRC\_BDP0120542; ZRC\_BDP0128624; ZRC\_BDP0132804; ZRC\_BDP0132807; ZRC\_BDP0132814; ZRC\_BDP0132815; ZRC\_BDP0132840; ZRC\_BDP0132843; ZRC\_BDP0132847; ZRC\_BDP0132850; ZRC\_BDP0132858; ZRC\_BDP0132859; ZRC\_BDP0132861; ZRC\_BDP0132862; ZRC\_BDP0132863; ZRC\_BDP0132864; ZRC\_BDP0132866; ZRC\_BDP0132867; ZRC\_BDP0132868; ZRC\_BDP0132871; ZRC\_BDP0132874; ZRC\_BDP0132886; ZRC\_BDP0132887; ZRC\_BDP0132889; ZRC\_BDP0132890; ZRC\_BDP0133095; ZRC\_BDP0133098; ZRC\_BDP0133100; ZRC\_BDP0133102; ZRC\_BDP0133116; ZRC\_BDP0133118; ZRC\_BDP0133119; ZRC\_BDP0133133; ZRC\_BDP0133137; ZRC\_BDP0133143; ZRC\_BDP0133147; ZRC\_BDP0133149; ZRC\_BDP0133151; ZRC\_BDP0133155; ZRC\_BDP0133156; ZRC\_BDP0133157; ZRC\_BDP0133159; ZRC\_BDP0133160; ZRC\_BDP0133162; ZRC\_BDP0133172; ZRC\_BDP0133174; ZRC\_BDP0133386; ZRC\_BDP0133388; ZRC\_BDP0133389; ZRC\_BDP0133396; ZRC\_BDP0133403; ZRC\_BDP0133404; ZRC\_BDP0133418; ZRC\_BDP0133475; ZRC\_BDP0133476; ZRC\_BDP0133485; ZRC\_BDP0133489; ZRC\_BDP0133492; ZRC\_BDP0133495; ZRC\_BDP0133496; ZRC\_BDP0133501; ZRC\_BDP0133502; ZRC\_BDP0133505; ZRC\_BDP0133507; ZRC\_BDP0133508; ZRC\_BDP0133509; ZRC\_BDP0133510; ZRC\_BDP0133518; ZRC\_BDP0133542; ZRC\_BDP0133546; ZRC\_BDP0133843; ZRC\_BDP0136972; ZRC\_BDP0136974; ZRC\_BDP0137042; ZRC\_BDP0137083; ZRC\_BDP0137097; ZRC\_BDP0137295; ZRC\_BDP0155078; ZRC\_BDP0278335; ZRC\_BDP0278335; ZRC\_BDP0278336; ZRC\_BDP0278336; ZRC\_BDP0278338; ZRC\_BDP0278338; ZRC\_BDP0278339; ZRC\_BDP0278339; ZRC\_BDP0278340; ZRC\_BDP0278340; ZRC\_BDP0279132; ZRC\_BDP0279132; ZRC\_BDP0279135; ZRC\_BDP0279135; ZRC\_BDP0279157; ZRC\_BDP0279157; ZRC\_BDP0284234; ZRC\_BDP0284234; ZRC\_BDP0284235; ZRC\_BDP0284235; ZRC\_BDP0284236; ZRC\_BDP0284236; ZRC\_BDP0284237; ZRC\_BDP0284237; ZRC\_BDP0284238; ZRC\_BDP0284238; ZRC\_BDP0284291; ZRC\_BDP0284291; ZRC\_BDP0284292; ZRC\_BDP0284292; ZRC\_BDP0284294; ZRC\_BDP0284294; ZRC\_BDP0284294; ZRC\_BDP0284295; ZRC\_BDP0284295; ZRC\_BDP0284304; ZRC\_BDP0284304; ZRC\_BDP0314069; ZRC\_BDP0314070; ZRC\_BDP0314141; ZRC\_BDP0314142.

**Etymology.** The species epithet of this species honors Janet Yee (1934–2019). Born in Singapore, she is recognized as a pioneering social worker who campaigned to ensure that abandoned babies would be considered citizens and thus able to receive social services. For her advocacy of children’s rights, she was one of 11 women inducted to Singapore Women’s Hall of Fame in 2015.

**Remarks.** This is one of the most abundant mycetophilid species in Singapore and has eight different haplotypes. The sequenced specimens have two main subcluster, with 4.21% of divergence between them and we have males belonging to each of these subclusters. There is hardly any difference in the male terminalia between the males of both subclusters. This seems to be a grey zone case and for the time being we kept all them in a single nominal morphological species.

*Epicypta kohkhenglianae* Amorim & Oliveira, sp.nov.

(Figs. G22A–D, 23A–B)

**Diagnosis.** Head ochre-yellow, antennal scape and pedicel ochre-yellowish, first flagellomere ochre-brown, flagellum distally grey-brown. Scutum blackish-brown with an ochre-brown collar along anterior fourth; most pleural sclerites dark brown, antepronotum, proepisternum, katepisternum, antero-ventral corner of anepisternum and ventral half of mesepimeron ochre-yellow. Coxae and femora whitish, with yellowish tinge. Wing membrane light brownish, area along anterior margin slightly darker. C extending shortly beyond tip of  $R_5$ ;  $M_{1+2}$  shorter than r-m. Dorsal macrotrichia on posterior veins  $M_1$ ,  $M_2$ , posterior half of  $M_4$  and distal end of CuA, anal lobe with macrotrichia. Abdominal tergite 1 brown, tergites 2–5 brownish medially with yellow margins larger on posterior tergites, tergite 6 mostly yellowish with some greyish-brown tinge, tergite 7 yellowish, terminalia yellowish. Female terminalia cercus reniform.

**Description. Male. Head.** Head ochre-yellowish. Scape and pedicel light ochre-yellowish, scape  $2.0 \times$  pedicel length; flagellomere 1 ochre-yellow, remaining flagellomeres greyish-yellow, face and clypeus light brown. Basal three palpomeres dark ochre-yellowish, distal two palpomeres whitish-yellow, labella slightly lighter than head color. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, six setae posteriorly to ocellus. Flagellomere 4 length  $2.0 \times$  width. **Thorax.** Scutum anterior fifth ochre-yellow, remaining dark brown, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum, proepisternum, katepisternum, antero-ventral corner of anepisternum and anterior half of mesepimeron ochre-yellow, other pleural sclerites greyish-brown, mediotergite light brown dorsally, proepisternum with a diffuse greyish-brown mark along dorsal half. Pleural membrane yellowish. Scutum with no bristles except for some supra-alars and prescutellars, two pairs of scutellar bristles. Proepisternum with three long bristles directed ventrally, anepisternum with four bristles along posterior margin. Mesepimeron with one long seta and seven smaller fine setae, laterotergite with two bristles and seven fine setae. Metepisternum with seven small fine setae. Haltere with light brown pedicel, whitish knob with light brownish tinge. **Legs.** Front coxa whitish-yellow, mid and hind coxae whitish, hind coxa with a brown band at dorsal sixth; femora, tibiae and tarsi light brownish-yellow, tarsi darker. Mid coxa with a slender band of fine setae across basal fifth, hind coxa with fine setae on basal third. Front tibia with a single dorsal strong seta latero-dorsally on distal third of wing; mid tibia with a row of three to five bristles latero-dorsally, three bristles ventrally and one bristle laterally midway to apex; hind tibia with two irregular

rows of three to five small bristles dorso-laterally and two bristles on a lateroventral row. Fore leg tarsomere 1 as long as tibia,  $1.8 \times$  tarsomere 2 length, mid and hind tarsomeres 1–3 with ventral rows of stronger short setae. Tibial spurs light brown, about  $4 \times$  tibia width at apex, inner spur subequal to outer spur. **Wing.** Membrane fumose light brown, slightly darker along anterior margin; dorsal macrotrichia on anal lobe. C extending beyond apex of R<sub>5</sub> for one third of distance to M<sub>1</sub>. First sector of Rs slightly oblique, less than half of r-m length; r-m oblique. M<sub>1+2</sub> about as long as r-m; bM  $5 \times$  r-m length; first sector of CuA about  $0.38 \times$  length of second sector of CuA. Cubital pseudovein weakly sclerotized, CuP hardly extending beyond level of origin of M<sub>4</sub>. Among posterior veins, M<sub>1</sub> and M<sub>2</sub> with macrotrichia on most of their length, M<sub>4</sub> on distal half and CuA on distal fourth, anal fold bare. **Abdomen.** Abdominal tergites 1–2 greyish-brown, tergite 3 greyish-brown medially, yellow at laterals, tergites 4–5 with a greyish-brown medial mark and wide ochre-yellowish areas laterally, tergite 6 dark ochre-yellowish, tergite 7 ochre-yellowish; sternites 1–7 whitish, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G23A–B). Gonocoxite small, slender, entirely bare, fused with no medial suture, not projecting beyond insertion of gonostylus. Gonostylus dorsoventrally compressed, displaced laterally, slightly curved inwards at apex, with microtrichia and setulae on outer basal half, fine setae on distal half. Gonocoxal apodemes short, directed inwards. Aedeagus well-sclerotized distally; parameres projected beyond tip of aedeagus, with some setulae on a triangular distal end. Tergite 9 with a pair of large, subtriangular lateroposterior lobes bearing microtrichia and setae, longer setae on posterior margin internally. Cerci small, weakly sclerotized, separate from each other. **Female** (Fig. G22A). As male, except for the following. **Wing** (Fig. G22B). Length, 2.08–2.14, width, 0.77–0.80 (n=2). **Terminalia** (Figs. G22C–D). Whitish-yellow. Sternite 8 subquadrate, posterior end with a pair of short lobes, tips widely separated, with a wide, short posterior incision, microtrichia and some setae, longer setae along posterior margin. Sternite 9 wide, anterior apodeme wide at tip, triangular on distal third, setulae along margins subdistally, genital chamber and gonopore well sclerotized, two gonoducts reaching gonopore. T8 short and wide, no laterodistal lobe, covered with microtrichia and long setae. T9+10 as a pair of bare lateral lobes with a short, slender medial connection. Cercomeres 1 and 2 apparently fused, no suture apparent, basal half wider, distal half slender, projected ventro-posteriorly.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000728>)

**Material examined.** **Holotype:** male, ZRC\_BDP0072736, Bukit Timah Forest (BT05), 14-Dec-16, MIP leg. (slide-mounted). **Paratypes:** 14 males, 11 females. **Males:** ZRC\_BDP0047790, Pulau Ubin (PU4), mangrove, 14-20.April.2013, MIP leg.; ZRC\_BDP0047893, Nee Soon (NS1), swamp forest, 14-20.March.2013, MIP leg.; ZRC\_BDP0047959, Pulau Ubin (PU2), mangrove, 26-01.April.2013, MIP leg.; ZRC\_BDP0048432, Nee Soon (NS2), swamp forest, 12-18.July.2012, MIP leg.; ZRC\_BDP0048433, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048434, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg.; ZRC\_BDP0048754, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048763, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0049187, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0049241, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049242, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0072682, Bukit Timah, primary forest (BT05), 16-22.December.2016, MIP leg.; ZRC\_BDP0072706, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072736, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg. **Females:** ZRC\_BDP0047782, Nee Soon (NS2), swamp forest, 14-20.February.2013, MIP leg. (slide-mounted); ZRC\_BDP0047951, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg.; ZRC\_BDP0048435, Nee Soon (NS1), swamp forest, 24-30.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048825, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048994, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049101, Nee Soon (NS1), 18-24.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0049260, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0066775, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0066808, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0066809, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0072741, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0154857 (website photo specimen); ZRC\_BDP0134055; ZRC\_BDP0143094 (missing terminalia).

**Etymology.** The species epithet of this species honors Koh Kheng Lian (1937–). She is an internationally recognized expert in Environmental law, who led Asia-Pacific Centre for Environmental Law, at the National University of Singapore, to become a leading institution for the study of environmental law. In 2012, Kheng Lian was awarded Stockholm University's Elizabeth Haub Prize for Environmental Law for her pioneering contributions to the development of the field in Singapore and the ASEAN region. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** There are seven haplotypes for *Epicypta kohkhenglianae*, sp.nov. from specimens collected in different environments, that come together using any of the species delimitation approaches.

***Epicypta daintoni* Amorim & Oliveira, sp.nov.**

(Figs. G24A–D)

**Diagnosis.** Head and scutum bright yellowish, antennal scape, pedicel and first flagellomere more yellowish, other flagellomeres more brownish; scutellum brown; pleural sclerites mostly yellowish, with more brownish areas on proepisternum, katepisternum, mesepimeron,

and laterotergite, metepisternum and mediotergite brown. Coxae and femora whitish, an orangish tinge along dorsal and ventral femora crests. Wing membrane light brownish, cells c and br darker. C produced slightly beyond tip of  $R_5$ ;  $M_{1+2}$  about half of r-m length. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergites 1 brown, tergites 2–6 dark brown medially, with cream-yellow laterals, brown area on tergite 6 wider, tergite 7 brownish-yellow, terminalia yellowish. Female terminalia sternite 8 with no medial incision along posterior margin, cercus slender, slightly reniform.

**Description. Female (Fig. G24A).** Wing length, 3.07; width, 0.96. **Head (Fig. G24B).** Head bright ochre-yellow. Scape and pedicel light ochre-yellowish, flagellomeres light greyish-yellow, darker towards distal end. Face and clypeus ochre-yellow; palpomeres 1–3 brownish-yellow, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, five posteriorly to ocellus. Scape about  $2.0 \times$  pedicel length; flagellomere 4  $1.7 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $1.6 \times$  palpomere 4 length. **Thorax.** Scutum bright ochre-yellow, brown medio-posteriorly, scutellum brown with ochre-yellow antero-lateral corners. Antepronotum, proepisternum and anepisternum bright ochre-yellow, katepisternum, mesepimeron, laterotergite and metepisternum greyish ochre-brown; mediotergite brown medially, lighter laterally. Haltere pedicel light ochre, basal two-thirds of knob dark brown, whitish-yellow on apical third. Pleural membrane yellowish. Scutum with five long supra-alar bristles and three pairs of prescutellar bristles; two pairs of scutellar bristles. Proepisternum with four bristles; anepisternum with four bristles along posterior margin. Mesepimeron with two long setae and 27 small setae, laterotergite with three longer setae and two small setae. Metepisternum with 11 fine setae. **Legs.** Coxae whitish, front coxa with light brownish tinge, hind coxa with a light brownish tinge on basal fourth; front femur whitish with a reddish tinge, mid and hind femora more whitish, a brownish line along dorsal and ventral edges; tibiae and tarsi light ochre-brown, tips yellowish, tarsi darker. Mid coxa with some few setae across basal fifth, hind coxa with basal third covered with fine setae. Front tibia with a single bristle dorso-laterally on distal third, mid tibia with a pair of dorsolateral rows of 4–5 bristles and four bristles along ventral edge, hind tibia with two rows of 5–7 bristles latero-dorsally; mid and hind tarsomeres 1–3 with rows of ventral setae. Front tibia  $1.4 \times$  tarsomere 1 length,  $1.7 \times$  tarsomere 2 length. Hind tibial inner spur over  $5 \times$  tibia width at apex. **Wing (Fig. G24C).** Membrane fumose yellowish-brown, slightly darker along anterior margin. C extending

slightly beyond apex of  $R_5$ . Sc short, ending free,  $R_1$  reaching C at apical fifth of wing;  $R_5$  reaching C at level of tip of  $M_1$ . First sector of Rs slightly oblique, bare,  $0.67 \times r\text{-m}$  length;  $r\text{-m}$  almost longitudinal.  $M_{1+2}$   $0.70 \times r\text{-m}$  length; bM  $4.0 \times r\text{-m}$  length. First sector of CuA  $0.37 \times$  length of second sector of CuA. Cubital pseudovein not reaching level of origin of  $M_4$ . Anal fold only gently curved, almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  with dorsal macrotrichia almost entire length,  $M_4$  and CuA with macrotrichia on distal fourth of wing; dorsal macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 light brown, darker along posterior margin, tergites 2–5 light brown medially with a wide cream-yellow area laterally; tergite 6 mostly dark brown medially, yellowish-brown laterally, tergite 7 yellowish-brown; sternites 1–7 whitish-yellow, sternite 7 yellowish-brown. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G24D). Whitish-yellow. Sternite 8 wide anteriorly, subrectangular, posterior margin straight, no medial incision, very short projection latero-posteriorly, covered with microtrichia and fine setae, setae on lateroposterior corners longer. Sternite 9 wide and well-sclerotized, notum wide anteriorly, gonapophysis 9 well-developed, gonopore at center of a subquadrate, well-sclerotized plate. Tergite 8 wide, very short medially, connecting a pair of lateral short lobes with setulae, partially overlapping to sternite 8. Tergite 9+10 short, slender, bare. Cercomeres 1 and 2 apparently fused, no sign of suture, elongate, distal end curved ventrally, covered with microtrichia and setae, setae at tip longer.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000737>)

**Material examined. Holotype:** female, ZRC\_BDP0048460, Nee Soon (NS1), swamp forest, 17–23 May 2012, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors Frederick Dainton, a British academic and university administrator. He was asked in 1979 by then Prime Minister Lee Kuan Yew to conduct a preliminary study of university education in Singapore. The report recommended the establishment of a single, strong university covering a wide range of academic disciplines. The recommendation was accepted in April 1980 it was announced that the University of Singapore and Nanyang University would be merged to form NUS, officially inaugurated on 8 August 1980 with about 9,000 students and 800 academic staff.

***Epicypta holltumi* Amorim & Oliveira, sp.nov.**

(Figs. G25A–D)

**Diagnosis.** Head ochre-yellow, antennal scape and pedicel ochre-yellowish and basal flagellomeres ochre-brown, flagellum distally greyish-brown. Scutum blackish-brown with an ochre-yellowish mark medially on anterior end; pleural sclerites greyish-brown, dorso-posterior corner of anepisternum, laterotergite and mediotergite blackish-brown, some other sclerites with dark marks. Coxae and femora whitish, front leg with yellowish tinge, hind coxa with brown mark at basal end. Wing membrane light brownish, cells c and br slightly darker. C extending shortly beyond tip of R<sub>5</sub>; M<sub>1+2</sub> about as long as r-m. Dorsal macrotrichia on all posterior veins, anal lobe with macrotrichia. Abdominal tergite 1 dark brown, tergites 2–5 dark brownish medially with yellow margins larger on posterior tergites, tergite 6 mostly yellowish with some greyish-brown tinge medially, tergite 7 yellowish, terminalia yellowish. Gonocoxites medially fused, no suture evident, a strongly sclerotized medial pair of projections, a long pair of blade-like dorsal lobes; gonostylus dorsoventrally compressed, setose, more or less rectangular; parameres trapezoid distally with some few fine setae at lateroposterior corners; tergite 9 with a pair of long digitiform, setose extensions.

**Description. Male.** Wing length, 2.02; width, 0.74 mm. **Head.** Head ochre-yellowish. Scape and pedicel light ochre-yellowish, flagellomeres greyish-yellow. Face and clypeus ochre-yellowish, maxillary palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, six posteriorly to ocellus. Scape about 1.5 pedicel length; length of flagellomere 4 1.9× width. Palpomere 4 1.1× palpomere 3 length, palpomere 5 1.9× palpomere 4 length. **Thorax.** Scutum anterior tip ochre-yellow, remaining dark brown, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum, proepisternum, katepisternum, antero-ventral corner of anepisternum, mid of mesepimeron greyish-brown, with a lighter areas on antepronotum dorsally, anepisternum antero-ventrally, katepisternum and mesepimeron, mediotergite dark brown. Haltere light ochre-yellowish, no larger setae. Pleural membrane ochre-yellowish. Scutum with six supra-alar and three pairs of prescutellar bristles; two pairs of scutellar bristles. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 31 small setae, laterotergite with two bristles and ten small setae. Metepisternum with 15 fine setae. **Legs.** Coxae whitish, front coxa with yellowish tinge, hind coxa with a small brown band along proximal end; femora concolor with coxae, slightly darker at tip, tibiae light brownish-yellow, tarsi slightly darker. Mid coxa with fine setae across basal fifth. Front tibia with a single strong seta laterally; mid

tibia with two dorsolateral rows of 4–5 bristles and a ventral row of three small bristles and one strong seta; hind tibia with a pair of dorsolateral rows of 5–6 bristles. Fore leg tarsomere 1  $1.1 \times$  tibia length,  $1.5 \times$  tarsomere 2 length. Hind tibial inner spur  $5.4 \times$  tibia width at apex.

**Wing** (Fig. G25B). Membrane fumose light brown, slightly darker along anterior margin. C extending slightly beyond apex of  $R_5$ . Sc barely produced.  $R_1$  reaching C on distal fifth of wing;  $R_5$  reaching C at level of tip of  $M_1$ . First sector of Rs slightly oblique,  $0.76 \times r-m$  length.  $M_{1+2}$   $1.2 \times r-m$  length; bM about  $8 \times r-m$  length; first sector of CuA short, about 0.37 length of second sector of CuA. Cubital pseudovein inconspicuous, CuP short, reaching level of origin of  $M_4$ . Anal fold sclerotized, gently curved, nearly reaching wing margin. Posterior veins  $M_1$  and  $M_2$  with dorsal macrotrichia on three-fourths of length,  $M_4$ , CuA and anal fold with macrotrichia at distal fifth, anal lobe with macrotrichia. **Abdomen**. Abdominal tergite 1 greyish-brown, tergites 2–5 brownish medially, with cream-yellow lateral bands, small band on tergite 2, wider on tergites 3–5, connecting each other along anterior margin on tergite 5, tergite 6 almost entirely cream-yellow, with only a brownish tinge medio-posteriorly, tergite 7 cream-yellow; sternites 1–7 whitish-yellow. Sternite 2 with a strong ventral pair of brown bristles, sternites 3–6 medially with groups of short bristles. **Terminalia** (Fig. G25C).

Whitish-yellow. Gonocoxites fused medially, no suture present, bare ventrally, a short incision medially on posterior margin of ventral face, a lateral short round projection with elongate setae, gonocoxite posterior ends dorsally touching medially without fusion.

Gonostylus displaced more medially, simple, elongate, dorsoventrally compressed, with setae along inner margin and on both faces at distal half. Gonocoxal bridge wide, with a pair of short, sub-medial apodemes anteriorly. Aedeagus composed of a large, sclerotized subquadrate structure extending from gonocoxal apodeme to beyond level of tip of gonostylus, wide at distal margin, from which a pair of long lobes project anteriorly and meet at syngonocoxite medio-posterior incision, with subdistal denticles, distally with a strong medial projection rounded distally ventrally to a large gonopore, latero-posteriorly with a pair of long, slender bare blades curved outwards, almost as long as lateroposterior lobe of gonocoxite. Parameres trapezoid projecting behind aedeagus, with a wide straight posterior margin with four pairs of long fine setae. Tergite 9 with an additional pair of long digitiform projections extending beyond tip of lateral extensions of parameres, covered with microtrichia and setae, setae at tip longer. A pair of elongate, flattened cerci covered with microtrichia and setae.

**Female** (Fig. G25A). As male, except for the following. **Wing**. Length, 2.08; width, 0.75.

**Head**. Occiput with two longer setae dorsally to eye anteriorly to ocellus, three dorsally to

ocellus, five posteriorly to ocellus. **Thorax.** Scutum with six supra-alar and three pairs of prescutellar bristles, two pairs of scutellar bristles. Proepisternum with three bristles directed ventrally, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 14 small setae and setulae, laterotergite with two bristles and five smaller setae or setulae. Metepisternum with 22 small fine setae. **Legs.** Front tibia with one bristle at outer face, mid tibia with two dorsolateral rows of 3–4 bristles. **Wing.** Dorsal macrotrichia present on anal lobe. **Terminalia** (Fig. G25D). Light brownish-yellow. Sternite 8 subquadrate, lateroposterior end slightly more developed than posterior margin medially, microtrichia and setae concentrated mainly on distal half, two pairs of long setae subapically. Sternite 9 with lateral arms not too wide, sclerotized as a pair of diverging slender bands, genital chamber elongate, distal end acute, with some subapical setulae laterally, anterior apodeme not extending beyond anterior end of terminalia. Tergite 8 short and bare medially, lateral lobes slightly projected posteriorly, microtrichia spread on posterior half, setae restricted to posterior margins, longer laterally. Tergite 9+10 with a slender medial bare sclerotized band connecting a pair of lobes fused to sternite 9 lateroventrally. Cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000739>)

**Material examined. Holotype:** male, ZRC\_BDP0047954, Nee Soon (NS1), swamp forest, 27.June-03.July.2013, MIP leg. (slide-mounted). **Paratypes:** 3 females, ZRC\_BDP0048471, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0049079, Nee Soon (NS1), 18-24.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0049112, Nee Soon (NS1), 18-24.December.2014, MIP leg.

**Etymology.** The species epithet of this species honors Professor Richard Eric Holttum (1895–1990), first Head of the Department of Botany, later merged with the Department of Zoology to result in the present Department of Biological Sciences of the National University of Singapore. A botanist by training, he had expertise in growth and cultivation of orchids. He was earlier in his career assistant-director and then director at the Singapore Botanical Gardens, where he worked even during the Japanese occupation of the country.

**Remarks.** There is a single haplotype known for *Epicypta holttumi*, sp.nov., which seems to be close to *Epicypta angusticollaris* (Edwards), from the Philippines, with some differences in the color of the head and of the abdomen.

*Epicypta alii* Amorim & Oliveira, sp.nov.

(Figs. G26A–D)

**Diagnosis.** Head dark ochre-yellowish, occiput lighter, antennal scape and pedicel ochre-yellow, flagellomeres brownish-yellow. Scutum dark brown, anterior end ochre-yellow; scutellum blackish-brown; pleural sclerites mostly dark greyish-brown, katepisternum lighter, mediotergite dark brown on dorsal half. Coxae whitish, fore coxa with an orangish tinge, mid and hind coxae with a brownish band on proximal fifth. Wing membrane light brownish, more yellowish along cells c and br; C produced beyond tip of  $R_5$ ;  $M_{1+2}$  1.0× than r-m. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA distal half, anal lobe slender, macrotrichia on anal lobe. Abdominal tergites 1–2 and 6 brownish, tergites 3–5 brown medially with cream-yellow area laterally, tergite 7 cream-yellow. Gonocoxites with no lobes projecting beyond base of gonostylus; gonostylus more or less dorsoventrally compressed; paramere with a row of curved short setae distally; tergite 9 with a pair of long parallel projections laterally on terminalia dorsal face.

**Description. Male.** Wing length, 2.18; width, 0.80. **Head.** Ochre-yellowish, occiput lighter towards ventral margin. Scape and pedicel greyish ochre-yellow, flagellomeres brownish-yellow, darker dorsally towards tip. Face and clypeus ochre-yellowish. Maxillary palpomeres 1–3 brownish-yellow, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, seven posteriorly to ocellus. Scape 1.7× pedicel length, flagellomere 4 1.9× longer than wide. Palpomere 4 1.2× palpomere 3 length, palpomere 5 2.0× palpomere 4 length. **Thorax** (Fig. G26A). Scutum dark brown, anterior end ochre-yellow; scutellum blackish-brown with lighter laterals. Antepronotum, proepisternum, anepisternum, katepisternum, mesepimeron, laterotergite and metepisternum dark greyish-brown, katepisternum slightly lighter, mediotergite dark brown, lighter at ventral half. Haltere light ochre-yellowish, no larger setae. Pleural membrane ochre-yellow. Scutum with 4+1 supra-alars and three pairs of prescutellars. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and ten fine setae and setulae, laterotergite with 2–3 bristles and five fine setae. Metepisternum with 5–6 fine setae. **Legs.** Fore coxa whitish with an orangish tinge, mid and hind coxae whitish, a brownish band across proximal fifth of hind coxa [all three legs broken]. **Wing** (Fig. G26B). Membrane light fumose brown, slightly darker along anterior margin. C extending slightly beyond  $R_5$ . Sc barely produced.  $R_1$  reaching C on distal fourth

of wing;  $R_5$  reaching  $C$  slightly before level of tip of  $M_1$ . First sector of  $Rs$  almost transverse,  $0.68 \times r-m$  length;  $r-m$  oblique.  $M_{1+2}$   $1.0 \times r-m$  length;  $bM$   $6.0 \times r-m$  length; first sector of  $CuA$  0.39 length of second sector of  $CuA$ . Cubital pseudovein absent,  $CuP$  reaching slightly beyond level of origin of  $M_4$ . Anal fold gently curved, almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  almost entirely with dorsal macrotrichia,  $M_4$  with macrotrichia on distal half,  $CuA$  with macrotrichia on distal third of wing; anal lobe with macrotrichia.

**Abdomen.** Abdominal tergites 1–2 and 6 brownish, tergites 3–5 brown medially with cream-yellow area laterally, tergite 7 cream-yellow; sternites 1–7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G26C–D). Ochre-yellowish. Gonocoxites fused medially, no suture present, bare ventrally, no medioventral projection, a pair of short sub-medial projections, no laterodistal extensions. Gonostylus simple, elongate, dorsoventrally compressed, elongate setae on distal third and along inner margin, ventral face proximal third densely covered by fine setulae. Aedeagus relatively small, anterior ejaculatory apodeme slender at tip, reaching level of insertion of gonostylus, widening medially, distally with a tubular projection with gonopore at level of tip of gonostylus; parameres present as a pair of elongate, weakly sclerotized sclerites laterally, connected to aedeagus. Gonocoaxal bridge evident, without apodemes. Tergite 9 present as a pair of long laterodistal digitiform extensions, about as long as gonocoxite lateral extensions, setose at tip. Cerci weakly sclerotized between tergite 9 elongate lateral lobes.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0066714, Bukit Timah, maturing secondary forest (BT08), 16–22 September 2016, MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Ali, a Sarawakian boy who started as a cook and servant to Alfred Russel Wallace in 1855, and gradually became his chief assistant. Ali later on became an expert at shooting and skinning birds. It was probably Ali who collected the specimens of the king bird-of-paradise (*Cicinnurus regius* Linnaeus) in Aru and an ivory-breasted pitta (*Pitta maxima* Müller & Schlegel, 1845) from Halmahera. He is often referred to as Ali Wallace in the published literature. Ali accompanied Wallace through Singapore for 96 days from 17 February 1856.

***Epicypta ridleyi* Amorim & Oliveira, sp.nov.**

(Figs. G27A–D)

**Diagnosis.** Head light ochre-yellowish, antennal scape, pedicel and basal half of first flagellomere ochre-yellowish, other flagellomeres grey-brownish. Scutum with three connected blackish-brown longitudinal bands over light ochre-yellowish background, scutellum mostly blackish-brown. Pleural sclerites light brownish, antepronotum and dorso-posterior end of anepisternum ochre-yellowish, mediotergite dark brown. Coxae and femora whitish, on front leg with orangish tinge, a small brown mark at basal end of hind coxa. Wing membrane light brownish, darker along anterior margin. C barely produced beyond tip of R<sub>5</sub>; Sc incomplete, ending free; M<sub>1+2</sub> 0.75× r-m length. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, M<sub>4</sub> and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergite 1 brown, tergites 2–5 brown medially with light ochre-yellow laterals, wider on tergites 4–5, tergite 6 ochre-yellow with brownish tinge, tergite 7 cream-yellow, terminalia cream-yellow. Male terminalia gonocoxite with no lobes projecting beyond base of gonostylus, gonostylus wide, dorsoventrally compressed; aedeagus with a pair of separate tubular extensions with independent gonopores; parameres with a pair of long lateral projections; tergite 9 with a pair of long, digitiform separate extensions. Female terminalia with a wide and short medial incision on posterior margin of sternite 8.

**Description. Male.** Wing length, 2.182.26–2.56; width, 0.77–0.83 (n=2). **Head.** Light ochre-yellowish, face and clypeus whitish-yellow. Scape and pedicel light ochre-yellowish, flagellomeres 1–2 yellowish-brown, remaining flagellomeres greyish-brown. Palpomeres ochre-yellowish, palpomeres 3–5 whitish-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, five posteriorly to ocellus. Scape 1.4 pedicel length, length of flagellomere 4 1.1× width. Palpomere 4 1.2× palpomere 3 length, palpomere 5 1.7× palpomere 4 length. **Thorax.** Scutum background ochre-yellow with three blackish-brown bands, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum and posterior half of anepisternum, proepisternum, anterior half of anepisternum, katepisternum, mesepimeron, laterotergite and metepisternum greyish-yellow, mediotergite blackish-brown, lighter at laterals. Pleural membrane yellowish. Haltere pedicel and base of knob light brownish-yellowish, knob whitish distally. Scutum with 6+1 supra-alaris and three pairs of prescutellars, scutellum with two pairs of bristles along posterior margin. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and nine small setae, laterotergite with three stronger

setae and four small setae. Metepisternum with 11 fine setae. **Legs.** Coxae whitish, front coxa with a rose tinge; front femur concolor with coxa, mid and hind femora whitish, no brown proximal band on hind coxae; tibiae and tarsi light whitish-yellow, tarsi slightly darker, tibiae brownish-yellow at tip. Mid coxa with a band of fine setae across basal fifth, hind coxa with fine setae on proximal third. Front tibia with one strong seta medially on distal third, hind tibia with two dorsolateral rows of 5-6 small bristles [mid tibiae and tarsi missing]. Fore leg tarsomere 1  $1.2 \times$  tibia length,  $1.7 \times$  tarsomere 2 length. Hind tibia inner spur  $7.1 \times$  tibia width at apex. **Wing.** Membrane fumose ochre-yellowish, more yellowish along anterior margin. C produced only slightly beyond tip of  $R_5$ . Sc barely produced.  $R_1$  reaching C on distal sixth of wing;  $R_5$  reaching C slightly beyond level of tip of  $M_2$ . First sector of Rs slightly oblique,  $0.75 \times$  r-m length; r-m almost longitudinal.  $M_{1+2}$   $1.0 \times$  r-m; bM  $8.3 \times$  r-m length; first sector of CuA  $0.40 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP not even reaching level of origin of  $M_4$ . Anal fold gently curved, almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  with dorsal macrotrichia along most of their length,  $M_4$  and CuA with macrotrichia on distal fourth of wing; macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 dark brown, tergites 2–5 brown medially, with a wide cream-yellow band laterally, tergites 4–5 with yellow band extending towards mid along anterior margin, tergite 6 mostly dark cream-yellow, only with a medial brownish tinge, sternites 1–7 whitish-yellow; sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G27C). Whitish-yellow. Gonocoxites fused medially, no suture present, bare ventrally, a medioventral bare flat, wide projection, a long digitiform laterodistal projection dorsally to insertion of gonostylus at each side, extending way beyond tip of gonostylus, with scattered microtrichia and fine setae, distal seta longer. Gonostylus simple, elongate, wide, dorsoventrally compressed, with fine setae on ventral face, longer setae along distal margin longer. Aedeagal-parameral complex almost as wide as terminalia, at each latero-distally corner with a long, digitiform, bare branch and a pair of short sclerotized lobes medially. Gonocoxal bridge wide, apodemes as a pair of long slender sclerotized bands. Tergite 9 present as a pair of wide laterodistal digitiform extensions with microtrichia and setae. Cerci not recognizable.

**Female** (Fig. G27A). As male, except for the following. **Wing** (Fig. G26B). Length, 2.69; width, 0.96. **Terminalia** (Fig. G26D). Sternite 8 rectangular, elongate, posterior margin with a medial rather deep incision, with widespread microtrichia and small setae, posterior margin with longer setae. Sternite 9 with anterior apodeme extending beyond anterior end of terminalia widening close to tip, lateral arms wide, distal end triangular, acute, bare, genital chamber bell-shaped. Tergite 8 slender medially, wide, lateral setose lobes projected

posteriorly. Tergite 9+10 present as a pair of slender sclerotized inclined band, connected to sternite 9 lateroventrally. Sternite 10 triangular, with some setae close to tip directed dorsally. Cercus large, cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000821,-002079>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047083, National University of Singapore (Icube), 11-17.June.2015, MIP leg. (slide-mounted). **Paratypes:** 14 males, 5 females. **Males:** ZRC\_BDP0047089, National University of Singapore (Icube), 09-15.July.2015, MIP leg.; ZRC\_BDP0048774, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048776, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048778, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0049063, National University of Singapore (PGP), 21-27.May.2015, MIP leg.; ZRC\_BDP0049064, National University of Singapore (PGP), 21-27.May.2015, MIP leg.; ZRC\_BDP0049065, National University of Singapore (PGP), 21-27.May.2015, MIP leg.; ZRC\_BDP0049275, National University of Singapore (Uhall), 09-15.April.2015, MIP leg.; ZRC\_BDP0049287, National University of Singapore (Icube), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0049295, National University of Singapore (Icube), 14-20.May.2015, MIP leg.; ZRC\_BDP0049328, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0049337, National University of Singapore (PGP), 02-08.April.2015, MIP leg.; ZRC\_BDP0278220 (extracted, slide-mounted). **Females:** ZRC\_BDP0048072, Pulau Semakau (SMO2), old mangrove, 30.November-06.December.2012, MIP leg.; ZRC\_BDP0048302, Sungai Buloh (SB1), mangrove, 10-16.October.2013, MIP leg.; ZRC\_BDP0049062, National University of Singapore (Uhall), 14-20.May.2015, MIP leg. (slide-mounted); ZRC\_BDP0049152, National University of Singapore (Uhall), 14-20.May.2015, MIP leg. (website photo specimen); ZRC\_BDP0049341, National University of Singapore (PGP), 02-08.April.2015, MIP leg. (extracted). **Additional sequenced specimens:** female, ZRC\_BDP133548, UHall, 03.May.2017, MIP leg. (website photo specimen); ZRC\_BDP0040988; ZRC\_BDP0041015; ZRC\_BDP0041045; ZRC\_BDP0041047; ZRC\_BDP0049211 (extracted); ZRC\_BDP0069000; ZRC\_BDP0069001; ZRC\_BDP0069002; ZRC\_BDP0069003; ZRC\_BDP0069004; ZRC\_BDP0069005; ZRC\_BDP0069333; ZRC\_BDP0069335; ZRC\_BDP0070120; ZRC\_BDP0070125; ZRC\_BDP0070134; ZRC\_BDP0070142; ZRC\_BDP0070430; ZRC\_BDP0070431; ZRC\_BDP0070432; ZRC\_BDP0070440; ZRC\_BDP0070547; ZRC\_BDP0082340; ZRC\_BDP0082343; ZRC\_BDP0132808; ZRC\_BDP0132865; ZRC\_BDP0132873; ZRC\_BDP0133092; ZRC\_BDP0133106; ZRC\_BDP0133112; ZRC\_BDP0133121; ZRC\_BDP0133127; ZRC\_BDP0133139; ZRC\_BDP0133168; ZRC\_BDP0133173; ZRC\_BDP0133382; ZRC\_BDP0133399; ZRC\_BDP0133405; ZRC\_BDP0133500; ZRC\_BDP0133514; ZRC\_BDP0133517; ZRC\_BDP0133535; ZRC\_BDP0133539; ZRC\_BDP0133544; ZRC\_BDP0136950; ZRC\_BDP0278283; ZRC\_BDP0278341; ZRC\_BDP0278342; ZRC\_BDP0278350; ZRC\_BDP0278357; ZRC\_BDP0278370; ZRC\_BDP0278371; ZRC\_BDP0278399; ZRC\_BDP0278419; ZRC\_BDP0278421; ZRC\_BDP0278450; ZRC\_BDP0278455; ZRC\_BDP0278468; ZRC\_BDP0279130; ZRC\_BDP0279191; ZRC\_BDP0284155; ZRC\_BDP0284239; ZRC\_BDP0284308; ZRC\_BDP0296753.

**Etymology.** The species epithet honors Henry Nicholas Ridley (CMG) (FRS) (1855–1956), an English botanist, geologist and naturalist who served as the first Director of the Singapore Botanical Gardens. Also known as ‘Mad Ridley’ or ‘Rubber Ridley’, he had a fantastic amount of interest in furthering the cultivation of rubber trees in Malaya, and is largely responsible for the burgeoning rubber industry in the early 1900s. He lived much of his life in Singapore and was also an enthusiastic collector of insects during his tenure.

**Remarks.** We found six haplotypes among our specimens of *Epicypta ridleyi*, sp.nov., which are brought together as one species by all delimitation approaches except ABGD=0.001–0.005. A cluster initially suggested as a separate species appears in the mitogenome tree deeply nested inside the cluster corresponding to *E. ridleyi*, sp.nov. The terminalia in males of both species is identical and there is no question that they belong to the same species. This

is a case in which it is possible to verify that some of the distance methods may produce equivocate results while delimiting species.

### Group *tanjiakkimi*

#### *Epicypta chezaharaae* Amorim & Oliveira, sp.nov.

(Figs. G28A–E)

**Diagnosis.** Head light ochre-yellowish, antenna light ochre-yellowish. Scutum ochre-yellowish, anterior fifth lighter, scutellum brown. Antepronotum, proepisternum, katepisternum, anepisternum, and mesepimeron light ochre-yellowish with brownish diffuse marks; laterotergite, mediotergite and metepisternum light brown. Coxae and femora whitish. Wing membrane light brownish, area along anterior margin slightly darker. C clearly extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> almost as long as r-m. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub> and distal end of CuA, no macrotrichia on anal lobe. Abdominal tergite 1 brown, tergites 2–5 cream-yellow, with a brown mark medially on posterior half, tergite 6 mostly brown, with cream-yellow mark laterally, terminalia whitish-yellow with brownish tinge. Female terminalia sternite 8 trapezoid, rounded along posterior border medially, sclerotization of vaginal furca cross-like, four short curved setae on ventral face of sternite 10, cercus digitiform. Male terminalia gonocoxite with no projection beyond base of gonostylus; gonostylus elongate, weakly sclerotized, with long setae; parameres with a pair of long, curved spines projecting distally; tergite 9 with a pair of long digitiform branches, each with a distal elongate spine.

**Description. Male.** Wing length, 1.87–1.89; width, 0.75–0.77 (n=2). **Head.** Head entirely light ochre-yellowish. Scape and pedicel light ochre-yellowish, flagellomere 1 ochre-yellowish, remaining flagellomeres light greyish-yellow. Frons and clypeus light ochre-yellowish, maxillary palpus palpomeres 1–3 ochre-yellowish, palpomeres 4–5 whitish-yellow, labella cream-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, six posteriorly to ocellus. Scape about 2.3× length of pedicel, flagellomere 4 1.4× longer than wide. Palpomere 4 1.4× palpomere 3 length, palpomere 5 1.4× palpomere 4 length. **Thorax.** Scutum anterior fifth light ochre-yellow, remaining ochre-yellow, scutellum brown with ochre-yellow antero-lateral corners. Antepronotum anterior

fifth and anepisternum posterior half, ventral two-thirds of mesepimeron ochre-yellow, anterior half of anepisternum, most of katepisternum, dorsal end of mesepimeron, laterotergite and metepisternum ochre-brown, proepisternum ochre-yellowish with some diffuse ochre-brown marks; mediotergite dark brown medially, lighter laterally. Pleural membrane yellowish. Haltere light ochre-yellowish, no larger setae. Scutum with a row with four stronger and one smaller supra-alar setae and three pairs of prescutellars, two pairs of scutellar bristles. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 14 small setae, laterotergite with four bristles and four smaller fine setae; metepisternum with six fine setae. **Legs.** Coxae whitish, front coxa with yellowish-brown tinge; femora, tibiae, and tarsi light whitish-yellow, tarsi slightly darker, hind femur with a dark brown mark at tip. Front coxa with four bristles along front distal margin, mid coxa with four fine setae across basal fifth, hind coxae covered with a number of fine setae at basal fourth. Front tibia with a single latero-dorsal strong seta medially; mid tibia with two rows of 2–5 small bristles, two ventral long setae; hind tibia with two rows of 4-5 bristles dorso-laterally and no long setae ventrally, a comb of long setae at outer face apically. Mid and hind tarsomeres 1–3 with rows of lateroventral longer setae. Fore leg tarsomere 1  $1.2 \times$  tibia length,  $1.6 \times$  tarsomere 2 length. Hind tibial inner spur  $5 \times$  tibia width at apex. Tarsal claws with a large apical tooth and a smaller, more basal one. **Wing.** Membrane fumose brownish-yellow, darker on cells c, br and R<sub>1</sub>. C produced beyond tip of R<sub>5</sub> for a fourth of distance to M<sub>1</sub>. Sc barely produced. R<sub>1</sub> long, reaching C on distal fifth of wing; R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>. First sector of Rs slightly oblique, devoid of setae,  $0.91 \times$  r-m length; r-m almost longitudinal. M<sub>1+2</sub> short,  $1.0 \times$  r-m length; bM slightly over  $5 \times$  r-m length. First sector of CuA  $0.27 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP extending slightly beyond level of origin of M<sub>4</sub>. Anal fold gradually curved along its length, almost reaching wing margin. Posterior veins M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub> and CuA with dorsal macrotrichia, on M<sub>4</sub> restrict to distal half, on CuA restrict to tip. Anal lobe with some few macrotrichia. **Abdomen.** Abdominal tergite 1 brownish, lighter on anterior third, tergites 2–5 brown medially, cream-yellow on anterior half and laterally, tergites 6–7 greyish-brown medially and cream-yellow laterally, sternites 1-7 whitish-yellow, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G28C–D). Whitish-yellow. Gonocoxites fused together medially on their anterior third, no sign of suture, no medioventral process, syngonocoxite projected latero-distally, with a wide gap between arms, extending slightly beyond insertion of gonostylus, no setation on medioventral face of syngonocoxite, long setae on distal end of lateral projections, gonocoxites projecting dorsally,

with lobes that meet each other medially with a complete suture between them, a slender V-shaped incision medially on posterior margin, slightly projected latero-posteriorly beyond level of insertion of gonostylus, long fine setae close to posterior margin laterally. Gonostylus laterally compressed, slender basal end gradually widening towards apex, no setae on inner face, setation on entire outer face, longer at distal margin, no branches. Aedeagus with a bulbous base, close to medial margin of syngonocoxite, abruptly slendering distally, a pair of lateral parameral blades across terminalia connected together dorsally to aedeagus, extending posteriorly into a medial single arm with two digitiform short extensions close to each other medially beyond level of insertion of gonostylus, bearing two long spines. Gonocoxal bridge wide, with a short sclerotized peak medially, apodemes almost touching each other. Tergite 9 divided into a pair of well sclerotized projections at distal margin of gonocoxal medio-dorsal lobes, extending way beyond distal end of gonostylus, close to each other at anterior end, gradually diverging towards apex, long setae dorsally and laterally, an elongate spine at tip.

**Female** (Fig. G28A). Wing (Fig. G28B) length, 1.79–2.08; width, 0.69–0.78 (n=3). **Head**. Occiput with two longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, four posteriorly to ocellus. **Thorax**. Scutum with a row with six long supra-alar bristles and three pairs of prescutellars; two pairs of scutellar bristles. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 18 small setae, laterotergite with two bristles and four small fine setae; metepisternum with six longer setae on posterior end, six small setae on anterior end. **Terminalia** (Fig. G28E). Sternite 8 rectangular, elongate, posterior margin straight medially, with short latero-posterior extensions, microtrichia and fine setae covering entire sclerite, longer setae at posterior margin, lateral ones curved inwards, labia beneath distal margin extending to close to tip of cerci, with four long fine setae. Sternite 9 with wide genital chamber, lined with microtrichia, gonopore connected to two gonoducts, sclerotized part sword-like with a pair of arms extending laterally towards T9+10, an anterior apodeme widening towards apex and a posterior median sclerotized band reaching genital chamber. Tergite 8 short and wide, with microtrichia and short and long setae along posterior margin. T9+10 bare, with a pair of short lateral lobes connected medially by a slender, sclerotized band, lateral ends extending posteriorly, fused to sternite 9 laterally. Cercomeres 1 and 2 probably fused, no sign of suture, digitiform, covered with microtrichia and elongate setae, one stronger seta at apex, apparently an ovoid sensorial area at inner face on anterior third.

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**Material examined.** **Holotype:** male, ZRC\_BDP0048757, Nee Soon (NS1), 19-25.February.2015, MIP leg. (slide-mounted). **Paratypes:** 8 males, 27 females. Males: ZRC\_BDP0048796, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048803, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048823, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048842, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048862, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048913, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049213, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0066805, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg. Females: ZRC\_BDP0049085, Nee Soon (NS1), 18-24.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0047799, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg.; ZRC\_BDP0047908, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg.; ZRC\_BDP0048442, Nee Soon (NS1), swamp forest, 17-23.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048444, Nee Soon (NS1), swamp forest, 31.May-6.June.2012, MIP leg. (slide-mounted); ZRC\_BDP0048445, Nee Soon (NS2), swamp forest, 17-23.January.2013, MIP leg.; ZRC\_BDP0048722, Nee Soon (NS2), 22-28.January.2015, MIP leg.; ZRC\_BDP0048741, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048802, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048871, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049122, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0066819, Bukit Timah, maturing secondary forest (BT09), 29.September-05.October.2016, MIP leg.; ZRC\_BDP0072458, Bukit Timah, old secondary forest (BT07), 02-08.December.2016, MIP leg.; ZRC\_BDP0072688, Bukit Timah, old secondary forest (BT07), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072713, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072717, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0074026, Bukit Timah, maturing secondary forest (BT08), 08-14.December.2016, MIP leg.; ZRC\_BDP0074029, Bukit Timah, maturing secondary forest (BT08), 29.September-05.October.2016, MIP leg.; ZRC\_BDP0133430, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0133443, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0136948, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0154808, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0154856, Singapore, (date range 2012-2018), MIP leg. (slide-mounted); ZRC\_BDP0154860, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0154872, Singapore, (date range 2012-2018), MIP leg.; ZRC\_BDP0048442, Singapore, NS01, 23-May-12, MIP leg. (website imaged specimen, extracted); ZRC\_BDP0137218, Bukit Timah Forest (BT06), 26-Apr-17, MIP leg. (extracted, slide-mounted). **Additional sequenced specimens**: male, ZRC\_BDP0066746, Bukit Timah, maturing secondary forest (BT06), 28.September.2016, MIP leg.; female, ZRC\_BDP0072691, Singapore, no date, MIP leg.; female, ZRC\_BDP0078975, Singapore, no date, MIP leg.; ZRC\_BDP0041130; ZRC\_BDP0047799; ZRC\_BDP0047908; ZRC\_BDP0048443; ZRC\_BDP0048444 (extracted); ZRC\_BDP0048445; ZRC\_BDP0048722; ZRC\_BDP0048741; ZRC\_BDP0048742; ZRC\_BDP0048746; ZRC\_BDP0048751; ZRC\_BDP0048753; ZRC\_BDP0048755; ZRC\_BDP0048796; ZRC\_BDP0048802; ZRC\_BDP0048803; ZRC\_BDP0048823; ZRC\_BDP0048842; ZRC\_BDP0048862; ZRC\_BDP0048871; ZRC\_BDP0048907; ZRC\_BDP0048913; ZRC\_BDP0049213 (extracted); ZRC\_BDP0049122; ZRC\_BDP0058716; ZRC\_BDP0058720; ZRC\_BDP0058727; ZRC\_BDP0058761; ZRC\_BDP0066688; ZRC\_BDP0066717; ZRC\_BDP0066769; ZRC\_BDP0066805; ZRC\_BDP0066815; ZRC\_BDP0066819; ZRC\_BDP0067192; ZRC\_BDP0067324; ZRC\_BDP0071054; ZRC\_BDP0071078; ZRC\_BDP0072458; ZRC\_BDP0072688; ZRC\_BDP0072713; ZRC\_BDP0072717; ZRC\_BDP0074026; ZRC\_BDP0074029; ZRC\_BDP0082288; ZRC\_BDP0082313; ZRC\_BDP0120467; ZRC\_BDP0120511; ZRC\_BDP0120512; ZRC\_BDP0120528; ZRC\_BDP0120540; ZRC\_BDP0128599; ZRC\_BDP0128607; ZRC\_BDP0128614; ZRC\_BDP0128634; ZRC\_BDP0136947; ZRC\_BDP0136971; ZRC\_BDP0136973; ZRC\_BDP0137032; ZRC\_BDP0137057; ZRC\_BDP0137065; ZRC\_BDP0137074; ZRC\_BDP0137075; ZRC\_BDP0137092; ZRC\_BDP0137115; ZRC\_BDP0140198; ZRC\_BDP0140204; ZRC\_BDP0140205; ZRC\_BDP0140206; ZRC\_BDP0140211; ZRC\_BDP0140221; ZRC\_BDP0140735; ZRC\_BDP0140738; ZRC\_BDP0140745; ZRC\_BDP0140754; ZRC\_BDP0140755; ZRC\_BDP0143095; ZRC\_BDP0143096; ZRC\_BDP0143100; ZRC\_BDP0143107; ZRC\_BDP0143110; ZRC\_BDP0143111; ZRC\_BDP0143112; ZRC\_BDP0143119; ZRC\_BDP0154790; ZRC\_BDP0154792; ZRC\_BDP0154797; ZRC\_BDP0154801; ZRC\_BDP0154805; ZRC\_BDP0154811; ZRC\_BDP0154864 (extracted); ZRC\_BDP0154865; ZRC\_BDP0154866; ZRC\_BDP0154870; ZRC\_BDP0154914; ZRC\_BDP0154925; ZRC\_BDP0154930; ZRC\_BDP0154947; ZRC\_BDP0154961; ZRC\_BDP0154962; ZRC\_BDP0155019; ZRC\_BDP0155041; ZRC\_BDP0155049; ZRC\_BDP0155051; ZRC\_BDP0155099; ZRC\_BDP0155104; ZRC\_BDP0155124; ZRC\_BDP0155125; ZRC\_BDP0278292.

**Specimens from probably non-conspecific cluster.** female, ZRC\_BDP0048094, Pulau Semakau (SMO2), old mangrove, 31.October-6.November.2013, MIP leg.; ZRC\_BDP0048237, Pulau Semakau (SMO2), old mangrove, 08-14.November.2013, MIP leg. (website photo specimen, slide-mounted); female, ZRC\_BDP0048120, Pulau Semakau (SMO2), old mangrove, 12-18.July.2013, MIP leg. (slide-mounted); male, ZRC\_BDP0278218, Pulau Ubin (PU18), mangrove, 31.May.2018, MIP leg.; male, ZRC\_BDP0279198, Singapore, 07.Jun.2018, MIP leg.; male, ZRC\_BDP0278180, Pulau Ubin (PU18), mangrove, 10.May.2018, MIP leg.; male, ZRC\_BDP0278191, Pulau Ubin (PU18), mangrove, 31.May.2018, MIP leg.; male, ZRC\_BDP0278237, Pulau Ubin (PU18), mangrove, 31.May.2018, MIP leg.; female, ZRC\_BDP0278258, Singapore, 07.Jun.2018, MIP leg.; male, ZRC\_BDP0278260, Singapore, 07.Jun.2018, MIP leg.; male, ZRC\_BDP0279113, Singapore, 31.May.2018, MIP leg.; male, ZRC\_BDP0279121, Singapore, 31.May.2018, MIP leg.; male, ZRC\_BDP0284178, Pulau Ubin (PU18), mangrove, no date, MIP leg.; male, ZRC\_BDP0284248, Singapore, no date, MIP leg.; ZRC\_BDP0070131, Sungei Buloh (SB07), mangrove,

30.May.2016, MIP leg.; ZRC\_BDP0070433, Pulau Ubin (PU06), mangrove, 07.Jul.2016, MIP leg.; ZRC\_BDP0070444, Pulau Ubin (PU10), mangrove, 08.Jun.2016, MIP leg.; ZRC\_BDP0070587, Labrador (LAB01), 29.Jul.2016, MIP leg.; ZRC\_BDP0314124, Pulau Ubin (PU18), mangrove, 05.Apr.2018, MIP leg.; ZRC\_BDP0314131, Pulau Ubin (PU18), mangrove, 05.Apr.2018, MIP leg.; ZRC\_BDP0314197, Pulau Ubin (PU02), mangrove, 09.Feb.2013, MIP leg.; female, ZRC\_BDP0278259, Singapore, 07.Jun.2018, MIP leg.

**Etymology.** The species epithet of this species honors Che Zahara binte Noor Mohamed (1907-1962). Born in Singapore, she was one of the first Malay women to fight for modern women's rights in Singapore. She founded the Malay Women's Welfare Association, the first Muslim women's organization in Singapore, and was instrumental in the passage of the Women's Charter, a women's rights act. Che Zahara was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** This is the second most abundant species of *Epicypta*. There are three subclusters (one of them with a single specimen), diverging from each other by 3.53% and 3.19%—only mPTP, OC4-5% and ABGD P=0.1 would bring all 18 haplotypes together. We assume this as another grey-zone case and there are no males of two of the clusters. It is not possible to decide about conspecificity of the subclusters without examining males. Only the specimens of the subcluster including the holotype are included as paratypes.

### *Epicypta tanjiakkimi* Amorim & Oliveira, sp.nov.

(Figs. G29A–D)

**Diagnosis.** Head ochre-yellow, antennal scape, pedicel and basal half of flagellum ochre-yellowish, distal half greyish-yellow. Scutum ochre-yellow, scutellum brown; most pleural sclerites ochre-yellow, anepisternum, katepisternum, mesepimeron, mediotergite and metepisternum with brownish marks. Fore coxa and femur cream-yellowish, mid and hind coxae and femora whitish, hind femur with brownish tip. Wing membrane light brownish, area along anterior margin on basal half more yellowish. C clearly extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> much shorter than r-m, r-m almost longitudinal. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, and on M<sub>4</sub> close to tip, no macrotrichia on anal lobe. Abdominal tergite 1 yellowish-brown, tergites 2–6 dark ochre-yellowish with a dark brown medial mark, tergite 7 cream-yellow, terminalia whitish-yellow. Gonocoxites fused medially and extending dorsally, displacing tergite 9 distally; gonostylus simple, elongate, displaced medially.

Aedeagus tubular, simple. Parameres with a pair of strongly sclerotized distal flaps. Tergite 9 with a pair of large, independent lobes with a row of short spines at distal margin.

**Description. Male.** Wing length, 2.08–2.14; width, 0.78–0.80 (n=2). **Head.** Head light ochre-yellowish. Scape and pedicel ochre-yellowish, flagellomere 1 ochre-yellowish, remaining flagellomeres light greyish-yellow. Face and clypeus ochre-yellowish; palpomeres 1–3 light brown, palpomeres 4–5 lighter; labella ochre-yellowish. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. Scape about 1.7× pedicel length; flagellomere 4 2.0× longer than wide. Palpomere 4 as long as palpomere 3, palpomere 5 2.0× palpomere 4 length. **Thorax.** Scutum light ochre-yellow, scutellum brown with ochre-yellow antero-lateral corners. Most antepronotum, dorsal half of proepisternum, posterior half of anepisternum and most katepisternum ochre-yellowish, posterior half of antepronotum, anterior half of anepisternum, dorsal half of katepisternum, dorsal end of mesepimeron, laterotergite and metepisternum greyish ochre-brown; mediotergite brown dorsally, lighter lateroventrally. Haltere light ochre-yellowish, no larger setae. Pleural membrane yellowish. Scutum with seven supra-alar and two post-alar bristles, and three pairs of prescutellar bristles; scutellum with two pairs of marginal bristles. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 13 small setae and setulae, laterotergite with one bristles and two small setae. Metepisternum with 15 fine setae. **Legs.** Front coxa light ochre-yellowish, mid and hind coxae whitish; front femur light ochre-yellowish, mid and hind femora whitish-yellowish, mid femur with a basal brown mark ventrally and a small brown mark distally, hind femur with a basal mark tibiae ventral and an ochre-brownish mark distally; tarsi light ochre-yellowish. Mid coxa with a band of fine setae at basal fifth, hind coxa covered with fine setae on basal third. Front tibia with a single dorsal bristle medially, mid tibia with a row of 4–5 brown bristles dorso-laterally and three fine bristles ventrally, besides distal strong bristles, hind tibia with two rows of 4–6 dorsolateral bristles. Mid and hind tarsomeres with rows of ventrolateral setae. Fore leg tarsomere 1 1.2× tibia length, 1.6× tarsomere 2 length. Hind inner tibial spur almost 4.4× tibia width at apex. **Wing** (Fig. G29B). Membrane fumose light brown, yellowish along anterior margin. Sc barely produced. C extending beyond apex of R<sub>5</sub> for one third of distance to M<sub>1</sub>. R<sub>1</sub> reaching C on distal sixth, R<sub>5</sub> reaching C beyond level of tip of M<sub>2</sub>. First sector of Rs slightly oblique, 1.1× length of r-m; r-m quite longitudinal. M<sub>1+2</sub> very short, 0.50× length of r-m; bM slightly over 7.4× r-m length; first sector of CuA 0.33× length of second sector of CuA. Cubital pseudovein entirely absent,

CuP ending slightly beyond level of origin of M<sub>4</sub>. Anal fold almost reaching wing margin. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, and on M<sub>4</sub> close to tip, no macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 light brown, tergites 2–6 brown medially, cream-yellow on anterior half and laterally, tergites 2 and 5 with larger darker areas, tergite 6 ochre-yellowish with a brown band anteriorly and medially, tergite 7 ochre-yellow; sternites 1–7 whitish-yellow, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G29C). Whitish-yellow, with dark brown tip of parameres and brown cerci. Gonocoxites fused together medially on ventral face, no suture, entirely devoid of setae ventrally, syngonocoxite with a pair of postero-lateral extensions with setae distally, long straight setae along margin, no medioventral process, dorso-median lobes of gonocoxites fused to each other on dorsal face of terminalia, no sign of fusion. Gonostylus elongate, more or less compressed dorsoventrally, with setae on both faces, setae along distal end longer. Parameral sclerites large, semicircular at base, with strongly sclerotized medio-posterior projections bearing a beak directed dorsally at distal end, a weakly sclerotized triangular, weakly sclerotized connection between parameres with a row of small setae on distal margin. Aedeagus weakly sclerotized, between parameres. Tergite 9 present as a pair of entirely separated long lobes extending way beyond tip of parameres and gonostylus, in contact at anterior end, each lobe with a subdistal winglet on inner edge and a sclerotized, slightly curved tip with a crown of short spines. Cerci present as a pair of short stripes ventrad to base of tergite 9 lobes.

**Female** (Fig. G29A). As male, except for the following. **Wing.** Length, 2.02–2.03; width, 0.77–0.80 (n=2). **Head.** Occiput with two longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. **Thorax.** Scutum with seven supra-alar long setae and three pairs of prescutellars, two pairs of scutellar bristles. Proepisternum with three bristles directed ventrally, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 17 small setae and setulae, laterotergite with two long setae, no smaller setae or setulae. Metepisternum with 17 small fine setae and setulae. **Legs.** Mid tibia with two dorsolateral rows of 3–5 bristles and 3 bristles along ventral edge, hind tibia with a row of 5–6 bristles dorsally, a row of three long setae ventrally. **Wing.** Posterior veins M<sub>1</sub> and M<sub>2</sub> with over half of their length with dorsal macrotrichia, M<sub>4</sub> with macrotrichia at distal fourth, one macrotrichium on CuA close to tip, anal fold with four macrotrichia on distal fourth, no macrotrichia on anal lobe. **Terminalia** (Fig. G29D). Sternite 8 wide, a pair of lateroposterior projections and a medial acute, sclerotized posterior projection separated by a pair of curved medio-lateral incisions, few microtrichia and fine setae scattered on anterior

half, some few fine setae and a pair of subapical strong setae on medial projections, setulae along incisions and long setae posteriorly on lateroposterior projections. Sternite 9 with a pair of lateral wide arms and an anterior apodeme with a sclerotized axis extending to anterior end of terminalia, genital chamber sclerotized, displaced distally. Tergite 8 wide, short medially and with a pair of short lobes lateroventral lobes, no microtrichia medially, long setae restricted to lateroventral lobes. T9+10 bare, medially short and slender with a pair of wide lateral lobes, fused to sternite 9. Cercomeres 1 and 2 probably fused, no sign of suture, basal half ovoid, large, slender on distal half, covered with microtrichia and elongate setae, distal setae longer and curved.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000735>)

**Material examined. Holotype:** male, ZRC\_BDP0048748, Nee Soon (NS1), 19-25.February.2015, MIP leg. (slide-mounted). **Paratypes:** 6 males, 10 females. **Males:** ZRC\_BDP0133427, Singapore, Nee Soon, swamp forest, (date range 2012-2018), MIP leg.; ZRC\_BDP0133432, Singapore, Nee Soon, swamp forest, (date range 2012-2018), MIP leg.; ZRC\_BDP0133437, Singapore, NeeSoonSwampForest, (date range 2012-2018), MIP leg.; ZRC\_BDP0133447, Singapore, Nee Soon, swamp forest, (date range 2012-2018), MIP leg.; ZRC\_BDP0133468, Singapore, NUSInsectSurvey, (date range 2012-2018), MIP leg. (slide-mounted); ZRC\_BDP0133561, Singapore, (date range 2012-2018), MIP leg. **Females:** ZRC\_BDP0047866, Nee Soon (NS2), swamp forest, 26.September-02.October.2013, MIP leg. (slide-mounted); ZRC\_BDP0048452, Nee Soon (NS2), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048752; ZRC\_BDP0048853, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048929, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0154874, Singapore, NUSInsectSurvey, (date range 2012-2018), MIP leg.; ZRC\_BDP0133458, Singapore, NUSInsectSurvey, (date range 2012-2018), MIP leg.; ZRC\_BDP0137017, Singapore, BukitTimahInsectSurvey, (date range 2012-2018), MIP leg.; ZRC\_BDP0154873, Singapore, Nee Soon, swamp forest, (date range 2012-2018), MIP leg.; ZRC\_BDP0154967, Singapore, Nee Soon, swamp forest, (date range 2012-2018), MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0072751; male, ZRC\_BDP0154929 (website photo specimen); female, ZRC\_BDP0072721; female, ZRC\_BDP0072737; female, ZRC\_BDP0154929 (imaged); ZRC\_BDP0058633; ZRC\_BDP0058731; ZRC\_BDP0066720; ZRC\_BDP0066728; ZRC\_BDP0066754; ZRC\_BDP0066760; ZRC\_BDP0120483; ZRC\_BDP0128598; ZRC\_BDP0128625; ZRC\_BDP0133429; ZRC\_BDP0133461; ZRC\_BDP0136940; ZRC\_BDP0136946; ZRC\_BDP0136977; ZRC\_BDP0137069; ZRC\_BDP0137107; ZRC\_BDP0137282; ZRC\_BDP0140739; ZRC\_BDP0140747; ZRC\_BDP0140749; ZRC\_BDP0140750; ZRC\_BDP0140753; ZRC\_BDP0140774; ZRC\_BDP0143087; ZRC\_BDP0143088; ZRC\_BDP0143092; ZRC\_BDP0143093; ZRC\_BDP0143097; ZRC\_BDP0143098; ZRC\_BDP0143102; ZRC\_BDP0143116; ZRC\_BDP0154789; ZRC\_BDP0154802; ZRC\_BDP0154809; ZRC\_BDP0154810; ZRC\_BDP0154816; ZRC\_BDP0154817; ZRC\_BDP0154821; ZRC\_BDP0154822; ZRC\_BDP0154863; ZRC\_BDP0154868; ZRC\_BDP0154869; ZRC\_BDP0154952; ZRC\_BDP0155043; ZRC\_BDP0155053.

**Etymology.** The species epithet of this species honors Tan Jiak Kim (1859–1917). A Straits-born Chinese, he was businessman and philanthropist, President of the Straits Chinese British Association. He was a leading force to establish a medical school in Singapore, petitioning the colonial Governor of the Straits Settlements, Sir John Anderson, in name of a group of representatives of the Chinese and other non-European communities. He disbursed medical scholarships to poorer students, giving them an opportunity to study abroad while pursuing their academic career.

**Remarks.** *Epicypta tanjiakkimi*, sp.nov. has eight haplotypes and group in three 1% subclusters in our material. One subcluster has a single specimen from Sumatra; another subcluster has specimens from both, Java and Sumatra; the third cluster has specimens from dry forest and swamp forest in Singapore.

***Epicypta gehminae* Amorim & Oliveira, sp.nov. [= sp.nov. 45]**

(Figs. G30A–D)

**Diagnosis.** Head brown, most of antenna light brown. Scutum most brown, anterior end and laterals more yellowish, scutellum dark brown; most pleural sclerites light brown, anepimeron, proepisternum and katepisternum light brownish yellowish. Fore coxa ochre-yellowish, mid and hind coxae whitish, mid femur with brownish tip. Wing vein C not extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> as long as r-m, r-m almost longitudinal. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub> and CuA, no macrotrichia on anal lobe. Abdominal tergites brown. Female terminalia with no posterior lobes on sternite 8, a medial sclerotized longitudinal line on sternite 9x.

**Description. Male.** Wing length, 2.08–2.14; width, 0.78–0.80. **Head** (Fig. G30A). Head brown. Scape light brown, pedicel ochre-yellowish, flagellomeres light brown. Face and clypeus light brown; palpomeres 1–3 dark ochre yellowish [both palpomeres 4–5 brown in the holotype]; labella brownish-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, four posteriorly to ocellus. Scape about 1.8× pedicel length; flagellomere 4 2.3× longer than wide. **Thorax** (Fig. G30B). Scutum brown, anterior end and lateral margins brownish-yellow, scutellum dark brown. Antepronotum, proepisternum and katepisternum light brownish-yellow, anepisternum, mesepimeron and metepisternum light brown, laterotergite and mediotergite dark brown. Pleural membrane light yellowish-brown. Scutum with five supra-alar and three pairs of prescutellar bristles; scutellum with two pairs of marginal bristles. Proepisternum with three bristles, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and six setulae, laterotergite with two bristles and some small setae. **Legs.** Front coxa ochre-yellowish, mid and hind coxae whitish; front femur light ochre-yellowish, mid and hind femora whitish-yellow, mid femur with a small brown mark distally; tarsi light ochre-yellowish. Mid coxa with a band of fine setae at basal fifth, hind coxa covered with fine setae on basal third. Front

tibia with a single dorsal bristle medially, mid tibia with two rows of 4–5 brown bristles dorso-laterally and three fine bristles ventrally, besides distal strong bristles, hind tibia with two rows of 3–5 dorsolateral bristles. Mid and hind tarsomeres with rows of ventrolateral setae. Fore leg tarsomere 1  $1.0 \times$  tibia length,  $1.6 \times$  tarsomere 2 length. Hind inner tibial spur almost  $6.3 \times$  tibia width at apex. **Wing** (Fig. G30C). Membrane fumose light brown, yellowish along anterior margin. Sc barely produced. C barely produced beyond apex of R<sub>5</sub>. R<sub>1</sub> reaching C on distal fifth, R<sub>5</sub> reaching C beyond level of tip of M<sub>2</sub>. First sector of Rs slightly oblique,  $0.8 \times$  length of r-m; r-m quite longitudinal. M<sub>1+2</sub> very short,  $1.0 \times$  length of r-m; bM slightly over  $6.0 \times$  r-m length; first sector of CuA  $0.40 \times$  length of second sector of CuA. Cubital pseudovein entirely absent, CuP not even reaching level of origin of M<sub>4</sub>. Anal fold almost reaching wing margin. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, distal half of M<sub>4</sub> and distal third of CuA, no macrotrichia on anal lobe. **Abdomen**. Abdominal tergites brown, sternites light brownish-yellow, sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G30D). Sternite 8 subtrapezoid, no lateroposterior projections. Sternite 9 with a pair of medial sclerotized line, anterior arm of genital fork extending to anterior end of terminalia, slightly wider at tip. Tergite 8 much wider than sternite 8, short medially, latero-anterior arms extending anteriorly, some setae along posterior margin. T<sub>9+10</sub> bare, short medially, with a pair of long lateral projections. Cercomeres 1 and 2 probably fused, no sign of suture, basal half ovoid, slender on distal half, covered with microtrichia and elongate setae, distal setae longer and curved.

**Material examined. Holotype:** female, ZRC\_BDP0284297, Singapore, 16-May-18, MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Geh Min (1950–), an eye surgeon by trade, best known for her work as a conservationist, who served as the head of the Nature Society (Singapore) from 2000 to 2008. Her efforts were important in ensuring the preservation of the biodiverse Chek Jawa wetlands at Pulau Ubin. For her contributions to environmental sustainability, Geh Min was awarded the inaugural President's Award for the Environment as well as the Stellar Award from the United Nations Development Fund for Women in 2006. She was inducted into the Singapore Women's Hall of Fame in 2014.

### *Epicypta jackieyingae* Amorim & Oliveira, sp.nov.

(Figs. G31A–E)

**Diagnosis.** Head ochre-yellow, antennal scape, pedicel ochre-yellowish, flagellum yellowish-brown. Scutum ochre-yellow, with a dark brown mark above wing; scutellum dark brown; pleural sclerites ochre-yellowish, with brown marks on dorsal half of mesepimeron and paratergite, mediotergite dark brown, yellowish laterally. Front coxa ochre-yellowish with brownish tinge, mid and hind coxae whitish with a brown mark at tip, mid and hind femora yellowish-brown with a brown mark at proximal end, hind femur with a brown mark also at distal end. Wing membrane light brownish, cells c and br more yellowish. C extending way beyond tip of  $R_5$ ;  $M_{1+2}$   $1.0 \times r-m$  length. Dorsal macrotrichia on posterior veins  $M_1$ ,  $M_2$ ,  $M_4$ , CuA and anal fold, no macrotrichia on anal lobe. Abdominal tergite 1 whitish-yellow laterally, a brown medial mark, tergites 2–3 and 5 brown medially with a cream-yellow lateral, tergite 4 yellowish-brown with lighter laterals, tergite 6 yellowish with a pair of large separate brownish areas on anterior two-thirds, tergites 7–8 yellowish. Gonocoxites with a pair of short dorsolateral lobes extending slightly beyond base of gonostylus, dorsal borders of gonocoxites fused to each other dorsally. Gonostylus with a flat sclerite at level of laterodistal extension of gonocoxite, extending medio-posteriorly as a slightly curved, bare blade and an elongate digitiform lateral lobe. Aedeagus tubular, no clear opening medially. Tergite 9 with a pair of long posterior digitiform setose extensions, extending way beyond tip of parameres, with a distal spine. Female sternum 8 with no incision medially along posterior border, genital furca slender at anterior end.

**Description. Male.** Wing length, 2.43; width, 0.91. **Head** (Fig. G31A). Ochre-yellowish. Antennal scape and pedicel ochre-yellowish, flagellomeres yellowish-brown. Face and clypeus light brown. Palpomeres light yellowish-brown. Labella cream-yellowish. Occiput with two longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. Scape about  $1.6 \times$  pedicel length; length of flagellomere 4  $2.2 \times$  width. Palpomere 4  $1.3 \times$  palpomere 3 length, palpomere 5  $1.6 \times$  palpomere 4 length. **Thorax** (Fig. G31A). Scutum ochre-yellow, with a dark brown mark laterally above wing, scutellum dark brown, ochre-yellow along anterior and posterior margins. Pleural sclerites ochre-yellowish, with brown marks on dorsal half of mesepimeron and anterior basalare, mediotergite dark brown with yellowish laterals and ventral end. Haltere whitish-yellow. Pleural membrane yellowish. Scutum with 5+1 supra-alars, three pairs of prescutellar bristles and two additional smaller pairs in a slightly more anterior line, scutellum with two pairs of marginal bristles. Proepisternum with three bristles, anepisternum with four bristles along posterior margin.

Mesepimeron with two bristles and 16 small setae and setulae, laterotergite with one large bristle and one small bristle, and two smaller setae; metepisternum with 12 fine setae. **Legs.** Front coxa ochre-yellowish with a brownish tinge, mid coxa whitish with a brown mark at tip on ventral face, hind coxa whitish, with a brown mark at tip on external face. Mid and hind femora yellowish-brown, mid femur with a brown mark at proximal end ventrally, hind femur with a brown mark at proximal and distal ends ventrally. Tibiae and tarsi yellowish-brown, hind leg tarsomere 1 proximal fifth with a dark brown mark. Mid coxa with some few fine setae across basal fifth, hind coxa with fine setae on basal third extending more distally along anterior margin. Front tibia with one bristle medially on inner face, mid tibia with two irregular rows of 3–5 bristles dorso-laterally, three bristles along ventral edge, distalmost stronger, hind tibia with two irregular dorsolateral rows of 5–6 bristles. Hind tibia inner spur over  $5.7 \times$  tibia width at apex. **Wing** (Fig. G31B). Membrane fumose brown, darker along anterior margin, a dark brown mark at wing base. Sc faint (visible only in phase contrast), with two dorsal macrotrichia. C produced beyond tip of R<sub>5</sub> for over a third distance to M<sub>1</sub>. R<sub>1</sub> reaching C on distal fifth of wing; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>. First sector of R<sub>s</sub> clearly oblique,  $1.0 \times$  r-m length; r-m almost longitudinal. M<sub>1+2</sub>  $0.63 \times$  r-m length; bM slightly over  $7.6 \times$  r-m length; first sector of CuA  $0.34 \times$  length of second sector of CuA. Cubital pseudovein present only as a fold, CuP extending slightly beyond level of origin of M<sub>4</sub>. Anal fold gradually curved, almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia along most of their length, M<sub>4</sub> with macrotrichia on distal half, CuA with setae on distal fifth, no macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 whitish-yellow with a brown medial mark, tergites 2–3 and 5 brown medially with cream-yellow lateral bands, tergite 4 yellowish-brown with lighter laterals, tergite 6 yellowish with a pair of large separate brownish areas on anterior two-thirds, tergites 7–8 yellowish; sternites 1–7 whitish-yellow. Sternite 2 with a strong ventral pair of brown bristles, tergites 2–6 with long, darker setae medially. **Terminalia** (Figs. G31C–D). Whitish-yellow. Gonocoxites fused medially, no suture present, bare ventrally and with a pair of short dorsolateral lobes extending only slightly beyond insertion of gonostylus, gonocoxite dorsal borders fused to each other dorsally with no suture, displacing tergite 9 to a posterior position. Gonostylus with a flat sclerite at level of laterodistal extension of gonocoxite, extending medio-posteriorly as slightly curved bare blade almost to level of tip of paramere spines, and an elongate digitiform lateral lobe, with setae at distal half on both faces, a longer seta at tip. Aedeagus tubular, without a clear anterior medial ejaculatory apodeme, opening medially between distal arms of parameres on a sclerotized distal structure medially. Parameres connected

together medially, each side with a pair of projections, a more ventral blade-like branch falciform distally and one more dorsal strongly sclerotized bearing a pair of digitiform distal sublobes, each ending with a long spine, weakly sclerotized medially, a pair of long sub-medial setae on posterior margin. Gonocoxal bridge not detected. Tergite 9 present as a pair of long posterior digitiform extensions close to each other at anterior end, covered with long setae, extending way beyond tip of parameres, with a spine at tip. Cerci small, setose, dorsad to posterior margin of parameres.

**Female.** As male, except for the following. **Wing.** Length, 2.37; width, 0.90. **Head.** Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, six posteriorly to ocellus. **Thorax.** Scutum with 4+1 supra-alar long setae and three pairs of prescutellars, lateral pair smaller; two pairs of scutellar bristles. Proepisternum with three bristles directed ventrally, anepisternum with four bristles along posterior margin.

Mesepimeron with two bristles and 14 small setae, laterotergite with two bristles (one of them smaller) and two small setae. Metepisternum with 14 small fine setae. **Abdomen.** Tergite 1 cream-yellow, tergites 2–3 cream-yellow with a pair of separated large brown marks, tergite 4 cream-yellow with a small brownish mark medially, tergite 5 cream-yellow with a median brown mark and a pair of additional, larger brown marks more laterally, tergite 6 yellowish-brown. **Terminalia** (Fig. G31E). Sternite 8 wide, rectangular, posterior margin straight, no medial incision, no latero-posterior projections, covered with microtrichia and fine setae, longer setae on posterior margin, setae on lateroposterior corners strong and curved. Sternite 9 wide, anterior apodeme extending beyond anterior end of terminalia, with a sclerotized axis and slightly widening at tip, genital chamber slender. Tergite 8 short, wide, covered with microtrichia and with setulae along posterior margin, long setae restrict to lateroventral lobes. T9+10 bare, U-shaped, projecting latero-distally at sides of cerci, rounded at tip. Cercomeres 1 and 2 probably fused, no sign of suture, basal half large, ovoid, slender on distal half, covered with microtrichia and elongate setae, distal setae longer and curved.

**Material examined. Holotype:** male, ZRC\_BDP0278332, Singapore, 3-May-18, MIP leg. (extracted, slide-mounted). **Paratype.** Female, ZRC\_BDP0284204, Singapore, PU20, (date range 2012-2018), MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Jackie Yi-Ru YING (1966-). Taipei-born, she is a leading researcher in nanotechnology who left a professorship (as one of the youngest full Professors at 35) at MIT to found the Institute of Bioengineering and

Nanotechnology in Singapore to advance biomedical research. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** Despite the differences in the shape of the arms of tergite 9, the pattern of the male terminalia of *Epicypta jackieyingae*, sp.nov. and of *E. tanjiakkimi*, sp.nov. is quite unique, and they come as sister species in mitogenome tree.

### Group *khatijunae*

#### *Epicypta khatijunae* Amorim & Oliveira, sp.nov.

(Figs. G32A–C)

**Diagnosis.** Head dark brown, antennal scape and pedicel ochre-yellowish, flagellum light brown. Scutum and scutellum blackish-brown, scutum with an ochre-brown collar along anterior end; pleural sclerites dark brown. Coxae whitish, with a brown band on basal end. Wing membrane light brownish, a large brownish area along anterior margin. C not extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> shorter than r-m. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub> and distal end of CuA. Abdominal tergites 1–6 dark brown, tergite 6 with yellowish posterior margin, tergite 7 and terminalia yellowish. Female terminalia cercus digitiform, elongate.

**Description. Female** (Fig. G32A). Wing length, 2.58; width, 0.93 mm. **Head.** Vertex dark brown, two longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, eight setae posteriorly to ocellus. Occiput dark brown, yellowish-brown towards ventral margin, a yellowish slender gena with dark brown ventral margin. Fine inter-ommatidial setae over entire eye surface. Scape and pedicel light ochre, first two flagellomeres ochre-yellowish, remaining greyish-brownish. Frons, face and clypeus brown; maxillary palpus with first two palpomeres yellowish-brown, distal three flagellomeres whitish; labella whitish-yellow. Scape twice length of pedicel, flagellomere 4 length 2.0× width. Maxillary palpomere 4 1.7× palpomere 3, palpomere 5 1.5× palpomere 4 length. **Thorax.** Scutum shining blackish-brown, lighter on anterior sixth. Pleural sclerites blackish-brown except for light brown mediotergite and metepisternum. Pleural membrane yellowish. Antepronotum with three bristles directed ventrally. Anepisternum with five bristles at posterior margin

directed posteriorly. Mesepimeron with two bristles and 16 smaller setae; laterotergite with four bristles and eight smaller setae. Metepisternum with 12 setulae. Haltere whitish. **Legs.** Coxae and femora light ochre-yellowish, with a brown band basally, femora slightly darker with a brown tinge along dorsal edge, tibiae and tarsomeres dark ochre-yellowish, mid and hind tibiae greyish-brown at basal end. A group of four bristles and some long setae along frontal distal margin of front coxa; a band of small fine setae across basal end of mid coxa, hind coxa with fine setae on basal half; femora with a short row of 4-5 brownish setae ventrally on distal end. Hind tibial spur over  $5\times$  tibia width at apex. Tarsal claws with an elongate pointed tooth coming out on inner margin medially. **Wing** (Fig. G32B). Membrane fumose light brown, darker cells c, br and r1. Humeral vein present, Sc virtually not produced. C barely produced beyond tip of R<sub>5</sub>. R<sub>1</sub> long, reaching C on wing distal fifth; R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>. First sector of Rs slightly oblique, devoid of setae; r-m more or less longitudinal, over  $3\times$  longer than first sector of Rs. M<sub>1+2</sub> short, 0.67× r-m length; bM about  $5\times$  r-m length; first sector of CuA about 0.30× length of second sector of CuA. Cubital pseudovein absent, CuP weakly sclerotized, barely extending beyond level of origin of M<sub>4</sub>. Anal fold long, nearly reaching wing margin. Dorsal setae on posterior veins M<sub>1</sub>, M<sub>2</sub>, M<sub>4</sub> and distal end fourth of CuA. Some few dorsal macrotrichia on anal lobe.

**Abdomen.** Abdominal tergites 1-6 shining brown, posterior margin of tergite 6 and tergite 7 yellow; sternites 1-7 whitish, sternite 2 with a strong ventral pair of brown bristles.

**Terminalia** (Fig. G32C). Dirty-yellow. Sternite 8 large, with a pair of long lateroposterior lobes close together, with a medial posterior incision, some stronger setae along posterior margin longer. Sternite 9 well-defined, tapered at anterior end, genital chamber slender, laterodistal margin close to tip with some fine setae, distal end acute. Tergite 8 large, subquadrate, covered with setae and microtrichia, posterior margin straight. Tergite 9+10 short, slender, with sclerotized band along anterior margin extending anteriorly to lateral apodemes directed anteriorly, entirely bare of setae. Cercomeres 1 and 2 probably fused, cerci very long, about  $7\times$  longer than wide.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000722,-002091>)

**Material examined. Holotype:** female, ZRC\_BDP0048068, Nee Soon (NS1), swamp forest, 06-12.June.2013, MIP leg. (slide-mounted). **Paratypes:** 5 females, ZRC\_BDP0048322, Nee Soon (NS2), swamp forest, 14-20.June.2012, MIP leg. (website photo specimen); ZRC\_BDP0048426, Nee Soon (NS1), swamp forest, 03-09.May.2012, MIP leg. (website photo specimen); ZRC\_BDP0048431, Nee Soon (NS2), swamp forest, 12-18.July.2012, MIP leg. (website photo specimen); ZRC\_BDP0048749, Nee Soon (NS1), 19-25.February.2015,

MIP leg.; ZRC\_BDP0048861, Nee Soon (NS1), 08-14.January.2015, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0134020, female, ZRC\_BDP0137100 (website photo specimen).

**Etymology.** The species epithet of this species honors Khatijun Nissa Siraj (1925-), a Singaporean women's rights activist and the co-founder of the Young Women's Muslim Association (PPIS) and the Muslim Women's Welfare Council in 1964. In response to an epidemic of women in the Singaporean Muslim community being abandoned through inexpensive and easy divorces, she pressed for the formation of a Syariah Court, and served as its first caseworker in the 1960s. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** There are three haplotypes for *Epicypta khatijunae*, sp.nov. and all delimitation approaches point to a single species.

***Epicypta purchoni* Amorim & Oliveira, sp.nov.**

(Figs. G33A–D)

**Diagnosis.** Head, scutum, scutellum and thoracic pleural sclerites blackish-brown, antenna light brown, scape, pedicel and first flagellomere lighter. Coxae whitish, except for brown band on proximal fourth of hind coxa; femora whitish, except for proximal and distal ends of mid femur and for a brown line along dorsal edge of hind femur. Wing membrane light brownish, area along anterior margin slightly darker. C extending shortly beyond tip of R<sub>5</sub>; First section of R<sub>5</sub> short,  $0.46 \times$  r-m length; M<sub>1+2</sub> very shorter,  $0.27 \times$  r-m length. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub>, anal lobe with macrotrichia. Abdominal tergite 1–2 dark brown, tergites 3–5 greyish-brown medially, with wide lateral cream-yellow bands, tergites 6–7 greyish-brown. Gonocoxites with a long lateral digitiform lobe and a long, blade-like posterior lobe; gonostylus flat, small, displaced medially; paramere with a pair of strong spines on a triangular projection distally; tergite 9 with a pair of long parallel projections.

**Description. Male.** Wing length, 2.37; width, 0.86. **Head.** Vertex dark brown, occiput dark caramel-brown. Scape and pedicel ochre-yellow, flagellomere 1 dark yellow-brown, remaining greyish-brown. Face and clypeus light caramel-brown; palpomeres 1–3 light

brownish, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, six posteriorly to ocellus. Scape about 1.8× pedicel length; flagellomere 4 1.6× longer than wide. Palpomere 4 1.5× palpomere 3 length, palpomere 5 1.6× palpomere 4 length. **Thorax.** Scutum blackish-brown. Pleural sclerites dark brown. Pleural membrane ochre-yellow. Haltere whitish-yellow. Scutum with seven supra-alar and three pairs of prescutellar bristles; two pairs of scutellar bristles and one outer pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 23 small setae, laterotergite with three bristles and 16 small setae. Metepisternum with 16 fine setae. **Legs.** Coxae whitish-yellow with orangish tinge, hind coxa with a brown band on basal fifth; femora, tibiae and tarsi whitish-yellow with orangish tinge, tibiae and tarsi darker. Mid tibia with a band of fine setae across proximal fourth, hind coxa covered with setulae on basal third, extending posteriorly close to anterior margin. Fore tibia with two dorsolateral bristles; mid tibia with two dorsolateral rows of four short bristles, a pair of lateral bristles and a row with four long setae along ventral edge; hind tibiae with a pair of dorsolateral rows of six bristles and four long setae on inner face. Fore leg tarsomere 1 1.1× tibia length, 1.5× tarsomere 2 length. Hind leg inner tibial spur 5.0× tibia width at apex. **Wing** (Fig. G33B). Membrane light brown fumose, darker along anterior margin. Sc faint, with dorsal macrotrichia (visible only with phase contrast). C extending beyond apex of  $R_5$  for about a third of distance to  $M_1$ .  $R_1$  reaching C at wing distal fourth;  $R_5$  reaching C slightly before level of  $M_1$ . First sector of Rs oblique, bare, 0.46× r-m length; r-m slightly oblique.  $M_{1+2}$  almost absent, 0.27× r-m length; bM 3.1× r-m length. First sector of CuA 0.35× length of second sector of CuA. Cubital pseudovein inconspicuous sclerotized, CuP reaching level of origin of  $M_4$ . Anal fold almost reaching wing margin, curved along most of its length, slightly bent towards base close to margin. Posterior veins  $M_1$  and  $M_2$  with of dorsal macrotrichia on almost entire length,  $M_4$  on distal half and CuA on distal fifth of wing; no macrotrichia on anal lobe. **Abdomen.**

Abdominal tergite 1 greyish-brown with a dark brown slender band across posterior end, tergites 2–5 brown medially with yellowish-brown to cream-yellow lateral bands, tergites 6–7 light brown; sternites 1–7 light brownish-yellow. Sternite 2 with a pair of long, slightly curved ventral bristles. **Terminalia** (Fig. G33C). Light brown, cerci lighter. Gonocoxites fused medially, no suture present, bare ventrally, a medioventral digitiform projection with setulae at tip, reaching level of tip of gonostylus, sided by a pair of shorter digitiform projections, each with an elongate seta at tip, a pair of long digitiform laterodistal extensions reaching way beyond tip of gonostylus, a large lobe just external to base of gonostylus, with

setae on both faces, setae on dorsoposterior margin longer and curved, extending to level of inner arms of aedeagus, gonocoxites fused medially on dorsal face, with no suture left.

Gonostylus simple, elongate, displaced to a more medial position, dorsoventrally compressed, with setae on both faces, ventral setae on basal half longer than distal setae. Aedeagus with an anterior ejaculatory apodeme, widening midway to apex, then divided distally into a pair of lobes in contact medially and extending distally beyond tip of gonostylus, gonopore apparently short, medially; parameres present as a triangular sclerite extending distally, with a medial short beak at tip, two pairs of small setae close to each other subapically and a pair of strong curved spines close to tip, laterally with a pair of long, slender projections extending beyond tip of gonocoxite lateral lobes, each with five setulae on distal end.

Gonocoxal bridge not evident. Tergite 9 present as a pair of long laterodistal digitiform extensions, entirely disconnected from each other, about as long as gonocoxite lateral extensions, setose at tip. Cerci weakly sclerotized between tergite 9 elongate lateral lobes.

**Female** (Fig. G33A). As male, except for the following. **Wing**. Length, 2.21–2.69; width, 0.82–0.99. **Head**. Occiput with three longer setae dorsally to eye anteriorly to ocellus, one seta dorsally to ocellus, ten setae posteriorly to ocellus. **Thorax**. Scutum with seven supraalar bristles and three pairs of prescutellars; three pairs of scutellar bristles, outer pair smaller. Proepisternum with three bristles directed ventrally, anepisternum with four bristles along posterior margin. Mesepimeron with two bristles and 30 small setae and setulae, laterotergite with three bristles and 18 small setae. Metepisternum with 16 small fine setae. **Legs**. Front tibia with two strong setae at outer face, mid tibia with two dorsolateral rows of 5–6 bristles, one outer bristle and three bristles along ventral edge, hind tibia with a row of four dorsal bristles, one lateral subdistal strong seta and three setae and one bristle along ventral edge.

**Terminalia** (Fig. G33D). Light brownish-yellow. Sternite 8 elongate, trapezoid, posterior margin nearly straight, microtrichia and setae evenly distributed, long setae at posterior margin. Sternite 9 slender, elongate, anterior apodeme extending to slightly beyond anterior end of terminalia, widening at apex, a pair of sclerotized bands extending into lateral arms, genital chamber elongate. Tergite 8 with a pair of separate large lateral lobes touching medially, microtrichia and setae on lateral lobes. Tergite 9+10 very slender, a pair of sclerotized bands connected medially, latero-posteriorly fused to sternite 9. Cercomeres 1 and 2 fused, no sign of suture, elongate, wider midway to apex posterior end digitiform, distal setae longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000786>)

**Material examined.** **Holotype:** male, ZRC\_BDP0047803, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg. (slide-mounted). **Paratypes:** 1 male, 1 female. **Male:** ZRC\_BDP0047857, Nee Soon (NS1), swamp forest, 04-10.July.2013, MIP leg. (website photo specimen, slide-mounted). **Female:** ZRC\_BDP0047813, Nee Soon (NS2), swamp forest, 20-26.March.2014, MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Professor Richard Denison Purchon (1916–1992), first Head of the Department of Zoology, later merged with the Department of Botany to constitute the present Department of Biological Sciences, National University of Singapore. A specialist in marine biology, he was a recognised authority in malacology, with a famous book *The Biology of the Mollusca*.

**Remarks.** *Epicypta purchoni*, sp.nov. has three haplotypes, each of which with a single specimen. They are separated in two species by OC2%, but kept together by all other delimitation approaches. We understand that this is a grey zone case and keep it as a single species. The female cannot have its conspecificity checked. *Epicypta purchoni*, sp.nov. is similar to *Epicypta wallacei*, sp.nov. and to *Epicypta peterngi*, sp.nov.

***Epicypta foomaosheng* Amorim & Oliveira, sp.nov.**

(Figs. G34A–D)

**Diagnosis.** Head and antenna ochre-yellowish; scutum brownish, with a dark ochre-yellowish diffuse area along anterior third, scutellum dark brown; pleural sclerites dark brown, with ochre-yellowish area on antepronotum and on ventro-posterior end of anepisternum. Coxae and femora whitish, on front leg with brownish light tinge, a dark brown line along posterior border of anterior coxa, fore femur with a blackish brown mark at proximal end and along ventral crest. Wing membrane light brownish, basal third of cell c and cell br with a brown mark. C slightly produced beyond tip of R<sub>5</sub>; M<sub>1+2</sub> nearly absent. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, M<sub>4</sub> and on CuA distal fourth, macrotrichia on anal lobe. Abdominal tergite 1 ochre-yellow with a brown transverse band close to posterior margin, tergites 2–5 mostly light brown with a yellowish-brown on anterior third; tergite 6 bright cream-yellow, terminalia bright ochre-yellow. Female terminalia with a wide, short incision on posterior margin of sternite 8.

**Description. Female** (Fig. G34A). Wing length, 2.82; width, 0.98. **Head.** Caramel-brown. Scape and pedicel light ochre-yellowish, flagellomeres light brownish-yellow. Face and clypeus light caramel-brown. Maxillary palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. Scape  $1.7 \times$  pedicel length, flagellomere 4  $1.5 \times$  longer than wide. Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $1.6 \times$  palpomere 4 length. **Thorax.** Scutum caramel-brown, anterior third ochre-yellowish; scutellum dark brown with ochre-yellow antero-lateral corners. Antepronotum ochre-yellow on dorsal end, greyish-brown ventrally, proepisternum greyish-brown, anepisternum dark greyish-brown with an ochre-yellow area medially along posterior margin, katepisternum, mesepimeron, laterotergite and metepisternum dark greyish-brown, mediotergite dark brown. Pleural membrane yellowish. Haltere pedicel and most knob light whitish-ochre, base of knob brownish, no larger setae. Scutum with 4+2 supra-alar and three pairs of prescutellar bristles. Proepisternum with four bristles (ventro-posterior one smaller), anepisternum with six bristles along posterior margin (two dorsal ones smaller). Mesepimeron with two bristles and 12 fine setae, laterotergite with four bristles and four setae. Metepisternum bare. **Legs.** Front coxa whitish with a brownish tinge, brownish along posterior margin and a brown mark at tip; mid and hind coxae whitish, both with a light brown band basally, dark on hind coxa. Femora whitish with a grey-brownish tinge, brownish at proximal end, darker along dorsal and ventral margin; tibiae and tarsi slightly darker, tips of mid and hind tibiae darker. Mid coxa with some fine setae across proximal fifth, hind coxa with a band of setulae at basal fourth. Front tibia, besides regular rows of fine trichia, with regular dorsal and ventral rows of microtrichia, two dorsolateral small bristles medially; mid tibia with three irregular dorsal rows of 3–5 bristles, one small bristle on distal third of inner face, and one bristle and four strong setae along ventral margin; hind tibia, besides regular rows of fine trichia, with a regular line of small bristles dorsally along entire length and a row of brown trichia at outer face, and three irregular dorsal rows of bristles and six small bristles on inner face. Front tibia tarsomere 1  $1.1 \times$  tibia length,  $1.9 \times$  tarsomere 2 length. Hind leg tibial inner spur  $6.0 \times$  tibia width at apex. **Wing** (Fig. G34B). Membrane fumose brown, darker along anterior margin, an elongate brownish mark on cell c to origin of Rs, on cell br and around base of  $M_{1+2}$ . C produced slightly beyond tip of  $R_5$ . Sc barely produced.  $R_1$  reaching C on distal fifth of wing;  $R_5$  reaching C before level of tip of  $M_1$ . First sector of Rs transverse,  $0.36 \times$  r-m length; r-m almost longitudinal.  $M_{1+2}$  absent,  $M_1$  forking from r-m together with  $M_2$ ; bM slightly  $3.3 \times$  r-m length; first sector of CuA short,  $0.23 \times$  length of second sector of CuA. Cubital pseudovein

absent, CuP extending to slightly beyond level of origin of M<sub>4</sub>. Anal fold long, almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> almost entirely with dorsal macrotrichia, M<sub>4</sub> with macrotrichia on distal half, macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 ochre-yellow with a brown transverse band close to posterior margin, tergites 2–5 light brown on posterior half, yellowish-brown on anterior half, lateral margins more yellowish; tergite 6 bright cream-yellow; sternites 1–7 whitish-yellow. Tergites 1–5 with dark brown elongate setae on dorsal part of sclerites. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G34C–D). Cream-yellow. Sternite 8 rectangular, elongate, lateral ends of posterior margin slightly more projected than medially, microtrichia and small setae widespread, posterior margin with three pairs of longer setae, those on lateroposterior corners stronger. Sternite 9 elongate, anterior apodeme widening close to tip, genital chamber elongate, distal end acute. Tergite 8 wide, lateral lobes projected posteriorly, medial connection slender, entirely bare. Tergite 9+10 present as a pair of slender sclerotized inclined band, connected to sternite 9 lateroventrally. Cercus large, cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000807, -002087>)

**Material examined. Holotype:** female, ZRC\_BDP0047057, National University of Singapore (PGP), 11-17.June.2015, MIP leg. (slide-mounted). **Paratypes:** 8 females, ZRC\_BDP0047058, National University of Singapore (PGP), 11-17.June.2015, MIP leg.; ZRC\_BDP0047075, National University of Singapore (PGP), 09-15.July.2015, MIP leg.; ZRC\_BDP0047076, National University of Singapore (PGP), 09-15.July.2015, MIP leg.; ZRC\_BDP0048770, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0049066, National University of Singapore (PGP), 21-27.May.2015, MIP leg.; ZRC\_BDP0049068, National University of Singapore (PGP), 21-27.May.2015, MIP leg. (website photo specimen); ZRC\_BDP0049326, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0049330, National University of Singapore (PGP), 04-10.June.2015, MIP leg. **Additional sequenced specimens:** female, ZRC\_BDP0133522 (website photo specimen); ZRC\_BDP0078989; ZRC\_BDP0279153; ZRC\_BDP0279154; ZRC\_BDP0279163; ZRC\_BDP0279170; ZRC\_BDP0284190; ZRC\_BDP0284196; ZRC\_BDP0284299; ZRC\_BDP0284302; ZRC\_BDP0041017; ZRC\_BDP0058624; ZRC\_BDP0066715; ZRC\_BDP0070119; ZRC\_BDP0070140; ZRC\_BDP0070585; ZRC\_BDP0082310; ZRC\_BDP0132879; ZRC\_BDP0133377; ZRC\_BDP0133398; ZRC\_BDP0133551; ZRC\_BDP0278420; ZRC\_BDP0278456; ZRC\_BDP0314072; ZRC\_BDP0314073; ZRC\_BDP0314148; ZRC\_BDP0314167.

**Etymology.** The species epithet of this species honors FOO Maosheng (1988-), a curator at the Lee Kong Chian Natural History Museum, specializing in Blattodea. He is one of the researchers associated with the Singapore Mangrove Insect Project. The name is used in apposition.

**Remarks.** All specimens of the type-series are from the National University of Singapore campus, with an urbanized area bolding some spots of impacted secondary forest. *Epicypta*

*foomaosheng*, sp.nov. has four haplotypes that are brought together into a single species by all delimitation approaches except mPTP. There is no support from morphology to split it into separate species.

***Epicypta ganengsensi* Amorim & Oliveira, sp.nov.**

(Figs. G35A–C, G36A–B)

**Diagnosis.** Head brown, antennal scape and pedicel ochre-yellowish, flagellum greyish-brown; scutum dark brown, a dark ochre-yellowish diffuse area along anterior margin, scutellum blackish-brown; pleural sclerites dark brown, antepronotum and proepisternum dark ochre-yellowish. Coxae and femora whitish, on front leg with brownish light tinge, mid and hind coxae with a brown band on proximal end, tip brownish. Wing membrane light brownish, cell c and cell br darker. C barely produced beyond tip of R<sub>5</sub>; M<sub>1+2</sub> 0.58× r-m length. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, M<sub>4</sub> and on CuA distal fourth; macrotrichia on anal lobe. Abdominal tergites 1–6 dark brown, tergite 7 brownish-yellow. Gonocoxites fused medially, with a short and wide medioventral projection, a pair of laterodistal projection over five times longer than length of syngonocoxite medially, with scattered fine setae and a couple of subdistal strong setae and some longer setae at tip. Gonostylus simple, digitiform. Aedeagus rhomboid, bare, well sclerotized, parameres weakly sclerotized, with a pair of strong, straight spines close together medially. Tergite 9 present as a pair of wide posterior lobes covered with microtrichia and setae, straight on the outer margins, wider at base. Female terminalia with short incision on posterior margin of sternite 8.

**Description. Female** (Fig. G35A). Wing length, 2.38; width, 0.83. **Head.** Vertex dark caramel-brown, occiput dark caramel-brown. Scape and pedicel ochre-yellowish, first two flagellomeres light brown, remaining yellowish-brown at basal third, light brown at distal two-thirds. Face and clypeus light caramel-brown. Maxillary palpomeres light brownish. Scape 1.6× pedicel length; flagellomere 4 1.5× longer than wide, covered with scattered whitish setae. Face and clypeus light caramel-brown; face covered with short darker setae, clypeus short, densely covered with setulae. Palpomeres light brownish; labella whitish-yellow. Occiput with three longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, seven posteriorly to ocellus. Scape 1.6× pedicel length, flagellomere 4 1.5× width.

Palpomere 4 1.1× palpomere 3 length, palpomere 5 2.3× palpomere 4 length. **Thorax.**

Scutum dark caramel-brown, scutellum blackish-brown. Antepronotum and proepisternum light caramel-brown, anepisternum dark caramel-brown, light along anterior margin, other sclerites greyish-brown, mediotergite dark brown. Pleural membrane ochre-yellow. Haltere ochre-yellowish. Scutum with 5+1 supra-alars (first small) and three pairs of prescutellar bristles, scutellum with two pairs of bristles along posterior margin. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 16 small setae, laterotergite with two long setae and seven small setae.

Metepisternum with three fine setae. **Legs.** Coxae light ochre-yellowish, mid and hind coxae with a brown band basally, hind coxa with a brown posterior mark distally; femora light ochre-yellowish with a brown tinge along dorsal and ventral edges; tibiae ochre-yellowish, mid and hind tibiae greyish-brown at basal end, yellowish-brown at tip, tarsi light greyish-brown. Fore tibia with one strong seta on distal third of inner face; mid tibia with three irregular dorsolateral rows of 3–5 small bristles, one strong seta on distal third of inner face; hind tibia with three irregular rows of 3–5 dorsolateral small bristles and five larger setae on distal third of inner face. Front leg tarsomere 1 1.2× tibia length [tarsomeres 2–5 broken].

Hind tibial inner spur over 4.6× tibia width at apex. **Wing** (Fig. G35B). Membrane light brown fumose. C not extending beyond apex of R<sub>5</sub>. Sc barely produced. R<sub>1</sub> reaching C on distal fifth of wing; R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>. First sector of Rs nearly transverse, 0.52× r-m length; r-m almost longitudinal. M<sub>1+2</sub> 0.58× r-m length; bM about 4.7× r-m length; first sector of CuA about 0.18 length of second sector of CuA. Cubital pseudovein absent, CuP extending slightly beyond level of origin of M<sub>4</sub>. Anal fold gradually curved, nearly reaching wing margin. Posterior M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia on most of their length, M<sub>4</sub> with macrotrichia on distal three-fourths, CuA with macrotrichia on distal fourth, macrotrichia on anal lobe. **Abdomen.** Abdominal tergites 1–6 brown, posterior margin of tergite 6 yellowish, tergite 7 yellowish; sternites 1–7 whitish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G35C). Light brownish-yellow, cerci lighter. Sternite 8 trapezoid, elongate, posterior margin straight, with a rather deep medial incision, widespread microtrichia and small setae, posterior margin with longer setae. Sternite 9 with anterior apodeme extending beyond anterior end of terminalia, widening close to tip, genital chamber bell-shaped, lateral arms wide, distal end triangular, acute, bare. Tergite 8 wide, lateral lobes projected posteriorly with setae, with a slender medial connection. Tergite 9+10 present as a pair of slender sclerotized inclined band, connected to sternite 9 lateroventrally. Sternite 10 triangular, with some setae close to tip directed dorsally. Cercus large, cercomeres

1 and 2 fused, no sign of suture, basal three-fourths wider, posterior end digitiform, distal setae longer.

**Male.** As female, except for the following. **Terminalia** (Figs. G36A–B). Gonocoxites fused medially, no suture present, bare ventrally, a large and short medioventral projection, a laterodistal projection dorsally to insertion of gonostylus at each side that is over five times longer than length of syngonocoxite medially, with scattered fine setae along entire length, a couple of subdistal strong setae and some longer setae at tip. Gonostylus simple, digitiform, with fine setae, slightly stronger distally. Aedeagus rhomboid, bare, well sclerotized, parameres weakly sclerotized, projecting posteriorly beyond aedeagus, with a pair of strong, straight spines close together medially. Gonocoxal bridge wide, apodemes as a pair of long slender sclerotized bands. Tergite 9 present as a pair of wide posterior lobes covered with microtrichia and setae, straight on the outer margins, wider at base. Cerci not recognizable.  
(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000795>)

**Material examined.** **Holotype:** male, ZRC\_BDP0133402, National University of Singapore (Uhall), 17-May-17, MIP leg. (slide-mounted). **Paratypes:** 1 male, 4 females. **Males:** male, ZRC\_BDP0279158, Singapore, 7-Jun-18, MIP leg. (slide-mounted). **Females:** female, ZRC\_BDP0049300, National University of Singapore (Icube), 26.March-01.April.2015, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0049044, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0072662, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg.; ZRC\_BDP0072722, Bukit Timah, old secondary forest (BT01), 08-14.December.2016, MIP leg. **Additional sequenced specimens:** ZRC\_BDP0132824; ZRC\_BDP0133115; ZRC\_BDP0133129; ZRC\_BDP0133158; ZRC\_BDP0133169; ZRC\_BDP0133378; ZRC\_BDP0133417; ZRC\_BDP0133490; ZRC\_BDP0133504; ZRC\_BDP0133552; ZRC\_BDP0133945; ZRC\_BDP0279142; ZRC\_BDP0279159; ZRC\_BDP0284194; ZRC\_BDP0047073; ZRC\_BDP0120524; ZRC\_BDP0314152; ZRC\_BDP0314158; ZRC\_BDP0314159; ZRC\_BDP0314183.

**Etymology.** The species epithet of this species honors GAN Eng Seng (1844–1899), businessman and philanthropist, an early pioneer in Singapore. He is known for his generosity to many charitable causes in Malaya and Singapore during the British colonial era. He founded in 1885 the first school established by overseas Chinese in Singapore, which is one of the oldest educational institutions in the nation-state.

**Remarks.** There are five haplotypes for *Epicypta ganengsengi*, sp.nov., brought together in a single species with all species delimitation approaches, with specimens from urban forests and from the swamp forests.

***Epicypta leechooneoae* Amorim & Oliveira, sp.nov.**

(Figs. G37A-B)

**Diagnosis.** Head dark brown, antenna brown, scape and pedicel slightly lighter. Scutum and scutellum dark brown; pleural sclerites dark brown. Coxae yellowish, fore coxa with a brownish tinge, all three hind coxae with a brown proximal band; femora yellowish with a brownish tinge, mid and hind femora with a brown area at proximal and distal ends. Wing membrane light brownish, darker on cells c and br. C not produced beyond tip of  $R_5$ ;  $M_{1+2}$  nearly absent, many times shorter than length of r-m. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on third of second sector of CuA, macrotrichia on anal lobe. Abdominal tergites 1-7 dark-brown, sternite 1-7 light brown. Male terminalia gonocoxite short, a pair of long lobes projecting beyond tip of gonostylus, lateral lobe flat, setose, dorsal lobe digitiform, bare, except for a modified distal short spine; gonostylus digitiform small, capitate, with small distal setae; aedeagus with a pair of separate lateral blades; parameres with a pair of distal spines; tergite 9 with a pair of long, digitiform separate extensions.

**Description. Male.** Wing length, 2.66; width, 0.96. **Head.** Dark brown, antenna brown, scape and pedicel slightly lighter. **Thorax** (Fig. G37A). Scutum and scutellum dark brown; pleural sclerites dark brown. Haltere with light brown pedicel, whitish knob with light brownish tinge. Pleural membrane ochre-yellowish. Scutum no bristles except for nine supra-alars and three pairs of prescutellar bristles; three pairs of scutellar bristles and an additional pair of longer setae on margin outer end. Proepisternum with four long bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 11 fine small setae, laterotergite with five bristles and some few additional fine setae. **Legs.** Coxae yellowish, fore coxa with a brownish tinge, all three hind coxae with a brown proximal band; femora yellowish with a brownish tinge, front femur with a light brown band along dorsal and ventral edges, mid and hind femora with a slender brown band along ventral edge and a brown area at proximal and distal ends, mid femur with a row of small, conspicuous setae along entire dorsal edge. **Wing** (Fig. G37B). Membrane light brownish, darker on cells c and br. C not produced beyond tip of  $R_5$ ; Sc short, incomplete.  $R_1$  reaching C on distal fifth of wing;  $R_5$  reaching beyond level of tip of  $M_1$ . First sector of Rs transverse,  $0.30 \times$  r-m length; r-m almost longitudinal.  $M_{1+2} 0.35 \times$  r-m; bM  $2.9 \times$  r-m length; first sector of CuA about  $0.34 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP not reaching level of origin of  $M_4$ . Anal fold gently curved along basal three-fourth. Vein bR,  $R_1$ ,  $R_5$ , distal half of r-m,  $M_1$ ,  $M_2$ ,  $M_4$  and distal third of CuA with dorsal macrotrichia; anal lobe with dorsal macrotrichia.

**Abdomen.** Abdominal tergites 1–7 dark-brown, sternite 1–7 light brown. **Terminalia** (Figs. G37C–D). Gonocoxite short, a pair of long lateral setose lobes projecting beyond tip of gonostylus, dorsal lobe digitiform, long, mostly bare, a modified distal short spine. Gonostylus dorsoventrally compressed, capitate, with small setae distally. Aedeagus with a pair of parallel blades close to each other; parameres with a pair of long, distal spines close to each other. Tergite 9 with a pair of long, digitiform extensions, not reaching level of tip of gonocoxite lateral lobes.

**Material examined. Holotype:** male, ZRC\_BDP0132893, Singapore, (date range 2012–2018), MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species refers to The Nanyang University (Nan Yang meaning Southern Ocean, the sinocentric term for Southeast Asia), merged in 1980 with the University of Singapore to constitute the present National University of Singapore. The Nanyang University, which existed from 1956 to 1980, has been until 2005 the only private university in Singapore in the Chinese language.

### Group *nus*

*Epicypta nanyangu* Amorim & Oliveira, sp.nov.

(Figs. G38A–D, G39A–B)

**Diagnosis.** Head and scutum dark ochre-yellowish, scutellum brown; pleural sclerites greyish brown. Coxae and femora whitish, anterior leg with orangish tinge, hind coxa with a large brown area basally, hind femur conspicuously brownish along dorsal and ventral crest. Membrane fumose light brown, darker on cells c, br and r1. C clearly extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> 0.71× r-m length, r-m almost longitudinal. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub>, and on M<sub>4</sub> close to tip, no macrotrichia on anal lobe. Abdominal tergites 1–2 light brown, tergites 3–5 light brown with cream-yellow laterals, wider on tergites 4–5, tergite 6 light brown on anterior half, cream-yellow on posterior half, tergite 7 cream-yellow, terminalia whitish-yellow. Female terminalia sternite 8 with no medial incision along posterior margin.

**Description. Female.** Wing length, 2.02; width, 0.74. **Head.** Head dark ochre-yellowish. Scape and pedicel ochre-yellowish, flagellomeres light greyish-yellow. Face and clypeus ochre-yellow, labella whitish-yellow. Maxillary palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. Scape about  $1.5 \times$  pedicel length; flagellomere 4  $2.0 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $1.5 \times$  palpomere 4 length. **Thorax.** Scutum dark ochre-yellow; scutellum brown with ochre-yellow antero-lateral corners. Scutum with five supra-alar bristles and three pairs of prescutellar bristles; two pairs of scutellar bristles. Most antepronotum, proepisternum, anepisternum, katepisternum mesepimeron, laterotergite and metepisternum greyish ochre-brown, dorso-posterior corner ochre-yellow; mediotergite greyish ochre-brown dorsally, lighter ventrally. Haltere light ochre-yellowish, dark at base of knob, no larger setae. Pleural membrane yellowish. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 13 smaller setae, laterotergite with one bristle and six smaller setae. Metepisternum 24 small fine setae. **Legs.** Front coxa whitish-yellow with brownish tinge, mid and hind coxae whitish, hind coxa with dark brown basal fourth. Femora whitish-yellow with brownish tinge, a brown line along dorsal and ventral edges, hind femur with light brown distal fifth; tibiae and tarsi light ochre-brown, tarsi darker. Front tibia with two dorsal strong setae, mid tibia with two dorsolateral rows with 4–5 bristles, five bristles ventrally and one laterally on inner face, hind tibia with two dorsolateral rows with four bristles, three bristles on distal half of lateral external face. Mid and hind tarsomeres with rows of lateral and some few ventral setae. Front tibia  $1.3 \times$  length of tarsomere 1,  $1.7 \times$  tarsomere 2 length. Hind tibia inner spur over  $4 \times$  tibia width at apex. **Wing.** Membrane fumose light brown, darker on cells c, br and r1. R<sub>1</sub> reaching C on distal fourth. C not extending beyond tip of R<sub>5</sub>; R<sub>5</sub> reaching C at level of tip of M<sub>1</sub>. First sector of Rs slightly oblique,  $0.77 \times$  r-m length; r-m slightly oblique. M<sub>1+2</sub>  $0.71 \times$  r-m; bM slightly over  $7 \times$  r-m length. First sector of CuA about  $0.35 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP ending at about level of origin of M<sub>4</sub>. Anal fold gently curved, almost reaching wing margin. Dorsal macrotrichia on posterior veins M<sub>1</sub> and M<sub>2</sub> on most of their length, M<sub>4</sub> on distal half, CuA close to apex, some few macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1–2 light brown, tergite 3 mostly light brown with a small cream-yellow area latero-distally; tergites 4–5 light brown medially with wide cream-yellow area laterally, tergite 6 light brown on anterior half, cream-yellow on posterior half, tergite 7 cream-yellow; sternites 1–7 whitish-yellow, sternite 2 with a strong ventral pair of brown bristles. **Terminalia (Figs.**

**38C–D).** Whitish-yellow. Sternite 8 subquadrate, posterior end slightly more slender than anterior end, no lobes or incision along posterior margin, covered with microtrichia and fine setae, setae longer towards posterior end, four large setae along posterior margin. Sternite 9 slender, elongate, genital chamber slender, anterior arm long, reaching anterior end of terminalia, slightly widening at tip, lateral arms fused latero-posteriorly to tergite 9+10, three pairs of elongate setae at medio-distal margins. Tergite 8 straight at posterior margin, latero-anterior ends extending ventrally, bare medially, microtrichia and setae only at laterals, a wide and deep U-shape medial incision. Tergite 9+10 slender medially, laterals projected posteriorly, entirely bare. Cercomeres 1 and 2 probably fused, no sign of suture, digitiform, slightly curved inwards towards apex, covered with microtrichia and setae, four stronger distal setae.

**Male.** As male, except for the following. **Wing.** Length, 2.08; width, 0.75. **Terminalia** (Figs. 39A–B). Gonocoxites elongate, fused medially with no suture, with a long lateral digitiform lobe projecting beyond tip of gonostylus. Gonostylus slender basally, much wider towards apex, densely setose on distal half. Gonocoxal apodemes parallel, close to each other. Parameres elongate, blade-like, with a triangular distal end with a medial short and slender incision distally. Tergite 9 with a pair of setose digitiform lobes laterally connected anteriorly.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000736>)

**Material examined. Holotype:** male, ZRC\_BDP0048844, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted). **Paratypes:** 4 males, 23 females. **Males:** ZRC\_BDP0049088, Nee Soon (NS1), 18-24.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0049254, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0048456, Nee Soon (NS1), swamp forest, January-06.February.2013MIP leg. (slide-mounted); ZRC\_BDP0048864, Nee Soon (NS1), 04-10.December.2014, MIP leg. (slide-mounted). **Females:** ZRC\_BDP0048457, Nee Soon (NS2), swamp forest, 05-11.April.2012, MIP leg.; ZRC\_BDP0048463, Nee Soon (NS1), swamp forest, 01-07.November.2012, MIP leg.; ZRC\_BDP0048454, Nee Soon (NS1), swamp forest, 25-31.October.2012, MIP leg.; ZRC\_BDP0048682, Nee Soon (NS2), swamp forest, 29.August-05.September.2012, MIP leg.; ZRC\_BDP0048846, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0049002, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0047843, Nee Soon (NS1), swamp forest, 18-24.April.2013, MIP leg.; ZRC\_BDP0047903, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg.; ZRC\_BDP0048455, Nee Soon (NS1), swamp forest, 31.May-6.June.2012, MIP leg. (website photo specimen); ZRC\_BDP0048458, Nee Soon (NS2), swamp forest, 07-13.June.2012, MIP leg. (website photo specimen); ZRC\_BDP0048470, Nee Soon (NS2), swamp forest, 26.December.2012-02.January.2013, MIP leg.; ZRC\_BDP0048910, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048926, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0048990, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049004, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049046, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049083, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049102, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049103, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049110, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049116, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049126, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049224, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Additional sequenced specimens:**

female, ZRC\_BDP0155116 (website photo specimen); female, ZRC\_BDP0133913; ZRC\_BDP0133926 (abdomen missing); ZRC\_BDP0133452;

**Etymology.** The species epithet of this species refers to The Nanyang University (Nan Yang meaning Southern Ocean, the sinocentric term for Southeast Asia), merged in 1980 with the University of Singapore to constitute de present National University of Singapore. The Nanyang University, which existed from 1956 to 1980, has been until 2005 the only private university in Singapore in the Chinese language.

**Remarks.** There are ten haplotypes of this species and all delimitation approaches bring them together into a single species, with two 1% subclusters were formed.

***Epicypta nus* Amorim & Oliveira, sp.nov.**

(Figs. G40A–D, G41A–B)

**Diagnosis.** Head bright ochre-yellow, antennal scape, pedicel and first two flagellomeres ochre-yellowish, other flagellomeres grey-brownish. Scutum ochre-yellow, scutellum light brown; pleural sclerites light greyish-brown, antepronotum, proepisternum, anterior and posterior ends of anepisternum more ochre-yellow; laterotergite and mediotergite brown. Fore coxa and femur whitish with orange tinge, mid and hind coxae whitish with a brown mark at basal end, mid and hind femora light whitish-yellow with a brownish line along ventral and dorsal crests. Wing membrane light brownish, darker along cells c and br. C produced beyond tip of  $R_5$ ;  $M_{1+2}$  almost as long as r-m. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergite 1 ochre-yellowish, tergites 2–5 ochre-yellowish with a small brown mark latero-posteriorly, tergite 6 brownish on anterior half, ochre-yellow on posterior half, tergite 7 ochre-yellow, terminalia yellowish. Gonocoxites medial suture evident, a long lateral lobe widening towards apex and an even longer digitiform dorsal lobe; gonostylus small, digitiform, slightly wider subapically; parameres with a pair of subapical spines and a pair of lateral lobes similar to can openers; tergite 9 with a pair of long digitiform extensions.

**Description. Female** (Fig. G40A). Wing length, 2.11; width, 0.77. **Head** (Fig. G40B).

Vertex ochre-yellowish. Scape and pedicel whitish-yellow, flagellomeres ochre-yellow with

whitish band basally. Face and clypeus light ochre-yellow. Palpomeres yellowish-ochre; labella whitish. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. Scape about  $1.5 \times$  pedicel length; flagellomere 4  $1.5 \times$  longer than wide. Palpomere 4  $1.3 \times$  palpomere 3 length, palpomere 5  $1.4 \times$  palpomere 4 length. **Thorax.** Scutum ochre-yellowish, with a pair of dark brown marks medially at posterior margin, scutellum light brown. Scutum with seven long supra-alar setae and three pairs of prescutellars bristles; two pairs of scutellar bristles and one additional outer pair of long setae. Antepronotum yellowish-ochre on dorsal half, brownish-ochre on ventral half, anepisternum light brown medially, light yellowish-ochre on antero-ventral corner, yellowish-ochre on posterior fourth, katepisternum, anepimeron, laterotergite and metepisternum light brown. Haltere whitish with some ochre areas, no larger setae. Pleural membrane yellowish. Anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 15 small setae, laterotergite with one bristle and 8 small setae; metepisternum with 18 small fine setae. **Legs.** Coxae whitish, front coxa with brownish tinge, mid coxa with brownish tinge on basal half, hind coxa light brown on basal fifth. Femora whitish-yellow with brownish tinge, tibiae and tarsi light ochre-yellow. Mid coxa with a small band of fine setae across proximal fifth, hind coxa covered with fine setae on proximal fifth. Front tibia with one bristle dorsoventrally, mid tibia with two dorsolateral rows of 4–5 bristles, a row with 3 bristles on outer face and a row of three bristles ventrally, hind tibia with two dorsolateral rows with five bristles and a lateral row with two longer setae. Fore leg tarsomere 1  $0.9 \times$  tibial length,  $1.4 \times$  tarsomere 2 length. Hind tibial inner spur  $5.0 \times$  tibia width at apex. **Wing** (Fig. G40C). Membrane light yellowish fumose, darker along anterior margin. Sc very short (visible with phase contrast), ending free. C extending beyond tip of R<sub>5</sub> for one third of distance to M<sub>1</sub>. R<sub>1</sub> reaching C on wing distal fourth; R<sub>5</sub> reaching C before level of tip of M<sub>1</sub>. First sector of Rs slightly oblique, bare,  $0.52 \times$  r-m length; r-m slightly oblique. M<sub>1+2</sub> 0.89 r-m length; bM  $4.3 \times$  longer than r-m; first sector of CuA about 0.45 length of second sector of CuA. CuP well produced to level of origin of M<sub>4</sub>. Anal fold only gently curved, almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia on about distal three-fourth, M<sub>4</sub> on distal half, CuA on distal end; anal lobe with dorsal macrotrichia. **Abdomen.** Abdominal tergites dark ochre-yellowish with light brown marks, tergite 2–5 light brown on posterior half or third, ochre-yellowish on anterior half or two-thirds, tergite 6 light brown on anterior half, ochre-yellowish on posterior half; sternites 1–7 as tergites but lighter. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G40D). Light brownish-yellow. Sternite 8 large, trapezoid, distal end more slender than anterior end,

posterior margin with a short medial incision, microtrichia and setae concentrated mainly on distal half, two pairs of long setae subapically. Sternite 9 with wide medial arms, anterior apodeme (notum) long, extending beyond anterior end of terminalia, genital chamber elongate. Sternite 10 with distal end acute, with some subapical setulae laterally. Tergite 8 large, a complete suture dividing the tergite into a pair of plates barely in contact medially, a pair of apodemes extending anteriorly from lateral corners, microtrichia spread on posterior half, setae restrict to posterior margins, longer laterally. Tergite 9+10 also separate into a pair of separate sclerites with a slender medial connection, bare. Cercomeres 1 and 2 fused, no sign of suture, basal half wider, posterior end digitiform, distal setae longer.

**Male.** As male, except for the following. **Wing.** Length, 1.92; width, 0.69 mm. **Terminalia** (Figs. G41A–B). Yellowish. Gonocoxites medially fused, suture evident, bare ventrally, with a long lateral, setose lobe widening towards apex, much longer than gonostylus and an even longer digitiform dorsal lobe. Gonostylus small, simple, digitiform, slightly wider subapically. Parameres with a pair of strong subapical spines on a triangular projection, laterally with a pair of strong bifid lobes similar to can openers. Tergite 9 present as a pair of long distal, setose extensions. No sign of cerci.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000734,-002127>)

**Material examined. Holotype:** male, ZRC\_BDP0047864, Nee Soon (NS2), swamp forest, 13-19.March.2014, MIP leg. (imaged, slide-mounted). **Paratypes:** 14 males, 15 females. **Males:** ZRC\_BDP0048469, Nee Soon (NS1), swamp forest, 01-07.November.2012, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0048747, Nee Soon (NS1), 19-25.February.2015, MIP leg.; ZRC\_BDP0048799, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0049244, Nee Soon (NS1), 04-10.December.2014, MIP leg. ZRC\_BDP0066812, Bukit Timah, maturing secondary forest (BT08), 10-16.August.2016, MIP leg.; ZRC\_BDP0072663, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg.; ZRC\_BDP0072667, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg.; ZRC\_BDP0072718, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072723, Bukit Timah, maturing secondary forest (BT06), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072726, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0072742, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0074042, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg.; ZRC\_BDP0072734, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; male, ZRC\_BDP0155084, Singapore, NSM1, 3-Dec-14, MIP leg. (imaged) **Females:** ZRC\_BDP0048451, Nee Soon (NS2), swamp forest, 06-12.December.2012, MIP leg. (extracted); ZRC\_BDP0048798, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048805, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048881, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048900, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0048916, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048920, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0049059, Nee Soon (NS2), 01-07.January.2015, MIP leg.; ZRC\_BDP0049119, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049125, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049178, Nee Soon (NS2), 07-13.May.2015, MIP leg.; ZRC\_BDP0072690, Bukit Timah, maturing secondary forest (BT06), 22-28.December.2016, MIP leg.; ZRC\_BDP0072708, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072728, Bukit Timah, primary forest (BT05), 08-14.December.2016, MIP leg.; ZRC\_BDP0074036, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg. **Additional sequenced specimens:** ZRC\_BDP0066820; ZRC\_BDP0078947; ZRC\_BDP0078970; ZRC\_BDP0078974; ZRC\_BDP0133970; ZRC\_BDP0279165; ZRC\_BDP0284198; ZRC\_BDP0049090; ZRC\_BDP0058587; ZRC\_BDP0058589;

ZRC\_BDP0058591; ZRC\_BDP0058592; ZRC\_BDP0058594; ZRC\_BDP0058596; ZRC\_BDP0058597; ZRC\_BDP0058623; ZRC\_BDP0058665; ZRC\_BDP0058666; ZRC\_BDP0058670; ZRC\_BDP0058672; ZRC\_BDP0058723; ZRC\_BDP0058732; ZRC\_BDP0058735; ZRC\_BDP0058752; ZRC\_BDP0058754; ZRC\_BDP0058769; ZRC\_BDP0058771; ZRC\_BDP0058787; ZRC\_BDP0066716; ZRC\_BDP0066741; ZRC\_BDP0066763; ZRC\_BDP0066770; ZRC\_BDP0066772; ZRC\_BDP0067855; ZRC\_BDP0071058; ZRC\_BDP0082291; ZRC\_BDP0082293; ZRC\_BDP0082332; ZRC\_BDP0082333; ZRC\_BDP0120476; ZRC\_BDP0120520; ZRC\_BDP0120536; ZRC\_BDP0128621; ZRC\_BDP0128629; ZRC\_BDP0137060; ZRC\_BDP0137064; ZRC\_BDP0137076; ZRC\_BDP0303885; ZRC\_BDP0314083.

**Etymology.** The species epithet of this species refers to the National University of Singapore, NUS, the national research university of Singapore. Founded in 1905 as the Straits Settlements and Federated Malay States Government Medical School, NUS is the oldest higher education institution in Singapore. It is consistently ranked within the top 20 universities in the world and is considered to be the best university in the Asia-Pacific by the QS ranking. NUS offers a wide range of disciplines, including the sciences, medicine and dentistry, design and environment, law, arts and social sciences, engineering, business, computing and music at both the undergraduate and postgraduate levels. The name is used in apposition.

**Remarks.** There are three haplotypes in our samples for *Epicypta nus*, sp.nov., which come together into a single species according to all delimitation approaches.

***Epicypta peterngi* Amorim & Oliveira, sp.nov.**

(Figs. G42A–E)

**Diagnosis.** Head ochre-yellowish with large brownish areas, antennal scape, pedicel and first flagellomere, remaining flagellomere light greyish-brown. Scutum dark brown, with ochre-yellowish band at anterior end; scutellum blackish-brown; thoracic pleural sclerites dark brown. Coxae whitish, tip of mid and hind femora with a brown mark. Wing membrane light brownish fumose, area along anterior margin on basal half of wing more yellowish. C not extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> about half of r-m length. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub>, no macrotrichia on anal lobe. Abdominal tergite 1 dark brown, tergites 2–5 greyish-brown medially with lateral cream-yellow band, which is larger on tergites 3–4 and connect each other medially on tergite 5, tergites 6–7 greyish-brown. Gonocoxites with a long lateral lobe and a long digitiform dorsal lobe; gonostylus bifid at base, a short, digitiform internal lobe and a longer outer lobe; aedeagus with a pair of parallel

projections distally; paramere with a pair of strong spines on a triangular projection distally; tergite 9 with a pair of long projections slender towards apex.

**Description. Male.** Wing length, 2.56; width, 0.93. **Head.** Light brownish-yellow medially, ochre-yellowish laterally. Scape and pedicel greyish ochre-yellow, flagellomeres ochre-yellow. Face and clypeus light brownish-yellow, palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter, labella whitish-yellow. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, ten posteriorly to ocellus. Scape about  $2.0 \times$  pedicel length; flagellomere 4  $1.5 \times$  longer than wide. Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $1.9 \times$  palpomere 4 length. **Thorax.** Scutum dark brown anterior end ochre-yellow, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum, proepisternum, anepisternum, katepisternum, mesepimeron, laterotergite and metepisternum dark greyish-brown, katepisternum slightly lighter, dark brown. Haltere light ochre-yellowish, no larger setae. Pleural membrane ochre-yellow. Scutum with nine supra-alar and three pairs of prescutellar bristles, two pairs of scutellar bristles and one outer pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two small bristles and 18 small setae, laterotergite with three bristles, one long seta and 18 small setae. Metepisternum with 18 fine setae. **Legs.** Front coxa whitish with an orangish tinge, mid and hind coxae whitish, hind coxa with a light brownish tinge at basal end; femora whitish with a light brown tinge, mid and hind femora darker at tip; tibiae and tarsi light ochre-yellow, tibia and each tarsomere with a yellowish tinge at tip. Front tibia with two lateral bristles medially; mid tibia with 2–3 irregular rows of 4–6 small bristles dorsally, one bristle on inner face medio-distally and three long setae along ventral edge; hind tibiae with two irregular rows of six small bristles dorsally and four longer setae at inner face medio-distally. Front leg tarsomere 1 as long as tibia,  $1.4 \times$  tarsomere 2 length. Hind tibial inner spur  $4.4 \times$  tibia width at apex. **Wing** (Fig. G42B). Membrane fumose light brown, darker along anterior margin. Sc barely produced. C not produced beyond tip of  $R_5$ .  $R_1$  reaching C on distal sixth of wing;  $R_5$  reaching C before level of tip of  $M_1$ . First sector of Rs oblique,  $0.63 \times$  r-m length; r-m oblique.  $M_{1+2}$   $0.61 \times$  r-m length; bM  $4.6 \times$  r-m length; first sector of CuA  $0.29 \times$  length of second sector of CuA. Cubital pseudovein not produced, CuP extending slightly beyond level of origin of  $M_4$ . Anal fold almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  almost entirely with dorsal macrotrichia,  $M_4$  with macrotrichia on distal half, CuA with macrotrichia on distal fourth of wing; some few macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 greyish-brown medially, ochre-yellowish laterally,

tergites 2–5 light brown medially, with cream-yellow areas laterally and anteriorly, wider on posterior segments, tergite 6 almost entirely brownish, with only an ochre-yellow tinge latero-anteriorly, tergite 7 cream-yellow; sternites 1–7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G42C–D). Ochre-yellowish.

Gonocoxites fused medially, no suture present, bare ventrally, a medioventral projection slightly at base than at tip, about half of gonostylus length, with four setulae at distal end, sided by a pair of shorter digitiform projections with three distal small setae, a pair of long laterodistal extensions slightly shorter than gonostylus. Gonostylus simple, elongate, slightly clavate, dorsoventrally compressed, with fine setae along inner margin. Aedeagus large, oblong, ejaculatory apodeme slender at anterior end, wide midway to apex, then divided distally into a pair of lobes extending posteriorly and pointed at tip, extending beyond tip of laterodistal projections of gonocoxite, gonopore dorsally to base, between these lobes; paramere as a triangular sclerite extending distally, medial short beak at tip with a pair of subapical small setae close to each other and a pair of strong curved spines close to tip, laterally with a pair of long, digitiform projections extending beyond tip of gonocoxite lateral lobes, five setae along most of their length. Gonocoaxal bridge not evident. Tergite 9 present as a pair of long laterodistal digitiform extensions, about as long as gonocoxite lateral extensions, setose at tip. Cerci weakly sclerotized between tergite 9 elongate lateral lobes.

**Female** (Fig. G42A). As male, except for the following. **Wing**. Length, 2.75; width, 1.01 mm. **Head**. Occiput with four longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, 8 posteriorly to ocellus. **Thorax**. Scutum with eight supra-alar bristles and three pairs of prescutellars; three pairs of scutellar bristles, outer pair smaller. Proepisternum with four bristles directed ventrally, anepisternum with 5–6 bristles along posterior margin. Mesepimeron with three bristles and 19 small setae and setulae, laterotergite with three bristles and 17 smaller setae or setulae. Metepisternum with 20 small fine setae. **Legs**. Front tibia with two bristles at outer face, mid tibia with two dorsolateral rows of 4–5 small bristles, one bristle on outer face medio-distally and 4 strong setae along ventral margin; hind tibia with three irregular rows of 4–6 small bristles. **Terminalia** (Fig. G42E). Light brownish-yellow. Sternite 8 elongate, posterior margin with a short median incision, microtrichia and setae evenly distributed, long setae at posterior margin. Sternite 9 slender, anterior apodeme extending to slightly beyond anterior end of terminalia, lateral arms ovoid, elongate, genital chamber elongate. Tergite 8 with a pair of separate large lateral lobes with microtrichia and setae. Tergite 9+10 slender, a pair of sclerotized bands connected medially. Cercomeres 1 and

2 fused, no sign of suture, elongate, wider midway to apex posterior end digitiform, distal setae longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000794>)

**Material examined. Holotype:** male, ZRC\_BDP0047888, Nee Soon (NS2), swamp forest, 17-23.October.2013, MIP leg. (slide-mounted). **Paratypes:** 1 male, 1 female. Male: ZRC\_BDP0047907, Nee Soon (NS2), swamp forest, 24-30.October.2013, MIP leg. Female: ZRC\_BDP0047927, Nee Soon (NS1), swamp forest, 11-17.July.2013, MIP leg. (website photo specimen, slide-mounted).

**Additional sequenced specimens.** Male, ZRC\_BDP0154987 (website photo specimen).

**Etymology.** The species epithet of this species honors Peter NG Kee Lin (1960-), prominent crustacean and fish systematist, with contributions to conservation biology and aquatic ecology. He has been the Director of the Raffles Museum of Biodiversity Research since 1998 and published over 1,000 scientific papers.

**Remarks.** *Epicypta peterngi*, sp.nov., with *E. wallacei*, sp.nov. and *E. purchoni*, sp.nov., seem to be part of a small clade within the genus, as indicated particularly by the shape of the aedeagus, besides similarities shared by a larger group of species, as the spines distally on the parameres.

### ***Epicypta maggielima* Amorim & Oliveira, sp.nov.**

(Figs. G43A–D)

**Diagnosis.** Head dark brown, antennal scape, pedicel and first flagellomere ochre-yellowish, other flagellomeres grey-brownish. Scutum dark ochre-yellow with a blackish-brown mark on posterior fifth, scutellum blackish-brown; pleural sclerites with a dark ochre-yellow background, antepronotum, proepisternum, katepisternum and mesepimeron more brownish, mediotergite blackish-brown on posterior half, paratergite blackish-brown. Fore coxa and femur whitish with orange tinge, mid coxa and femur whitish, femur with a faint brownish mark dorsally close to tip. Wing membrane light brownish, more yellowish along cells c and br; C clearly produced beyond tip of  $R_5$ ;  $M_{1+2}$   $0.80 \times r\text{-}m$ . Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA distal half, anal lobe slender, no macrotrichia on membrane. Abdominal tergites ochre-yellowish. Female terminalia vaginal furca with wide, rounded anterior half.

**Description. Female** (Fig. G43A). Wing length, 2.00; width, 0.75. **Head.** Dark brown. Scape and pedicel greyish ochre-yellow, flagellomere 1 light brownish-yellow, flagellomeres 2–14 light greyish-brown. Face and clypeus brown. Palpomeres 1–3 brownish-yellow, palpomeres 4–5 lighter. Labella whitish-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, six posteriorly to ocellus. Scape  $1.8 \times$  pedicel length, flagellomere 4  $1.8 \times$  longer than wide. Palpomere 4  $1.5 \times$  palpomere 3 length, palpomere 5  $1.7 \times$  palpomere 4 length. Scutum with 4+3 supra-alar bristles, three pairs of prescutellars; two pairs of scutellar bristles and one additional external pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 12 small setae and setulae, laterotergite with two bristles and 13 small setae. Metepisternum with 23 fine setae. **Thorax** (Fig. G43B). Scutum caramel-yellow, a blackish-brown medial band at posterior end; scutellum blackish-brown with ochre-yellow laterals. Antepronotum, proepisternum, katepisternum, dorsal half of mesepimeron and anterior end of laterotergite brownish, ventral half of mesepimeron and most of laterotergite caramel-brown, anepisternum caramel-brown with dark areas dorso-anteriorly, mediotergite blackish-brown medially, caramel-yellow laterally. Pleural membrane ochre-yellow. Scutum with 4+3 long supra-alar bristles, three pairs of prescutellar bristles; two pairs of bristles and one additional external pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two longer setae and 17 small setae and setulae, laterotergite with no bristles, only four small setae [hind legs and posterior part of thorax missing in holotype]. **Legs.** Front coxa light yellowish-brown with an orangish tinge, mid coxa whitish. Front and mid femora concolor with front coxa, mid femur with light brown tip. Front and mid tibiae and tarsi ochre-yellow, tibiae with brownish-yellow tip. Mid coxa with a small group of fine setae across proximal fifth. Front tibia with one strong seta medially on external face, mid tibia with two irregular dorsolateral rows of 3–5 brownish bristles laterally, one lateral seta on external face on distal fourth, three bristles along ventral edge. Hind tibia inner spur  $6.7 \times$  tibia width at apex. **Wing** (Fig. G43C). Membrane fumose light brown, slightly darker along anterior margin. C extending beyond apex of  $R_5$  for a third of distance to  $M_1$ . Sc short, weakly sclerotized beyond humeral vein.  $R_1$  reaching C on distal fourth of wing;  $R_5$  reaching C before level of tip of  $M_1$ . First sector of  $Rs$  slightly oblique,  $0.82 \times r-m$  length;  $r-m$  slightly oblique.  $M_{1+2}$   $1.8 \times r-m$  length;  $bM$   $9 \times r-m$  length; first sector of  $CuA$   $0.25 \times$  length of second sector of  $CuA$ . Cubital pseudovein absent,  $CuP$  reaching slightly beyond level of origin of  $M_4$ . Anal fold only gently curved, almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  with dorsal macrotrichia along most of their length,  $M_4$  with

macrotrichia along distal half, CuA with macrotrichia on distal third, anal lobe with no macrotrichia. **Abdomen.** Abdominal tergite 1 ochre-yellowish, tergites 2–5 light brownish-yellow medially, with a wide light ochre-yellowish band laterally, tergites 6–7 light ochre-yellowish; sternites 1–7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G43D). Ochre-yellowish. Sternite 8 trapezoid, posterior margin with no medial incision, microtrichia and setae concentrated mainly on distal half. Sternite 9 with lateral arms slender, anterior apodeme wide, rounded anteriorly, genital chamber elongate. Sternite 10 with distal end acute, with some subapical setulae laterally. Tergite 8 short and bare medially, lateral lobes slightly projected posteriorly and entirely separated medially, microtrichia spread on posterior half, setae restrict to posterior margins, longer laterally. Tergite 9+10 with a slender medial bare sclerotized band connecting a pair of lobes fused to sternite 9 lateroventrally. Cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000828>)

**Material examined. Holotype:** female, ZRC\_BDP0048259, Sungei Buloh (SB1), mangrove, 03–09.October.2013, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors Maggie LIM (née Tan; 1913–1995), a physician, public health official and family planning and reproductive rights advocate. She was the first girl in Singapore to win the Queen’s Scholarship in 1930. During World War II, Lim was a camp medical doctor at Endau Settlement in Johor. After the war, she worked as an obstetrician and public health official in Singapore. She was president of the Family Planning and Population Board, and an advisor to the Midwives’ Council. Later in her career, Lim became a professor of epidemiology and public health at the University of Hawai’i’s East–West Center. She was inducted into the Singapore Women’s Hall of Fame in 2014.

### *Epicypta yupeigaoae* Amorim & Oliveira, sp.nov.

(Figs. G44A–C)

**Diagnosis.** Light brownish-yellow, lighter laterally, antennal scape and pedicel ochre-yellowish, flagellomeres light brown. Scutum ochre-yellow with a transverse dark brown

mark medially at posterior end, scutellum ochre-yellow with a brown medial mark. Pleural sclerites light brown, antepronotum and proepisternum yellowish-brown. Wing membrane light brown, cells c and br darker. C produced way beyond tip of  $R_5$ ;  $M_{1+2}$   $1.0 \times r-m$  length; dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on distal end of CuA, macrotrichia on anal lobe. Abdominal tergites 1–6 light yellowish-brown on anterior half, light brown on posterior half, tergite 7 ochre-yellowish. Gonocoxites medially fused, a medial projection rounded distally, a long lateral lobe widening towards apex and an even longer digitiform lobe dorsally; gonostylus small; parameres with a pair of subapical spines and a pair of lateral lobes similar to can openers; tergite 9 with a pair of long, setose digitiform extensions.

**Description. Male.** Wing length, 1.86; width, 0.70. **Head** (Fig. G44A). Light brownish-yellow, lighter laterally on occiput. Scape and pedicel ochre-yellowish, flagellomeres light brown. Face and clypeus light brownish-yellow, palpomeres light brown, labella whitish-yellow. Occiput with 3 longer setae dorsally to eye anteriorly to ocellus, 3 dorsally to ocellus, 8 posteriorly to ocellus. Scape about  $1.4 \times$  pedicel length; length of flagellomere 4  $1.9 \times$  width. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $2.3 \times$  palpomere 4 length. **Thorax**. Scutum ochre-yellow with a transverse dark brown mark medially at posterior end; scutellum ochre-yellow with a brown transverse mark medially at anterior end. Antepronotum and proepisternum yellowish-brown, anepisternum, katepisternum, mesepimeron and laterotergite light brown, metepisternum and mediotergite light brown. Haltere ochre-yellowish. Pleural membrane ochre-yellow. Scutum with 5+2 supra-alars and three pairs of prescutellar bristles, two pairs of scutellar bristles and one outer pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two small bristles and eight small setae, laterotergite with one bristle and ten small setae.

Metepisternum with 12 fine setae and setulae. **Legs**. Front coxa whitish with an orangish tinge, mid and hind coxae whitish, mid and hind coxae with a brownish band at proximal end, mid coxa brownish at anterior face distally, hind coxa with a brown mark at distal third on posterior face; front femur light yellowish-brown, mid and hind femora light brown; front tibia and tarsus light yellowish-brown, hind tibia light brown, tarsus light yellowish-brown [mid tibiae and tarsi missing]. Front tibia with two lateral bristles medially; hind tibia with 2–3 irregular rows of 5 small bristles dorsally, 2–3 bristles on inner face medio-distally. Front leg tarsomere 1 about as long as tibia,  $1.4 \times$  tarsomere 2 length. Hind tibial inner spur  $5.3 \times$  tibia width at apex. **Wing** (Fig. G44B). Membrane fumose light brown, darker along anterior margin. Sc barely produced. C produced beyond tip of  $R_5$  for about a third of distance to  $M_1$ .

$R_1$  reaching C on distal fourth of wing;  $R_5$  reaching C close to level of tip of  $M_2$ . First sector of Rs almost transverse,  $0.60 \times r\text{-}m$  length;  $r\text{-}m$  oblique.  $M_{1+2}$  about  $1.0 \times r\text{-}m$  length;  $bM$   $4.6 \times r\text{-}m$  length; first sector of CuA short,  $0.46 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP not reaching level of origin of  $M_4$ . Anal fold only gently curved, almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  almost entirely with dorsal macrotrichia,  $M_4$  with macrotrichia on distal three-fourths, CuA with macrotrichia on distal fifth of wing; macrotrichia on anal lobe. **Abdomen.** Abdominal tergites 1–6 light yellowish-brown on anterior half, light brown on posterior half, tergite 7 ochre-yellowish; sternites 1–7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G44C). Ochre-yellowish. Gonocoxites fused medially, no suture present, bare ventrally, a large medioventral projection of syngonocoxite, wide at base, with two pairs of setulae subapically, extending to about three-fourth of gonostylus length, a pair of long laterodistal extensions dorsally to insertion of gonostylus and extending much beyond tip of gonostylus, with fine setae on dorsal face on basal half and with five fine setae on inner margin on distal half, a setula at tip. Gonostylus composed of two lobes in connection only at base, inner lobe smaller, with a pair of longer setae at base of lobe on dorsal face and fine setae on ventral face at distal half; outer lobe larger, extending to level of tip of aedeagal distal projections, also compressed, more densely setose, with setae on both faces, more distal setae on inner face curved, larger setae along posterior end of outer face. Aedeagal-parameral complex with a more ventrally pair of sclerite connected together anterior and projected posteriorly as a strongly sclerotized bottle-openers extending slightly beyond tip of gonostylus and a medial short distal triangular projection more dorsally at tip, with two pairs of subapical small setae close to each other and a pair of strong spines close to tip. Gonocoxal bridge evident, incomplete medially, a pair of oblique apodemes directed anteriorly. Tergite 9 present as a pair of long laterodistal digitiform extensions, about as long as gonocoxite lateral extensions, setose at tip. Cerci not visible.

**Female.** Unknown.

**Material examined. Holotype:** male, ZRC\_BDP0066740, Bukit Timah, primary forest (BT05), 24–30.August.2016, MIP leg. (slide-mounted).

**Etymology.** The species epithet of this species honors Madame YU Pei Gao, inaugural principal of the Singapore Nanyang Girls' School – the first Chinese educational institution for girls in Singapore. Yu was an independent-minded principal who challenged obsolete

traditions such as allowing only female teachers for a girl's school, and hired teachers based on their capabilities instead of gender.

**Remarks.** *Epicypta yupeigaoae*, sp.nov. is obviously close to *E. nus*, sp.nov., as can be inferred by the uniquely derived can-opener shape of the paramere. The haplotype network leaves no question that they are separate species. We have the mitogenome of *E. nus*, sp.nov., but not of *E. yupeigaoae*, sp.nov.

### Group *annwee*

#### *Epicypta annwee* Amorim & Oliveira, sp.nov.

(Figs G45A–D)

**Diagnosis.** Head ochre-yellow, antennal scape, pedicel and flagellomeres 1 and 2 ochre-yellowish, distal flagellomeres dark brown. Scutum ochre-yellow, scutellum dark brown; most pleural sclerites dark ochre-yellow, some sclerites with brownish diffuse marks; mediotergite and metepisternum brown. Coxae and femora whitish, fore coxa with brownish tinge, femora with dorsal and ventral crest orange-brown, hind femur with brownish tip. Wing membrane light brownish, area along anterior margin slightly darker. C not extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> clearly shorter than r-m. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub> and distal end of CuA, macrotrichia on anal lobe. Abdominal tergite 1 brown, tergites 2–6 dark caramel-brown, whitish laterally, tergite 7 cream-yellow, terminalia whitish-yellow with brownish tinge. Gonocoxites fused medially, no suture, a pair of laterodistal long digitiform lobes slightly widening towards apex. Gonostylus simple, elongate, directed inwards. Aedeagus widening midway to apex, with a pair of separate distal gonopores at tip of tubular extensions. Parameres with a pair of strong setae at tip. Tergite 9 with a pair of entirely separated, elongate and compressed lobes, as long as gonocoxite laterodistal lobes.

**Description. Male.** Wing length, 2.27; width, 0.83 mm. **Head.** Head ochre-yellowish. Scape and pedicel light ochre-yellowish, first two flagellomeres ochre-yellowish, remaining flagellomeres brown. Face and clypeus light brown, palpomeres 1–3 ochre-yellowish, 4–5 whitish-yellow, labella cream-yellow. Occiput with two longer setae dorsally to eye

anteriorly to ocellus, two dorsally to ocellus, five posteriorly to ocellus. Scape about  $1.6 \times$  pedicel length; flagellomere 4  $2.0 \times$  as long as wide. Palpomere 4  $1.3 \times$  palpomere 3 length, palpomere 5  $2.0 \times$  palpomere 4 length. **Thorax.** Scutum ochre-yellow, scutellum blackish-brown with ochre-yellow antero-lateral corners. Antepronotum and ventral half of katepisternum light ochre, proepisternum, proepimeron, most of anepisternum, dorsal half of katepisternum, mesepimeron and laterotergite light greyish-brown with some diffuse lighter areas, metepisternum dark greyish-brown, mediotergite brown, lighter lateroventrally. Haltere pedicel whitish, knob brownish basally, whitish distally. Pleural membrane yellowish. Scutum with six supra-alar long setae and three pairs of prescutellars, two pairs of scutellar bristles and one outer pair of longer setae. Proepisternum with three bristles directed ventrally, anepisternum with five bristles along posterior margin. Mesepimeron with three long setae and 29 small setae, laterotergite with two long setae and five smaller setae. Metepisternum with eight small setae. **Legs.** Front coxa light whitish-yellow, mid and hind coxae whitish; femora, tibiae, and tarsi light whitish-yellow, tarsi darker, femora with a yellowish-brown line along dorsal edge, hind femur with brown tip. Front tibia with two latero-dorsal strong setae medially, mid tibia with two dorsolateral rows of 4–5 bristles and two strong setae along ventral edge, hind tibia with a row of six bristles dorsally, a line of four long setae on outer lateral face and five bristles on inner lateral face. Fore leg tarsomere 1  $1.2 \times$  tibia length,  $1.9 \times$  tarsomere 2 length, mid and hind tarsomeres 1–3 with rows of ventral setae besides trichia. Hind tibia inner spur  $5 \times$  tibia width at apex. **Wing** (Fig. G45B). Membrane fumose light brown, darker on cells c, br and r1. Sc barely produced. C not extending beyond apex of R<sub>5</sub>. R<sub>1</sub> reaching C on distal sixth, R<sub>5</sub> reaching C slightly beyond level of tip of M<sub>1</sub>. First sector of Rs oblique, slightly over half of r-m length; r-m almost longitudinal. M<sub>1+2</sub> short,  $0.68 \times$  r-m length; bM about  $5 \times$  r-m length; tip of M<sub>1</sub> slightly curved posteriorly at tip. First sector of CuA  $0.34 \times$  length of second sector of CuA. Cubital pseudovein not produced, CuP extending slightly beyond level of origin of M<sub>4</sub>. Anal fold long, only gently curved, almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia along most of their length, M<sub>4</sub> and CuA restricted to distal end; anal lobe with some macrotrichia. **Abdomen.** Abdominal tergite 1 greyish-brown, with dark brown mark along posterior margin, tergite 2 brown, tergites 3–5 light-brown medially with cream-yellow marks laterally and along anterior margin, tergite 7 cream-yellow; sternites 1–7 whitish-yellow. Sternite 2 with a pair of strong ventral brown bristles. **Terminalia** (Fig. G45C). Whitish-yellow. Gonocoxites fused medially, no suture, bare ventrally, a pair of laterodistal long digitiform lobes with long setae on ventral, outer and dorsal faces, dorsal

face of terminalia without clear dorso-medial borders, a pair of digitiform projections medio-posteriorly with 4–5 fine setae at tip. Gonostylus simple, elongate, directed inward, basally about as wide as base of laterodistal projection of gonocoxite, slender towards tip, slightly tapered distally, two fine sub-basal setae and some few setulae at tip. Aedeagus with an anterior medial ejaculatory apodeme, widening midway to apex, divided into a pair of separate distal gonopores at tip of tubular extensions. Parameres present basically as a triangular sclerite with rounded tip dorsally to aedeagus, with a pair of strong setae at tip. Gonocoxal apodemes elongate, extending from inner base of gonocoxite laterodistal lobe, directed inwards. Tergite 9 present dorsally as a pair of entirely separated, elongate and compressed lobes extending as distally as gonocoxite laterodistal lobes, covered with microtrichia and setae, distal setae longer. No sign of cerci.

**Female** (Fig. G45A). As male, except for the following. **Wing**. Length, 2.59–2.66; width, 0.91–0.94 (n=2). **Head**. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, eight posteriorly to ocellus. **Thorax**. Scutum with seven supra-alar long setae and three pairs of prescutellars; two pairs of scutellar bristles. Proepisternum with four bristles directed ventrally, anepisternum with five bristles along posterior margin. Mesepimeron with two long setae and 31 small setae and setulae, laterotergite with two bristles and 13 smaller setae. Metepisternum with 63 small fine setae and setulae. **Legs**. Front tibia with two latero-dorsal strong setae medially, mid tibia with two dorsolateral rows of 3–5 bristles and three strong setae along ventral edge, hind tibia with a row of 5–6 bristles dorsally, a line of seven long setae on inner lateral face. Fore leg tarsomere 1  $1.2 \times$  tibia length,  $1.7 \times$  tarsomere 2 length, mid and hind tarsomeres 1–3 with rows of ventral setae besides trichia. Hind tibia inner spur  $5 \times$  tibia width at apex. **Wing**. Membrane fumose light brown, darker on cells c, br and r1. Posterior veins M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> with dorsal macrotrichia along most of their length, on CuA restricted to distal end; anal lobe with macrotrichia.

**Abdomen**. Abdominal tergite 1 greyish-brown with dark brown mark along posterior margin, tergite 2 brown, tergites 3–5 light-brown medially with cream-yellow laterally and along anterior margin, tergite 7 cream-yellow; sternites 1–7 whitish-yellow. Sternite 2 with a strong ventral pair of brown bristles. Tergite 2 with a pair of concentrated setae medially.

**Terminalia** (Fig. G45D). Sternite 8 trapezoid, posterior end more slender than anterior end, posterior margin straight, no lateroposterior extensions, microtrichia and fine setae covering entire sclerite, some long setae at posterior margin, labia beneath distal margin with four long fine setae. Sternite 9 with slender genital chamber, lined with microtrichia, gonopore connected to two gonoducts, sclerotized part with a pair of arms extending laterally, an

anterior apodeme extending into segment 7 and a sclerotized medial band extending along genital chamber. Tergite 8 short medially and wide, a pair of lobes laterally, with microtrichia and some few elongate setae on lateroposterior corners. T9+10 bare, medially short, a pair of lateral short lobes connected extending latero-posteriorly, fused to sternite 9. Cercomeres 1 and 2 probably fused, no sign of suture, ovoid, laterally compressed, covered with microtrichia and elongate setae, distal setae longer and curved.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000732,-002110>)

**Material examined. Holotype:** male, ZRC\_BDP0047808, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg. (slide-mounted). **Paratypes:** 14 males, 14 females. **Males:** ZRC\_BDP0047797, Nee Soon (NS2), swamp forest, 07-13.November.2013, MIP leg.; ZRC\_BDP0048697, Nee Soon (NS1), 07-13.May.2015, MIP leg.; ZRC\_BDP0048793, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048794, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0048815, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048816, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048903, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048928, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048935, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0048969, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0048970, Nee Soon (NS1), 09-15.April.2015, MIP leg.; ZRC\_BDP0049234, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0072716, Bukit Timah, primary forest (BT05), 25.November-01.December.2016, MIP leg.; ZRC\_BDP0072725, Bukit Timah, old secondary forest (BT01), 02-08.December.2016, MIP leg. **Females:** ZRC\_BDP0047811, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg.; ZRC\_BDP0047917, Nee Soon (NS2), swamp forest, 23-27.November.2013, MIP leg. (slide-mounted); ZRC\_BDP0048059, Pulau Ubin (PU2), mangrove, 26-01.April.2013, MIP leg.; ZRC\_BDP0048446, Nee Soon (NS2), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048804, Nee Soon (NS1), 12-18.March.2015, MIP leg.; ZRC\_BDP0049084, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049098, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049216, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049232, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049233, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0049236, Nee Soon (NS1), 04-10.December.2014, MIP leg.; ZRC\_BDP0072661, Bukit Timah, primary forest (BT05), 22-28.December.2016, MIP leg.; ZRC\_BDP0074037, Bukit Timah, primary forest (BT05), 02-08.December.2016, MIP leg.; female, ZRC\_BDP0137199, Bukit Timah Forest (BT06), 8-Mar-17, MIP leg. (slide-mounted). **Additional sequenced specimens:** male; ZRC\_BDP0134023; female; ZRC\_BDP0078955; female; ZRC\_BDP0078956; female; ZRC\_BDP0078960; female; ZRC\_BDP0078981; female; ZRC\_BDP0078982; female; ZRC\_BDP0133921; female; ZRC\_BDP0133935; female; ZRC\_BDP0133952; female; ZRC\_BDP0134005; female, ZRC\_BDP0154904 (website imaged specimen); ZRC\_BDP0058671; ZRC\_BDP0058773; ZRC\_BDP0058791; ZRC\_BDP0058795; ZRC\_BDP0058797; ZRC\_BDP0066691; ZRC\_BDP0066702; ZRC\_BDP0066771; ZRC\_BDP0071053; ZRC\_BDP0082338; ZRC\_BDP0128600; ZRC\_BDP0128616; ZRC\_BDP0133426; ZRC\_BDP0133460; ZRC\_BDP0133466; ZRC\_BDP0136938; ZRC\_BDP0136943; ZRC\_BDP0136962; ZRC\_BDP0136976; ZRC\_BDP0137046; ZRC\_BDP0137102; ZRC\_BDP0137114; ZRC\_BDP0137195 (extracted); ZRC\_BDP0137261; ZRC\_BDP0140736; ZRC\_BDP0140741; ZRC\_BDP0143085; ZRC\_BDP0154899; ZRC\_BDP0154902; ZRC\_BDP0154988; ZRC\_BDP0155088; ZRC\_BDP0155090; ZRC\_BDP0155128.

**Etymology.** The species epithet of this species honors Ann Elizabeth WEE (1926-2019; née Wilcox), a British-born academic and social worker. Considered the “founding mother of social work in Singapore”, she worked with the abused and abandoned, before joining the staff of the then-University of Malaya, pushing for the development of a four-year degree program to train social workers. She was the inaugural recipient of the lifetime volunteer achievement award of the Ministry of Community Development, Youth and Sports in 2009,

was honored with the Meritorious Service Medal in 2010 and was inducted into the Singapore Women's Hall of Fame in 2014. The name is used in apposition.

**Remarks.** *Epicypta annweei*, sp.nov. has five different haplotypes that are brought together by all species delimitation approaches. OC=5% indicates that *E. annweei* would join the specimens of *E. catherinelimae*, sp.nov. into a single species, what is immediately contradicted by major differences in body color patterns.

***Epicypta wallacei* Amorim & Oliveira, sp.nov.**

(Figs. G46A–D, G47A–B)

**Diagnosis.** Head and scutum ochre-yellowish, antenna brownish; scutellum yellowish-brown; pleural sclerites dark ochre-yellowish, antepronotum and proepisternum lighter, laterotergite, metepisternum and mediotergite brown. Coxae and femora whitish, a small brown mark at basal tip of hind coxa and at tip of hind femur. Wing membrane light brownish, cell c and cell br darker. C not produced beyond tip of  $R_5$ ; Sc long;  $M_{1+2}$  about half of r-m length. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergites 1–6 greyish-brown with light ochre-yellow antero-lateral corners, wider on tergites 4–5, tergite 7 ochre-yellow, terminalia yellowish. Male terminalia gonocoxite with a medioventral digitiform projection and a digitiform laterodistal extension reaching way beyond tip of gonostylus; gonostylus simple, elongate, dorsoventrally compressed; aedeagus with a pair of separate tubular extensions each with a gonopore; parameres triangular with a pair of strong, curved spines close to tip; tergite 9 present as a pair of very long laterodistal separate extensions, much longer than gonostylus or gonocoxite.

**Description. Male** (Fig. G46A). Wing length, 2.21; width, 0.80. **Head.** Head ochre-yellowish. Scape greyish-yellow, pedicel ochre-yellowish, flagellomeres light brown. Face and clypeus ochre-yellowish, palpomeres 1–3 ochre-yellowish, palpomeres 4–5 whitish-yellow, labella cream-yellow. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, eight posteriorly to ocellus. Scape about  $1.3 \times$  pedicel length; flagellomere 4  $1.7 \times$  as long as wide. Palpomere 4  $1.1 \times$  palpomere 3 length, palpomere 5  $2.0 \times$  palpomere 4 length. **Thorax.** Scutum ochre-yellow, scutellum yellowish-brown with lighter corners. Pleural sclerites light ochre-yellowish, laterotergite and metepisternum greyish-

brown, mediotergite yellowish-brown. Haltere pedicel whitish, knob brownish basally, whitish distally. Pleural membrane yellowish. Scutum with seven supra-alar bristles and three pairs of prescutellar bristles, plus a pair of long setae between inner two, three pairs of scutellar bristles and one outer pair of longer setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with three bristles and 20 small setae, laterotergite with three bristles and 18 smaller setae. Metepisternum with 29 small setae. **Legs.** Front coxa whitish-yellow with a light brownish tinge, mid and hind coxae whitish, hind coxa with a greyish-brown mark at dorsal end; femora, tibiae, and tarsi light whitish-yellow, tarsi darker, hind femur with brownish mark at distal end. Front tibia with two latero-dorsal bristles, mid tibia with two dorsolateral rows of 3–5 bristles and 3 bristles along ventral edge, hind tibia with a row of 5–6 bristles dorso-laterally, a line of 5 long setae on outer lateral face. Fore leg tarsomere 1  $1.1 \times$  tibia length,  $1.7 \times$  tarsomere 2 length, mid and hind tarsomeres 1–3 with rows of ventral setae besides trichia. Hind tibia inner spur  $5.0 \times$  tibia width at apex. **Wing** (Fig. G46B). Membrane fumose light brown, darker on cells c, br and r1. Sc barely produced. C barely extending beyond apex of R<sub>5</sub>. R<sub>1</sub> reaching C on distal sixth, R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>. First sector of Rs oblique, slightly over half of r-m length; r-m almost longitudinal. M<sub>1+2</sub>  $0.8 \times$  r-m length; bM  $5.0 \times$  r-m length. First sector of CuA 0.45× length of second sector of CuA. Cubital pseudovein barely reaching level of origin of M<sub>4</sub>. Anal fold long, only gently curved, almost reaching wing margin. Posterior veins M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> with dorsal macrotrichia along more than half their length, CuA with macrotrichia on distal fourth of wing; macrotrichia present on anal lobe. **Abdomen.** Abdominal tergite 1 greyish-brown with dark brown mark along posterior margin, tergites 2–6 greyish-brown medially with cream-yellow laterally and along anterior margin, cream-yellow marks larger on segments 4–5, tergite 7 cream-yellow; sternites 1–7 whitish-yellow. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G46C–D). Whitish-yellow. Gonocoxites fused medially, suture present, bare ventrally, a medioventral digitiform projection with setulae at tip sided by a pair of short pointed lobe with a small seta at tip, a pair of long, digitiform laterodistal extensions reaching way beyond tip of gonostylus. Gonostylus simple, elongate, dorsoventrally compressed, with setae along inner margin and at distal half on both faces. Aedeagus with an anterior medial ejaculatory apodeme, widening midway to apex, then divided distally into a pair of separate tubular extensions with independent gonopores, laterally with a pair of long, slender distal projections, slightly capitate at tip. Parameres as a triangular sclerite dorsad to aedeagus extending distally, with a medial short beak at tip, a pair of small setae close to each other subapically, a pair of strong,

curved spines close to tip. Gonocoxal bridge present, slender medially, no apodemes visible. Tergite 9 present as a pair of long laterodistal extension, much longer than gonostylus or gonocoxite extensions, setose at tip. Cerci not visible.

**Female.** As male, except for the following. **Wing.** Length, 2.27; width, 0.86. **Terminalia** (Figs. G47A–B). Brownish-yellow. Sternite 8 wide anteriorly, subquadrate, posterior margin slightly more slender than base, a very short medial incision, covered with microtrichia and fine setae, longer setae medially. Sternite 9 wide medially, anterior end slender, extending beyond anterior end of sternite 8, gonopore at center of a well-sclerotized plate. Tergite 8 wide, very short medially, connecting a pair of lateral short lobes with fine setae, partially overlapping to sternite 8. Tergite 9+10 short, slender, bare. Cercomeres 1 and 2 apparently fused, no sign of suture, elongate, distal end curved ventrally, covered with microtrichia and setae, setae at tip longer.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000738>)

**Material examined.** **Holotype:** male, ZRC\_BDP0048465, Nee Soon (NS1), swamp forest, 29.March-04.April.2012, MIP leg. (website photo specimen, slide-mounted). **Paratypes:** 4 females, ZRC\_BDP0048832, Nee Soon (NS1), 08-14.January.2015, MIP leg. (slide-mounted); ZRC\_BDP0048868, Nee Soon (NS1), 25-31.December.2014, MIP leg. (slide-mounted); ZRC\_BDP0048884, Nee Soon (NS1), 25-31.December.2014, MIP leg.; ZRC\_BDP0133462, Singapore, (date range 2012-2018), MIP leg.

**Etymology.** The species epithet of this species honors Alfred Russel Wallace (1823–1913), British naturalist, biogeographer, anthropologist, evolutionist and illustrator. He is best known for independently conceiving the very idea of phylogeny and the theory of evolution through natural selection. Aside from scientific work, he was a social activist, critical of an unjust social and economic system in 19th-century Britain. He had extensive field work in the Amazon and in the Malay Archipelago, including Singapore. His 1858 paper on the subject was one of the triggers for Charles Darwin to publish his own writings on evolution.

**Remarks.** There are only two haplotypes in our samples of *Epicypta wallacei*, **sp.nov.** and they come together with all species delimitation approaches.

### *Epicypta lamtoongjini* Amorim & Oliveira, **sp.nov.**

(Figs. G48A–E)

**Diagnosis.** Head dark ochre-orangish, scutum caramel-brown on posterior two-thirds. Antepronotum and proepisternum dark ochre-yellow, proepisternum with a small greyish-brown mark; other sclerites dark greyish-brown, mediotergite dark brown. Coxae and femora whitish, fore coxa and femora with an orangish tinge, a small brown mark at distal end of hind femur. Wing membrane light brownish, darker along anterior margin. C barely produced beyond tip of  $R_5$ ; Sc faint, with a row of dorsal macrotrichia;  $M_{1+2}$  about half of r-m length. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergite 1 dark brown, tergites 2–5 brown with light ochre-yellow laterals extending inwards along anterior margin, wider on tergites 4–5, tergite 6 mostly ochre-yellow with brownish tinge. Male terminalia gonocoxite with a long medioventral projection, a digitiform long laterodistal extension and a bare dorsal projection; gonostylus simple, elongate, dorsoventrally compressed; aedeagus with a pair of separate extensions with independent gonopores; parameres triangular with a pair of strong curved spines close to tip; tergite 9 present as a pair of long, setose separate extensions.

**Description. Male.** Wing length, 2.59; width, 0.90. **Head.** Head light caramel-brown. Scape and pedicel light ochre-yellowish, flagellomeres light greyish-yellow, basal two flagellomeres lighter. Face and clypeus light caramel-brown. Palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter. Labella cream-yellowish. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, eight posteriorly to ocellus. Scape about  $2.0 \times$  pedicel length; flagellomere 4  $1.7 \times$  longer than wide. Palpomere 4  $1.1 \times$  palpomere 3 length, palpomere 5  $1.5 \times$  palpomere 4 length. **Thorax.** Scutum compressed, caramel-brown on posterior two-thirds, ochre-orangish on anterior third and laterally to level of wing base, scutellum dark brown with ochre-yellow antero-lateral corners. Antepronotum and proepisternum light ochre-yellow, proepisternum with a small ventral greyish-brown mark; anepisternum mostly ochre-brown, light on antero-ventral corner; katepisternum light greyish-brown, mesepimeron, laterotergite and metepisternum dark ochre-brown; mediotergite dark brown. Haltere pedicel light whitish-ochre. Pleural membrane yellowish. Scutum with eight supra-alar bristles, three pairs of prescutellar bristles, two additional smaller pairs in a slightly more anterior line, scutellum with three pairs of marginal bristles, outer pair smaller. Proepisternum with four bristles directed ventrally. Anepisternum with six bristles along posterior margin. Mesepimeron with four bristles and 35 small setae, laterotergite with three longer setae and 11 smaller setae. Metepisternum with 18 fine setae. **Legs.** Coxae and femora whitish with a brownish tinge, mid and hind femora with a brownish

mark at tip; tibiae and tarsi ochre-yellowish, tarsi darker. Mid coxa with some few fine setae across basal fifth, hind coxa with fine setae on basal fourth. Front tibia with two strong seta laterally on distal half, mid tibia with two dorsolateral rows with 4–6 bristles, ventrally a row of five strong setae. Mid and hind tarsomeres 1–3 with rows of ventral longer setae. Fore leg tarsomere 1 as long as tibia,  $1.6 \times$  tarsomere 2 length. Hind tibia inner spur over  $5 \times$  tibia width at apex. **Wing** (Fig. G48C). Membrane fumose brown, darker along anterior margin. Sc faint, with a row of dorsal macrotrichia. C produced slightly beyond tip of R<sub>5</sub>. R<sub>1</sub> reaching C on distal sixth of wing; R<sub>5</sub> reaching C slightly before level of tip of M<sub>1</sub>. First sector of Rs almost transverse,  $0.54 \times$  r-m length; r-m slightly oblique. M<sub>1+2</sub> short,  $0.52 \times$  r-m length; bM slightly over  $6 \times$  r-m length; first sector of CuA  $0.34 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP reaching level of origin of M<sub>4</sub>. Anal fold gradually curved, almost reaching wing margin. Posterior veins M<sub>1</sub>, M<sub>2</sub> and M<sub>4</sub> with dorsal macrotrichia along more than half their length, CuA with setae on distal fourth, macrotrichia on anal lobe. **Abdomen**. Abdominal tergite 1 greyish-brown, tergites 2–6 brownish medially with cream-yellow area laterally, bands larger from segments 3–5, tergite 6 almost entirely cream-yellow, with only a brownish tinge medio-posteriorly, tergite 7 cream-yellow; sternites 1–7 whitish-yellow. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Figs. G48D–E). Whitish-yellow. Gonocoxites fused medially, no suture present, bare ventrally, with two dorsolateral lobes: laterally a long, digitiform lobe with setae on outer face and a strong seta at tip, extending beyond tip of gonostylus; a blade-like projection dorsally to other and as long as other lobe, slender and curved inwards towards tip, almost entirely bare except for three setulae apically. Gonostylus simple, elongate, dorsoventrally compressed, with setae at distal half on both faces, longer setae along inner margin. Aedeagus with an anterior medial ejaculatory apodeme, widening towards apex and then divided distally into a pair of separate tubular extensions. Parameres trapezoid, extending distally, some setulae apically and a pair of strong subapical straight blunt spines. Gonocoaxal bridge weakly sclerotized, slender medially, no apodemes visible. Tergite 9 with a pair of long laterodistal extension, longer than gonostylus or gonocoxite extensions, covered with microtrichia and setae. Cerci not visible.

**Female** (Figs. G48A–B). As male, except for the following. **Wing**. Length, 2.48; width, 0.94. **Head**. Occiput with three longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, seven posteriorly to ocellus. **Thorax**. Scutum with six supra-alar bristles and three pairs of prescutellar bristles, three pairs of scutellar bristles, outer pair smaller. Proepisternum with three bristles directed ventrally, anepisternum with five bristles along posterior margin.

Mesepimeron with two bristles and 39 small setae and setulae, laterotergite with one bristle, one long seta and 10 smaller setae. Metepisternum with five small fine setae. **Legs.** Front tibia with two bristles at outer face, mid tibia with two dorsolateral rows of 4–5 bristles and three bristles along ventral edge, hind tibia two dorsolateral rows of six bristles and a row of six long setae on outer face. **Wing.** C not produced beyond tip of  $R_5$ . Posterior veins  $M_1$  and  $M_2$  with over half of their length with dorsal macrotrichia,  $M_4$  and  $CuA$  with macrotrichia at distal fourth, macrotrichia on anal lobe. **Terminalia.** Sternite 8 wide, no lateroposterior projections, posterior margin straight, covered with microtrichia and fine setae, longer setae on posterior margin. Sternite 9 wide medially, notum extending to anterior end of terminalia, blunt at end, genital chamber slender, two gonoducts. Tergite 8 short medially, wide, a pair of wide lateroventral lobes, no microtrichia or setae medially, setae restricted to lateral lobes. T9+10 bare, medially short and slender, with a pair of lateral lobes fused to sternite 9. Cercomeres 1 and 2 probably fused, no sign of suture, basal half ovoid, distal half slender, covered with microtrichia and elongate setae, distal setae longer and curved.

(<https://biodiversity.online/species/A-Arth-Hexa-Diptera-000729>)

**Material examined. Holotype:** male, ZRC\_BDP0047900, Nee Soon (NS2), swamp forest, 10-16.October.2013, MIP leg. (slide-mounted). **Paratypes:** 5 males, 11 females. **Males:** ZRC\_BDP0047919, Nee Soon (NS2), swamp forest, 23-27.November.2013, MIP leg.; ZRC\_BDP0048466, Nee Soon (NS1), swamp forest, 31.May-6.June.2012, MIP leg.; ZRC\_BDP0048852, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048982, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049123, Nee Soon (NS1), 18-24.December.2014, MIP leg. **Females:** ZRC\_BDP0047816, Nee Soon (NS1), swamp forest, 12-18.December.2013, MIP leg.; ZRC\_BDP0048071, Nee Soon (NS1), swamp forest, 06-12.June.2013, MIP leg.; ZRC\_BDP0048441, Nee Soon (NS2), swamp forest, 24-30.May.2012, MIP leg. (website photo specimen, slide-mounted); ZRC\_BDP0048824, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048851, Nee Soon (NS1), 08-14.January.2015, MIP leg.; ZRC\_BDP0048998, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049013, Nee Soon (NS2), 11-17.December.2014, MIP leg.; ZRC\_BDP0049096, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049115, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049117, Nee Soon (NS1), 18-24.December.2014, MIP leg.; ZRC\_BDP0049248, Nee Soon (NS1), 04-10.December.2014, MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0133442; female, ZRC\_BDP0133915; female, ZRC\_BDP0134054; female, ZRC\_BDP0134063; female, ZRC\_BDP0154939 (imaged); ZRC\_BDP0133455, ZRC\_BDP0140196, ZRC\_BDP0140760, ZRC\_BDP0140769, ZRC\_BDP0140778.

**Etymology.** The species epithet of this species honors Professor Lam Toong Jin, Head of Zoology, National University of Singapore (1981–1996), then Director of School of Biological Sciences (1996–1998) and finally Head of Department of Biological Sciences (1998–1999).

**Remarks.** There is a single haplotype for *Epicypta lamtoongjini*, sp.nov.

***Epicypta catherinelimae* Amorim & Oliveira, sp.nov.**

(Figs. G49A–D)

**Diagnosis.** Head and scutum ochre-yellow, posterior end of scutum slightly darker, scutellum brown; antennal scape and pedicel ochre-yellowish, flagellum light ochre-brown; pleural sclerites ochre-brown, posterior sclerites darker. Coxae and femora whitish, on anterior leg with an orangish tinge, tip of mid and hind coxae and tip of hind femur with a light brown small mark. Wing membrane light brownish, area along cells c and br slightly darker. C barely extending beyond tip of  $R_5$ ;  $M_{1+2}$   $0.89 \times r\text{-}m$  length,  $r\text{-}m$  almost longitudinal. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and  $CuA$  close to tip, macrotrichia on anal lobe. Abdominal tergites 1–2 light brown, tergites 3–5 light brown with slender cream-yellow laterals, slightly larger on tergites 4–5, tergite 6 mostly cream-yellow, light brown on latero-anterior corners, tergite 7 cream-yellow, terminalia whitish-yellow. Female terminalia sternite 8 trapezoid, elongate, no medio-posterior incision genital furca long, slightly wider at anterior end, cercus slender, digitiform.

**Description. Female** (Fig. G49A). Wing length, 2.14; width, 0.78. **Head.** Dark ochre-yellowish. Scape and pedicel greyish ochre-yellow, with a crown of darker, longer setae at distal margin, flagellomeres greyish-yellow. Face and clypeus ochre-yellowish. Palpomeres 1–3 light brownish-yellow, palpomeres 4–5 lighter. Labella whitish-yellow. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, ten posteriorly to ocellus. Scape  $1.6 \times$  pedicel length, flagellomere 4  $1.8 \times$  longer than wide. Palpomere 4  $1.2 \times$  palpomere 3 length, palpomere 5  $2.1 \times$  palpomere 4 length. **Thorax** (Fig. G49B). Scutum caramel-yellow, darker towards posterior end, scutellum blackish-brown with ochre-yellow antero-lateral corners. Pleural sclerites caramel-yellow, proepimeron and katepisternum slightly lighter, mediotergite dark brown, lighter laterally. Haltere light ochre-yellowish with brown base of knob. Pleural membrane ochre-yellow. Scutum with 5+2 supralar bristles and long setae, three pairs of prescutellars; two pairs of scutellar bristles and one additional external pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 17 small setae, laterotergite with two bristles and 15 small setae. Metepisternum with six fine setae. **Legs.** Coxae whitish, front coxa with a very light orangish tinge; femora whitish with a light orangish tinge, mid and hind femora with brownish tips, tibiae and tarsi ochre-yellow with

brownish tips, tarsi darker. Some few fine setae across basal fifth of mid coxa, hind coxa with fine setae along posterior half. Front tibia with a single lateral bristle medially, mid tibiae with a pair of irregular rows of 3-5 brownish bristles latero-dorsally, one bristle laterally, four bristles along ventral edge; hind tibia with a pair of irregular latero-dorsal rows of 4-6 brownish bristles and three bristles laterally. Hind tibia inner spurs  $4.1 \times$  tibia width at apex.

**Wing** (Fig. G49C). Membrane fumose light brown, slightly darker along anterior margin. Sc short (visible only on phase contrast). C ending at apex of R<sub>5</sub>. R<sub>1</sub> reaching C on distal fifth of wing; R<sub>5</sub> reaching C at level of tip of M<sub>1</sub>. First sector of Rs slightly oblique,  $0.72 \times$  r-m length; r-m oblique. M<sub>1+2</sub>  $0.89 \times$  r-m length; bM  $6.1 \times$  r-m length; first sector of CuA  $0.31 \times$  length of second sector of CuA. Cubital pseudovein not produced, CuP extending to slightly beyond level of origin of M<sub>4</sub>. Anal fold almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> with dorsal macrotrichia along most of their length, M<sub>4</sub> with macrotrichia along distal three-fourths, CuA with macrotrichia along distal fourth, anal lobe with macrotrichia.

**Abdomen.** Abdominal tergite 1 dark greyish-brown with a dark brown transverse band along posterior margin, tergite 2 greyish-brown, tergites 3–5 light brown with slender cream-yellow area laterally, lateral band of tergite 5 wider, tergite 6 largely cream-yellow with light brown lateral band, tergite 7 cream-yellow; sternites 1-7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G49D). Ochre-yellowish. Sternite 8 subquadrate, lateroposterior end gently more developed than posterior margin medially, microtrichia and setae concentrated mainly on distal half, two pairs of long setae subapically. Sternite 9 anterior apodeme not extending beyond anterior end of terminalia, widening at anterior end, lateral arms sclerotized as a pair of diverging slender bands, genital chamber elongate. Sternite 10 with distal end acute, with some subapical setulae laterally. Tergite 8 short and bare medially, lateral lobes slightly projected posteriorly, entirely separated medially, microtrichia spread on posterior half, setae restrict to posterior margins. Tergite 9+10 with a slender medial bare sclerotized band connecting a pair of lobes fused to sternite 9 lateroventrally. Cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

**Male.** Unknown.

**Material examined.** **Holotype:** female, ZRC\_BDP0048468, Nee Soon (NS2), swamp forest, 19-25.April.2012, MIP leg. (slide-mounted). **Paratype:** female, ZRC\_BDP0048062, Nee Soon (NS2), swamp forest, 21-27.March.2013, MIP leg. (website photo specimen).

**Etymology.** The species epithet honors Catherine Lim Poh Imm (1942–), known as the "doyenne of Singapore writers". Singaporean fiction author, she writes about the Singapore society and themes of traditional Chinese culture. She has published many collections of short stories, novels, and poetry collections. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** The specimens of *Epicypta catherinelimae*, sp.nov. are brought together to the specimens of *E. annweei*, sp.nov. by OC5%, which does not have support from body color patterns—other delimitation approaches point to separate species.

***Epicypta grootaerti* Amorim & Oliveira, sp.nov.**

(Figs. G50A–C)

**Diagnosis.** Head brown, dark ochre-yellow posteriorly, antennal scape, pedicel and first three flagellomeres ochre-yellowish, other flagellomeres grey-brownish, fourth flagellomere with a dark brown ring. Scutum dark ochre-yellow, with a blackish-brown mark on posterior fifth, scutellum blackish-brown; pleural sclerites dark ochre-yellow, darker on proepisternum, paratergite dark brown, laterotergite and mediotergite blackish-brown. Fore coxa and femur whitish with orange tinge, mid and hind coxae whitish, mid and hind femora light whitish-yellow with a brownish line along ventral and dorsal edges. Wing membrane light brownish, darker along cells c and br; C not produced beyond tip of  $R_5$ ;  $M_{1+2}$  about as long as r-m. Dorsal macrotrichia on posterior veins  $M_1$  and  $M_2$ ,  $M_4$  and on CuA close to tip, macrotrichia on anal lobe. Abdominal tergite 1 brownish, tergites 2–5 ochre-yellowish with a slender brownish mark medially, tergite 6–7 and terminalia ochre-yellowish. Female terminalia sternite 8 trapezoid without medial incision posteriorly, genital furca long, not wider at anterior end.

**Description. Female** (Fig. G50A). Wing length, 2.16 mm, width, 0.80 mm. **Head.** Dark ochre-yellowish, occiput lighter towards ventral margin. Scape and pedicel greyish ochre-yellow, flagellomeres 1–4 light ochre-yellow, flagellomere 4 light brown with a dark brown band on basal half, flagellomeres 5–14 light brown. Face and clypeus dark ochre-yellowish. Palpomeres 1–3 brownish-yellow, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with four longer setae dorsally to eye anteriorly to ocellus, two dorsally to ocellus, ten

posteriorly to ocellus. Scape 1.6× pedicel length, flagellomere 4 1.5× as long as wide. Palpomere 4 1.5× palpomere 3 length, palpomere 5 1.7× palpomere 4 length. **Thorax.** Scutum caramel-yellow, a dark brown band at posterior sixth; scutellum blackish-brown with ochre-yellow antero-lateral corners. Pleural sclerites caramel-yellow, except for proepisternum and mesepimeron much darker, blackish-brown with ochre-yellow laterally. Pleural membrane ochre-yellow. Haltere light ochre-yellowish with brown base of knob. Scutum with 4+3 supra-alar bristles, three pairs of prescutellars; two pairs of scutellar bristles and one additional external pair of long setae. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with two bristles and 12 small setae, laterotergite with two bristles and 13 small setae. Metepisternum with 23 fine setae. **Legs.** Coxae whitish, front coxa with a light orangish tinge, basal sixth of hind coxa with a light brown band; femora whitish with an orangish tinge, mid and hind femora with brownish distal tips, tibiae and tarsi ochre-yellow with brownish distal tips, tarsi darker. Mid coxa with a band of fine setae across proximal fifth, hind coxa with setae covering basal fourth. Front tibia with two bristles latero-dorsally, mid tibia with a pair of irregular dorsolateral rows of 4-5 bristles, one bristle laterally on outer face, and three long setae along ventral edge. Fore leg tarsomere 1 1.1× tibia length, 1.3× tarsomere 2 length. Hind tibial inner spur 4.9× tibia width at apex. **Wing** (Fig. G50B). Membrane fumose light brown, slightly darker along anterior margin. C not produced beyond tip of  $R_5$ . Sc barely produced.  $R_1$  reaching C on distal fourth of wing;  $R_5$  reaching C at level of tip of  $M_1$ . First sector of Rs slightly oblique, 0.7× r-m length; r-m oblique.  $M_{1+2}$  0.76× r-m length; bM 5.9× r-m length; first sector of CuA 0.34× length of second sector of CuA. Cubital pseudovein absent, CuP extending to slightly beyond level of origin of  $M_4$ . Anal fold almost reaching wing margin. Posterior veins  $M_1$  and  $M_2$  with dorsal macrotrichia along almost entire length,  $M_4$  with dorsal macrotrichia along distal three-fourths, CuA with macrotrichia on distal fourth, anal lobe with macrotrichia. **Abdomen.** Abdominal tergite 1 brown, with a dark brown transverse band close to posterior margin, lighter laterally, tergites 2–5 light brown medially, with a wide cream-yellow area laterally, tergites 6–7 light brownish-yellow; sternites 1-7 light ochre-yellowish. Sternite 2 with a strong ventral pair of brown bristles. **Terminalia** (Fig. G50C). Ochre-yellowish. Sternite 8 trapezoid, slender, posterior margin with no incision medio-posteriorly, scattered microtrichia and setae, setae along posterior margin longer. Sternite 9 slender, anterior apodeme extending slightly beyond anterior end of terminalia, pointed at apex, lateral arms not strongly diverging, genital chamber elongate, distal end acute, with some subapical setulae laterally. Tergite 8 short, lateral lobes slightly projected

posteriorly, not in contact medially, microtrichia spread on posterior half, setae restrict to posterior margins. Tergite 9+10 with a slender medial bare sclerotized band connecting a pair of lobes fused to sternite 9 lateroventrally. Cercomeres 1 and 2 fused, no sign of suture, basal two-thirds wider, posterior end digitiform, distal setae longer.

**Male.** Unknown.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000779>)

**Material examined. Holotype:** female, ZRC\_BDP0048128, Pulau Semakau (SMO2), old mangrove, 05-11.July.2013, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors Patrick Grootaert, member of the Royal Belgian Institute of Natural Sciences, Belgium. Specialist in Dolichopodidae, the long-legged flies. He is one of the researchers associated to the Singapore Mangrove Insect Project.

**Remarks.** This species seems to be close to *Epicypta pallida* (Edwards), from Krakatau, with minor differences in the color of the antenna, mesepimeron and metepisternum, and in the extension of C beyond the tip of R<sub>5</sub>.

***Epicypta joaquimae* Amorim & Oliveira, sp.nov.**

(Figs. G51A–D)

**Diagnosis.** Head ochre-yellow, antennal scape, pedicel and flagellomeres 1–3 ochre, ochre basally with a brownish ring distally. Scutum ochre-yellow, scutellum light yellowish-brown; pleural sclerites dark ochre-yellow, laterotergite with a dark brown mark. Coxae and femora whitish, fore coxa with brownish tinge, femora dorsal crest greyish-brown. Wing membrane light brownish, cells c and br more yellowish. C not extending beyond tip of R<sub>5</sub>; M<sub>1+2</sub> 0.88× r-m. Dorsal macrotrichia on posterior veins M<sub>1</sub>, M<sub>2</sub>, posterior half of M<sub>4</sub> and distal end of CuA; macrotrichia on anal lobe. Abdominal tergite 1 ochre-yellow, tergites 2–4 ochre-yellowish with a brownish diffuse mark medially, tergite 5 and 7 entirely ochre-yellowish, tergite 6 ochre-yellowish with two pairs of brownish marks laterally, one at anterior margin and another one at posterior margin; terminalia whitish-yellow. Female sternum 8 with a shallow incision medially along posterior border, genital furca wide at anterior end.

**Description. Female** (Fig. G51A). Wing length, 2.30; width, 0.83. **Head.** Vertex dark yellowish-brown, occiput lighter laterally. Scape and pedicel ochre-yellow, flagellomeres light-brown. Face and clypeus light brown; palpomeres 1–3 light yellowish-brownish, palpomeres 4–5 lighter; labella whitish-yellow. Occiput with two longer setae dorsally to eye anteriorly to ocellus, one dorsally to ocellus, nine posteriorly to ocellus. Scape about 1.9× pedicel length; flagellomere 4 1.9× longer than wide. Palpomere 4 1.3× palpomere 3 length, palpomere 5 2.0× palpomere 4 length. **Thorax** (Fig. G51B). Scutum yellowish-brown, scutellum light yellowish-brown. Antepronotum and proepisternum light brown, anepisternum, laterotergite and mediotergite yellowish-brown, katepisternum ochre-brown, mesepimeron brown on dorsal half, ochre-brown on ventral half, metepisternum brown. Pleural membrane ochre-yellow. Haltere with whitish-yellow pedicel, knob brownish on proximal half, whitish-yellow on distal half. Scutum with 6+3 supra-alars and three pairs of prescutellar bristles; three pairs of scutellar bristles, outer pair smaller. Proepisternum with three bristles, anepisternum with five bristles along posterior margin. Mesepimeron with one bristle and 17 small setae, laterotergite with four bristles, posterior one smaller, and 6 small setae. Metepisternum with seven fine setae. **Legs.** Coxae whitish-yellow with orangish tinge, hind coxa with a brown band on basal fifth; front femur yellowish-brown, mid and hind femora lighter, tibiae and tarsi light ochre-yellow. Front tibia dorsal rows of strong, two dorsolateral small brown bristles medially; mid tibia with three irregular dorsolateral rows of 3–5 bristles, one strong lateral seta on inner face and a row with four bristles along ventral edge; hind tibia with two dorsolateral rows of 4–5 bristles and four long setae on inner face. Fore leg tarsomere 1 1.0× tibia length, 1.6× tarsomere 2 length. Hind tibia inner spur over 5× tibia width at apex. **Wing** (Fig. G51C). Membrane light brown fumose, darker along anterior margin. Sc faint, incomplete (visible in phase contrast) with dorsal macrotrichia. C ending at tip of R<sub>5</sub>. R<sub>1</sub> reaching C at wing distal fourth; R<sub>5</sub> reaching C slightly before level of M<sub>1</sub>. First sector of Rs oblique, bare, 0.40× r-m length; r-m almost longitudinal. M<sub>1+2</sub> 0.88× r-m length; bM 4.7× r-m length. First sector of CuA 0.26× length of second sector of CuA. Cubital pseudovein absent, CuP barely reaching level of origin of M<sub>4</sub>. Anal fold gently curved along basal half, almost reaching wing margin. Posterior veins M<sub>1</sub> and M<sub>2</sub> with of dorsal macrotrichia on almost entire length, M<sub>4</sub> on distal two-thirds, CuA on distal fourth, macrotrichia on anal lobe. **Abdomen.** Abdominal tergite 1 ochre-yellow, tergites 2–4 ochre-yellowish with a brownish diffuse mark medially, tergite 5 and 7 entirely ochre-yellowish, tergite 6 ochre-yellowish with two pairs of brownish marks laterally, one at anterior margin

and another one at posterior margin; sternite 2 with a pair of long, slightly curved ventral bristles. **Terminalia** (Fig. G51D). Light brownish-yellow. Sternite 8 elongate, trapezoid, posterior margin nearly straight, posterior margin with a short medial incision, microtrichia and setae evenly distributed, long setae at posterior margin. Sternite 9 elongate, anterior apodeme extending to anterior end of terminalia, wide, genital chamber elongate. Tergite 8 with a pair of separate large lateral lobes with microtrichia and setae. Tergite 9+10 slender, a pair of sclerotized bands connected medially, latero-posteriorly fused to sternite 9. Cerci long, cercomeres 1 and 2 fused, no sign of suture, elongate, wider midway to apex posterior end digitiform, distal setae longer.

**Material examined.** **Holotype:** female, ZRC\_BDP0072680, Bukit Timah Forest (BT05), 22-Dec-16, MIP leg. (slide-mounted). **Additional sequenced specimens.** female, ZRC\_BDP0137314 (website photo specimen, extracted); ZRC\_BDP0058641.

**Etymology.** The species epithet of this species honors Agnes Joaquim (or Ashkhen Hovakimian) (1854-1899). A Singaporean Armenian was a horticulturalist, who bred the first hybrid orchid, the Vanda ‘Miss Joaquim’, now the national flower of Singapore.

### ***Aspidionia* Colless**

*Aspidionia* Colless, 1966: 664. Type-species, *Aspidionia palauensis* Colless (orig. des.).

**Diagnosis.** Head flattened, elongate, placed under anterior end of scutum, vertex displaced to a frontal position. Scutum lateral margin with sharp incision at above level of anterior spiracle; shining medial keel on anterior third of scutum due to modification of setulae sockets. Antepronotum lateral lobes completely separated, katepisternum strongly compressed; laterotergite and mediotergite small, strongly compressed.  $M_{1+2}$  long, over  $3 \times r_m$  length, aligned with  $M_2$ ;  $M_4$  missing; CuA straight, distance from tip of CuA to tip of  $M_2$  about same as from tip of  $M_2$  to tip of  $M_1$ . Anal fold long, straight, only gently curved close to posterior margin.

This is one of the least known mycetophilid genera. Originally described from the Caroline Island, Palau, in Micronesia, based on two specimens (Colless, 1966), it had a second species formally described based on six specimens from the Comores Island (Matile, 1974), between Madagascar and continental Africa. With this paper, the number of described

species in the genus moves from two to five. Colless (1966) also referred to an undescribed species from Australia, making this another case of Indo-Pacific distribution, quite similar to that of *Platyprosthiogyne*. *Aspidionia palauensis* Colless was described based on males and *A. balachowski* Matile was described based on males and females. Our material from Singapore has only females.

Two of the Singapore species—*Aspidionia cheesweeleeae*, sp.nov. and *Aspidionia fatimahae*, sp.nov.—are brought together by mPTP, but all other criteria show them as separate species. There are clear differences in different aspects of the morphology of these two species. *A. fatimahae*, sp.nov. has two haplotypes and the other two species have only one (Fig. G53B). These species are very rare in our samples, with only five specimens of all three species.

#### ***Aspidionia cheesweeleeae* Amorim & Oliveira, sp.nov.**

(Figs. G52A–D, G53A–B)

**Diagnosis.** Scutum mostly ochre-yellowish, with a dark brown band along anterior margin, a dark brown mark above wing and a dark brown band along posterior end. Thoracic pleura mostly ochre-brown with a light brown mark on posterior half of anepisternum, mid and hind coxae entirely whitish, hind coxa with a brown basal band. Wing vein r-m present. Abdominal tergites ochre-yellowish with a brown medial longitudinal band, sternites ochre-yellowish.

**Description. Female** (Fig. G52A). Wing length, 1.66; width, 0.67. **Head** (Figs. G52B–C). Brown medially on frons, brownish-yellow around eye, head partially fit under anterior end of scutum. Face and clypeus dirty-yellowish. Lateral ocelli blackish-brown, nearly touching eye margin, no mid ocellus, frontal furrow short. Antennal scape and pedicel light brown, flagellum brown. Maxillary palpus light brown, lighter towards apex. Labella light brownish-yellow. Dark brown small setae scattered over vertex, four slightly longer setae on occiput around dorsal margin of eye posteriorly to ocellus, a line of long setae close to anterior margin of frons. Face slender, with a transverse line of setulae. Clypeus with scattered setulae. Mid ocellus present, at posterior end of frontal furrow. Antennal scape twice pedicel length, a crown of setae distally and on inner face of scape; setulae on both lateral faces and on distal margin of pedicel, in addition to one strong seta dorsally. Flagellomere 1 twice

flagellomere 2 length; flagellomere 4 1.5× longer than wide. Palpomere 1 twice length of palpomere 2, covered only with microtrichia, palpomere 2 short, with some setulae, palpomere 3 slightly longer than wide, sensorial pit conspicuous opening dorsally, setulae on external and dorsal faces, palpomere 4 almost twice palpomere 3 length, with setulae on external and dorsal faces, palpomere 5 slender, about twice palpomere 4 length, with scattered setulae. **Thorax.** Scutum ochre-yellow, with an elongate yellowish-brown mark along anterior margin, a mark along margin above anepisternum and a transverse band at posterior end of scutum; scutellum dark brown. Pleural sclerites mostly ochre-brown, basisternum brown, proepisternum with an ochre-yellow area on distal half, anepisternum with a brown mark on posterior half, mediotergite dark brown. Scutum densely covered with scattered fine setae, no shiny median keel anteriorly, five longer setae at small bulging area on margin above level of wing, four pairs of prescutellar bristles along posterior margin of scutum; a deep incision on margin of scutum above level of anterior spiracle. Scutellum large, trapezoid, two pairs of strong bristles aligned at distal end, additional setae along posterior margin. Basisternum dorso-posterior arms with some few setulae. Antepronotum lateral lobes completely separated, medial connection not sclerotized, only with short fine setae, proepisternum with three longer setae and two additional slightly smaller setae along ventral margin, scattered small setae on sclerite. Proepimeron reduced to a slender stripe at ventro-distal end of proepisternum, reaching antero-dorsal end of katepisternum. Anepisternum covered with scattered setulae, a line of four long setae along posterior margin; katepisternum strongly compressed dorsoventrally, about a third of height of anepisternum. Mesepimeron with two bristles along dorso-posterior end, not reaching ventral margin of thorax, a small connection between katepisternum dorso-posterior end and laterotergite anterior end. Laterotergite bulging, quite flattened, with two long setae and seven small setae; metepisternum with 14 fine setae along its length; mediotergite small, strongly folded, bare.

**Legs.** Coxae whitish, front coxa ochreous with an orangish tinge, mid and hind coxae whitish, hind coxa with a brown transverse band at basal end; femora whitish-yellow, front and mid femora with brownish-yellow tinge, mid femur with brownish along dorsal edge close to basal end, hind femur whitish with brown dorsal edge; tibiae and tarsi light yellowish-brown with an orangish tinge. Front coxa entirely covered with setulae at anterior face, a row of brown bristles along posterior margin and distal margins; mid coxa largely developed, anterior face covered with setae, a line of bristles along distal margin; hind coxa with a line of small setae on distal half of external face, including one subapical strong seta and a few small setae and one longer setae on anterior face distally. Femora covered with fine setae, a row 3–

5 longer setae along ventral margin distally, stronger on hind femur. Tibiae and tarsi with regular rows of trichia. Front tibia with a wide antero-apical depressed area lined with setulae and some few strong setae at distal end; mid tibia with two rows of bristles dorsally and two bristles on internal face, in addition to a bristle at distal end; hind tibia with two rows of latero-dorsal setae along entire length separated by a flat, bare area, a comb of long setae at internal face of distal end of tibia. First front tarsomere shorter than tibia, about twice tarsomere 2 length. Fore leg tarsomere only with rows of trichia and a couple of distal setae; mid and hind tarsomeres 1–4 with rows of ventral setae besides rows of trichia. Tibial spurs brown to yellowish-brown, mid tibia spur almost twice length of inner spur, outer spur of mid tibia about  $5\times$  tibial apex, outer spur of hind leg about  $3\times$  tibial apex. Tarsal claws with a long basal tooth. **Wing** (Fig. G53A). Wing membrane light yellowish-brown fumose, slightly darker along anterior margin. Membrane densely covered with regularly organized microtrichia on all cells, no macrotrichia on membrane; posterior margin emarginated at level of tip of CuP. Sc faint; R<sub>1</sub> reaching C at distal third of wing; R<sub>4</sub> absent; R<sub>5</sub> short, reaching C at level of M<sub>2</sub>, running parallel to R<sub>1</sub>, gently curved on distal third. C extending beyond R<sub>5</sub> for half distance to M<sub>1</sub>. First sector of Rs slightly oblique,  $1.1\times$  r-m length; r-m short, oblique. M<sub>1+2</sub>  $5.3\times$  r-m length; M<sub>1</sub> and M<sub>2</sub> gently diverging on distal half; M<sub>4</sub> absent; bM over  $7\times$  r-m length; posterior veins weak at tip. CuA straight, long, reaching margin slightly beyond level of tip of R<sub>1</sub>. Cubital pseudovein absent, CuP produced to level of basal end of M<sub>1+2</sub>. Anal fold long, almost straight, not reaching wing margin. Dorsal macrotrichia on bR, R<sub>1</sub> and Rs, ventral macrotrichia on distal half of bR, R<sub>1</sub> and on second sector Rs. **Abdomen**. Tergite 1 whitish laterally with medial brown mark, tergites 2–6 light yellowish-brown laterally and brownish medially; sternite 1 whitish, sternite 2–6 light yellowish-brown, darker towards distal segments; tergite and sternite 7 yellowish. **Terminalia** (Fig. G52D). Yellowish, small, weakly sclerotized. Sternite 8 trapezoid, a pair of distal lobes reaching level of tip of cercomere 2, with a median incision, microtrichia and elongate setae on ventral face, laterally bare; sternite 9 with medial end distally extending to level of tip of lobes sternite 8, anterior end extending to distal third of segment 7. Tergite 8 rectangular, longer than tergite 9+10. Tergite 9+10 short. Cercomere 1 over twice length of cercomere 2.

**Male.** Unknown.

**Material examined. Holotype:** female, ZRC\_BDP0049018, Nee Soon (NS2), 11-17 December 2014, MIP leg. (website photo specimen).

**Etymology.** The species epithet of this species honors CHEE Swee Lee (1955–), Singapore-born sprinter who won medals at the Southeast Asian Games (SEAG) in 1969, 1971, and 1973, before becoming the first woman from Singapore to win a gold medal and break a record at the Asian Games, in the 1974. She won a second gold medal the subsequent year before retiring from sports. She was inducted into the Singapore Women's Hall of Fame in 2014.

**Remarks.** An ochre-yellow background color of *Aspidionia cheesweeleae*, sp.nov. is shared with *A. fatimahae*, sp.nov., and these two species are probably closer to each other than any of them with *A. janetjesudasonae*, sp.nov.

### *Aspidionia janetjesudasonae* Amorim & Oliveira, sp.nov.

(Figs. G54A–F)

**Diagnosis.** Scutum mostly blackish-brown, with yellowish band along on anterior fifth. Thoracic pleura dark brown, mid coxa whitish with slender brown band at base, hind coxa whitish with brown mark at anterior third. Wing vein r-m absent. Abdomen with tergites and sternites brown.

**Description. Female** (Fig. G54A). Wing length, 1.47; width, 0.54. **Head.** Dark brown, face and clypeus dirty-yellowish. Antennal scape and pedicel ochre-yellowish, flagellum light brown; flagellomere 4 1.3× longer than wide. Palpus and labella light yellowish-brown.

**Thorax** (Figs. G54B–C). Scutum shinning dark brown except for ochre-yellow transverse band along anterior margin, two pairs of long prescutellar bristles and an additional pair of smaller bristles. Scutellum dark brown, with two pairs of strong bristles and two pairs of small additional small setae. All pleural sclerites dark brown, except for brown antepronotum, proepisternum and metepisternum. Antepronotum and proepisternum only with short setae. Anepisternum entirely covered with scattered setae, five longer setae along posterior margin. Mesepimeron with two strong bristles at dorsal end. Laterotergite with five elongate setae; metepisternum with nine elongate setae. **Legs.** Fore coxa whitish with orangish tinge, mid and hind coxae whitish with a brown transverse band across basal end; fore and mid femora whitish-yellow, hind femur mostly whitish-yellow, a dark brown mark along dorsal edge and distal third of femur. Tibiae light yellowish-brown, tarsi light brown.

Front tibia with regular rows of setulae, but no distinctive setae. Haltere white. **Wing** (Fig. G54D). Wing membrane fumose light brown, slightly darker along anterior margin. C extending beyond tip of R<sub>5</sub> over half of distance to M<sub>1</sub>. Sc short, ending free. First sector of Rs nearly transverse; first half of R<sub>5</sub> straight, gently curved on distal half, not too close to R<sub>1</sub> and C; r-m basically absent, origin of M<sub>1+2</sub> at level of distal end of bM; M<sub>1+2</sub> relatively long, about 4× first sector of Rs. Medial fork long, M<sub>1</sub> and M<sub>2</sub> gently diverging towards apex; tip of posterior veins weakly sclerotized; CuA straight, reaching margin before level of tip of R<sub>5</sub>. Sclerotized anal fold present, long, mostly straight. Dorsal setae present on bR, R<sub>1</sub>, R<sub>5</sub>, tip of bM, and distal two-thirds of M<sub>1</sub>, ventral setae on bR, R<sub>1</sub> and R<sub>5</sub>. **Abdomen**. Tergites 1–7 brown, sternite 1 white, sternite 2–7 light brown. **Terminalia** (Figs. G54E–F). Yellowish. Sternite 8 subtriangular with rounded distal end, reaching level of tip of cercomere 2, extending laterally, microtrichia and elongate setae on ventral face, laterally bare; sternite 9 with posterior margin medially extending to level of tip of posterior margin of sternite 8, anterior end with two rounded short lateral lobes, reaching distal third of segment 7. Tergite 8 rectangular, longer than tergite 9+10. Tergite 9+10 short. Cercomere 1 almost 3× cercomere 2 length.

**Material examined. Holotype:** female, ZRC\_BDP0048147, Sungei Buloh (SB1), mangrove, 25.September-02.October.2013, MIP leg. (website photo specimen, slide-mounted). **Additional sequenced specimen:** ZRC\_BDP0314085.

**Etymology.** The species epithet of this species honors Janet “Speedy Gonzales” Jesudason (1936–), Singapore-born pioneer women who represented Singapore in the 1956 Olympics in the 100 meters sprint. She was inducted into the Singapore Women’s Hall of Fame in 2016.

***Aspidionia fatimahae* Amorim & Oliveira, sp.nov.**

(Figs. G55A–E)

**Diagnosis.** Scutum ochre-yellowish, with a dark brown band along anterior margin, and a curved brown mark above anepisternum connecting to brown area on posterior fourth of scutum; scutellum dark brown. Anterior half of anepisternum and dorsoposterior corner of katepisternum greyish-ochre, antepronotum, proespisternum, antero-ventral corner of anepisternum, katepisternum and mesepimeron brownish, a brown mark on dorso-posterior corner of anepisternum, mediotergite dark brown. Mid and hind coxae whitish, hind coxa

with a greyish-brown mark at basal fourth. Wing vein r-m present. Abdomen with ochre-brownish tergites and ochre-yellowish sternites.

**Description. Female** (Fig. G55A). Wing length, 1.84; width, 0.67. **Head** (Fig. G55B).

Brown, face and clypeus light brown. A line of five longer setae on occiput around dorsal margin of eye posteriorly to ocellus. Antennal scape, pedicel and basal half of flagellomere 1 whitish-yellow, distal half of flagellomere 1 and other flagellomeres brown; flagellomere 4 1.8× longer than wide. Palpus whitish, labella whitish-yellow. **Thorax.** Scutum background light ochre-yellow, a dark brown transverse band along anterior margin, a pair of curved elongate brown maculae above anepisternum connecting medially to a brown macula across posterior fourth of scutum. Scutellum dark brown. Antepronotum brown, lighter on posterior half, proepisternum brownish. Ventro-anterior corner and posterior third of anepisternum dark brown, ochre medially, as well as posterior fourth of katepisternum; proepisternum, most katepisternum, mesepimeron, laterotergite and metepisternum brownish, mediotergite dark brown. Antepronotum with some few short setae, proepisternum with short setae and a line with four long setae. Anepisternum with two long setae on ventro-anterior corner and four long setae along posterior margin. Mesepimeron with two strong setae close to dorsal margin. Laterotergite with 16 small and long setae; metepisternum with 14 fine setae. Haltere pedicel light brown, knob mostly cream brown. **Legs.** Front coxa light yellowish-brown, mid and hind coxae whitish, hind coxa with a brown transverse band along basal end; mid and hind femora light yellowish-brown, mid femur with a short brown band at dorsal edge close to anterior end, hind femur with a dark brown longitudinal band along dorsal edge; tibiae and tarsi yellowish-brown, tarsi slightly darker towards tip [front femora, tibiae and tarsi, and mid tibiae and tarsi missing]. **Wing** (Fig. G55C). Wing membrane light brown fumose. C extending beyond tip of R<sub>5</sub> to almost half distance to M<sub>1</sub>. First sector of Rs almost transverse; R<sub>5</sub> running not so close to R<sub>1</sub>/C, straight on basal two third, gently curved distally. First sector of Rs 1.0× r-m length, r-m short but produced, M<sub>1+2</sub> 4.0× r-m length; base of M<sub>1</sub> weakly sclerotized; M<sub>1</sub> and M<sub>2</sub> only gently diverging, tip of M<sub>1</sub>, M<sub>2</sub> and CuA barely sclerotized at very tip; CuA straight. Cubital pseudovein not produced, CuP present to slightly beyond basal end of M<sub>1+2</sub>; sclerotized anal fold long, straight. Setae present dorsally on bR, R<sub>1</sub>, R<sub>5</sub>, r-m and distal end of bM, entirely absent on medial and cubital veins, setae ventrally on bR, R<sub>1</sub> and R<sub>5</sub>. **Abdomen.** Tergite 1 brown, tergites 2–6 brown medially, ochre-yellowish on lateral borders, tergite 7 yellowish-brown. Sternites 1–7 yellowish-brown.

**Terminalia** (Figs. G55D–E). Sternite 8 subtriangular with rounded distal end, reaching level

of tip of cercomere 2, extending laterally, microtrichia and elongate setae on ventral face, laterally bare; sternite 9 posterior margin medially extending to level of posterior margin of sternite 8, anterior end wide. Tergite 8 rectangular, longer than tergite 9+10, mostly covered only with microtrichia, three elongate setae on each slightly projected lateroposterior corner, a short rounded incision present medially. Tergite 9+10 short, lateroposterior corners slightly extended posteriorly, with one seta on each lateroposterior corner. Cercomere 1 about 2× cercomere 2 length.

**Material examined. Holotype:** female, ZRC\_BDP0047810, Nee Soon (NS1), swamp forest, 26.April-01.May.2013, MIP leg. (slide-mounted) (website photo specimen). Paratype: ZRC\_BDP0133550, National University of Singapore (Uhall), 03.May.2017, MIP leg. (distal half of abdomen missing).

**Etymology.** The species epithet of this species honors Hajjah Fatimah binte Sulaiman (1754?–1852?). Born in Malacca, she was a Singaporean merchant and philanthropist, having donated money and land for the establishment of the mosque Masjid Hajjah Fatimah, which has her name, as well as funded homes for the poor adjacent to it. Fatimah was inducted into the Singapore Women's Hall of Fame in 2014.

### *Integricypta* Amorim & Oliveira, new genus

*Integricypta* Amorim & Oliveira. Type-species, *Integricypta* sp.nov. 3 Amorim & Oliveira

**Diagnosis.** Head placed under anterior end of scutum, vertex largely displaced to a frontal position; long inter-ommatidial setae. Scutum lateral border with sharp incision above antepronotum; no shining medial keel on scutum. Katepisternum strongly compressed; laterotergite and mediotergite small, strongly compressed. Wing membrane with a dark brown mark over area around origin of Rs;  $M_{1+2}$  only slightly longer than r-m length;  $M_2$  not aligned basally to  $M_{1+2}$ ;  $M_4$  present, arched, anterior end disconnected from CuA, slightly converging towards  $M_4$  on distal third; CuA straight, tip before level of tip of R<sub>5</sub>; anal fold long, almost straight.

This is one of the cases in which the reciprocal illumination between morphology and molecular data has been mostly useful. The parallel evolution of features often used in identification keys for genera of Mycetophilinae leads to a puzzling situation. The species of *Integricypta*, gen.n. present  $M_4$  (as *Mycetophila*, *Epicypta* and *Platurocypta*), differently from

*Sceptonia*, *Zygomyia*, *Platurocypta* and *Aspidionia*, but its origin is beyond level of base of the medial fork and it is not connected to CuA. As mentioned ahead, *Aspidionia* is a genus very superficially known in the literature, making comparisons more difficult. The slightly curved M<sub>4</sub> towards CuA is a typical feature of *Mycetophila*. The wing membrane has a dark mark medially along anterior margin of the wing, as some few species of *Epicypta*. It has a long C beyond tip of R<sub>5</sub>, as some of the species of *Platyprosthiogynae*, diverging with what is seen in *Epicypta*.

The mitogenome tree shows all five species of *Integricypta*, **gen.nov.** in a clade sister to *Aspidionia*—part of a slightly larger clade including *Epicypta*, *Platurocypta* and *Aspidionia*, which is sister to (*Mycetophila* + *Platyprosthiogynae*). This finds support on a combination of apomorphic features at different levels along the evolution of the Mycetophilinae. The incision at the margin of the scutum above the anterior spiracle is a uniquely derived feature in a clade including *Integricypta*, **gen.nov.**, *Epicypta*, *Platurocypta* and *Aspidionia*. The dorsoventral compression of the katepisternum, the reduction in size of the laterotergite and the mediotergite, the largely developed mid coxa and the size and position of the head are additional derived features shared by this clade.

This new genus raises the number of genera in the Mycetophilinae to 15. It is interesting to realize that this clade of mycetophilines largely have an Indo-Pacific distribution: *Aspidionia*, *Platyprosthiogynae* and *Integricypta* are exclusive distributed in this area and *Platurocypta* has most of its diversification in this region.

The species of *Integricypta*, **gen.nov.** could be placed under *Aspidionia*, but this would change significantly the diagnosis of the *Aspidionia*—M<sub>4</sub> entirely missing in *Aspidionia* and the modified sockets on the scutum antero-medial “keel” is unique for this genus. There are not conflicts between different the delimitation approaches of species of *Integricypta* (Fig. 57E).

**Etymology.** The name of the genus brings together the Latin word *integrum*, for whole, complete, and the Greek word κύπτω—borrowed from the related genus *Epicypta*—, that means “bending the head forward”. The name is a reference to integrative taxonomy, with reciprocal illumination between different sources of information.

***Integricypta fergusondavie Amorim & Oliveira, sp.nov.***

(Figs. G56A–G, G57A–E)

**Diagnosis.** Head blackish-brown, flagellum dark brown with lighter scape and pedicel. Scutum and pleural sclerites blackish-brown. Coxae and femora mostly whitish, mid and hind coxae with brown transverse band at proximal end, hind femur brown at distal third, anterior end of hind tibia with a brown mark. Wing membrane with dark brown mark along over area of origin of  $Rs$ ;  $C$  produced beyond tip of  $R_5$  on two-thirds of distance to  $M_1$ ;  $r-m$  oblique;  $M_{1+2}$   $1.4 \times r-m$  length; wing margin emarginated at level of tip of  $CuA$ . Abdominal tergites brown. Gonocoxites large, no medioventral process, no gonocoxite distal projection beyond base of gonostylus; gonostylus with an elongate ventral lobe with macrosetae on ventral end, a small digitiform median lobe with an apical seta and a weakly sclerotized dorsal lobe with a dorsal and a ventral sublobe with a megaseta apically.

**Description. Male** (Fig. G56A). Wing length, 1.79; width, 0.74. **Head** (Figs. G56C–D). Vertex and frons dark brown, face and clypeus light brown. Eyes small, blackish, with long inter-ommatidial setae. Antennal scape and pedicel whitish-yellow, flagellum light brown, flagellomere 1 and distal four flagellomeres lighter. Maxillary palpus whitish-yellow. Labella small, whitish-yellow. Head dorsoventrally compressed, scattered setulae over entire vertex, a row of five longer setae on occiput around eyes posteriorly to lateral ocellus, a row of setae along anterior margin of frons. Mid ocellus absent, lateral ocelli over a blackish background, touching eye margin. Eyes densely covered with long inter-ommatidial setulae except along dorsal margin. Face covered with short darker setae, clypeus slightly bulging, short, densely covered with setulae. Antennal scape  $1.5 \times$  pedicel length; flagellomere 1 barely longer than second flagellomere, covered with scattered light setae. Maxillary palpus with five palpomeres, palpomere 1 barely produced, palpomere 2 short, with dorsal small setae, palpomere 3 about twice as long as wide, sensorial pit conspicuous, opening at inner face on basal half, palpomere 4 slightly longer than palpomere 3, with dorsal and lateral setulae, palpomere 5 slender, over twice longer than palpomere 4. **Thorax** (Figs. G56E–F). Scutum compressed, dark brown, scutellum dark brown. Scutum entirely covered only with short light brown setae except for some supra-alar longer setae and three pairs of prescutellar bristles, second one at each side smaller. Small bulging area on scutum margin posteriorly to level of insertion of wing. Scutellum large, two pairs of bristles along posterior margin, some small scattered setae also along posterior margin, most of scutellum bare. Pleural sclerites dark brown. Pleural membrane ochre-yellow. Deep incision on scutum lateral margin above level of anterior spiracle. Basisternum extending dorsolateral arms to base of front coxa, not

fused to proepisternum, bare. Antepronotum triangular, fused to proepisternum at posterior margin, suture separating from proepisternum complete, covered only with small setae. Proepisternum largely developed, with small setae and three bristles along ventral margin. Anepisternum large, rectangular, entirely covered with brown setulae, a row of five long setae at posterior margin. Katepisternum strongly compressed, bare, anapleural suture restricted to posterior half. Mesepimeron and laterotergite strongly compressed, mesepimeron with two long setae and three small fine setae, laterotergite with two stronger setae and one small setae ventrally. Metepisternum long and slender, with a row of five fine setae; metepimeron not discernible. Mediotergite short, strongly curved, bare. Haltere pedicel whitish, knob brown, very few setulae on knob. **Legs.** Coxae strongly developed, especially mid and hind coxae. Front coxa whitish with very light orangish tinge, mid and hind coxae whitish, all coxae with a light brown band basally; front femur concolor with coxa, mid and hind femora whitish on basal two-thirds, dark brown on distal third of wing; tibiae ochre-yellowish, mid and hind tibiae brown at basal end, yellowish-brown at tip; tarsi light greyish-brown. Front coxa entirely covered with setulae at anterior face, a row of longer brown setae along margin on distal half of external face and at tip, and along margin on basal half of internal face; mid coxa nearly bare; hind coxa with some few small setae and one strong seta distally at external face. Femora covered with fine setae, a row of longer setae along ventral margin, hind femur with stronger setae. Tibiae and tarsi with regular rows of trichia. Front tibia with a wide antero-apical depressed area lined with setulae. Mid and hind tibiae with a regular row of long, fine setae externally on apex. Fore tibia with one stronger dorsal seta at distal half; mid tibia with a row of six bristles dorsally, two bristles laterally on anterior face and one strong ventral bristle midway to apex besides distal strong setae; hind tibia with four dorsal bristles and seven stronger lateral bristles besides distal strong setae. Fore leg tarsomeres only with rows of trichia and a couple of distal stronger setae; mid leg tarsomeres 1–3 with rows of stronger setae besides rows of trichia; hind leg tarsomeres 1–5 with stronger or longer setae besides regular rows of trichia. Tarsomere 1 of front leg  $0.7 \times$  tibia length and  $2.0 \times$  tarsomere 2 length. Tibial spurs light brown, subequal, less than  $3 \times$  tibia width at apex. Tarsal claws with an inconspicuous basal tooth. **Wing (Fig. G56G).** Membrane light brown fumose, a small light brown band on wing base and a dark brown macula medially on wing from anterior margin to base of medial fork; membrane densely covered with regularly organized microtrichia on all cells, no macrotrichia on membrane. Membrane emarginated at tip of CuA. Sc faint, a fold at that position directed towards C. R<sub>1</sub> relatively short, reaching C at distal third of wing; R<sub>4</sub> absent; R<sub>5</sub> short, reaching C before level of tip of M<sub>4</sub> running very

close to C; C extending for two-thirds of distance to M<sub>1</sub>. First sector of Rs oblique, devoid of setae,  $0.82 \times$  r-m length; r-m oblique, short. Posterior wing veins weakly sclerotized close to wing margin. M<sub>1+2</sub> short,  $1.4 \times$  r-m length; M<sub>1</sub> and M<sub>2</sub> well sclerotized, running more or less parallel along most of their length; bM over  $7 \times$  r-m length; M<sub>4</sub> short, arched, well sclerotized, origin beyond medial fork, base of M<sub>4</sub> detached from CuA. CuA straight, long, reaching margin beyond level of tip of R<sub>1</sub>; first sector of CuA  $1.3 \times$  length of second sector of CuA, reaching wing margin beyond level of tip of R<sub>1</sub>. Cubital pseudovein absent, CuP barely recognizable, reduced to basal fourth of CuA. Anal fold long, almost straight, not reaching wing margin. Dorsal macrotrichia on bR, R<sub>1</sub>, second sector of Rs and r-m; ventral macrotrichia on fourth of bR, R<sub>1</sub> and second sector of Rs. Wing margin emarginated at level of tip of CuA. **Abdomen.** Abdominal tergites 1–7 brown. Sternites 1-6 very slender, light brown. **Terminalia** (Figs. G57A–B). Light brown, cerci lighter. Gonocoxites large, close together medially, no medioventral process, no projection of gonocoxite distal border projecting beyond base of gonostylus. Gonostylus composed of: an elongate ventral lobe with strong setae and macrosetae on ventral end; a small digitiform median lobe with an apical seta; a dorsal weakly sclerotized lobe with a dorsal branch with setae externally and a ventral branch, each branch with a megaseta apically. Gonocoxal bridge very weakly sclerotized. Aedeagal-parameral complex subquadrate, weakly sclerotized, with a pair of short, pointed extension dorso-laterally Tergite 9 and cerci not clear.

**Female** (Fig. G56B). As male, except for the following. **Wing.** Length, 1.95; width, 0.75.

**Head.** Head with four long setae on occiput around eyes posteriorly to lateral ocellus.

**Thorax.** Laterotergite with four setae. Metepisternum with seven longer and four smaller setae along its length. **Terminalia** (Figs. G57C–D). Whitish-yellow. Sternite 8 elongate, no gonapophyses produced, setulae on posterior half, sternite reaching level of mid of cercomere 1. Sternite 9 elongate, Y-shaped, weakly sclerotized, anterior end slender, reaching proximal end of sternite 8. Tergite 8 wide anteriorly, tapering at posterior end, reaching level of base of cercomere 1. Tergite 9+10 elongate, wider midway to apex, weakly sclerotized. Cercomeres 1 and 2 produced, elongate, setose, subequal in length.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000827>)

**Material examined. Holotype:** male, ZRC\_BDP0049297, National University of Singapore (Icube), 26.March-01.April.2015, MIP leg. (slide-mounted). **Paratypes:** 12 males, 5 females. **Males:** ZRC\_BDP0047053, National University of Singapore (PGP), 11-17.June.2015, MIP leg.; ZRC\_BDP0047056, National University of Singapore (PGP), 11-17.June.2015, MIP leg.; ZRC\_BDP0047084, National University of Singapore (Icube), 11-17.June.2015, MIP leg.; ZRC\_BDP0047102, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0048133, Pulau Semakau (SMO2), old mangrove, 05-11.July.2013, MIP leg.;

ZRC\_BDP0048141, Sungei Buloh (SB1), mangrove, 25.September-02.October.2013, MIP leg.; ZRC\_BDP0048728, Nee Soon (NS2), 09-15.April.2015, MIP leg.; ZRC\_BDP0049298, National University of Singapore (Icube), 26.March-01.April.2015, MIP leg.; ZRC\_BDP0049313, National University of Singapore (Icube), 02-08.April.2015, MIP leg. ZRC\_BDP0049316, National University of Singapore (Icube), 02-08.April.2015, MIP leg.; ZRC\_BDP0049340, National University of Singapore (PGP), 02-08.April.2015, MIP leg.; ZRC\_BDP0066817, Bukit Timah, maturing secondary forest (BT09), 29.September-05.October.2016, MIP leg. Females: ZRC\_BDP0047092, National University of Singapore (PGP), 18-24.June.2015, MIP leg.; ZRC\_BDP0049135, National University of Singapore (PGP), 16-22.April.2015, MIP leg. (website photo specimen); ZRC\_BDP0049314, National University of Singapore (Icube), 02-08.April.2015, MIP leg. (slide-mounted); ZRC\_BDP0049318, National University of Singapore (Icube), 21-27.May.2015, MIP leg.; ZRC\_BDP0049325, National University of Singapore (Icube), 23-29.April.2015, MIP leg. **Additional sequenced specimens**: male, ZRC\_BDP0155020 (website photo specimen); ZRC\_BDP0132881; ZRC\_BDP0133420; ZRC\_BDP0133513; ZRC\_BDP0133529; ZRC\_BDP0133553; ZRC\_BDP0155002; ZRC\_BDP0278325; ZRC\_BDP0278330; ZRC\_BDP0278457; ZRC\_BDP0279137; ZRC\_BDP0279141; ZRC\_BDP0279177; ZRC\_BDP0279178; ZRC\_BDP0279182; ZRC\_BDP0279186; ZRC\_BDP0284177; ZRC\_BDP0284180; ZRC\_BDP0284182; ZRC\_BDP0284183; ZRC\_BDP0284186; ZRC\_BDP0284187; ZRC\_BDP0284191; ZRC\_BDP0284197; ZRC\_BDP0284199; ZRC\_BDP0284202; ZRC\_BDP0284228; ZRC\_BDP0284255; ZRC\_BDP0284268; ZRC\_BDP0284284; ZRC\_BDP0284300; ZRC\_BDP0314075; ZRC\_BDP0314078; ZRC\_BDP0314081; ZRC\_BDP0314090; ZRC\_BDP0314091; ZRC\_BDP0314096; ZRC\_BDP0314132; ZRC\_BDP0314133; ZRC\_BDP0314135; ZRC\_BDP0314147; ZRC\_BDP0314149; ZRC\_BDP0314151; ZRC\_BDP0314153; ZRC\_BDP0314155; ZRC\_BDP0314162; ZRC\_BDP0314164; ZRC\_BDP0314181; ZRC\_BDP0314184; ZRC\_BDP0314195; ZRC\_MIS0000053.

**Etymology.** The species epithet of this species honors Charlotte Elizabeth Ferguson-Davie (1880–1943). Born in Essex and moving to Singapore in 1909 already as a physician, she founded St. Andrew's Mission Hospital, the first women's and children's clinic in Singapore, and oversaw some of Singapore's first programs to train female midwives and nurses. She was inducted into the Singapore Women's Hall of Fame in 2014. The name is used in apposition.

**Remarks.** This is a pretty abundant species in Singapore, with nine different haplotypes, collected different environments.

***Integricypta teosoonkimaiae* Amorim & Oliveira, sp.nov.**

(Figs. G58A–E)

**Diagnosis.** Head blackish-brown, flagellum dark brown, with lighter scape and pedicel. Scutum and pleural sclerites blackish-brown. Coxae and femora mostly whitish, mid and hind coxae with brown transverse band at proximal end, hind femur brown at distal fourth, proximal end of mid and hind tibia brown. Wing membrane with dark brown mark along over area of origin of Rs; C well produced beyond tip of R<sub>5</sub>; vein r-m present, M<sub>1+2</sub> 0.88× r-m length; wing margin emarginated at level of tip of CuA. Abdominal tergites brown.

Gonocoxites fused to each other along anterior half of syngonocoxite, no medioventral process; gonostylus with a flat lobe with short denticles covering inner face, a ventral digitiform lobe with some setae and a falciform dorsal lobe.

**Description. Male** (Fig. G58A). Wing length, 1.76; width, 0.67 mm. **Head.** Vertex and frons brown, face and clypeus light brown. Antennal scape and pedicel whitish-yellow [flagelli of both antennae missing in the holotype]. Maxillary palpus whitish-yellow. Labella small, whitish-yellow. A row of six long setae on occiput around eyes posteriorly to lateral ocellus.

**Thorax** (Fig. G58B). Scutum brown, scutellum light brown. Mesepimeron with two long setae and three small fine setae, laterotergite with two long setae. Metepisternum with six long setae along sclerite and three setulae on anterior end. **Legs.** Coxae whitish, front coxa with a slender light brown band basally, mid and hind coxae with larger brown band basally.

**Wing** (Fig. G58C). Membrane light brown fumose, a small light brown band on wing base and a dark brown macula medially on wing from anterior margin to base of medial fork, more or less fading beyond tip of costal cell beyond  $R_1$ . Sc faint, a fold at that position directed towards C.  $R_1$  relatively short, reaching C at distal third of wing;  $R_4$  absent;  $R_5$  short, running close to C, reaching margin at level of tip of  $M_4$ ; C extending for over half distance to  $M_1$ . First sector of Rs oblique, devoid of setae; r-m oblique, short.  $M_{1+2}$  short,  $1.5 \times$  r-m length;  $M_1$  and  $M_2$  well sclerotized, slightly diverging from each other close to wing margin.  $M_4$  origin beyond level of medial fork, base of  $M_4$  detached from CuA, reaching wing margin well at level of tip of  $R_5$ , arched along most of its length; bM over  $9.1 \times$  r-m length. Posterior wing veins weakly sclerotized close to wing margin. CuA straight, long, reaching margin beyond level of tip of  $R_1$ ; first sector of CuA 1.2 length of second sector of CuA. Cubital pseudovein not produced, CuP weak, short, not reaching level of origin of  $M_4$ . Dorsal macrotrichia on bR,  $R_1$ , second sector of Rs and r-m; ventral macrotrichia on distal fourth of bR, on  $R_1$  and on second sector of Rs. Wing margin emarginated at level of tip of CuA. **Abdomen.** Abdominal tergites 1–7 light brown. Sternites 1–7 yellowish-brown. **Terminalia** (Figs. G58D–E). Light yellowish-brown. Gonocoxites fused to each other along anterior half of syngonocoxite, no medioventral process. Gonostylus composed of a large, flat lobe with short denticles covering inner face, a ventral, digitiform lobe with some few setae and a dorsal falciform bare lobe. Tergite 9 well developed, placed at anterior end of terminalia dorsally.

**Material examined. Holotype:** male, ZRC\_BDP0047054, National University of Singapore (PGP), 11–17.June.2015, MIP leg. (website photo specimen, slide-mounted).

**Etymology.** The species epithet of this species honors TEO Soon Kim (1904-1978). She was the third Malayan Chinese woman to be admitted to the bar of England and Wales (1927), the first woman admitted to the Straits Settlement bar (1928) after she returned to Singapore, and the first woman barrister in Hong Kong (1932). She was first woman to argue a case in front of the Supreme Court and drew a crowd in the public gallery. She was inducted into the Singapore Women's Hall of Fame in 2014.

***Integricypta shirinae* Amorim & Oliveira, sp.nov.**

(Figs. G59A–H)

**Diagnosis.** Head blackish-brown, flagellum dark brown with lighter scape and pedicel. Scutum, scutellum and pleural sclerites blackish-brown. Coxae and femora mostly whitish, mid and hind coxae with brown transverse band at proximal end, tip of mid femur and distal third of hind femur dark brown, proximal end of mid and hind tibia brown. Wing membrane with dark brown mark along over area of origin of Rs; C well produced beyond tip of Rs; r-m present,  $0.77 \times M_{1+2}$  length; wing margin strongly emarginated at level of tip of CuA. Abdominal tergites 1–6 brown. Gonocoxites fused to each other along anterior half of syngonocoxite, no medioventral process; gonostylus large, ventral lobe triangular with a row of slender spines along inner margin, a digitiform median lobe and a large, digitiform dorsal lobe.

**Description. Male** (Fig. G59A). Wing length, 1.73–1.76 mm; width, 0.67–0.74 mm. **Head.** Dark caramel-brown, a row of five dark brown longer setae dorsally to eyes on occiput. Scape and pedicel yellowish, scape twice pedicel length; flagellomeres greyish-brown, flagellomere 1 much lighter. Face and clypeus light brown. Maxillary palpus whitish; labella whitish-yellow. **Thorax** (Fig. G59C). Scutum caramel-brown, scutellum blackish-brown. Pleural sclerites caramel-brown, antepronotum, proepisternum and mesepimeron darker, laterotergite ochre-yellow. Pleural membrane ochre-yellow. Two pairs of scutellar bristles. Antepronotum only with small setae, proepisternum with three bristles along ventral margin. Mesepimeron with two strong setae and two small setae, laterotergite with three strong setae. Metepisternum with a row of five long setae and five setulae close to anterior end. Haltere pedicel whitish, knob brownish. **Legs.** Coxae strongly developed, especially mid and hind

coxae. Front coxa whitish with very light orangish tinge, mid and hind coxae whitish, all coxae with a light brown band basally; front femur concolor with coxa, mid and hind femora whitish on basal two-thirds, dark brown on distal fourth of wing; tibiae ochre-yellowish, mid and hind tibiae brown at basal end, yellowish-brown at tip; tarsi light greyish-brown. **Wing** (Fig. G59D). Membrane light brown fumose, a dark brown macula from anterior margin to base of medial fork, extending distally along cell c, a faint brownish mark on membrane at very base of wing anteriorly. Sc faint, present as a fold. R<sub>1</sub> relatively short, reaching C at distal third of wing; R<sub>4</sub> absent; R<sub>5</sub> short, reaching C before level of tip of M<sub>4</sub>; C extending for over half distance to M<sub>1</sub>. First sector of Rs oblique, devoid of setae; r-m oblique, short, slightly longer than first sector of Rs. M<sub>1+2</sub> short,  $2.0 \times$  r-m length; M<sub>1</sub> and M<sub>2</sub> well sclerotized, slightly diverging close to wing margin. M<sub>4</sub> origin beyond level of base of medial fork, base of M<sub>4</sub> detached from CuA, reaching wing margin beyond level of tip of R<sub>5</sub>, arched along most of its length; bM over  $8.9 \times$  r-m length. Posterior wing veins weakly sclerotized close to wing margin. CuA straight, long, reaching margin almost at level of tip of R<sub>5</sub>; first sector of CuA  $1.1 \times$  length of second sector of CuA. Cubital pseudovein not produced, CuP barely produced, not reaching level of origin of M<sub>4</sub>. Dorsal macrotrichia on bR, R<sub>1</sub>, second sector of Rs and r-m; ventral macrotrichia on distal fourth of bR, R<sub>1</sub> and second sector of Rs. Wing margin strongly emarginated at level of tip of CuA. **Abdomen.** Abdominal tergite 1 dark greyish-brown, tergites 1-6 light greyish-brown, tergite 6 cream-yellow along posterior margin, tergite 7 cream-yellow. Sternites 1-7 cream-yellow. **Terminalia** (Figs. G59E-F). Light brown, cerci lighter. Gonocoxites short, fused medially along anterior half of terminalia, suture of fusion present only at anterior end, posterior border of syngonocoxite without a medioventral process, short rounded lobes of posterior border of gonocoxite laterally, anteriorly and posteriorly to insertion of gonostylus, few long setae close to posterior margins of syngonocoxite ventrally and some few elongate fine setae on posterior half laterally. Gonostylus composed of: a triangular ventral lobe (more a ventral extension of distal lobe) with a long row of long, curved setae on posterior margin bearing a short, digitiform subterminal projection on anterior margin with two long distal setae; a long digitiform, weakly sclerotized distal lobe densely covered with long fine setae; a dorsal large lobe with a dense group of stronger setae distally and a strong seta directed inwards; a short digitiform median lobe with a single fine apical seta. Gonocoxal bridge very weakly sclerotized. Aedeagal-parameral complex encapsulated, with a ventral elongate capsule extending into a distal aedeagal plate more sclerotized on distal margin and with a pair of sub-medial setae and a pair of laterodistal short pointed projections. Tergite 9 fused to tergite

10 and cerci, present as a pair of large ovoid lobes dorsally, bearing microtrichia and fine setae.

**Female** (Fig. G59B). As male, except for the following. **Wing**. Length, 1.70 mm; width, 0.67 mm. **Head**. Four long setae on occiput around eyes posteriorly to lateral ocellus. **Thorax**.

Mesepimeron with five longer setae in a line and 11 small setae, laterotergite with three long setae and eight additional small setae. Metepisternum with three longer on posterior end and 14 setulae along its length. **Abdomen**. Tergites 1–5 brown, tergite 6 mostly brown, with a medial yellowish mark medially along posterior margin, tergite 7 mostly yellowish.

**Terminalia** (Figs. G59G–H). Whitish-yellow. Sternite 8 elongate, trapezoid, weakly sclerotized, with no gonapophyses produced, covered with microtrichia and fine setae.

Sternite 9 weakly sclerotized, very long, anterior arm reaching level of mid of segment 7, posteriorly extending to level of tip of cerci. Tergite 9+10 wide, covered with microtrichia over entire sclerite and some setulae on posterior half. Cercomeres 1 and 2 partially fused, with setae, setulae and microtrichia, cercomere 2 with a long apical seta.

(<https://singapore.biodiversity.online/species/A-Arth-Hexa-Diptera-000725>)

**Material examined. Holotype:** male, ZRC\_BDP0047077, National University of Singapore (PGP), 09-15.July.2015, MIP leg. (slide-mounted). **Paratypes:** 20 males, 8 females. **Males:** ZRC\_BDP0047093, National University of Singapore (PGP), 18-24.June.2015, MIP leg.; ZRC\_BDP0047096, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0047097, National University of Singapore (PGP), 02-08.July.2015, MIP leg.; ZRC\_BDP0048260, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.; ZRC\_BDP0048261, Sungei Buloh (SB1), mangrove, 03-09.October.2013, MIP leg.; ZRC\_BDP0048767, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048780, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048782, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048787, National University of Singapore (PGP), 28.May-03.June.2015, MIP leg.; ZRC\_BDP0048788, National University of Singapore (PGP), 28.May-03.June.2015, MIP leg.; ZRC\_BDP0049069, National University of Singapore (PGP), 21-27.May.2015, MIP leg.; ZRC\_BDP0049268, National University of Singapore (PGP), 30.April-06.May.2015, MIP leg.; ZRC\_BDP0049321, National University of Singapore (UHall), 26.March-01.April.2015, MIP leg.; ZRC\_BDP0049334, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0049343, National University of Singapore (PGP), 02-08.April.2015, MIP leg.; ZRC\_BDP0049344, National University of Singapore (PGP), 23-29.April.2015, MIP leg.; ZRC\_BDP0049346, National University of Singapore (PGP), 23-29.April.2015, MIP leg.; ZRC\_BDP0049347, National University of Singapore (PGP), 23-29.April.2015, MIP leg.; male, ZRC\_BDP0279115, Singapore, 31.May.2018, MIP leg. (slide-mounted); ZRC\_BDP0278248, Pulau Ubin (PU18), mangrove, 31.May.2018, MIP leg. (extracted). **Females:** ZRC\_BDP0047085, National University of Singapore (Icube), 11-17.June.2015, MIP leg.; ZRC\_BDP0048427, Nee Soon (NS2), swamp forest, 19-25.April.2012, MIP leg. (website photo specimen); ZRC\_BDP0048768, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0048783, National University of Singapore (PGP), 14-20.May.2015, MIP leg.; ZRC\_BDP0049331, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0049333, National University of Singapore (PGP), 04-10.June.2015, MIP leg.; ZRC\_BDP0049345, National University of Singapore (PGP), 23-29.April.2015, MIP leg. (slide-mounted); ZRC\_BDP0040965, National University of (date range 2012-2018), MIP leg. **Additional sequenced specimens:** male, ZRC\_BDP0132851; male, ZRC\_BDP0132855; male, ZRC\_BDP0132856; male, ZRC\_BDP0132880; male, ZRC\_BDP0132894; male, ZRC\_BDP0133136; male, ZRC\_BDP0133397; male, ZRC\_BDP0133538; male, ZRC\_BDP0133375 (website photo specimen); female, ZRC\_BDP0132832; female, ZRC\_BDP0132878; female, ZRC\_BDP0133484; female, ZRC\_BDP0133512; female, ZRC\_BDP0133520; female, ZRC\_BDP0133521. Abdomen missing, ZRC\_BDP0132829; abdomen missing, ZRC\_BDP0132833;

abdomen missing, ZRC\_BDP0133161; abdomen missing, ZRC\_BDP0133170; MC336\_30189; MC337\_30189; ZRC\_BDP0048779; ZRC\_BDP0048781; ZRC\_BDP0048785; ZRC\_BDP0048786; ZRC\_BDP0049071; ZRC\_BDP0049265; ZRC\_BDP0070128; ZRC\_BDP0082287; ZRC\_BDP0128603; ZRC\_BDP0132836; ZRC\_BDP0132849; ZRC\_BDP0132882; ZRC\_BDP0132883; ZRC\_BDP0133091; ZRC\_BDP0133094; ZRC\_BDP0133099; ZRC\_BDP0133101; ZRC\_BDP0133103; ZRC\_BDP0133114; ZRC\_BDP0133132; ZRC\_BDP0133140; ZRC\_BDP0133141; ZRC\_BDP0133177; ZRC\_BDP0133178; ZRC\_BDP0133180; ZRC\_BDP0133181; ZRC\_BDP0133182; ZRC\_BDP0133183; ZRC\_BDP0133391; ZRC\_BDP0133395; ZRC\_BDP0133406; ZRC\_BDP0133415; ZRC\_BDP0133416; ZRC\_BDP0133419; ZRC\_BDP0133421; ZRC\_BDP0133422; ZRC\_BDP0133423; ZRC\_BDP0133424; ZRC\_BDP0133478; ZRC\_BDP0133491; ZRC\_BDP0133506; ZRC\_BDP0133537; ZRC\_BDP0133543; ZRC\_BDP0142309; ZRC\_BDP0078962, ZRC\_BDP0078972, ZRC\_BDP0278282, ZRC\_BDP0278291, ZRC\_BDP0278294, ZRC\_BDP0278304, ZRC\_BDP0279136, ZRC\_BDP0279140, ZRC\_BDP0279144, ZRC\_BDP0279145, ZRC\_BDP0279146, ZRC\_BDP0279152, ZRC\_BDP0279155, ZRC\_BDP0279161, ZRC\_BDP0279190, ZRC\_BDP0279196, ZRC\_BDP0284189, ZRC\_BDP0284193, ZRC\_BDP0284201, ZRC\_BDP0284242, ZRC\_BDP0284253, ZRC\_BDP0284258, ZRC\_BDP0284259, ZRC\_BDP0284260, ZRC\_BDP0284261, ZRC\_BDP0284263.

**Etymology.** The species epithet of this species honors Shirin Fozdar (1905-1992). Mumbai-born, she worked on women's rights and welfare issues in India in the 1930s and 1940s, moving to Singapore in 1950, where she and her husband helped spreading the Bahá'í. In Singapore, she championed against marriage inequality and polygamy, and was instrumental in the founding of the Singapore Council of Women and of the nation's Syariah Court. Shirin was a leader in the advocacy effort that saw the Singapore Council of Women become law and played a major role in the creation of the Syariah Court.

**Remarks.** There are three haplotypes found for *Integricypta shirinae*, sp.nov. and all species delimitation approach indicate a single species. Two males correspond to sequence failures that have male terminalia identical to the holotype.

***Integricypta hoyuenhoeae* Amorim & Oliveira, sp.nov.**

(Figs. G60A–H)

**Diagnosis.** Head blackish-brown, flagellum dark brown with lighter scape and pedicel. Scutum, scutellum and pleural sclerites shining blackish-brown. Coxae and femora mostly whitish, mid and hind coxae with brown transverse band at proximal end; mid femur with no brown mark at basal end. Wing membrane light yellowish-brown fumose, with a light brown mark at wing base anteriorly, a dark brown mark anteriorly from C to M<sub>2</sub> between origin of Rs and tip of R<sub>1</sub>; C produced beyond tip of R<sub>5</sub> for over half distance to tip of M<sub>1</sub>; r-m oblique, 0.79× of M<sub>1+2</sub> length; wing margin strongly emarginated at level of tip of CuA. Abdominal tergites 1–5 brown, tergite 6 yellowish-brown.

**Description. Female** (Figs. G60A–B). Wing length, 1.98 mm; width, 0.75 mm. **Head.** Dark greyish-brown, a row of five dark brown longer setae dorsally to eyes on occiput. Scape and pedicel yellowish, flagellomeres light brown. Face and clypeus light brown. Maxillary palpus whitish. Labella whitish-yellow. **Thorax** (Fig. G60C). Scutum caramel-brown, scutellum light brown. Pleural sclerites blackish-brown. Pleural membrane ochre-yellow.

Antepronotum only with small setae, proepisternum with three bristles along ventral margin. Mesepimeron with two longer setae and two smaller setae, laterotergite with two long setae. Metepisternum with a row of four long setae and three setulae close to anterior end. Haltere pedicel whitish, knob brownish. **Legs.** Coxae whitish with very light orangish tinge, all coxae with a light brown band basally, less extensive in front coxa. Front femur concolor with coxa except for darker tip, mid and hind femora whitish with a greyish tinge; tibiae and tarsi light greyish-brown, at front leg darker. **Wing.** Membrane light brown fumose, a dark brown macula from anterior margin to base of medial fork, extending distally along cell c, a faint brownish mark on membrane at very base of wing anteriorly. Sc faint, a fold directed towards C. R<sub>1</sub> relatively short, reaching C at distal third of wing; R<sub>4</sub> absent; R<sub>5</sub> short, reaching C slightly before level of tip of M<sub>4</sub>; C extending for over half distance to M<sub>1</sub>. First sector of Rs oblique, devoid of setae; r-m oblique, short,  $0.82 \times$  first sector of Rs. M<sub>1+2</sub> short,  $1.7 \times$  r-m length; M<sub>1</sub> and M<sub>2</sub> well sclerotized, M<sub>1</sub> quite parallel to M<sub>2</sub> close to wing margin. M<sub>4</sub> origin beyond level of base of medial fork, base of M<sub>4</sub> detached from CuA, reaching wing margin before level of tip of R<sub>5</sub>, gently curved along distal half; bM over  $9.7 \times$  r-m length. Posterior wing veins weakly sclerotized close to wing margin. CuA straight, long, reaching margin beyond level of tip of R<sub>1</sub>; first sector of CuA  $1.2 \times$  length of second sector of CuA. Cubital pseudovein absent, CuP restrict to first third of CuA. Dorsal macrotrichia on bR, R<sub>1</sub>, second sector of Rs and r-m; ventral macrotrichia on fourth of bR, R<sub>1</sub> and second sector of Rs.

**Abdomen.** Abdominal tergite 1 dark greyish-brown, tergites 2-5 dark greyish-brown with margins grey-yellowish, tergite 6 darker only medially, large lighter portions laterally, tergite 7 cream-yellow. Sternites 1-7 cream-yellow. **Terminalia.** Light brown, cerci lighter. Sternite 8 elongate, trapezoid, weakly sclerotized, with no lobes on posterior margin, covered with microtrichia and fine setae. Sternite 9 weakly sclerotized, very long, anterior arm reaching level of mid of segment 7, posteriorly extending to level of tip of cerci. Tergite 9+10 wide, covered with microtrichia, two pairs of setae along posterior margin. Cercomeres 1 and 2 partially fused, with setae, setulae and microtrichia, cercomere 2 with a long apical seta.

**Material examined. Holotype:** female, ZRC\_BDP103977, Sungei Buloh (SB1), 31Oct–06Nov2013, MIP leg. (website photo specimen).

**Etymology.** The species epithet of this species honors Abbess HO Yuen Hoe (1908-2006), who had as Dharma name Venerable Jing Run. Born in Guangzhou, she was a Buddhist nun who was affectionately known as Singapore’s “grand dame of charity” for her lifelong devotion in helping the old and needy. She was the founder and abbess of the Lin Chee Cheng Sia Temple and founded in 1969 the Man Fu Tong Nursing Home, the first Buddhist nursing home. She received the Public Service Award from the President of Singapore in 2001 in recognition of her contribution to the country. She was inducted into the Singapore Women’s Hall of Fame in 2014.

**Remarks.** This single known specimen of *Integricypta hoyuenhoeae*, sp.nov. is a sequence failure. It is distinct of the remaining four species of *Integricypta*, gen.nov. based on the color of the abdomen and details of the wing venation—the wing is strongly emarginated, M<sub>4</sub> is not arched along distal half, M<sub>1</sub> and M<sub>2</sub> are not divergent at distal end etc.

## Discussion

### Collecting effort, environments, abundance, faunal composition

The Mangrove Insect Project had a total of 3,526 Malaise trap weeks, distributed into five environments in Singapore—mangrove (a total of 74 trap sites, 2,162 trap weeks), tropical forest (nine traps, 567 weeks), urban forests (15 traps, 280 weeks), swamp forest (four traps, 262 weeks), coastal forest (10 traps, 156 weeks) and freshwater swamp (seven traps, 99 weeks). Of the total trap sampling, 69 of the traps collected a total 3,032 mycetophilid specimens that were sequenced. Of these, only 1,312 specimens were available for morphological inspection—the 120 species in this manuscript come only from this subset. The remaining 1,720 specimens were collected later than the initial batch. These additional sequenced specimens only account for another 22–26 mOTUs (2 – 5% p-distance clustering).

The mangrove traps collected a relatively lower number of mycetophilid specimens/sample, when compared to Malaise traps working in other environments. Nevertheless, there was a surprisingly high diversity in an environment never associated in the literature to mycetophilids. Of the overall 120 species of Mycetophilidae recorded in the project, 25 species were recorded for the mangrove trap samples, while the urban forests had 17 species, the rainforest had 39 species, the freshwater swamp had seven species, the coastal forest had eight species and the swamp forest had an impressive total of 92 species—these numbers should, of course, be seen considering the correspondent sampling effort in each environment.

The most species-rich genera in our samples are the mycomyine *Neoempheria*, with 31 species, the mycetophiline *Epicypta*, with 29 species, and the leiine *Manota*, with 14 species. This pattern is quite typical for tropical areas in other parts of the globe. In the Neotropical region, the most species-rich genera are *Mycetophila* and *Mycomya*, respectively with 329 and 86 species—with species largely restricted to temperate areas in Chile, Argentina and southern Brazil. In tropical areas of the Neotropical region, *Neoempheria* (69 species), *Leia* (64), *Epicypta* (60) and *Manota* (55) are the most speciose genera. In this sense, the number of species of *Clastobasis* in Singapore was surprisingly low (as mentioned, *Leia* and *Clastobasis* are mutually paraphyletic).

Of the 120 species present in our samples, 32 are known from singletons (26.7%) and 12 are known from doubletons (10.0%), suggesting a much larger Mycetophilidae fauna in Singapore. The most abundant species found is *Clastobasis oranglaut*, sp.nov., with 357 specimens collected, of which 120 were available for this manuscript. The *Epicypta* species

are responsible for almost half of the specimens collected. The rarefaction curves so suggest around 150 species of Mycetophilidae in Singapore (maximum, 193).

Studies of local faunas based on generic revisions usually take decades until all genera are properly addressed—in many cases never fully accomplished. The reasons are many: size of the task in terms of number of species, too complex genera, bias from the literature in terms of genera to which no attention is given etc. A complete taxonomical approach of a family on a restricted geographic scale, as made here, allows a real estimation of species-richness and as well a proper understanding of faunal composition.

Of the genera collected in Singapore, many are worldwide in distribution and there is at most scarce information on smaller clades that could evidence regional patterns involving the Singaporean elements—this is the case, e.g., of *Leptomorphus*, *Azana* and *Monoclonia*. The northern range of the Oriental fauna has Palearctic elements that definitely does not reach the Singaporean fauna. Some few genera abundant in temperate regions have smaller clades distributed in different tropical areas (including Singapore), as *Allodia*, *Exechia*, *Mycetophila*, and maybe *Ectrepesthoneura*. Genera with tropical distribution worldwide (occasionally with species in temperate areas) are the bulk of the diversity of the family in Singapore:

*Tetragoneura*, *Manota*, *Mohelia*, *Neoempheria*, *Clastobasis* and *Epicypta*.

There are elements in Singapore that clearly belonging to an Afro-Oriental general pattern (including Australasian elements), as is the case of *Allactoneura*, *Eumanota* and the *Aspidionia/Integricypta*, gen.nov. clade. There are cases of predominantly Afro-Oriental groups that also have some few Palearctic and Neotropical species, as happens with *Platurocypta* and *Platyprosthiogyne* (that has one undescribed Neotropical species—see Brown et al., 2018; Borkent et al., 2018). The clade with *Chalastonepsia* and *Metanepsia* have Neotropical species nominally in *Dziedzickia*. Indeed, the generic composition of the Singaporean fauna of Mycetophilidae is considerably similar to the generic composition of Neotropical tropical forests, what suggests common evolutionary trends between the tropical elements in these two areas (Amorim et al., 2018).

#### *DNA barcoding and species delimitation*

A total of 1,312 313-bp *cox1* barcodes were obtained. ~~The barcoding of five specimens from the genus *Megophthalmidia* was unsuccessful, but were morphologically distinct enough such that representatives were selected for further sequencing.~~ The 1,312 barcoded specimens represent the 120 morphospecies included in this study. The barcodes were clustered into 115–130 molecular operational taxonomic units (mOTUs) via objective

clustering at 2 – 5% uncorrected p-distances (Table 1). With ABGD, the number of mOTUs range from 123 to 128, with the exception of the last prior ( $P = 0.1$ ), which lumps most specimens into a single mOTU. PTP and mPTP cluster the barcodes into 134 and 109 mOTUs respectively. With the exception of ABGD with the  $P = 0.1$  prior, there is overall high congruence with morphology for most of the molecular species delimitation algorithms and parameters tested. The most congruent treatment is from ABGD at  $P=0.06$  (114 clusters congruent), followed by objective clustering at 3 and 4% p-distance (112 clusters congruent), while the least congruent is with mPTP (75 clusters congruent)..

This is reinforced when examining congruence for each morphospecies. After excluding ABGD with the  $P = 0.01$  prior, most morphospecies are congruent with mOTUs derived from the various molecular species delimitation algorithms and parameters (Table S1: 60 of the 121 species have perfect congruence across all treatments). Excluding mPTP, the next poorest performing algorithm, 95 species would have perfect congruence across the remaining treatments.

[It would be interesting to address the grey zone cases, in which the sequences suggested that there could be more than one species. Answers could be given if the source of morphological information to delimit species—male terminalia—was available. Because we don't have males of some of these clusters, no answers could be obtained for some of these cases. In two of the cases, we found males confirming suspicion of separate species (one in *Allactoneura* and one in *Epicypta*), in one case the males all look identical and we rejected the H0 of separate species for both clusters, and in two cases there were only females, so we could not formally answer the question and we left the specimens outside the list of paratypes.]

*Integrative taxonomy—sequencing, imaging, describing, detailed morphology documentation*  
[Rudolf/Darren/Dalton/Sarah]

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## **Legend for Tables:**

1. Table I. Heatmap for species delimitation approaches for species of the Sciophilinae, Gnoristinae, Tetragoneurinae and Leiinae. See text for details.
2. Table II. Heatmap for species delimitation approaches for species of Mycomyinae. See text for details.
3. Table III. Heatmap for species delimitation approaches for species of Mycetophilinae Exechiini. See text for details.
4. Table IV. Heatmap for species delimitation approaches for species of Mycetophilinae Mycetophilini. See text for details.

## **Legend for Plates:**

1. Figure 1A-B. Geographic approach of the Singapore Mangrove Insect Project (MIP) (modified from [www.freeworldmaps.net](http://www.freeworldmaps.net)). A. Southeast Asia, with relative position of Singapore to close by localities. B. Distribution of Malaise traps in Singapore natural environments.
2. Figure 2A-E. Environments sampled in the Singapore Mangrove Insect Project. A. Mangrove. B. Rainforest. C. Urban forest. D. Swamp forest. E. Freshwater swamp.
3. Figure 5A-J. Wings of genera of Mycetophilidae sampled in the Mangrove Insect Project. Sciophilinae. A. *Leptomorphus rafflesii*, sp.nov. B. *Azana leekongchiani*, sp.nov. C. *Monoclonia simhapura*, sp.nov. Gnoristinae. D. *Metanepsia malaysiana* Kallweit. E. *Chalastonepsia* sp. Tetragoneurinae. F. *Tetragoneura crawfurdi*, sp.nov. G. *Ectrepesthoneura johor*, sp.nov. Leiinae. H. *Mohelia zubirsaidi*, sp.nov. I. *Clastobasis oranglaut*, sp.nov. J. *Eumanota rakola* Søli.
4. Figure 6A-D. Wings of genera of Mycetophilidae sampled in the Mangrove Insect Project. Leiinae. A. *Manota temenggong*, sp.nov. B. *Neoempheria dizonalis* Edwards. C. *Neoempheria* sp. D. *Parempheriella defectiva* Edwards.
5. Figure 7A-H. Wings of genera of Mycetophilidae sampled in the Mangrove Insect Project. Mycetophilinae. A. *Allodia gloriae*, sp.nov. B. *Exechia yangchangmanae*, sp.nov. C. *Mycetophila chngseoktinae*, sp.nov. D. *Platyprosthiogyne snehalethaae*, sp.nov. E. *Platyprosthiogyne phanwaithongae*, sp.nov. F. *Platyprosthiogyne gohsookhima*, sp.nov. G. *Aspidionia janetjesudasonae*, sp.nov. H. *Integricypta shirinae*, sp.nov. I. *Platurocypta adeleneweiae*, sp.nov. J. *Epicypta limchiumeiae*, sp.nov.

## **Sciophilinae**

6. Figure A1A-D. *Leptomorphus rafflesii* sp.nov., male holotype. A. Habitus. B. Head. C. Thorax. D. Wing.
7. Figure A2A-D. *Leptomorphus rafflesii* sp.nov. A. Terminalia, ventral view. B. Terminalia, dorsal view. C. Gonocoxite and gonostylus, ventral view. D. Haplotype network for *Leptomorphus*.
8. Figure A3A-F. *Monoclonia simhapura* sp.nov. A. Habitus, female paratype, ZRC\_BDP\_0048568. B. Head and thorax, holotype. C. Wing, female holotype D. Female terminalia, ventral view, holotype. E. Female terminalia, dorsal view, same. F. Haplotype network for *Monoclonia*.
9. Figure A4A-I. *Azana demeijeri* sp.nov. A. Habitus, male holotype. B. Dorsal view of head and thorax, male holotype. C. Head, lateral view, female paratype, ZRC\_BDP0047941. D. Thorax, lateral view, same. E. Wing, female paratype, ZRC\_BDP0047941. F. Terminalia,

Internal view, male holotype. G. Terminalia, ventral view, same. H. Terminalia, dorsal view, same. I. Haplotype network for *Azana*.

10. Figure A5A-F. *Azana leekongchiani* sp.nov. A. Habitus, female paratype ZRC\_BDP0049320. B. Head and thorax, male holotype. C. Wing, male holotype. D. Male terminalia, ventral view, holotype. E. Female terminalia, ventral view, paratype ZRC\_BDP0049121. F. Female terminalia, dorsal view, same.

### Tetragoneurinae

11. Figure B0. Haplotype network for *Tetragoneura*.
12. Figure B1A-D. *Tetragoneura crawfuri*, sp.nov., male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view.
13. Figure B2A-E. *Tetragoneura chola*, sp.nov. A. Male, paratype ZRC\_BDP0048501. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, ventral view, same.
14. Figure B3A-F. *Tetragoneura dayuan*, sp.nov., male holotype. A. Habitus. B. Head. C. Thorax. D. Wing. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.
15. Figure B4aA-D. *Tetragoneura farquhari*, sp.nov. A. Habitus, female paratype ZRC\_BDP0048503. B. Head, male holotype. C. Thorax, same. D. Wing, same.
16. Figure B4bA-D. *Tetragoneura farquhari*, sp.nov. A. Male terminalia, ventral view, holotype. B. Male terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRC\_BDP0048503. D. Female terminalia, dorsal view, same.
17. Figure B5A-J. *Ectrepesthoneura johor*, sp.nov. A. Habitus, male holotype. B. Female paratype ZRC\_BDP0048506. C. Thorax, male holotype. D. Head, same. E. Wing, same. F. Male terminalia, ventral, same. G. Male terminalia, dorsal, same. H. Female terminalia, ventral view, paratype ZRC\_BDP0048506. I. Female terminalia, dorsal view, same. J. Haplotype network for *Ectrepesthoneura*.

### Leiinae

18. Figure C1A-G. *Mohelia zubirsaidi*, sp.nov. A. Male, paratype ZRC\_BDP0048984. B. Male terminalia, ventral view, same. C. Male terminalia, internal view, same. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral, paratype ZRC\_BDP0048999. F. Female terminalia, dorsal view, same. G. Haplotype network for *Mohelia*.
19. Figure C2. *Mohelia zubirsaidi*, sp.nov, wing, male holotype.
20. Figure C3A-B. *Allactoneura tumasik* Amorim & Oliveira, sp.n., male holotype A. Habitus. B. Thorax.
21. Figure C4A-E. *Allactoneura tumasik*, Amorim & Oliveira, sp.nov. A. Wing, holotype. B. Male terminalia, ventral view, same. C. Detail of distal end of gonostylus, same. D. Female terminalia, ventral view, paratype ZRC\_BDP0048284. D. Same, dorsal view. E. Haplotype network for *Allactoneura*.
22. Figure C5. *Allactoneura limbosengi* Amorim & Oliveira, sp.n. A. Habitus, female holotype. B. Head, same. C. Abdomen, same. D. Wing, male paratype ZRC\_BDP0278244.
23. Figure C5B. *Allactoneura limbosengi* Amorim & Oliveira, sp.n., male paratype ZRC\_BDP0278244, terminalia, dorsal view.
24. Figure XXA-H. *Eumanota racola* Søli. A. Habitus, female ZRC\_BDP0048561. B. Head, male ZRC\_BDP0048560. C. Wing, same. D. Male terminalia, ventral view, same. E. Male terminalia, dorsal view, same. F. Female terminalia, ventral view, ZRC\_BDP0048927. G. Terminalia, dorsal view, same. H. Haplotype network for *Eumanota*.

25. Figure C7A-C. A. Haplotype network for *Manota*. B-C. *Manota banzu* Amorim & Oliveira, **sp.nov.** B. Habitus, female paratype ZRC\_BDP0048517. C. Habitus, male paratype ZRC\_BDP0137281.
26. Figure C8A-D. *Manota banzu* Amorim & Oliveira, **sp.nov.** A. Wing, male paratype ZRC\_BDP0047877. B. Terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRC\_BDP0048677. D. Female terminalia, dorsal view, paratype ZRC\_BDP0048677.
27. Figure C9A-E. *Manota tantocksegni* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype ZRC\_BDP0137247. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same. E. Female terminalia, ventro-lateral view, paratype ZRC\_BDP0072744.
28. Figure C10A-G. *Manota bukittimah* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0137035. B. Wing, male holotype. C. Terminalia, ventral view, same. D. Gonostylus, ventral view, same. E. Gonostylus, dorsal view, paratype same. F. Female terminalia, ventral view, paratype ZRC\_BDP0048527. G. Female terminalia, dorsal view, same.
29. Figure C11A-F. *Manota chiamassie* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Head. C. Mesonotum. D. Wing. E. Terminalia, ventral view. F. Terminalia, dorsal view, same.
30. Figure C12A-H. *Manota danmaxi* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype, ZRC\_BDP0137040. B. Wing, male holotype. C. Mesonotum, same. D. Terminalia, lateral view, same. E-F. Gonocoxite and gonostylus, lateral view, same. G. Female terminalia, ventral view, paratype ZRC\_BDP0074033. H. Female terminalia, dorsal view, same.
31. Figure C13A-F. *Manota mahuan* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype, ZRC\_BDP0137040. B. Wing, male holotype (wing partially folded). C. Male terminalia, ventral view, same. F. Male terminalia, dorsal view. E. Female terminalia, ventral view, paratype ZRC\_BDP0074033. F. Female terminalia, dorsal view, same.
32. Figure C14A-E. *Manota temenggong* Amorim & Oliveira, **sp.nov.** 11, male holotype. A. Habitus. B. Wing. C. Thorax. D. Terminalia, lateral view, mid-section. E. Terminalia, lateral view, external section.
33. Figure C15A-B. *Manota* sp. A, female, ZRC\_BDP0047870. A. Wing. B. Terminalia, dorsal view.
34. Figure C16A-C. *Manota* sp. B, female ZRC\_BDP0047826. A. Habitus. B. Wing. C. Terminalia, ventro-lateral view.
35. Figure C17A-F. *Manota* sp. C, female ZRC\_BDP0048300. A. Habitus. B. Head. C. Thorax. D. Wing. E. Female terminalia, ventral view. F. Female terminalia, dorsal view, same.
36. Figure C18A-D. *Manota* sp. D, female ZRC\_BDP0048676. A. Habitus. B. Wing. C. Female terminalia, ventral view. D. Female terminalia, dorsal view, same.
37. Figure C19A-C. *Manota* sp. E, female. A. Habitus, ZRC\_BDP0133494. B. Wing, ZRC\_BDP0047060. C. Terminalia, ventro-lateral view, same.
38. Figure C20A-E. *Manota* sp. F, female. A. Habitus, ZRC\_BDP0133440. B. Wing, ZRC\_BDP0072692. C. Head, same. D. Terminalia, ventral view, same. E. Terminalia, dorsal view, same.
39. Figure C21A-F. *Manota* sp. G, female. A. Habitus, ZRC\_BDP0132831. B. Head, frontal view, ZRC\_BDP0278331. C. Head, posterior view, same. D. Wing, same. E. Terminalia, ventral view, same. F. Terminalia, dorsal view, same.
40. Figure C22A-E. *Clastobasis sritribuana* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view. E Haplotype network for *Clastobasis*.

41. Figure C23A-F. *Clastobasis bugis* Amorim & Oliveira, sp.nov. A. Habitus, female paratype ZRC\_BDP0048245. B. Wing. C. Male terminalia, ventral view, holotype. D. Female terminalia, ventral view, paratype ZRC\_BDP0048242. E. Female terminalia, mid-section, same. F. Female terminalia, dorsal view, same.
42. Figure C24A-F. *Clastobasis oranglaut* Amorim & Oliveira, sp.nov. A. Habitus, male paratype ZRC\_BDP0049312. B. Head, male holotype. C. Thorax, same. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same.
43. Figure C24A-B. *Clastobasis oranglaut* Amorim & Oliveira, sp.nov, female terminalia, paratype ZRC\_BDP0049336. A. Ventral view, same. B. Dorsal view.

### **Gnoristinae**

44. Figure D1A-D. *Chalastonepsia* sp. A. Habitus, female paratype ZRC\_BDP0143086. B. Wing, female holotype. C. Terminalia, ventral view, same. D. Terminalia, dorsal view, same.
45. Figure D2A-C. *Chalastonepsia* sp. A. Head, female holotype. B. Thorax, female paratype ZRC\_BDP0047804. C. Haplotype network for *Chalastonepsia*.
46. Figure D3A-D. *Metanepsia malaysiana* Kallweit. A. Habitus, male, paratype, ZRC\_BDP0048531. B. Head, male holotype, ZRC\_BDP0048680, dorso-lateral view. C. Thorax, lateral view, same. D. Wing, same.
47. Figure D4A-F. *Metanepsia malaysiana* Kallweit. A. Male terminalia, ventral view, ZRC\_BDP0048680. C. Male terminalia, dorsal view, same. D. Female terminalia, ZRC\_BDP0048869, ventral view. E. Female terminalia, dorsal view, same. F. Haplotype network for *Metanepsia*.

### **Mycomyinae**

48. Figure E01A-H. *Parempheriella defectiva* Edwards. A. Habitus, male, paratype ZRC\_BDP0155005. B. Habitus, female, paratype ZRC\_BDP0048556. C. Wing, male, paratype ZRC\_BDP0048828. D. Thorax, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ZRC\_BDP0048556. H. Haplotype network for *Parempheriella*.
49. Figure E02A-D. *Parempheriella mait* Amorim & Oliveira, sp.nov., female paratype ZRC\_BDP0048559. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view.
50. Figure E03A-D. *Parempheriella mait* Amorim & Oliveira, sp.nov., male holotype. A. Head. B. Thorax. C. Terminalia, ventral view. D. Terminalia, dorsal view.
51. Figure E04A-G. *Parempheriella longyamen* Amorim & Oliveira, sp.nov. A. Habitus, male holotype. B. Wing, same. C. Thorax, same. D. Wing, same. E. Male terminalia, ventral view, same. F. Female terminalia, dorsal view, paratype ZRC\_BDP0072675. G. Female terminalia, ventral view, same.
52. Figure E05A-G. *Parempheriella peranakan* Amorim & Oliveira, sp.nov. A. Habitus, female, paratype ZRC\_BDP0049227. B. Wing, male, paratype ZRC\_BDP0049222. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same. G. Female terminalia, paratype ZRC\_BDP0133974.
53. Figure E06\_0. Haplotype network for the genus *Neoempheria*. Species delimitation methods used: Methods congruent with morphology unless conflict specified OC: 2 - 5% ABGD: P=0.001 - P=0.06 PTP.
54. Figure E06A-D. *Neoempheria sachmatich* Amorim & Oliveira, sp.nov. A. Habitus, female, ZRC\_BDP0049498. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, ZRC\_BDP48498.

55. Figure E07A-D. *Neoempheria merlio* Amorim & Oliveira, **sp.nov.** A. Habitus, male, ZRC\_BDP155067. B. Wing, female, ZRC\_BDP0049162. D. Male terminalia, ventral view, holotype.
56. Figure E08A-D. *Neoempheria sabana* Amorim & Oliveira, **sp.nov.** A. Habitus, female, ZRC\_BDP0048495. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, female ZRC\_BDP0047068.
57. Figure E09A-D. *Neoempheria* sp. A, female, ZRC\_BDP0048497. A. Habitus. B. Head. C. Wing. D. Terminalia, ventral view.
58. Figure E10A-D. *Neoempheria sangabo* Amorim & Oliveira, **sp.nov.** male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Detail of terminalia, dorsal view.
59. Figure E11A-D. *Neoempheria shicheng* Amorim & Oliveira, **sp.nov.** A. Habitus, male holotype. B. Wing, same. C. Male terminalia, same. D. Female terminalia, ventral view, ZRC\_BDP0047906.
60. Figure E12A-D. *Neoempheria ujong* Amorim & Oliveira, **sp.nov.** A. Habitus, male ZRC\_BDP0048978. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, mid-section, same.
61. Figure E13A-D. *Neoempheria subaraji* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Details of terminalia, dorsal view.
62. Figure E14A-D. *Neoempheria kokoiyeeae* Amorim & Oliveira, **sp.nov.** A. Habitus, female, ZRC\_BDP0049205. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same.
63. Figure E15A-E. *Neoempheria* sp. G, female, ZRC\_BDP0137178. A. Head. B. Wing. C. Detail of wing under phase contrast D. Terminalia, ventral view. E. Detail of terminalia, dorsal view.
64. Figure E16A-C. *Neoempheria mandai* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048478. B. Male terminalia, ventral view, holotype. C. Female terminalia, ventral view, paratype ZRC\_BDP0048962.
65. Figure E18A-C. *Neoempheria malacca* Amorim & Oliveira, **sp.nov.** A. Habitus, male holotype. B. Female terminalia, ventral view, paratype ZRC\_BDP0048482. C. Wing.
66. Figure E19A-D. *Neoempheria malacca* Amorim & Oliveira, **sp.nov.** A. Thorax, female paratype ZRC\_BDP0048482. B. Male holotype, terminalia, ventral view. C. Same, detail of anterior end. D. Same, detail of posterior end.
67. Figure E20A-D. *Neoempheria sinkapho* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Antenna. C. Wing. D. Male terminalia, ventral view.
68. Figure E21A-F. *Neoempheria singapura* Amorim & Oliveira, **sp.nov.** A. Habitus, female ZRC\_BDP0047930. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same. E. Detail of male terminalia, dorsal view, same. F. Female terminalia, ventral view, ZRC\_BDP0047796.
69. Figure E22A-C. *Neoempheria* sp. C, female, ZRC\_BDP0048477. A. Habitus. B. Detail of wing. C. Terminalia, ventral view.
70. Figure E23A-D. *Neoempheria xinjiapo* Amorim & Oliveira, **sp.nov.** A. Habitus, male ZRC\_BDP0048892. B. Head, female paratype ZRC\_BDP0049180. C. Wing, same. D. Female terminalia, ventral view, same.
71. Figure E24A-B. *Neoempheria xinjiapo* Amorim & Oliveira, **sp.nov.**, male holotype. A. Terminalia, ventral view. B. Terminalia, dorsal view.
72. Figure E25A-D. *Neoempheria* sp. D, female ZRC\_BDP0049022. A. Habitus. B. Wing. C. Detail of wing under phase contrast. D. Female terminalia, lateral view.

73. Figure E26A-C. *Neoempheria* sp. E, female ZRC\_BDP00491180. A. Habitus. B. Detail of wing under phase contrast. C. Female terminalia, ventral view.
74. Figure E27A-D. *Neoempheria* sp. F, female. A. Habitus, ZRC\_BDP0047902. B. Wing, ZRC\_BDP0047836. C. Detail of wing under phase contrast, same. D. Female terminalia, ventral view, same.
75. Figure E28A-D. *Neoempheria chantek* Amorim & Oliveira, **sp.nov.**, male holotype. A. Head. B. Abdomen. C. Wing. D. Terminalia, ventral view. E. Detail of terminalia, dorsal view.
76. Figure E29A-D. *Neoempheria puluochung* Amorim & Oliveira, **sp.nov.** A. Habitus, female, ZRC\_BDP0048494. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same.
77. Figure E30A-B. *Neoempheria puluochung* Amorim & Oliveira, **sp.nov.**. A. Female terminalia, paratype ZRC\_BDP0048493, ventral view. B. Female terminalia, dorsal view, same.
78. Figure E31A-D. *Neoempheria merdeka* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0155081. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, dorsal view, same.
79. Figure E32A-B. *Neoempheria merdeka* Amorim & Oliveira, **sp.nov.**, female terminalia, paratype ZRC\_BDP0074035. A. Ventral view. B. Dorsal view.
80. Figure E33A-D. *Neoempheria dizonalis* (Edwards). A. Habitus, male ZRC\_BDP0047918. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, dorsal view, same.
81. Figure E34A-D. *Neoempheria neesoon* Amorim & Oliveira, **sp.nov.** A. Habitus, female, ZRC\_BDP0154986. B. Wing, female holotype. D. Female terminalia, ventral view, ZRC\_BDP0049243.
82. Figure E35A-H. *Neoempheria pulau* Amorim & Oliveira, **sp.nov.** A. Habitus, male, ZRC\_BDP0048491. B. Habitus, female, ZRC\_BDP0155089. C. Head, male holotype. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, ZRC\_BDP0048485. H. Female terminalia, dorsal view, same.
83. Figure E36A-D. *Neoempheria cinkappur*, Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view.
84. Figure E37A-D. *Neoempheria temasek* Amorim & Oliveira, **sp.nov.** A. Habitus, male ZRC\_BDP0048695. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, same.
85. Figure E38A-D. *Neoempheria polunini* Amorim & Oliveira, **sp.nov.** A. Habitus, male, ZRC\_BDP0049204. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of terminalia, ventral view, same.
86. Figure E39A-C. *Neoempheria fajar* Amorim & Oliveira, **sp.nov.**, female holotype. A. Wing. B. Abdomen. C. Terminalia, ventral view.
87. Figure E40A-D. *Neoempheria riatanae*, Amorim & Oliveira, **sp.nov.** A. Habitus, female, ZRC\_BDP0049247. B. Wing, female paratype ZRC\_BDP0047840. C. Male terminalia, dorsal view, holotype. D. Female terminalia, ventral view, same.
88. Figure E41A-D. *Neoempheria* sp. B, female, ZRC\_BDP0047779. Habitus. B. Wing. C. Detail of anterior margin of wing under phase contrast, same. D. Female terminalia, ventral view, female paratype ZRC\_BDP0047840.

## Mycetophilinae

### Exchiini

89. Figure F01A-G. *Allodia glorialimae* Amorim & Oliveira, **sp.nov.** 01. A. Habitus, male holotype. B. Head, ventral view, same. C. Thorax, same. D. Wing, same. E. Female terminalia,

- dorsal view, paratype ZRC\_BDP0049093. F. Female terminalia, dorsal view, same. G. Haplotype network for *Allodia*.
90. Figure F02A-B. *Allodia glorialimae* Amorim & Oliveira, **sp.nov.** holotype. A. Male terminalia, dorsal view. B. Male terminalia, dorsal view.
91. Figure F03A-G. *Allodia murphyi* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype ZRC\_BDP0048976. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of gonostyle, ventral view, same. E. Detail of gonostyle, dorsal view, same. F. Female terminalia, ventral view, paratype ZRC\_BDP0048669. G. Female terminalia, ventral view, same.
92. Figure F04A-E. *Allodia limitzepengi* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype ZRC\_BDP0048511. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of gonostyle, ventral view, same. E. Detail of gonostyle, dorsal view, same.
93. Figure F05A-E. *Allodia teopohlengi* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.
94. Figure F06A-C. *Exechia tanswiehiani* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0137247. B. Wing, male holotype. C. Female terminalia, ventral view, paratype ZRC\_BDP0048668.
95. Figure F07A-C. *Exechia tanswiehiani* Amorim & Oliveira, sp.n., male holotype. A. Thorax. B. Terminalia, ventral view. C. Terminalia, dorsal view.
96. Figure F08A-G. *Exechia yangchangmanae* Amorim & Oliveira, **sp.nov.**, male holotype. A. Antenna. B. Wing. C. Male terminalia, ventral view. D. Gonocoxite posterior margin, ventral view. E. Gonostylus, dorsal view. G. Haplotype network for *Exechia*.

### Mycetophilini

97. Figure G01A-H. *Mycetophila chngseoktinae* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048447. B. Head, male paratype ZRC\_BDP0049191. C. Thorax, same. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Gonostylus, dorsal view, same. H. Female terminalia, ventral view, paratype ZRC\_BDP0048674. I. Female terminalia, dorsal view, same.
98. Figure G02A-D. *Mycetophila chngseoktinae* Amorim & Oliveira, **sp.nov.** A. Male terminalia, ventral view, male paratype ZRC\_BDP0049191. B. Male terminalia, dorsal view, same. C. Gonostylus, dorsal view, same. D. Haplotype network for *Mycetophila*.
99. Figure G03A-F. *Mycetophila chaenae* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Head. C. Wing. D. Thorax. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.
100. Figure G04A-F. *Mycetophila aishaae* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype ZRC\_BDP0133534. B. Thorax, male holotype. C. Wing, same. D. Male terminalia, mid-section. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.
101. Figure G05. Haplotype network of *Platyprosthiogyne*.
102. Figure G06A-G. *Platyprosthiogyne phanwaithongae* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048145. B. Head, male holotype. C. Thorax, same. D. Wing, same (wing folded close to margin anteriorly to M<sub>1</sub>). E. Male terminalia, same. F. Female terminalia, latero-dorsal view, same. G. Female terminalia, ventral view, paratype ZRC\_BDP0048144.
103. Figure G07A-E. *Platyprosthiogyne gohsookhima* Amorim & Oliveira, **sp.nov.** A. Habitus, male Wing, male paratype ZRC\_BDP0048965. B. Thorax, same. C. Male terminalia, ventral view, same. D. Male terminalia, mid-section, same. E. Male terminalia, dorsal view, same.

104. Figure G08A-D. *Platyprosthiogyne rahimahae* Amorim & Oliveira, **sp.nov.**. A. Habitus, male, paratype ZRC\_BDP0155018. B. Habitus, female, ZRC\_BDP0048428. C. Wing, male holotype. D. Male terminalia, ventral view, paratype ZRC\_BDP0049342.
105. Figure G09A-B. *Platyprosthiogyne lynetteseahae* Amorim & Oliveira, sp.n., holotype. A. Head and thorax, lateral view. B. Wing.
106. Figure G11A-E. *Platyprosthiogyne neilaae* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view. E. Terminalia, mid-section.
107. Figure G12A-D. *Platyprosthiogyne snehalethaae* Amorim & Oliveira, **sp.nov.**. A. Habitus, female paratype ZRC\_BDP0048566. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same.
108. Figure G13A-E. *Platurocypta adeleneweae* Amorim & Oliveira, **sp.nov.**, female. A. Habitus, paratype ZRC\_BDP0048323. B. Thorax, female paratype ZRC\_BDP0048063. C. Wing, same. D. Terminalia, ventral view, paratype ZRC\_BDP0048424. E. Terminalia, dorsal view, same.
109. Figure G14A-C. *Platurocypta adeleneweae* Amorim & Oliveira, **sp.nov.**, male holotype, terminalia. A. Ventral view. B. Mid-section. C. Dorsal view.
110. Figure G15A-F. *Platurocypta tanhoweliangi* Amorim & Oliveira, **sp.nov.**. A. Habitus, female paratype ZRC\_BDP0048325. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral view, paratype ZRC\_BDP0047940. F. Female terminalia, ventral view, same.
111. Figure G16. Haplotype network for part of the genus *Epicypta*.
112. Figure G17. Haplotype network for part of the genus *Epicypta*.
113. Figure G18A-G. *Epicypta constancesingamae*, Amorim & Oliveira, **sp.nov.**. A. Thorax, female paratype, ZRC\_BDP0278248. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same. E. Detail of male terminalia, dorsal view, same. F. Female terminalia, ventral view, paratype ZRC\_BDP0278248. G. Female terminalia, dorsal view, ZRC\_BDP0278248.
114. Figure G19A-D. *Epicypta jennylauae* Amorim & Oliveira, **sp.nov.**. A. Habitus, female paratype, ZRC\_BDP0048438. B. Head, female holotype. C. Wing, female paratype, ZRC\_BDP0048797. D. Female terminalia, ventral view, holotype.
115. Figure G19\_0A-B. *Epicypta jennylauae* Amorim & Oliveira, **sp.nov.**, male ZRC\_BDP0278324, terminalia. A. Ventral view, holotype. B. Dorsal view.
116. Figure G20A-E. *Epicypta limchiumeiae* Amorim & Oliveira, **sp.nov.**. A. Habitus, female paratype, ZRC\_BDP0048320. B. Thorax, dorsal view, same. C. Abdomen, dorsal view, same. D. Head, female holotype. E. Terminalia, ventral view, same.
117. Figure G21A-F. *Epicypta janetyeeae* Amorim & Oliveira, **sp.nov.**. A. Habitus, male paratype, ZRC\_BDP0048909. B. Wing, male holotype. C. Thorax, same. D. Male terminalia, ventral view, paratype ZRC\_BDP0072666. E. Same, mid-section. F. Same, dorsal view.
118. Figure G22A-D. *Epicypta kohkhenglianae* Amorim & Oliveira, **sp.nov.**. A. Habitus, female paratype, ZRC\_BDP0048433. B. Wing, same. C. Female terminalia, ventral view, paratype ZRC\_BDP0049101. D. Female terminalia, dorsal view, paratype ZRC\_BDP\_0047782.
119. Figure G23A-B. *Epicypta kohkhenglianae* Amorim & Oliveira, **sp.nov.**, male holotype, terminalia. A. Ventral view. B. Dorsal view.
120. Figure G24A-D. *Epicypta daintoni* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Head. C. Wing. D. Female terminalia, ventral view.

121. Figure G25A-D. *Epicypta holltumi* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048471. B. Wing, male holotype. C. Male terminalia, same. D. Female terminalia, ventral view, same.
122. Figure G26A-D. *Epicypta alii* Amorim & Oliveira, **sp.nov.** male holotype. A. Wing. B. Thorax. C. Terminalia, ventral view. D. Terminalia, dorsal view.
123. Figure G27A-D. *Epicypta ridleyi* **sp.nov.** 29, female paratype, ZRC\_BDP0049152. A. Habitus. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRC\_BDP0049062.
124. Figure G28A-E. *Epicypta chezaharaae* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0048442. B. Wing, female paratype ZRC\_BDP0154856. C. Male terminalia, ventral view, holotype. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral view, paratype ZRC\_BDP0048120.
125. Figure G29A-D. *Epicypta tanjiakkimi* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0048452. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRC\_BDP0047866.
126. Figure G30A-D. *Epicypta gehminae* Amorim & Oliveira, **sp.nov.**, female holotype. A. Head, lateral view. B. Thorax, lateral view. C. Wing. D. Female terminalia, ventral view.
127. Figure G31A-E. *Epicypta jackieyingae* Amorim & Oliveira, **sp.nov.** A. Thorax and head, male holotype. B. Wing, same. C. Male terminalia, ventral view, same. D. Male terminalia, distal end, ventral view, same. E. Female terminalia, paratype ZRC\_BDP0284204.
128. Figure G32A-C. *Epicypta khatijunaee* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0048431. B. Wing, male holotype. C. Female terminalia, ventral view.
129. Figure G33A-D. *Epicypta purchoni* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0047857. B. Wing, male holotype. C. Male terminalia, same. D. Female terminalia, ventral view, ZRC\_BDP0047813.
130. Figure G34A-D. *Epicypta foomaosheng* Amorim & Oliveira, **sp.nov.**, female paratype, ZRC\_BDP0049068. A. Habitus. B. Wing, holotype. C. Terminalia, ventral view, same. D. Detail of female terminalia, same.
131. Figure G35A-C. *Epicypta ganengsengi* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Wing. C. Terminalia, ventral view.
132. Figure G36A-B. *Epicypta ganengsengi* Amorim & Oliveira, **sp.nov.** male holotype, terminalia. A. Ventral view. B. Dorsal view.
133. Figure G37A-D. *Epicypta leechooneoae* Amorim & Oliveira, **sp.nov.**, male holotype. A. Thorax. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view.
134. Figure G38A-D. *Epicypta nanyangu* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0048455. B. Wing, female paratype ZRC\_BDP0048926. C. Female terminalia, ventral view, same. D. Female terminalia, dorsal view, same.
135. Figure G39A-B. *Epicypta nanyangu* Amorim & Oliveira, **sp.nov.**, male terminalia. A. Ventral view, paratype ZRC\_BDP0048864. B. Dorsal view, paratype ZRC\_BDP0049088.
136. Figure G40A-D. *Epicypta nus* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048469. B. Head, female paratype ZRC\_BDP0048900 (maxillary palpomeres 4–5 missing). C. Wing, same. D. Female terminalia, ventral view, same.
137. Figure G41A-B. *Epicypta nus* Amorim & Oliveira, **sp.nov.**, male terminalia, holotype. A. Ventral view (gonocoxite lateral lobe broken and slightly displaced). B. Dorsal view.
138. Figure G42A-E. *Epicypta peterngi* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0047927. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of distal end of male terminalia, same. E. Female terminalia, ventral view, ZRC\_BDP0047927.

139. Figure G43A-D. *Epicypta maggielimae* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Wing. C. Thorax. D. Terminalia, ventral view.
140. Figure G44A-C. *Epicypta yupeigaoae* Amorim & Oliveira, **sp.nov.** 33, male holotype. A. Head. B. Wing. C. Male terminalia, ventral view.
141. Figure G45A-D. *Epicypta annweei* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype, ZRC\_BDP0048446. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRC\_BDP0047917.
142. Figure G46A-D. *Epicypta wallacei* Amorim & Oliveira, **sp.nov.** A. Habitus, male paratype ZRC\_BDP0048465. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of distal end of male terminalia, same.
143. Figure G47A-B. *Epicypta wallacei* Amorim & Oliveira, sp.n., female terminalia, paratype ZRC\_BDP0048868. A. Ventral view. B. Dorsal view.
144. Figure G48A-E. *Epicypta lamtoongjini* Amorim & Oliveira, **sp.nov.** A. Habitus, lateral view, female paratype ZRC\_BDP0048440. B. Same, dorsal view. C. Wing, male holotype. D. Male terminalia, ventral view, same. E. Detail of distal end of male terminalia, same.
145. Figure G49A-D. *Epicypta catherinelimae* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0048062. B. Anterior end of thoracic pleura, lateral view, female holotype. C. Wing, same. D. Female terminalia, ventral view, same.
146. Figure G50A-C. *Epicypta grootaerti* Amorim & Oliveira, **sp.nov.** A. Habitus, female holotype. B. Wing, same. C. Female terminalia, ventral view, same.
147. Figure G51A-D. *Epicypta joaquimae* Amorim & Oliveira, **sp.nov.** A. Habitus, female paratype ZRC\_BDP0137314. B. Thorax, female holotype. C. Wing, same. D. Female terminalia, ventral view, same.
148. Figure G52A-D. *Aspidionia cheesweeleeae* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Head, dorsal view. C. Head, ventral view. D. Terminalia, lateral view.
149. Figure G53A-B. A. *Aspidionia cheesweeleeae* Amorim & Oliveira, **sp.nov.**, wing, female holotype. B. Haplotype network for *Aspidionia*.
150. Figure G54A-F. *Aspidionia janetjesudasonae* Amorim & Oliveira, **sp.nov.** 02, female holotype. A. Habitus. B. Thorax. C. Anterior end of scutum. D. Wing. E. Terminalia, ventral view. F. Terminalia, dorsal view.
151. Figure G55A-E. *Aspidionia fatimahae* Amorim & Oliveira, **sp.nov.**, female holotype. A. Habitus. B. Head. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.
152. Figure G56A-G. *Integricypta fergusondavie* Amorim & Oliveira, **sp.nov.** A. Habitus, male, paratype ZRC\_BDP0155020. B. Habitus, female, paratype ZRC\_BDP0049135. C. Maxillary palpus, male holotype. D. Antennae and labella, same. E. Thorax, anterior half, same. F. Thorax, posterior half, same. G. Wing, same.
153. Figure G57A-E. *Integricypta fergusondavie* **sp.nov.** A. Male terminalia, ventral view, holotype. B. Male terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRC\_BDP0049314. D. Female terminalia, ventral view, same. E. Haplotype network of *Integricypta—I. hoyuenhoeae*, **sp.nov.** is known only from the holotype, which could not be sequenced and is not included in the network.
154. Figure G58A-E. *Integricypta teosoonkimae* Amorim & Oliveira, **sp.nov.**, male holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.
155. Figure G59A-H. *Integricypta shirinae* Amorim & Oliveira, **sp.nov.** A. Habitus, male, paratype ZRC\_BDP0133375. B. Habitus, female, paratype ZRC\_BDP0048427. C. Thorax, male holotype. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, paratype ZRC\_BDP0049345. H. Female terminalia, dorsal view, same.

156. Figure G60A-H. *Integricypta hoyuenhoeae* Amorim & Oliveira, sp.nov. A. Habitus, male, paratype ZRC\_BDP0133375. B. Habitus, female, paratype ZRC\_BDP0048427. C. Thorax, male holotype. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, paratype ZRC\_BDP0049345. H. Female terminalia, dorsal view, same.

157. Figure XXX. Mitogenome tree.

158. Figure XXX. Rarefaction curve.

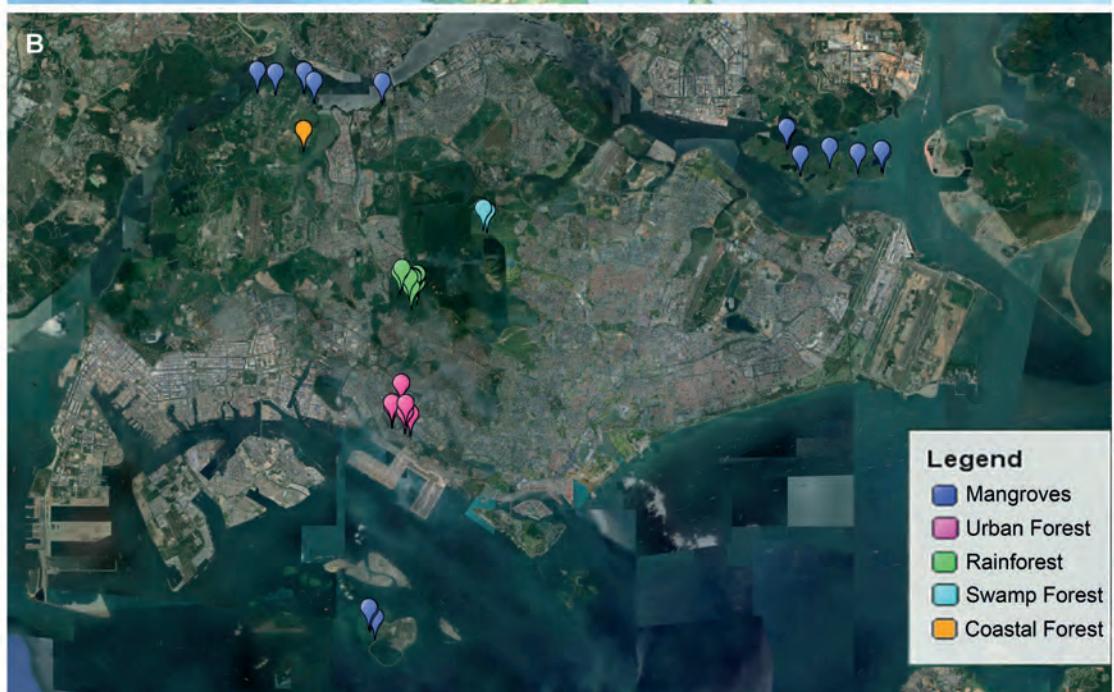


Figure 1A-B. Geographic approach of the Singapore Mangrove Insect Project (MIP) (modified from [www.freeworldmaps.net](http://www.freeworldmaps.net)). A. Southeast Asia, with relative position of Singapore to closeby localities. B. Distribution of Malaise traps in Singapore natural environments.



Figure 2A-F. Environments sampled in the Singapore Mangrove Insect Project.  
A. Mangrove. B. Rainforest. C. Urban forest. D. Swamp forest. E. Freshwater swamp.

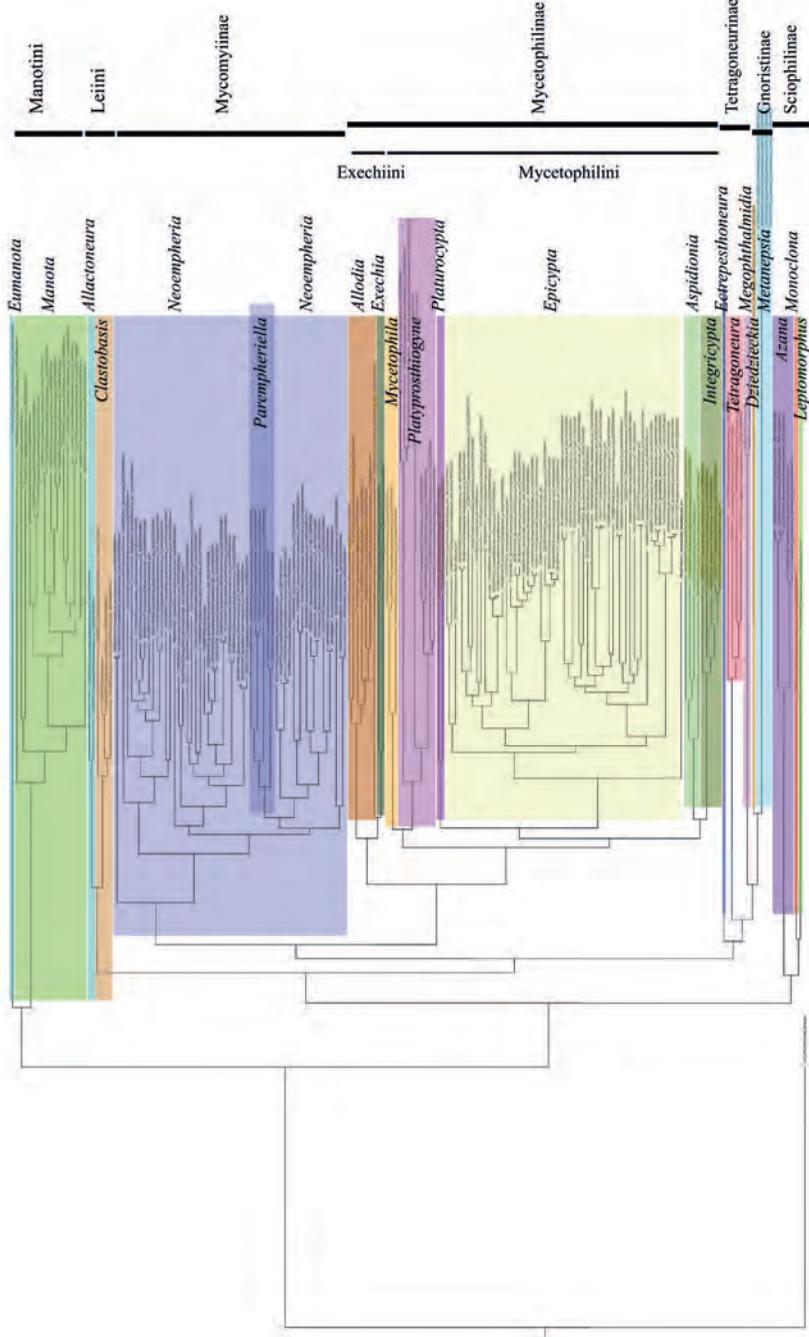
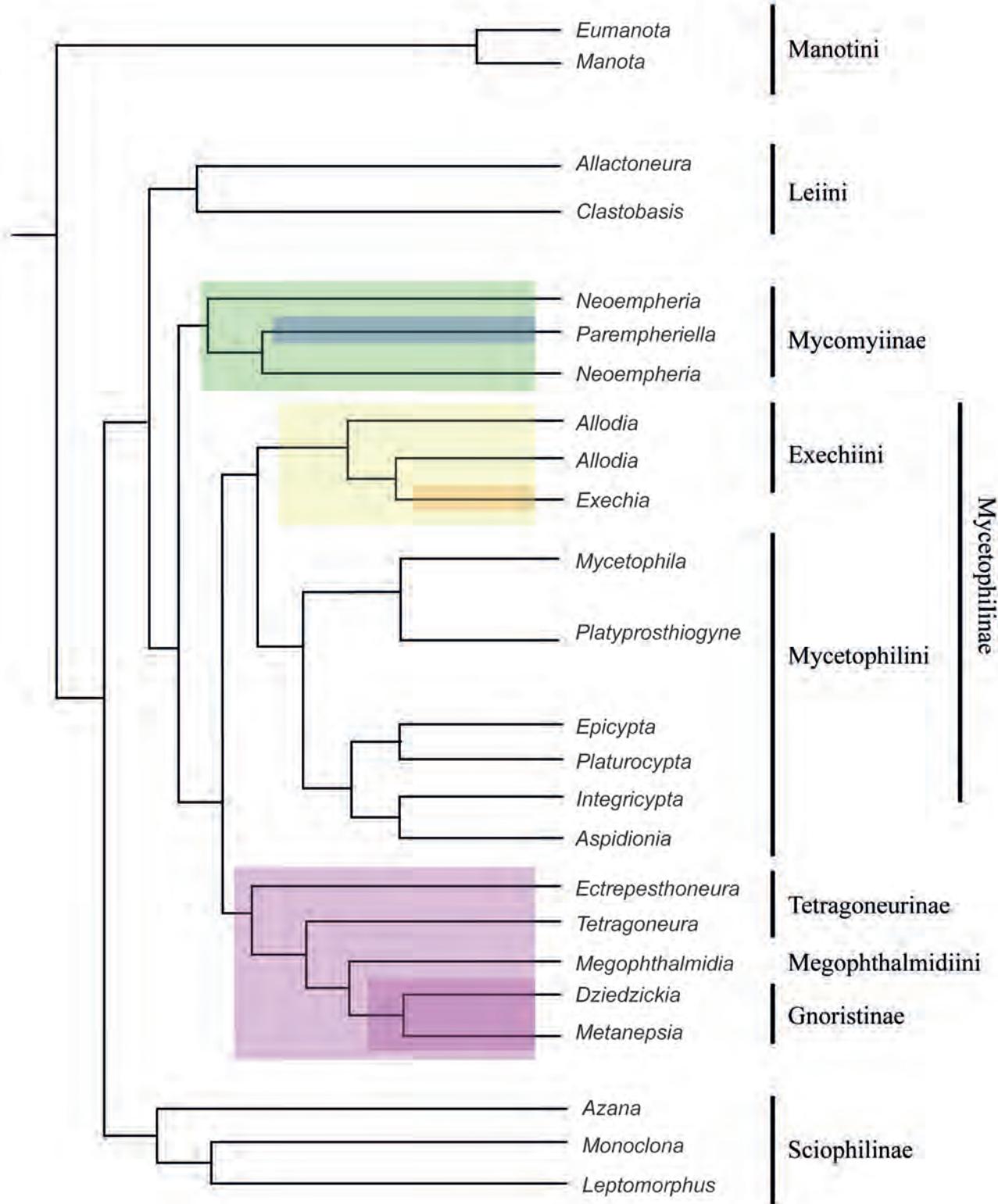
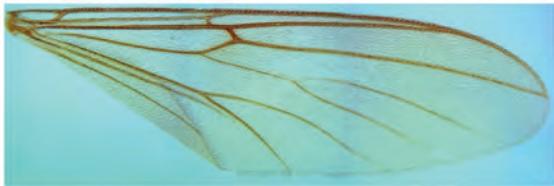


Figure 3. Mitogenome tree for the relationships between sampled/extracted mycetophilid specimens of the Singapore Mangrove Insect Project.



- Mangrove
- Swamp forest
- Rainforest
- Freshwater swamp
- Urban forest
- Coastal forest
- Unidentified

- Morphology
- Conflict 1
- Conflict 2
- Conflict 3



*Leptomorphus rafflesii* n.sp.



*Azana leei* n.sp.



*Monoclonia simhapura* n.sp.



*Metanepsia malaysiana* Kallweit



*Dziedzickia nilautama* n.sp.



*Tetragoneura* n.sp. 3



*Ectrepesthoneura* n.sp. 1



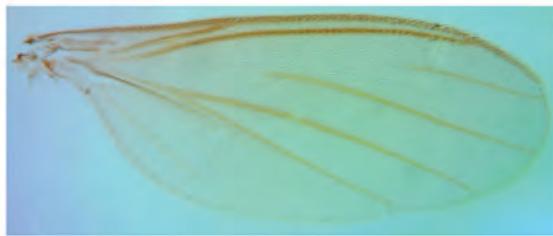
*Megophthalmidia* n.sp. 1



*Clastobasis* n.sp. 3



*Eumanota racola* Søli



*Manota* n.sp. 11



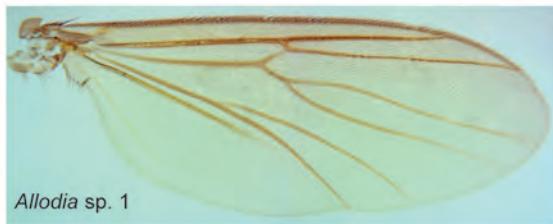
*Neoempheria* n.sp. 14



*Neoempheria* n.sp. 15



*Parempheriella* n.sp. 3



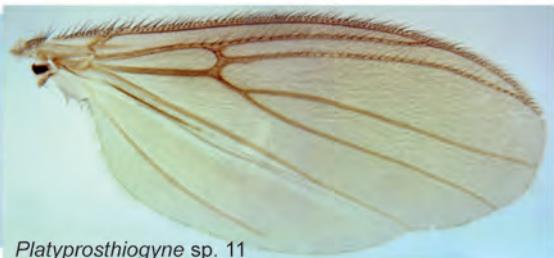
*Allodia* sp. 1



*Exechia* sp. 2



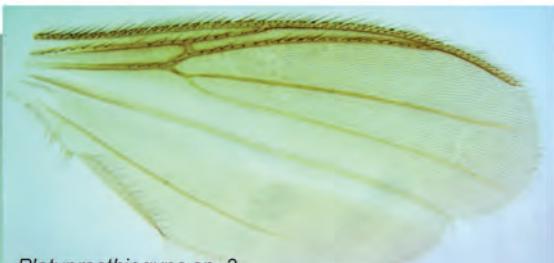
*Mycetophila* sp. 1



*Platyprosthiogyne* sp. 11



*Platyprosthiogyne* sp. 1



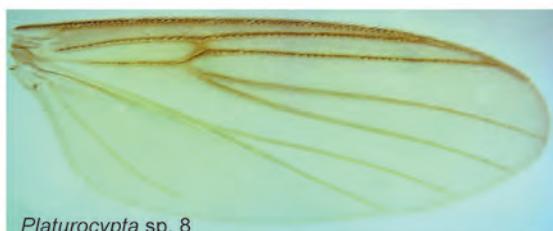
*Platyprosthiogyne* sp. 3



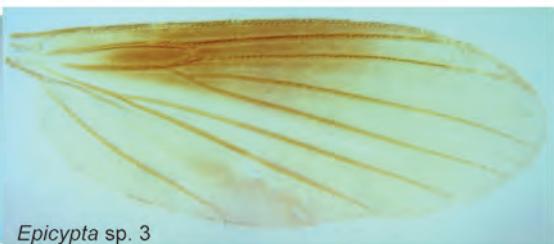
*Aspidionia* sp. 2



*Integricypta* sp. 3



*Platurocypta* sp. 8



*Epicypta* sp. 3

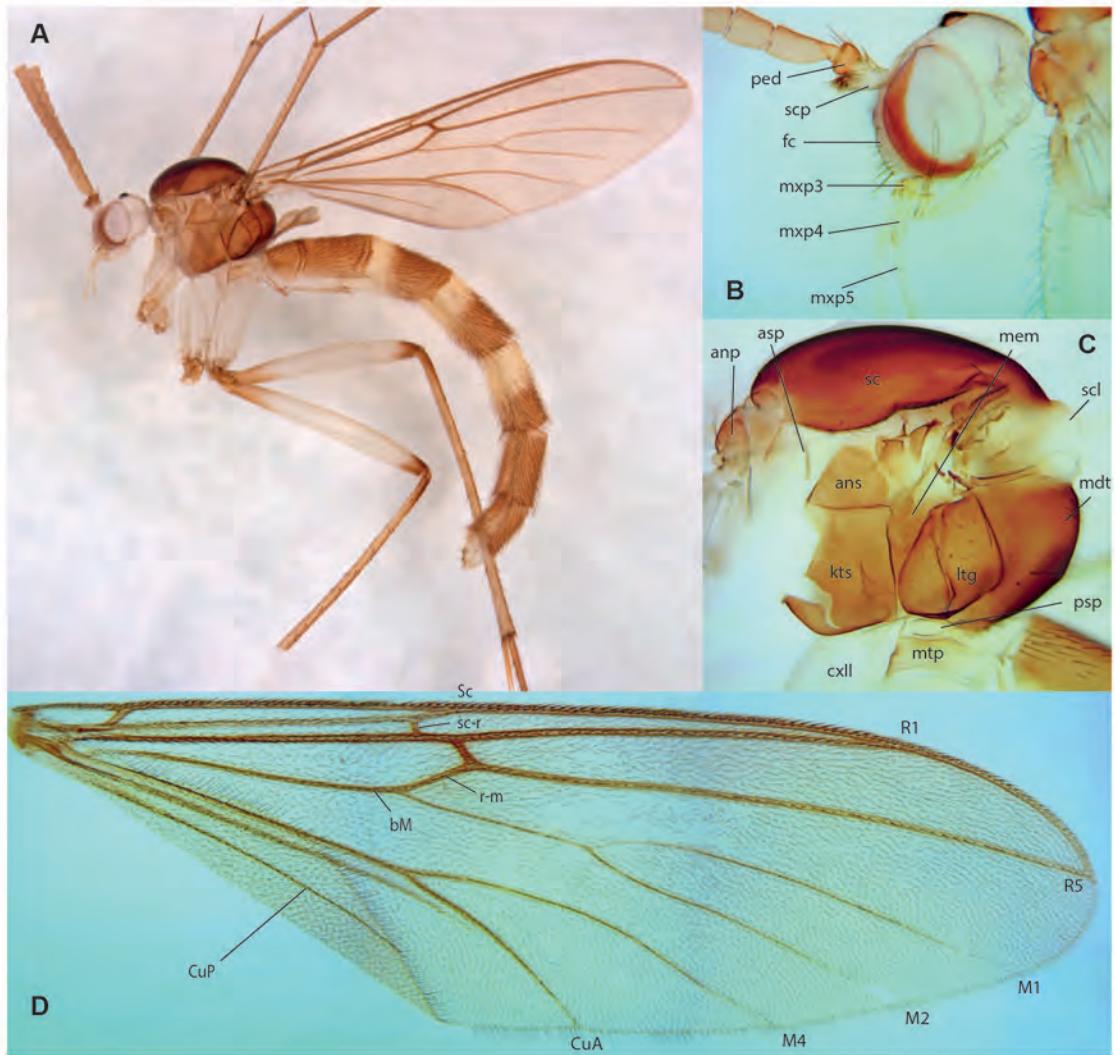


Figure XXA-F. *Leptomorphus rafflesii* sp.nov., male holotype. A. Habitus. B. Head. C. Thorax. D. Wing.

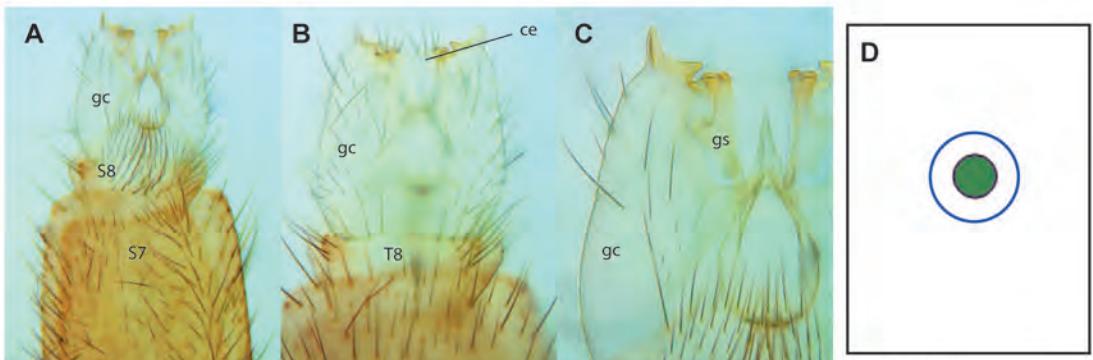


Figure XXA-F. *Leptomorphus rafflesii* sp.nov., male holotype. A. Terminalia, ventral view. B. Terminalia, dorsal view. C. Gonocoxite and gonostylus, ventral view. H. Haplotype network for *Leptomorphus*.

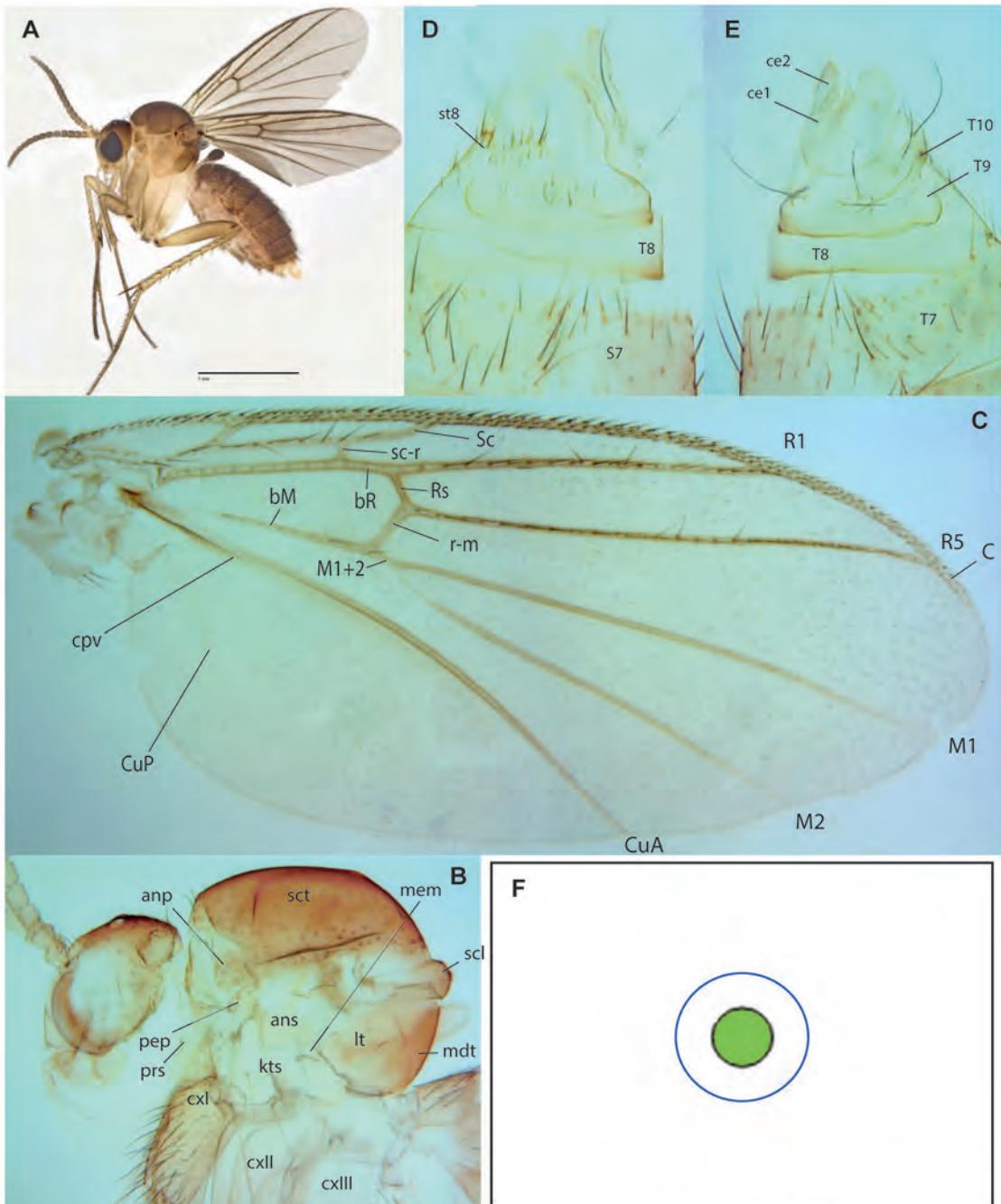


Figure XXA-E. *Monoclonia simhapura* sp.n. A. Habitus, female paratype, ZRCBDP\_0048568. B. Head and thorax, holotype. C. Wing, female holotype D. Female terminalia, ventral view, holotype. E. Female terminalia, dorsal view, same. F. Haplotype network for *Monoclonia*.

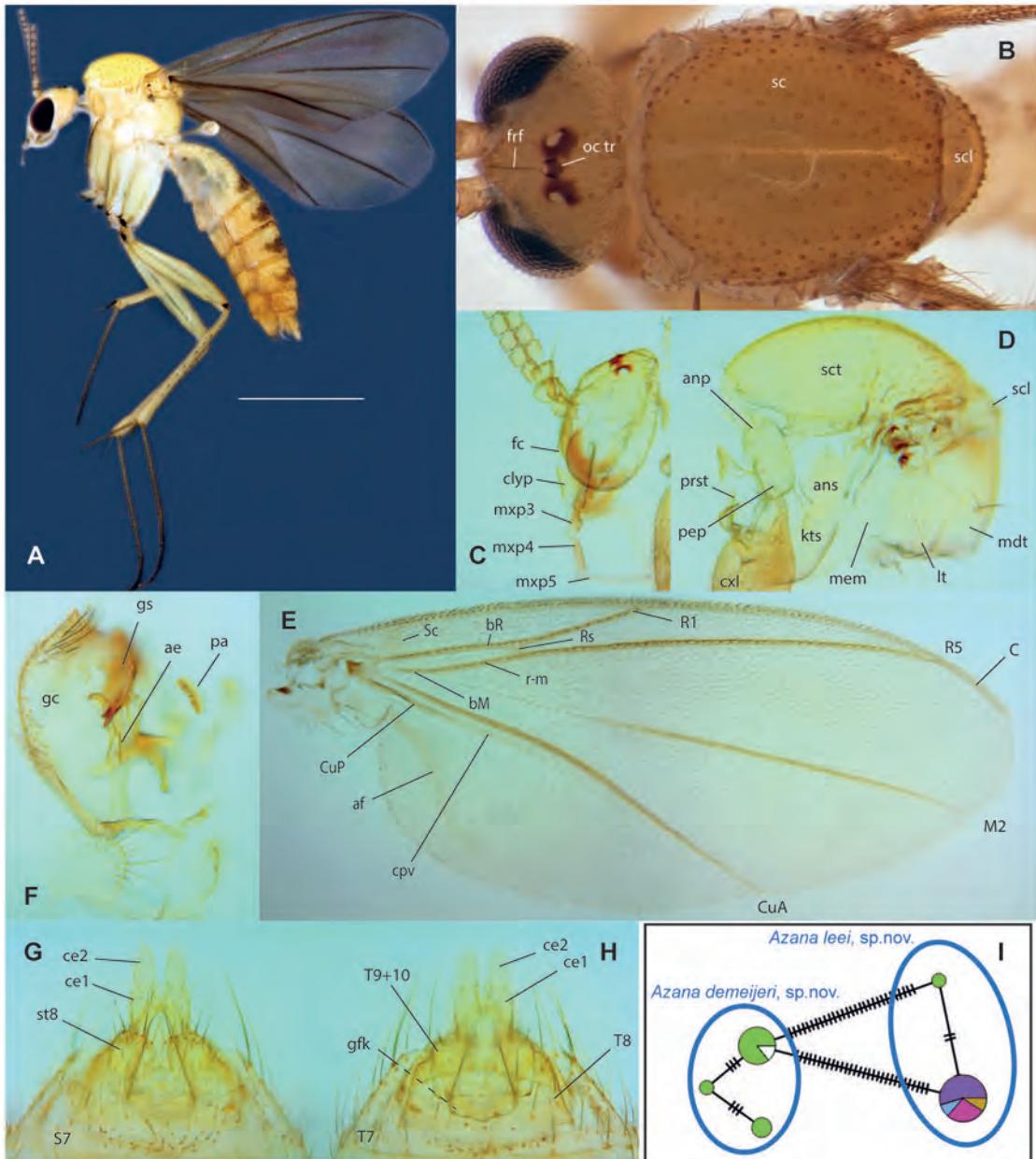


Figure XXA-I. *Azana demeijeri* sp.n. A. Habitus, male holotype. B. Dorsal view of head and thorax, male holotype. C. Head, lateral view, female paratype, ZRCBDP0047941. D. Thorax, lateral view, same. E. Wing, female paratype, ZRCBDP0047941. F. Terminalia, Internal view, male holotype. G. Terminalia, ventral view, same. H. Terminalia, dorsal view, same. I. Haplotype network for *Allactoneura* (see M&M for abbreviations and colors).

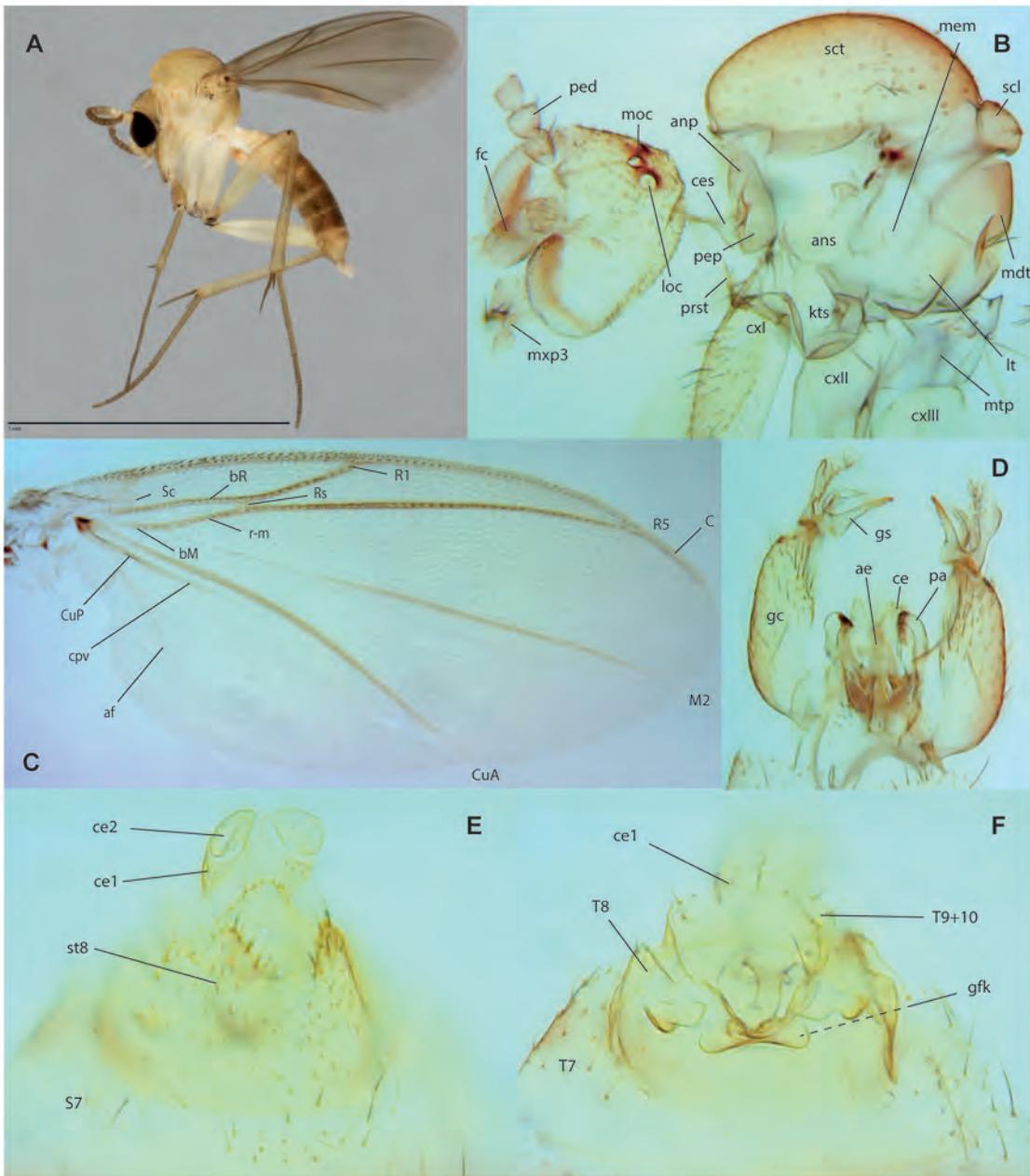


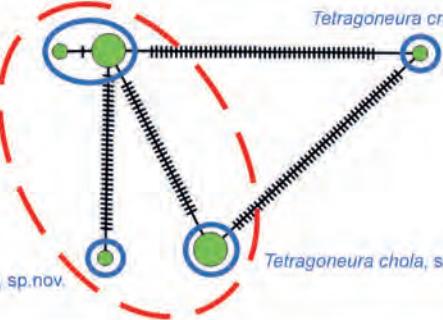
Figure XXA-I. *Azana leei* sp.n. A. Habitus, female paratype ZRCBDP0049320. B. Head and thorax, male holotype. C. Wing, male holotype. D. Male terminalia, ventral view, holotype. E. Female terminalia, ventral view, paratype ZRCBDP0049121. F. Female terminalia, dorsal view, same.

*Tetragoneura farquhari*, sp.nov.

*Tetragoneura crawfurdii*, sp.nov.

*Tetragoneura dayuan*, sp.nov.

*Tetragoneura chola*, sp.nov.



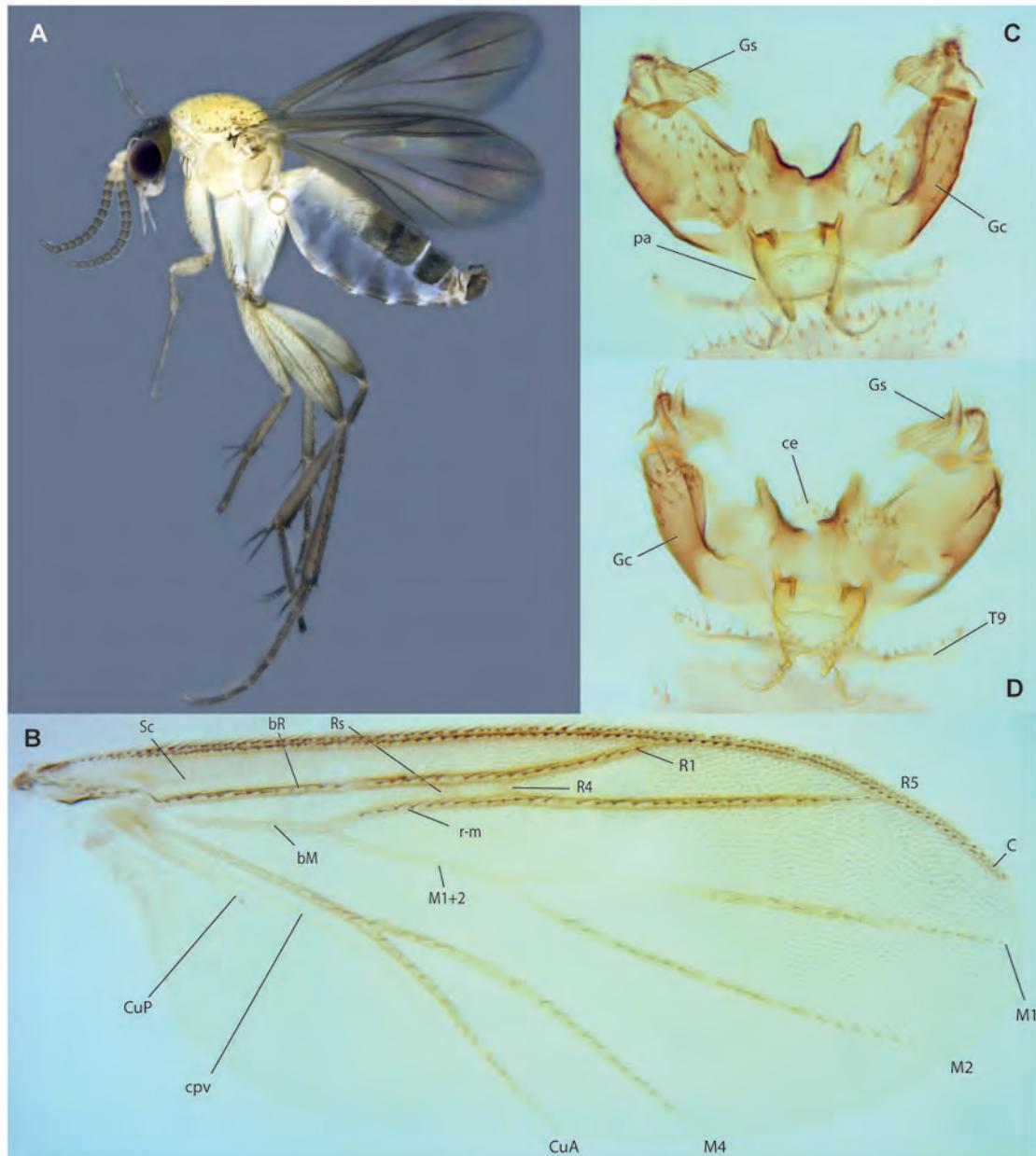


Figure XXA-D. *Tetragoneura* sp.n. 03. A. Habitus, male holotype. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same.

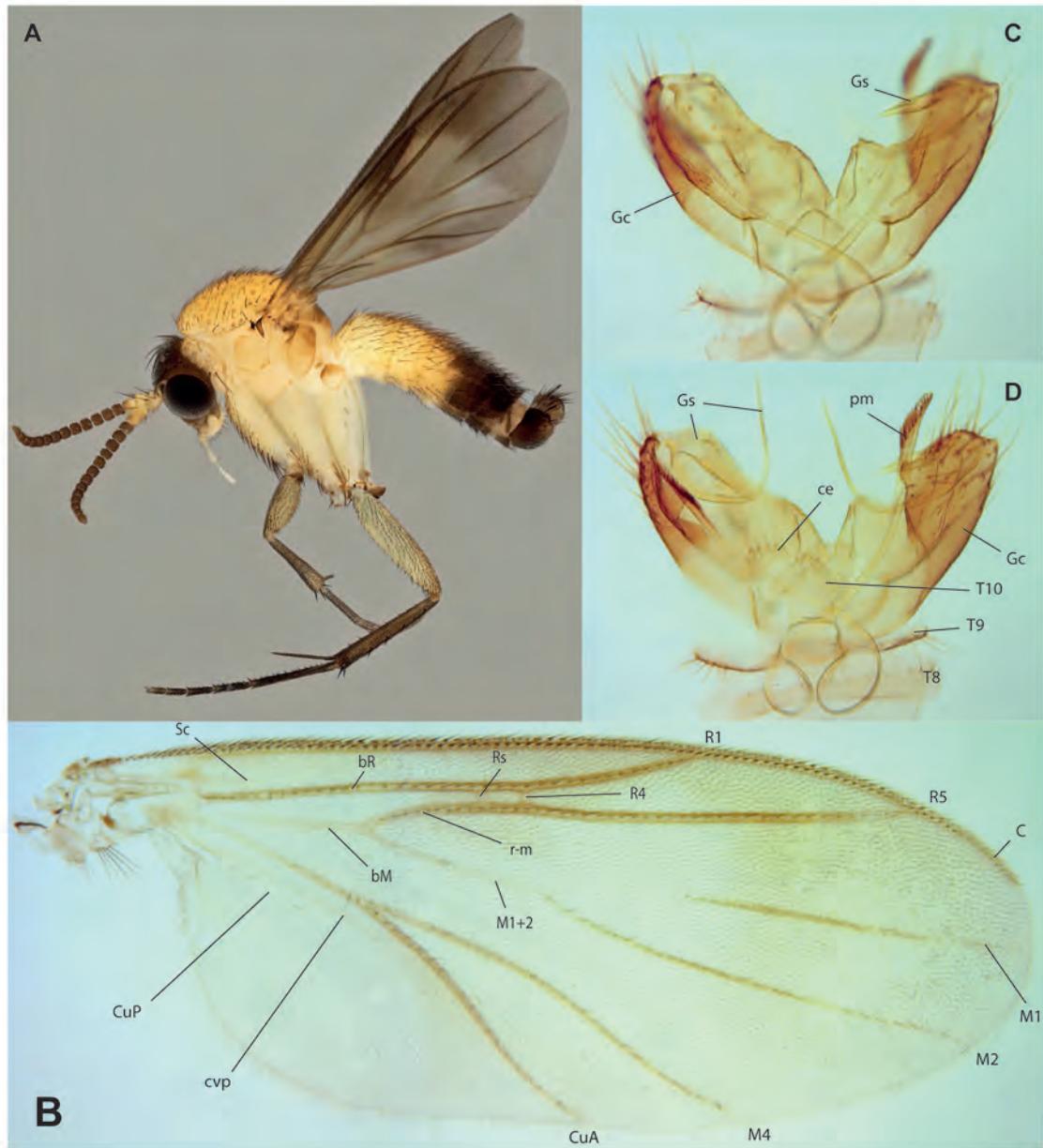


Figure XXA-D. *Tetragoneura* sp.n. 02. A. Male, paratype ZRCBDP0048501. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, ventral view, same.

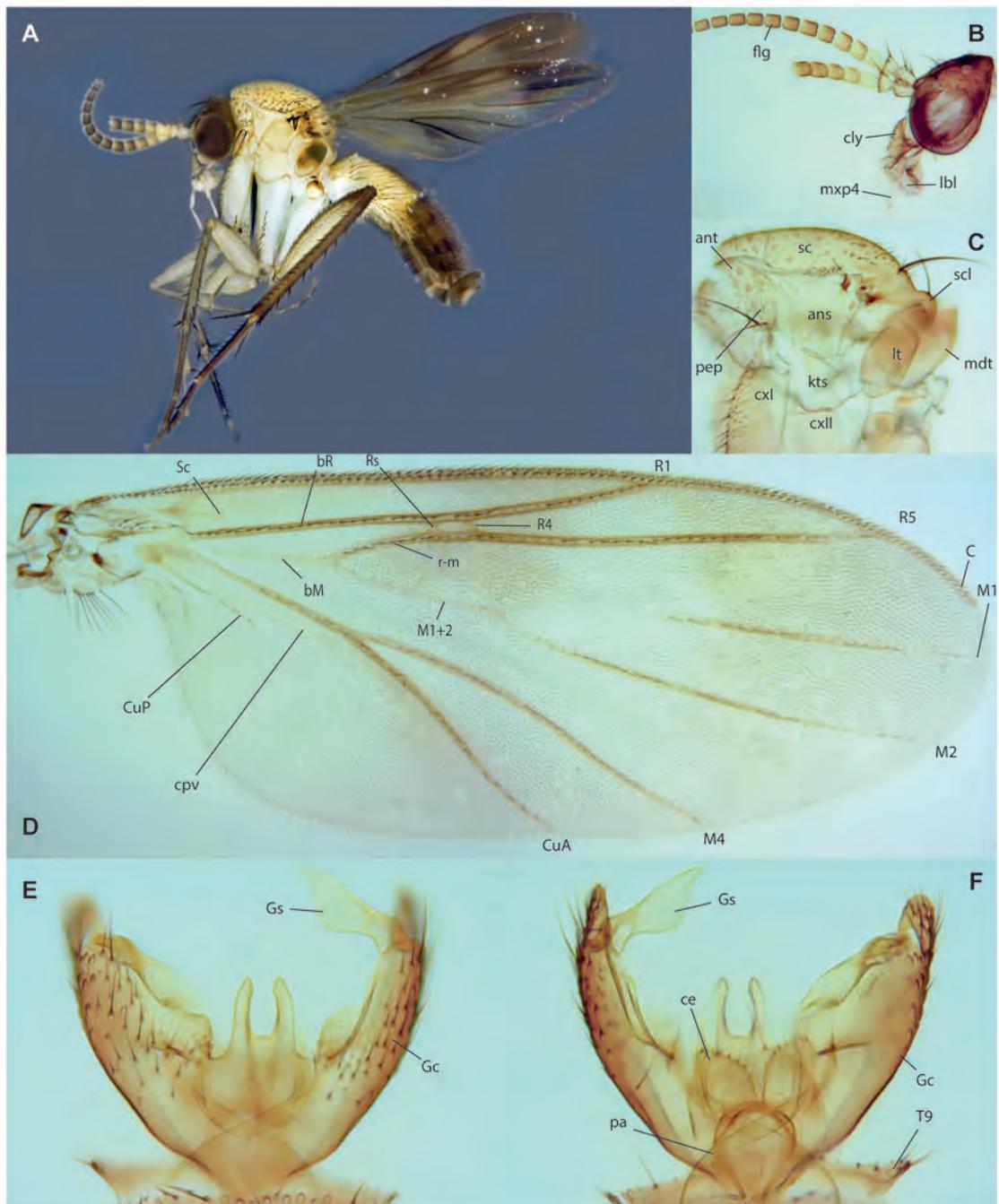


Figure XXA-F. *Tetragoneura* sp.n. 04, male holotype. A. Habitus. B. Head. C. Thorax. D. Wing. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.

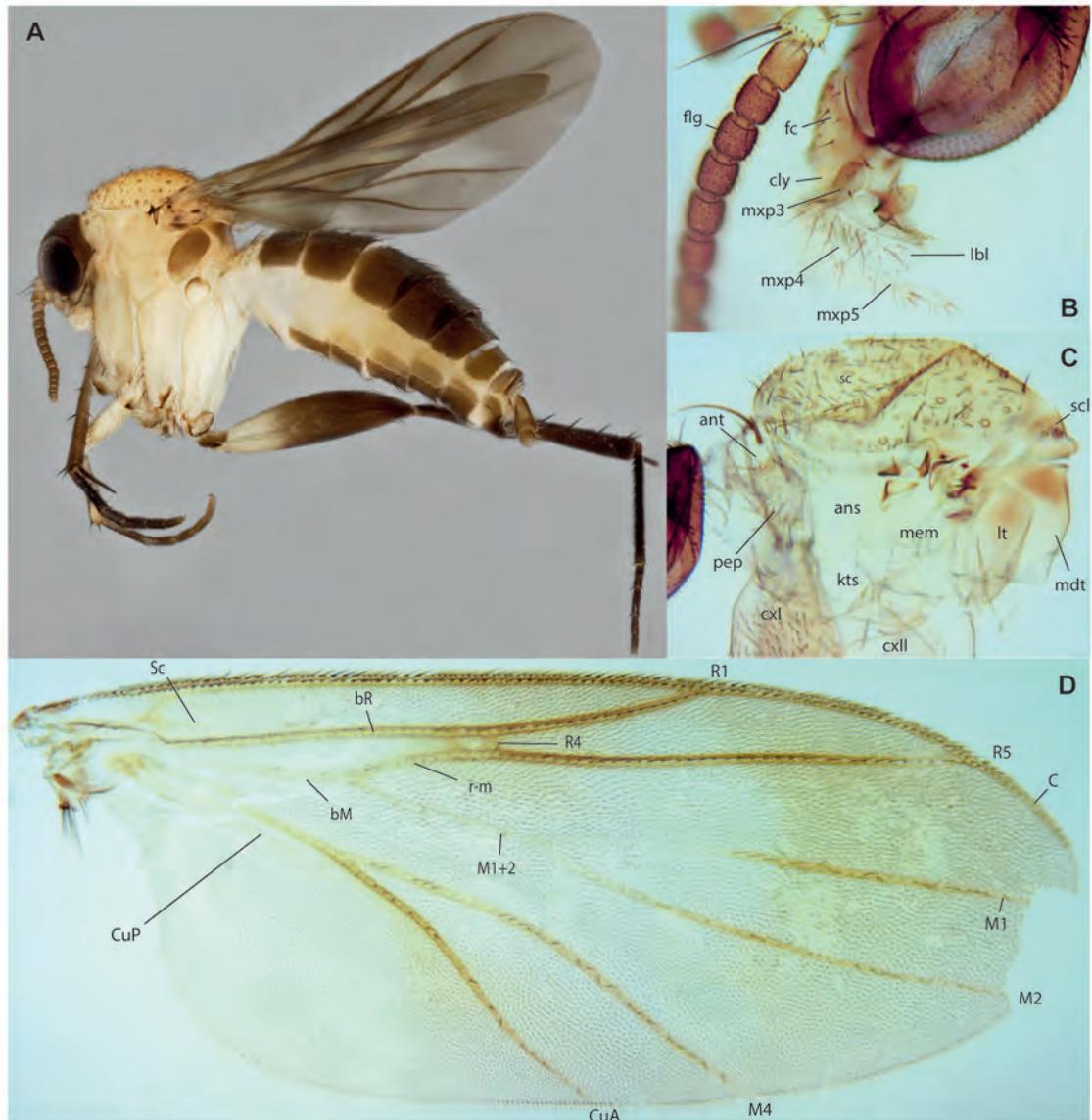


Figure XXA-F. *Tetragoneura* sp.n. 06, male holotype. A. Habitus. B. Head. C. Thorax. D. Wing.

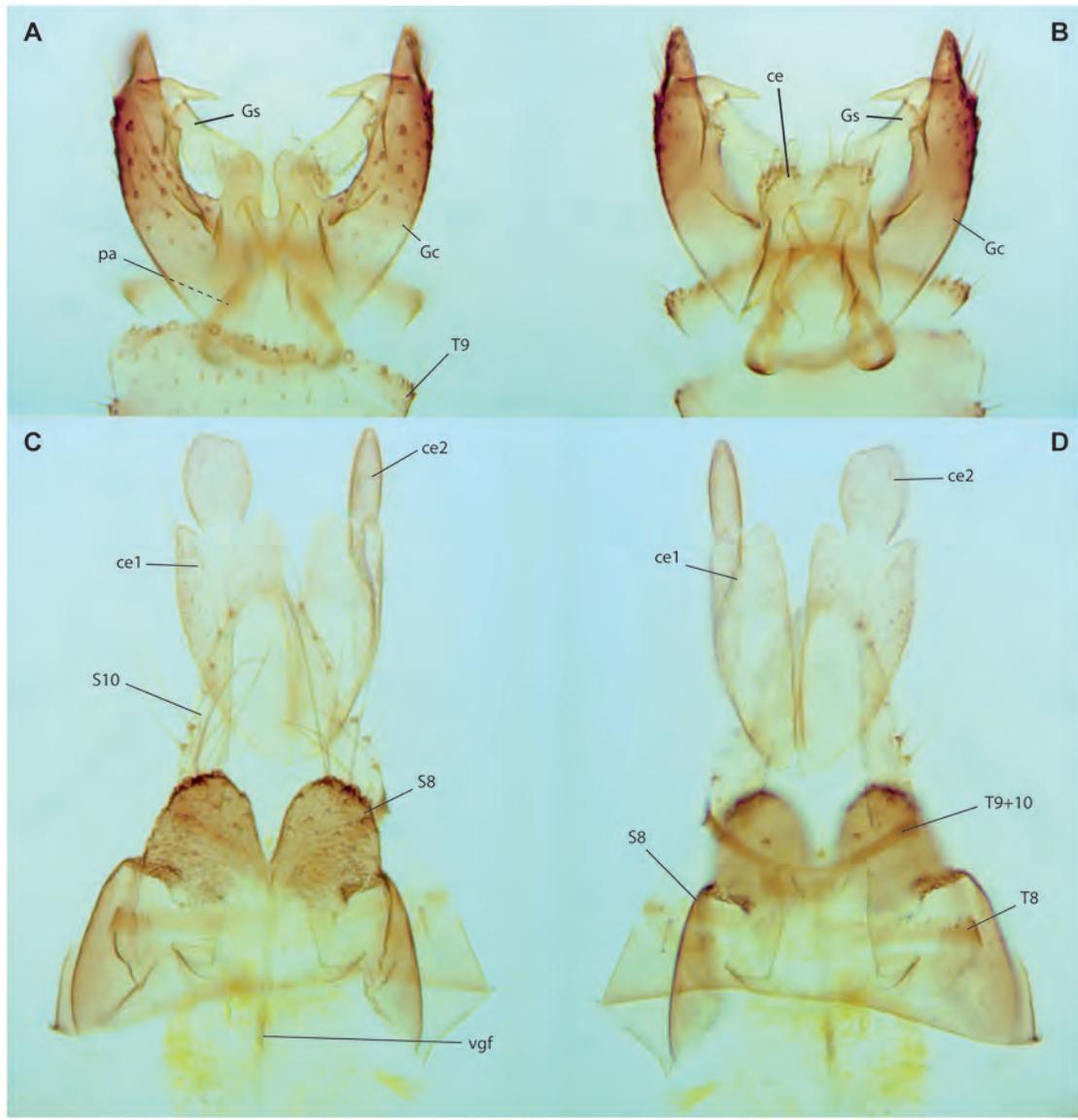


Figure XXA-B. *Tetragoneura farquhari* sp.n. A. Male terminalia, ventral view, male holotype. B. Male terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRCBDP0048503. D. Female terminalia, dorsal view, same.

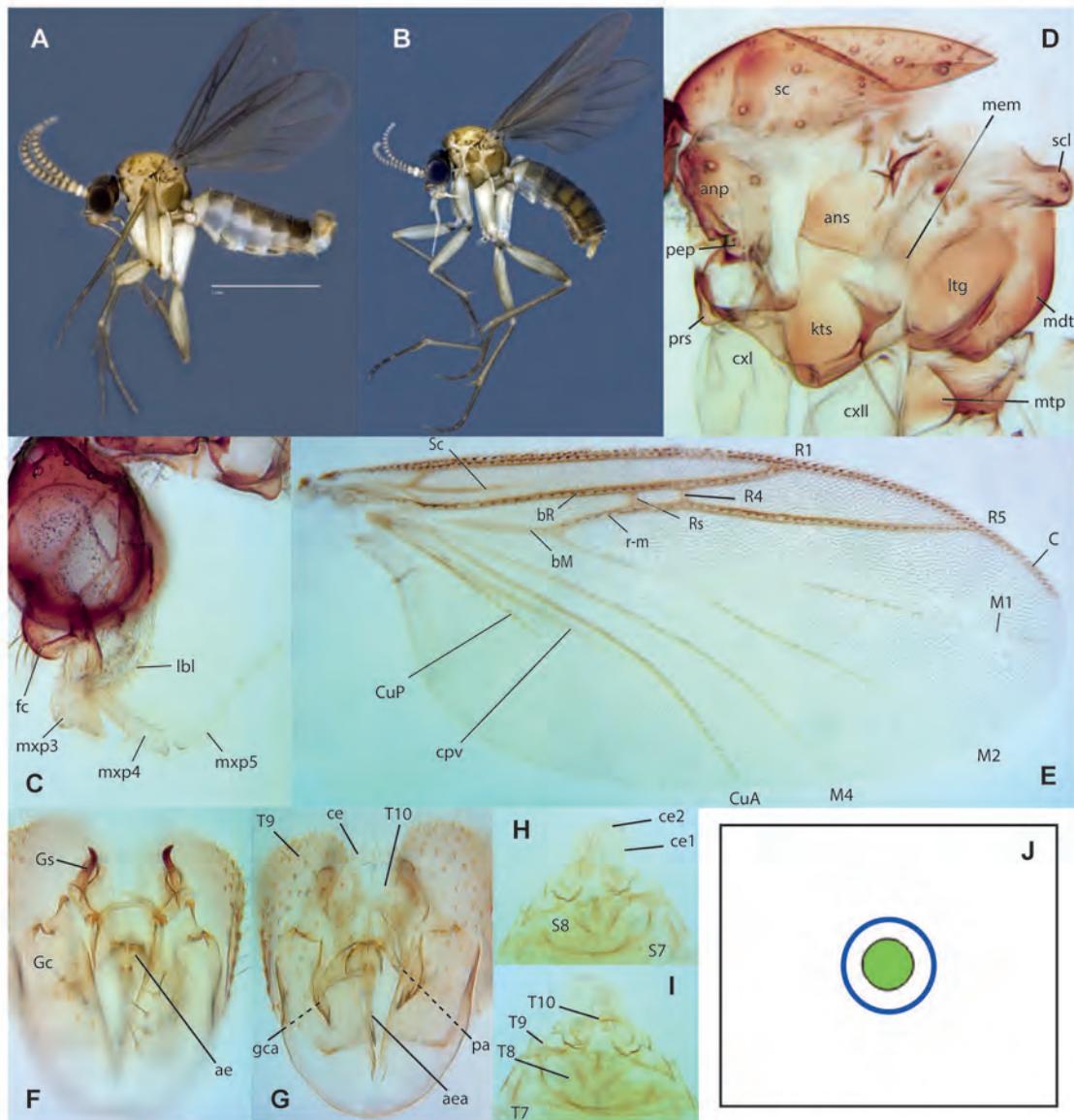


Figure XXA-F. *Ectrepesthoneura* sp.nov. 01. A. Habitus, male holotype. B. Female paratype ZRCBDP0048506. C. Thorax, male holotype. D. Head, same. E. Wing, same. F. Male terminalia, ventral, same. G. Male terminalia, dorsal, same. H. Female terminalia, ventral view, paratype ZRCBDP0048506. I. Female terminalia, dorsal view, same. J. Haplotype network for *Ectrepesthoneura*.

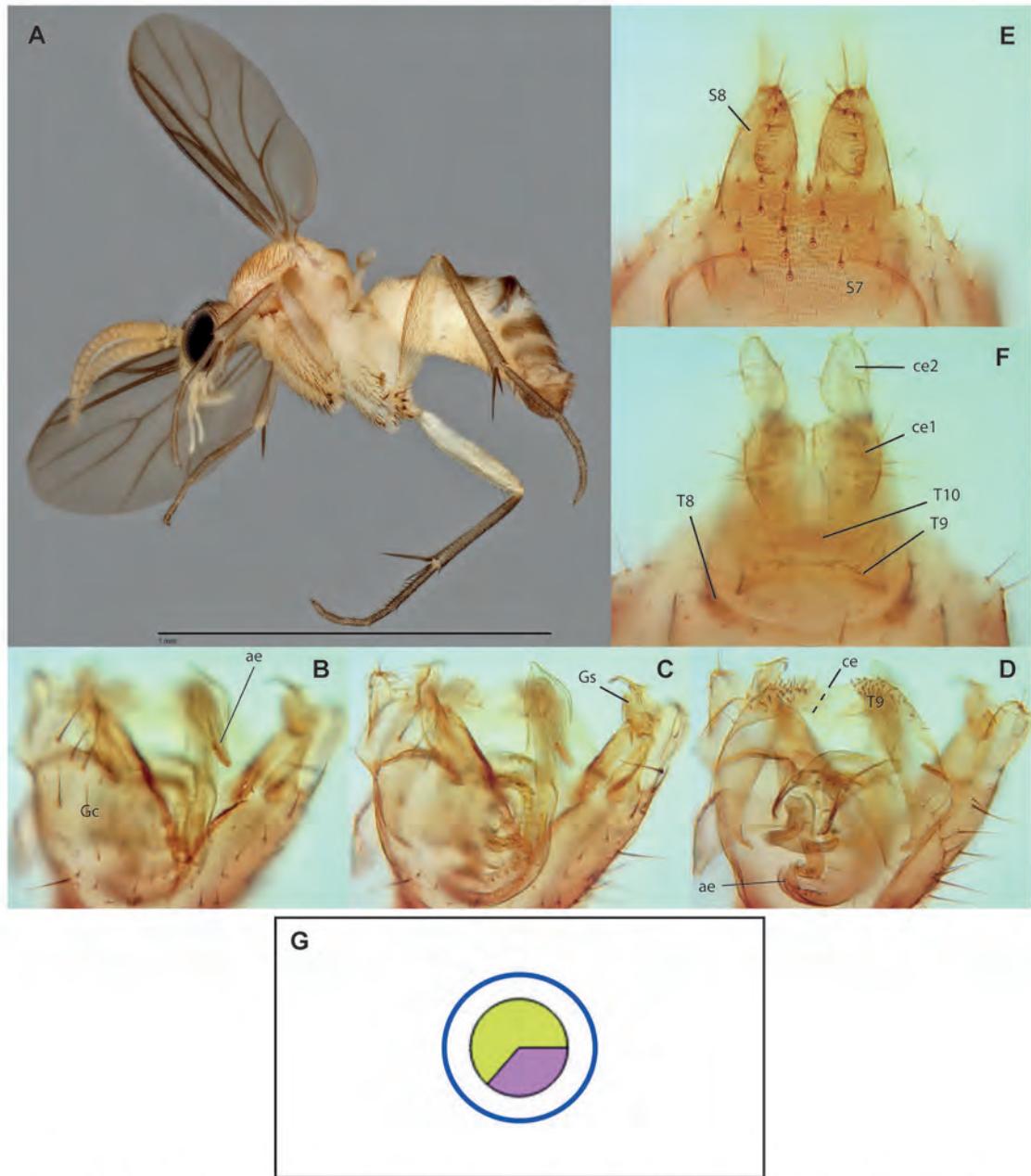


Figure XXA-F. *Mohelia zubirsaidi* Amorim & Oliveira, sp.n. A. Male, paratype ZRCBDP0048984. B. Male terminalia, ventral view, same. C. Male terminalia, internal view, same. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral, paratype ZRCBDP0048999. F. Female terminalia, dorsal view, same. G. Haplotype network for *Mohelia*.

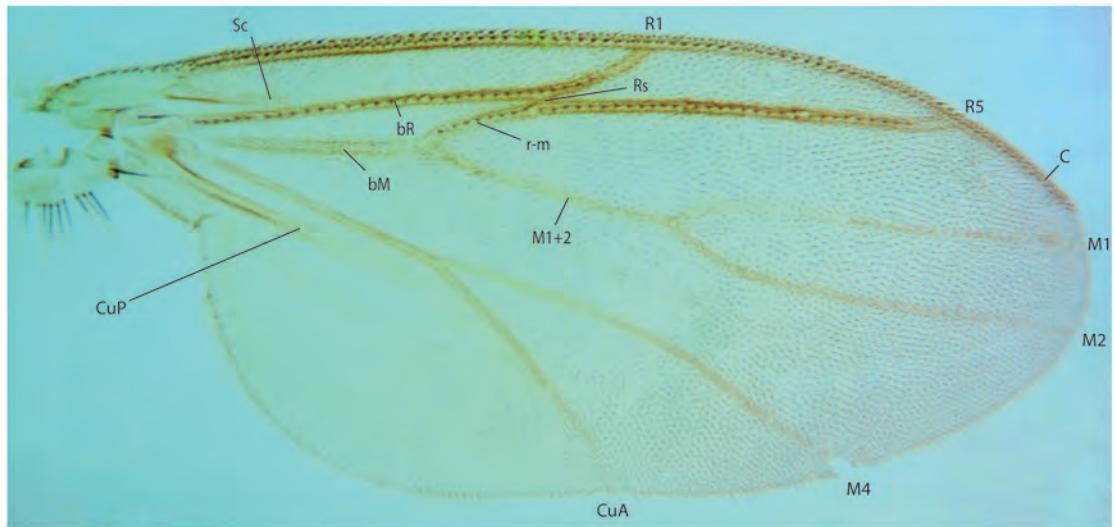


Figure XXA-F. *Megophthalmidia* sp.n. 01, wing, male holotype.

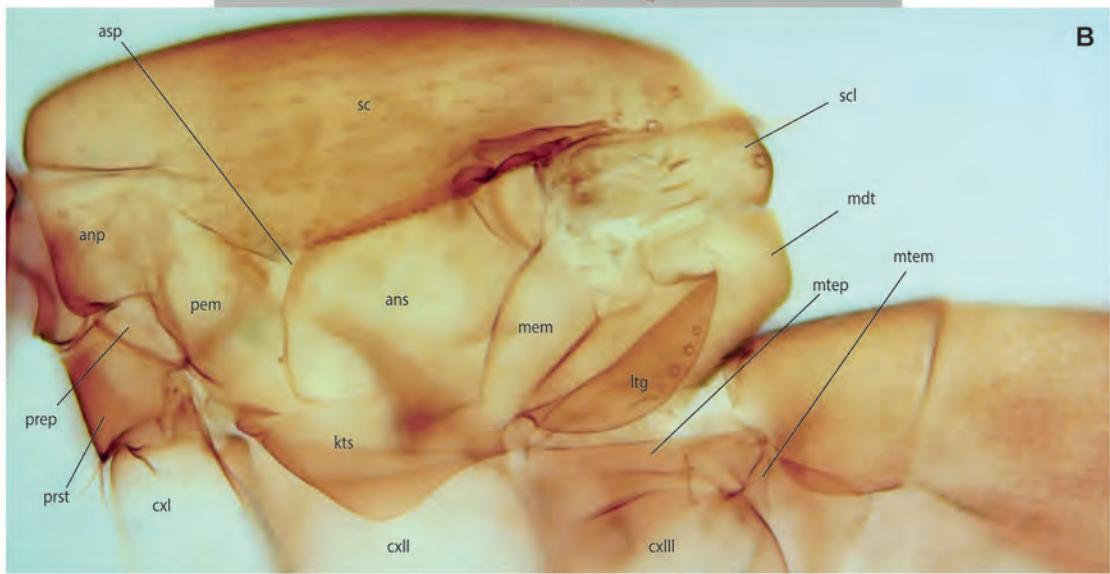


Figure XXA-F. *Allactoneura tumasik* Amorim & Oliveira, sp.n., male holotype A. Habitus. B. Thorax.

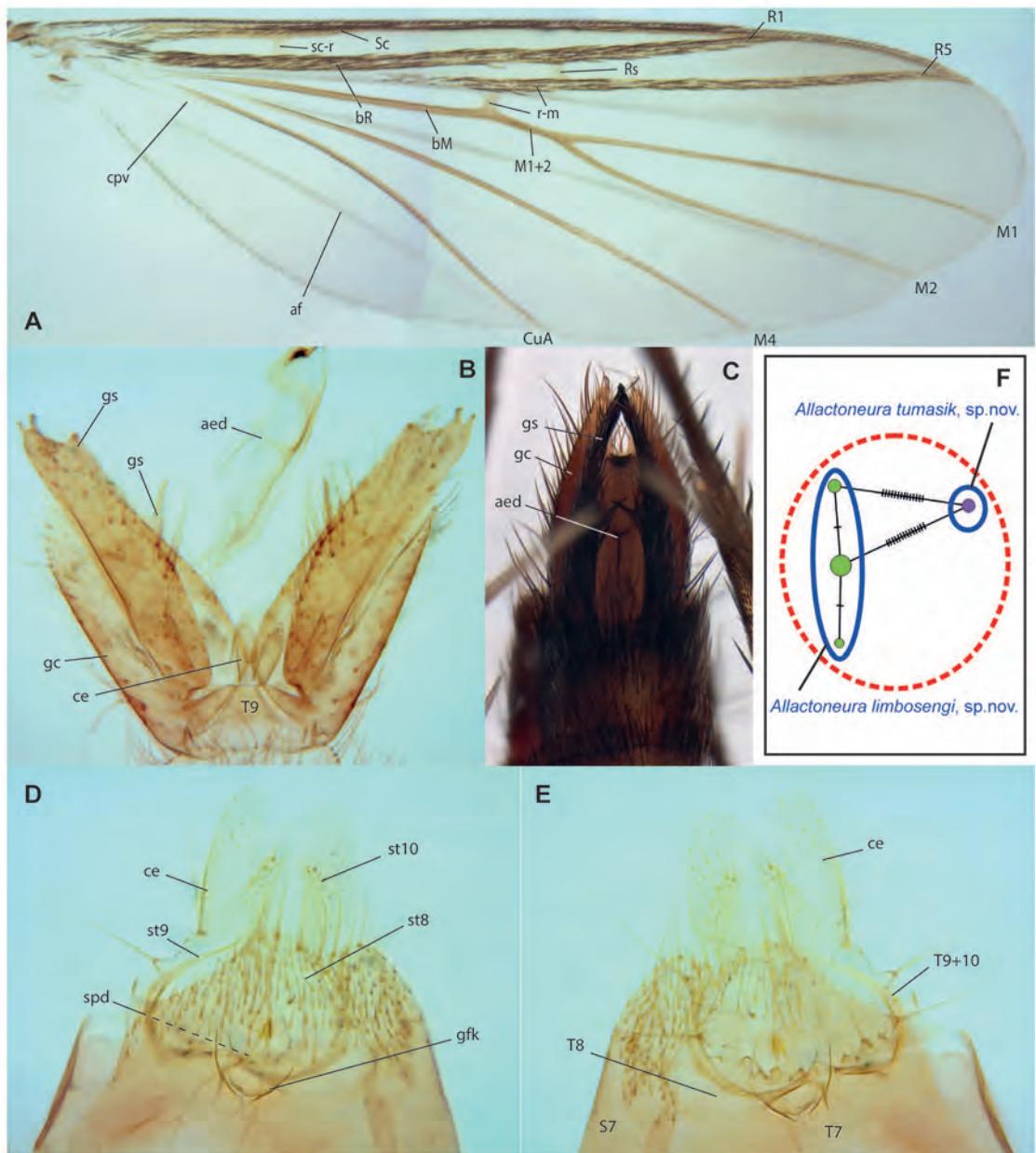


Figure XX. *Allactoneura tumasik*, Amorim & Oliveira, sp.nov. A. Wing, holotype. B. Male terminalia, ventral view, same. C. Detail of distal end of gonostylus, same. D. Female terminalia, ventral view, paratype ZRCBDP0048284. E. Same, dorsal view. F. Haplotype network for *Allactoneura*.

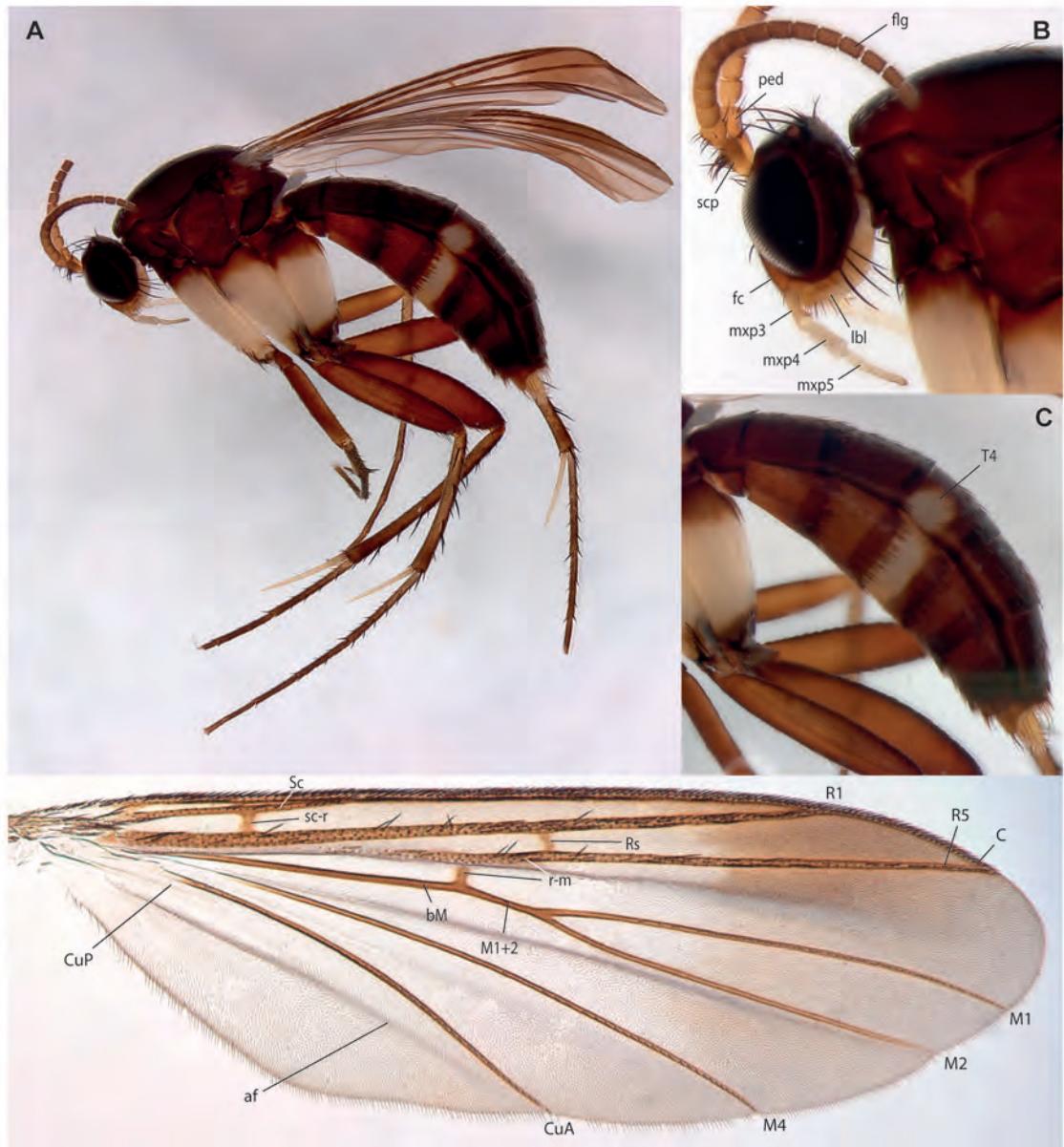


Figure XXA. *Allactoneura bosengi* Amorim & Oliveira, sp.n. A. Habitus, female holotype. B. Head, same. C. Abdomen, same. D. Wing, male paratype ZRCBDP0278244.

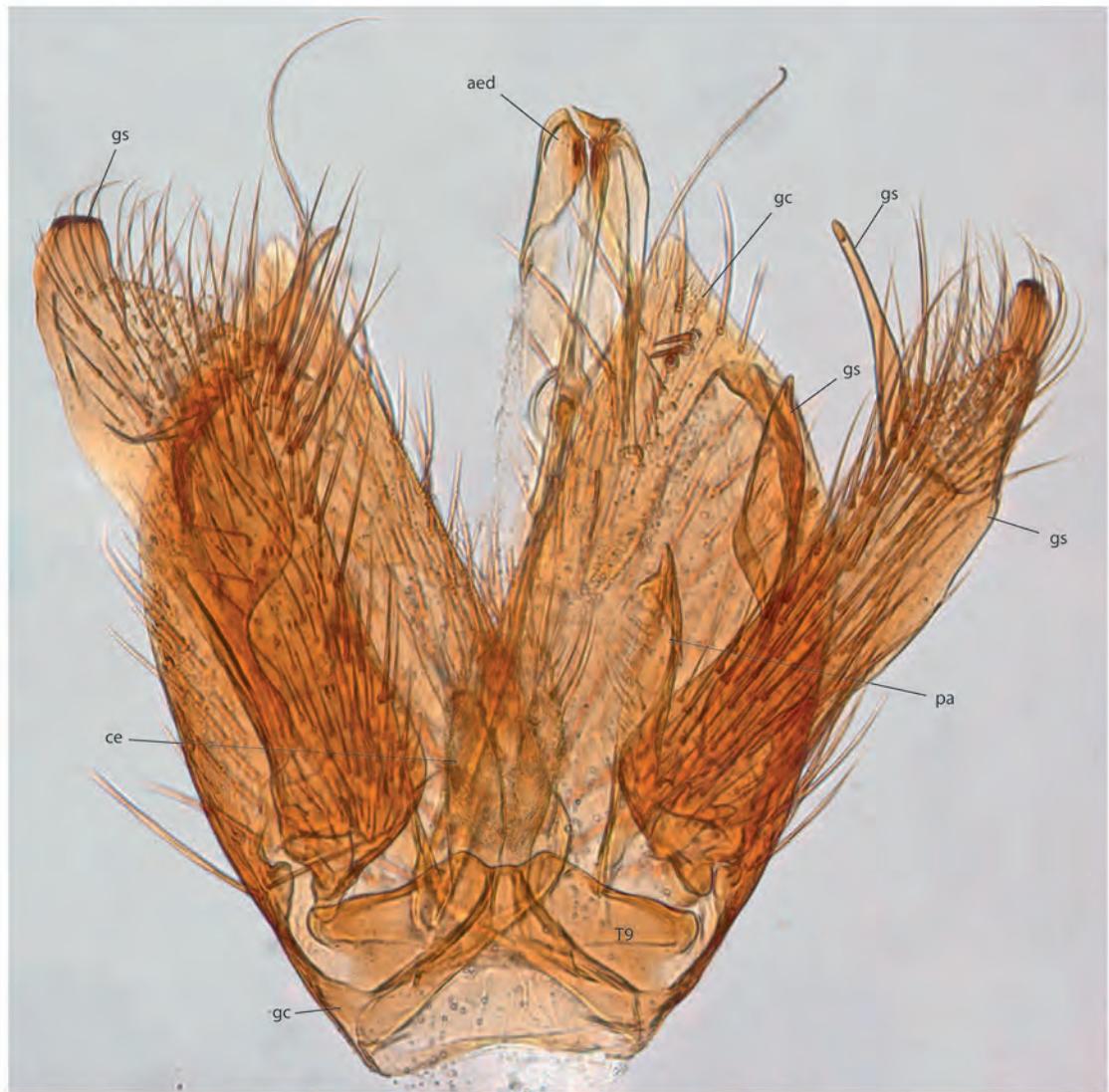


Figure C5B. *Allactoneura limbosengi* Amorim & Oliveira, sp.n., male paratype ZRCBDP0278244, terminalia, ventral view.

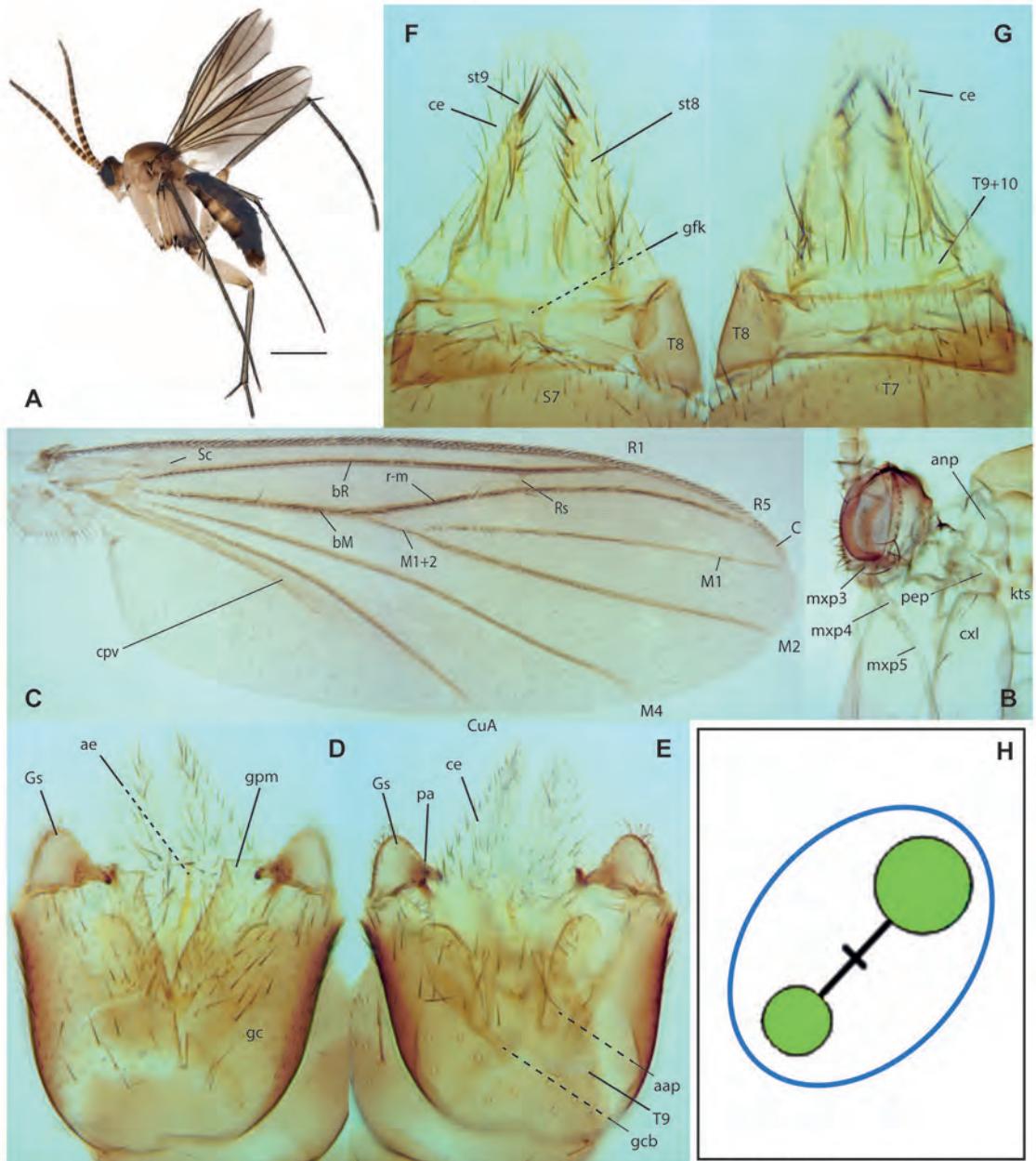


Figure XXA-F. *Eumanota racola* Søli. A. Habitus, female ZRCBDP0048561. B. Wing, male ZRCBDP0048560. C. Head, male ZRCBDP0048560. D. Terminalia, ventral view, female ZRCBDP0048927. E. Terminalia, dorsal view, same. F. Terminalia, ventral view, male ZRCBDP0048560. G. Terminalia, dorsal view, same. H. Haplotype network for *Eumanota*.

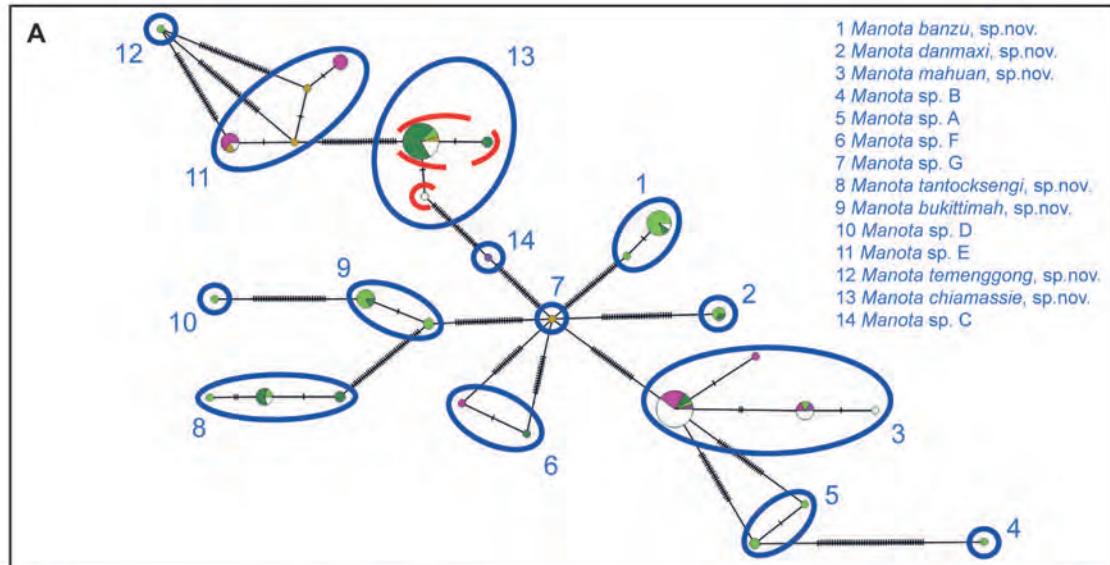


Figure XXA-F. *Manota* sp.n. 01, A. Habitus, female paratype ZRCBDP0048517. B. Habitus, male paratype ZRCBDP0137281. C. Haplotype network for *Manota*.

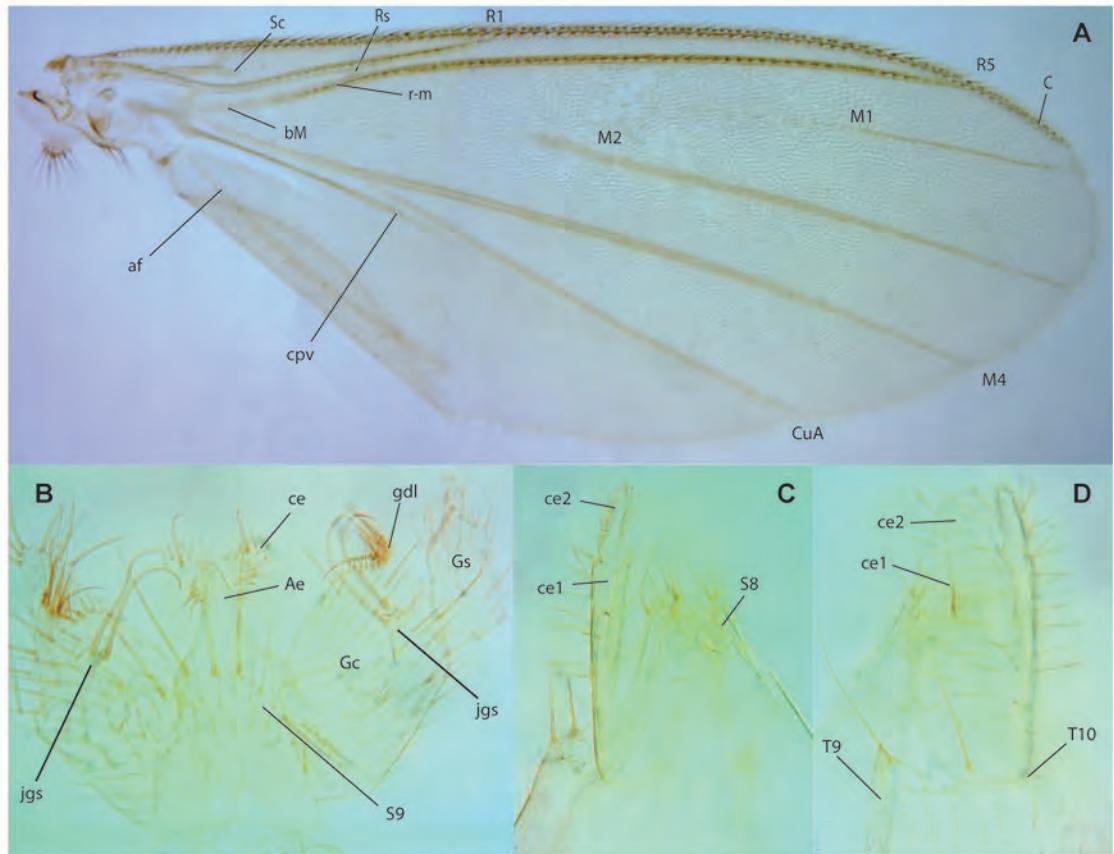


Figure XXA-F. *Manota* sp.n. 01. A. Wing, male paratype ZRCBDP0047877. B. Terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRCBDP0048677. D. Female terminalia, dorsal view, paratype ZRCBDP0048677.

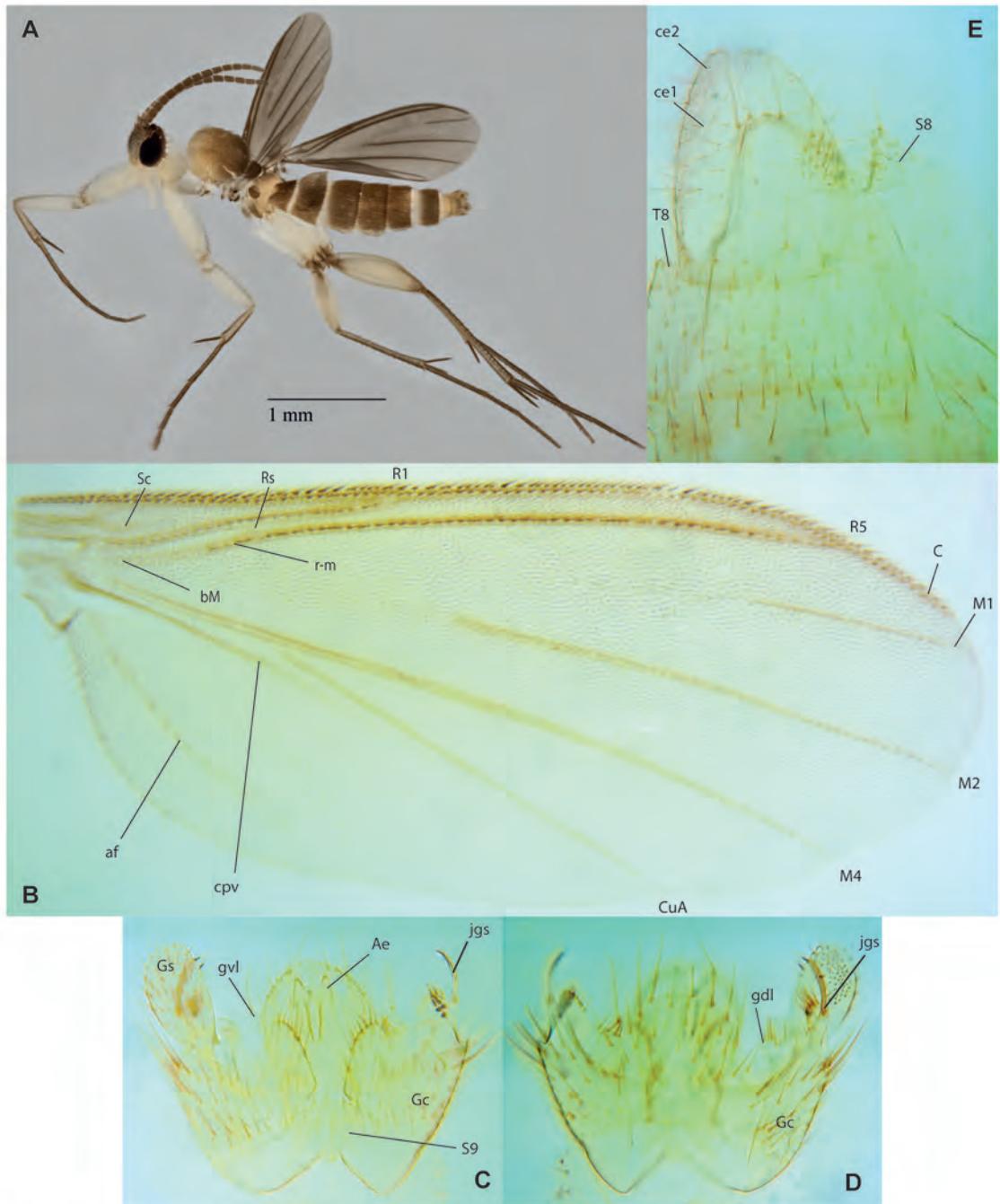


Figure XXA-F. *Manota* sp.n. 02. A. Habitus, male paratype ZRCBDP0137247. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same. E. Female terminalia, ventro-lateral view, paratype ZRCBDP0072744.

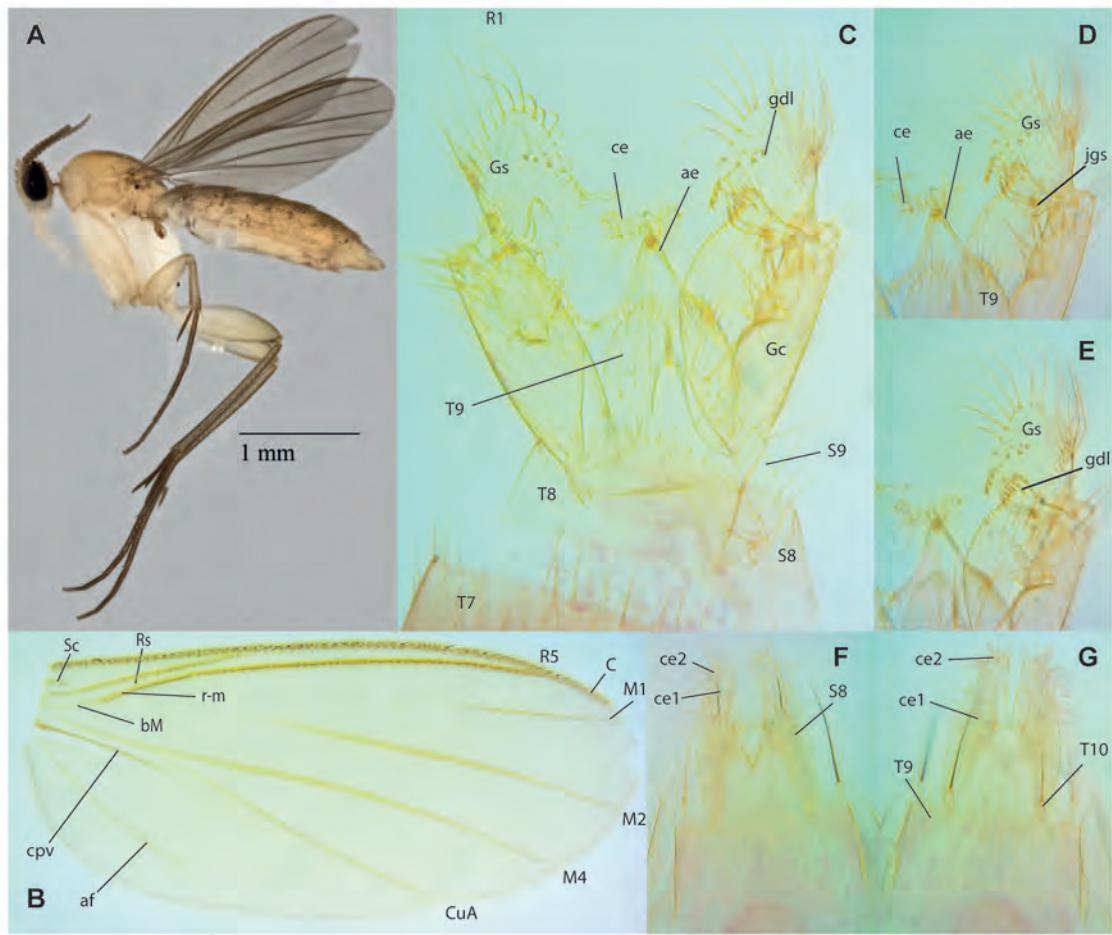


Figure XXA-F. *Manota* sp.n. 04. A. Habitus, female paratype, ZRCBDP0137035. B. Wing, male holotype. C. Terminalia, ventral view, same. D. Gonostylus, ventral view, same. E. Gonostylus, dorsal view, paratype same. F. Female terminalia, ventral view, paratype ZRCBDP0048527. G. Female terminalia, dorsal view, same.

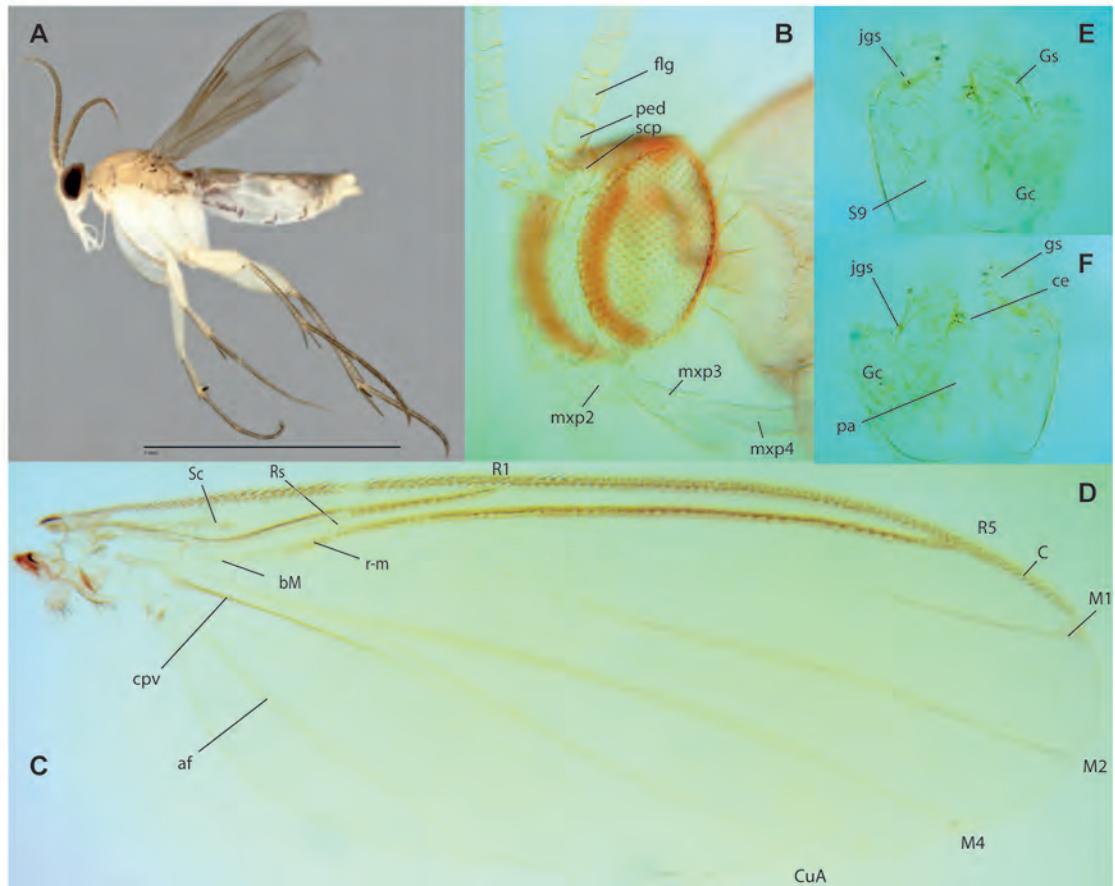


Figure XXA-F. *Manota* sp.n. 08, male holotype. A. Habitus. B. Head. C. Mesonotum. D. Wing. E. Terminalia, ventral view. F. Terminalia, dorsal view, same.

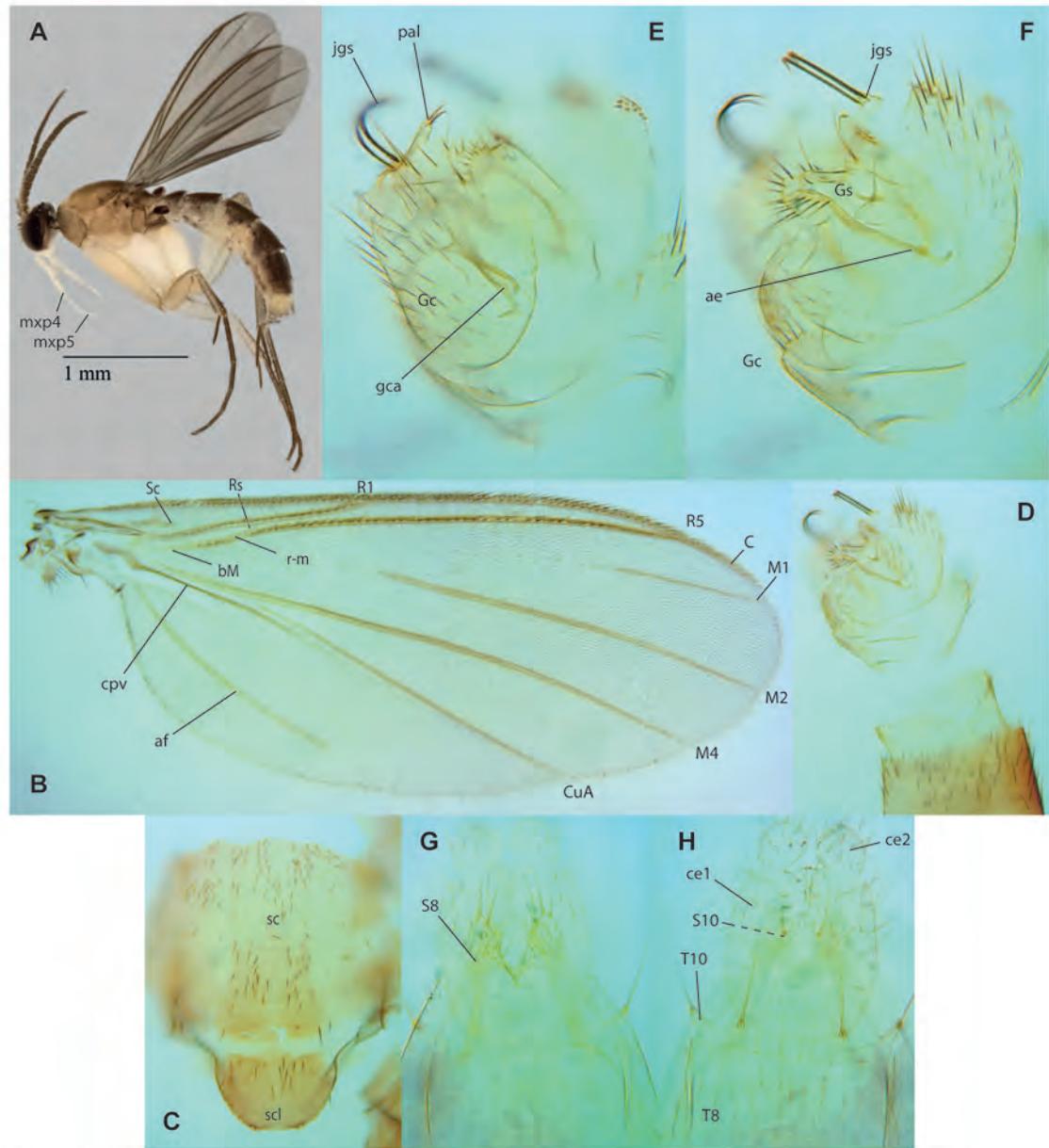


Figure XXA-F. *Manota* sp.n. 09. A. Habitus, male paratype, ZRCBDP0137040. B. Wing, male holotype. C. Mesonotum, same. D. Terminalia, lateral view, same. E-F. Gonocoxite and gonostylus, lateral view, same. G. Female terminalia, ventral view, paratype ZRCBDP0074033. H. Female terminalia, dorsal view, same.

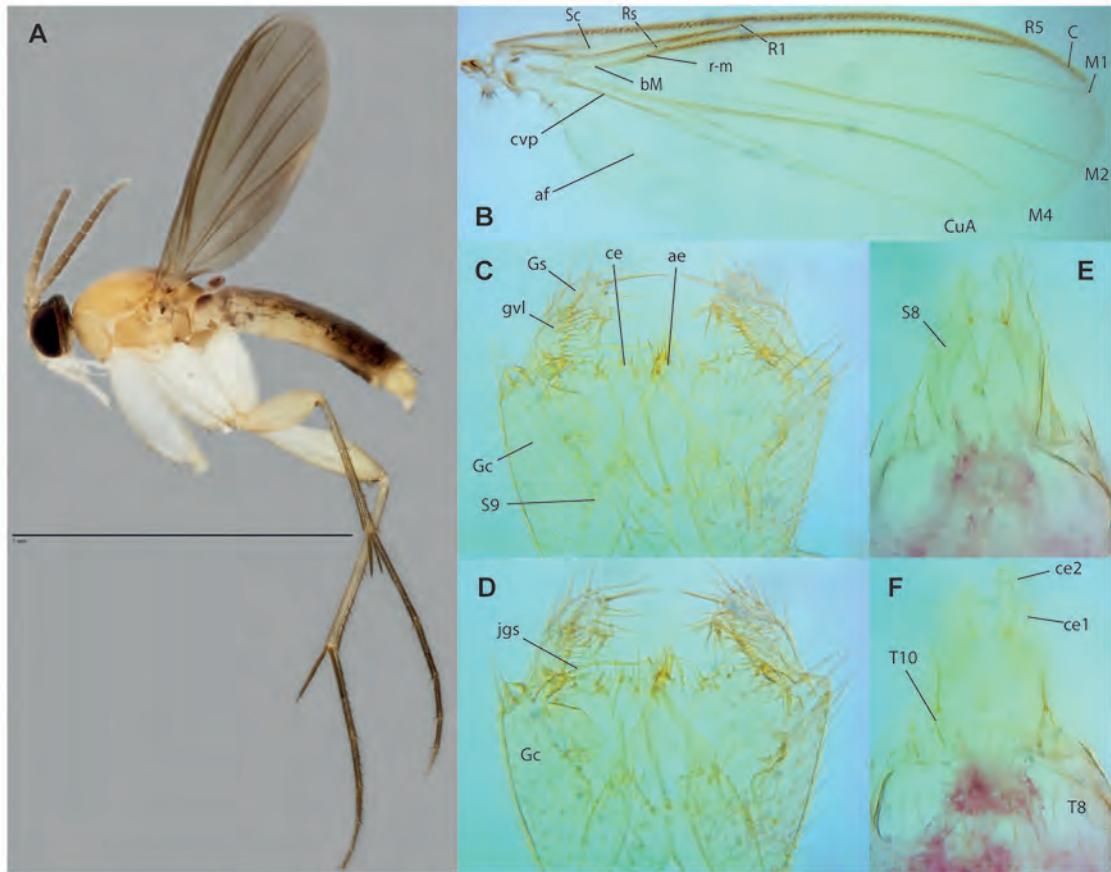


Figure XXA-F. *Manota* sp.n. 10. A. Habitus, male paratype, ZRCBDP0137040. B. Wing, male holotype (wing partially folded). C. Male terminalia, ventral view, same. F. Male terminalia, dorsal view. E. Female terminalia, ventral view, paratype ZRCBDP0074033. F. Female terminalia, dorsal view, same.

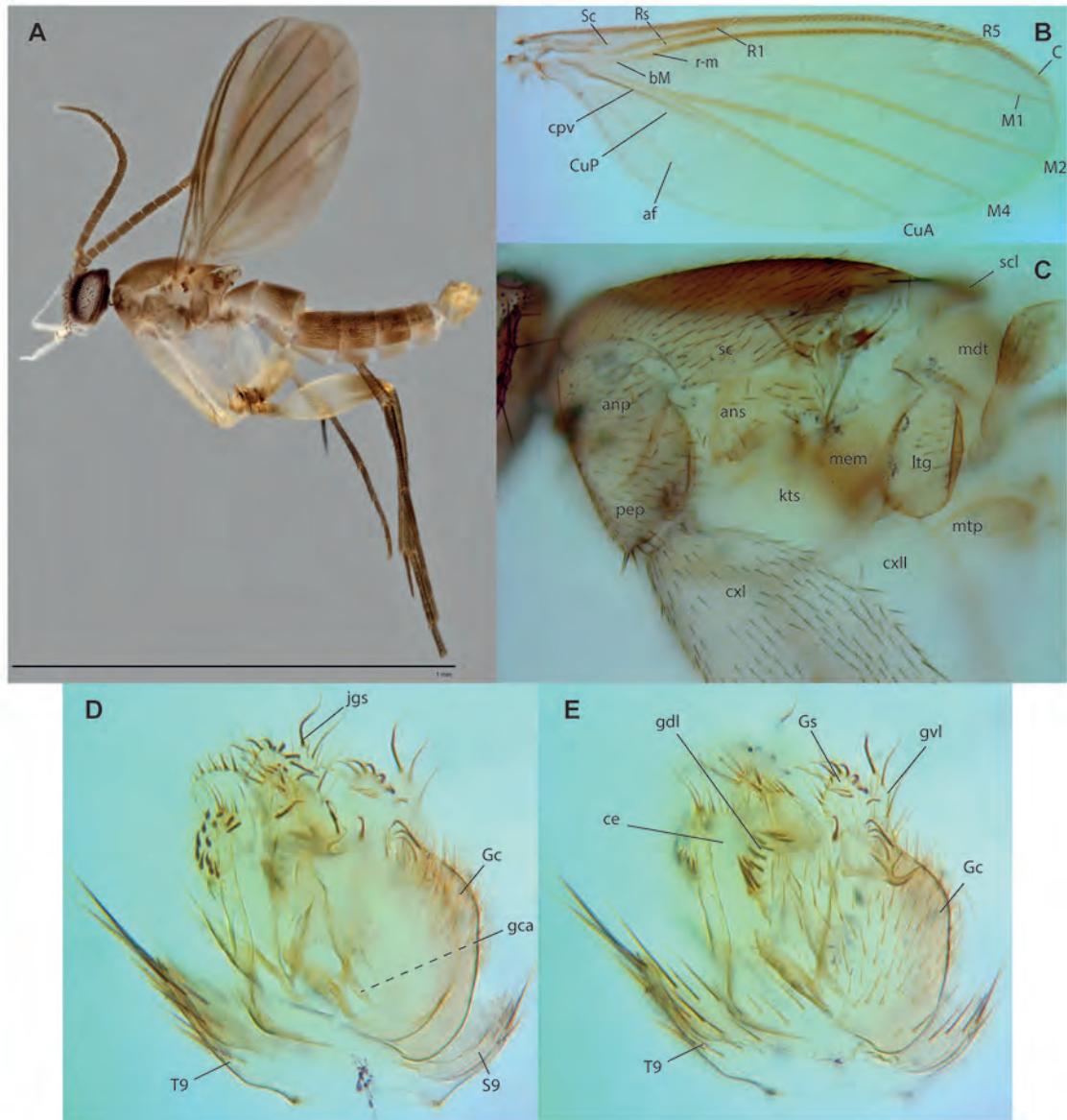


Figure XXA-F. *Manota* sp.n. 11, male holotype. A. Habitus. B. Wing. C. Thorax. D. Terminalia, lateral view, mid section. E. Terminalia, lateral view, external section.

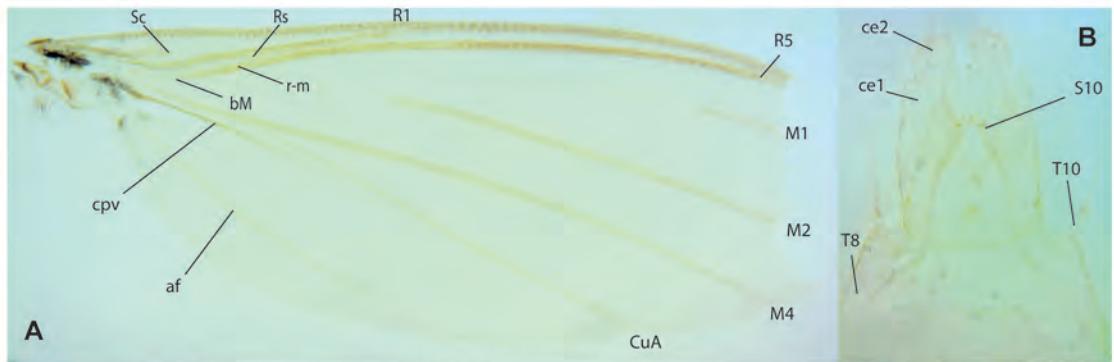


Figure XXA-F. *Manota* sp.n. 03, female holotype. A. Wing. B. Terminalia, dorsal view.

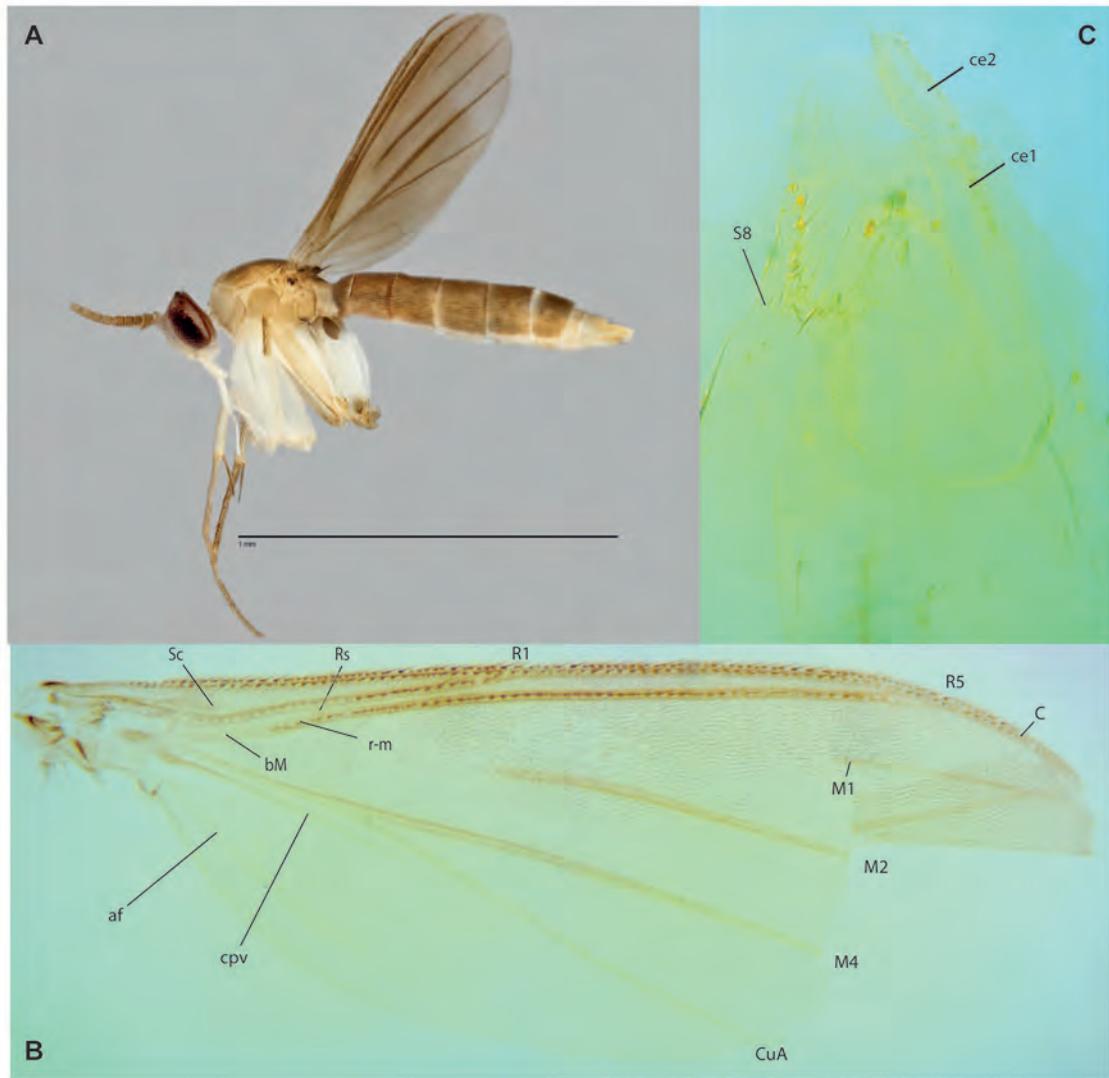


Figure XXA-F. *Manota* sp.n. 05, female holotype. A. Habitus. B. Wing. C. Terminalia, ventro-lateral view.

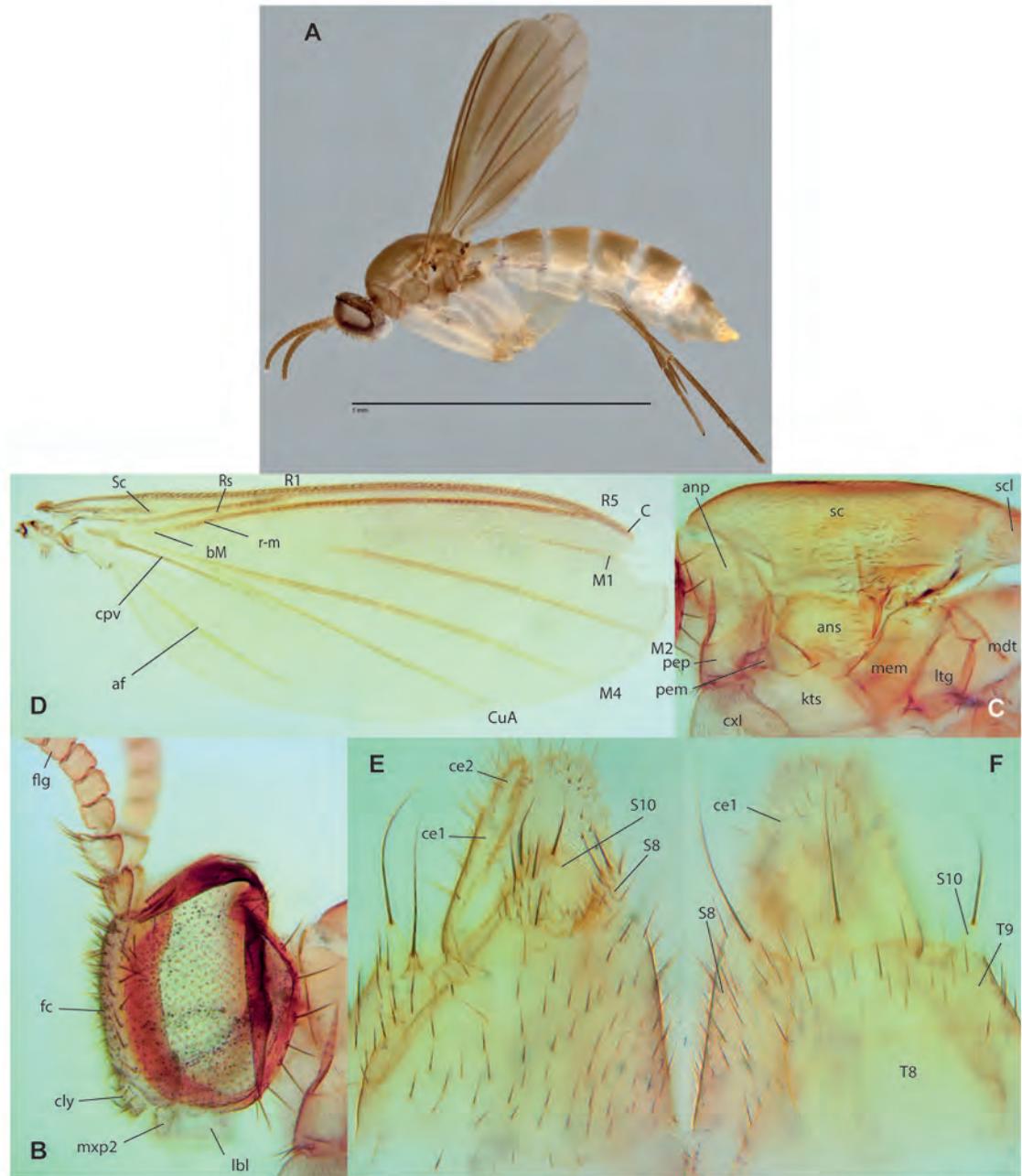


Figure XXA-F. *Manota* sp.n. 06, female holotype. A. Habitus. B. Wing. C. Thorax. D. Female terminalia, ventral view. E. Female terminalia, dorsal view, same.

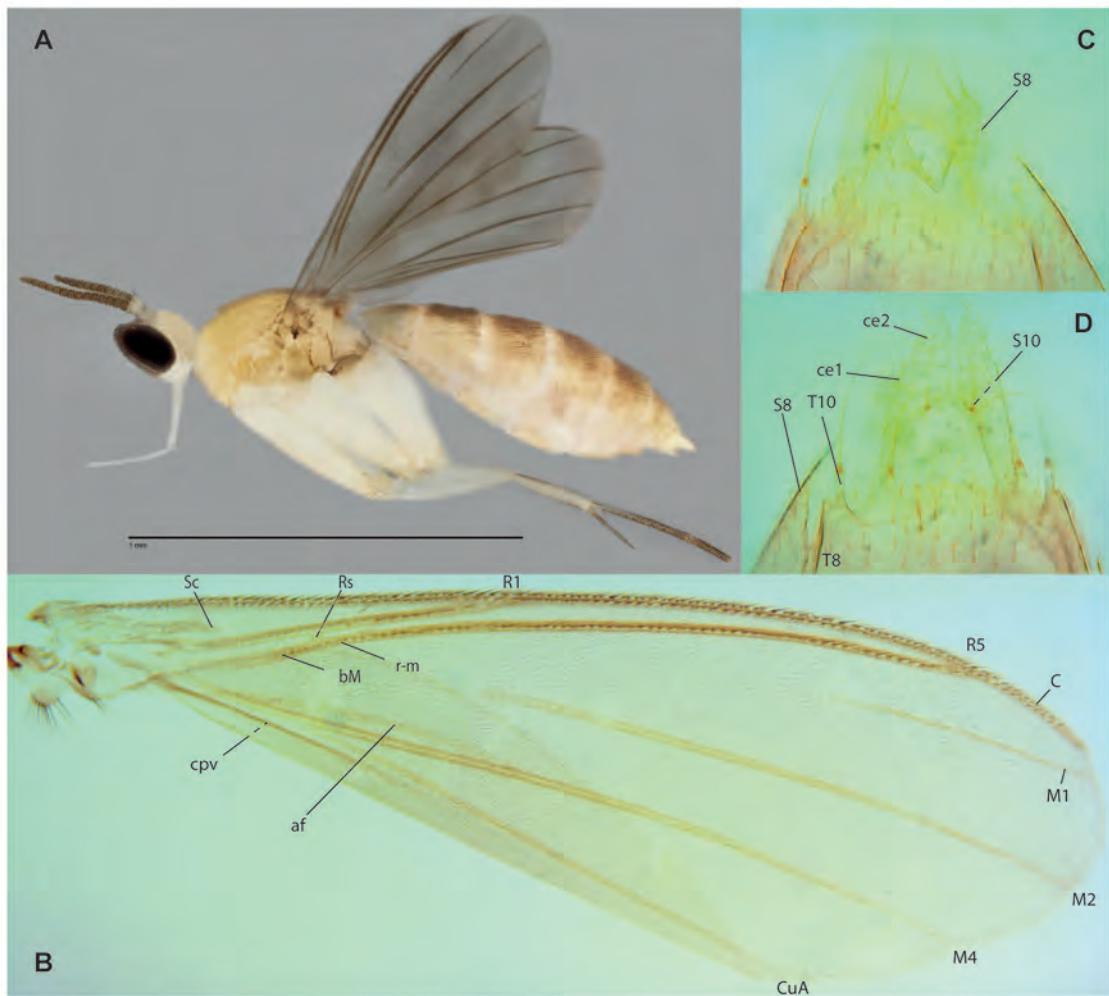


Figure XXA-F. *Manota* sp.n. 07, female holotype. A. Habitus. B. Wing. C. Female terminalia, ventral view. D. Female terminalia, dorsal view, same.

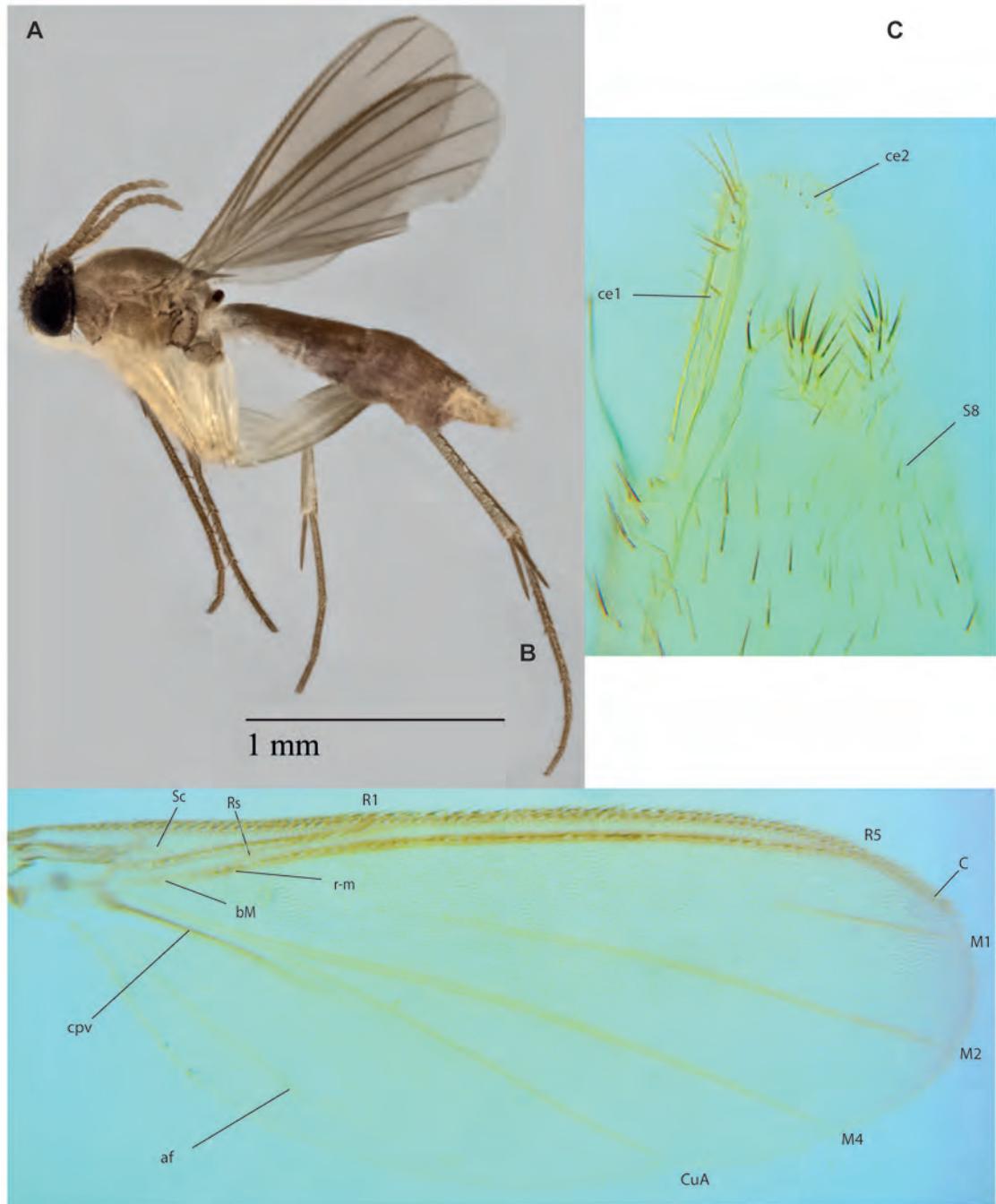


Figure XXA-F. *Manota* sp.n. 12, female holotype. A. Habitus. B. Wing. C. Terminalia, ventro-lateral view.

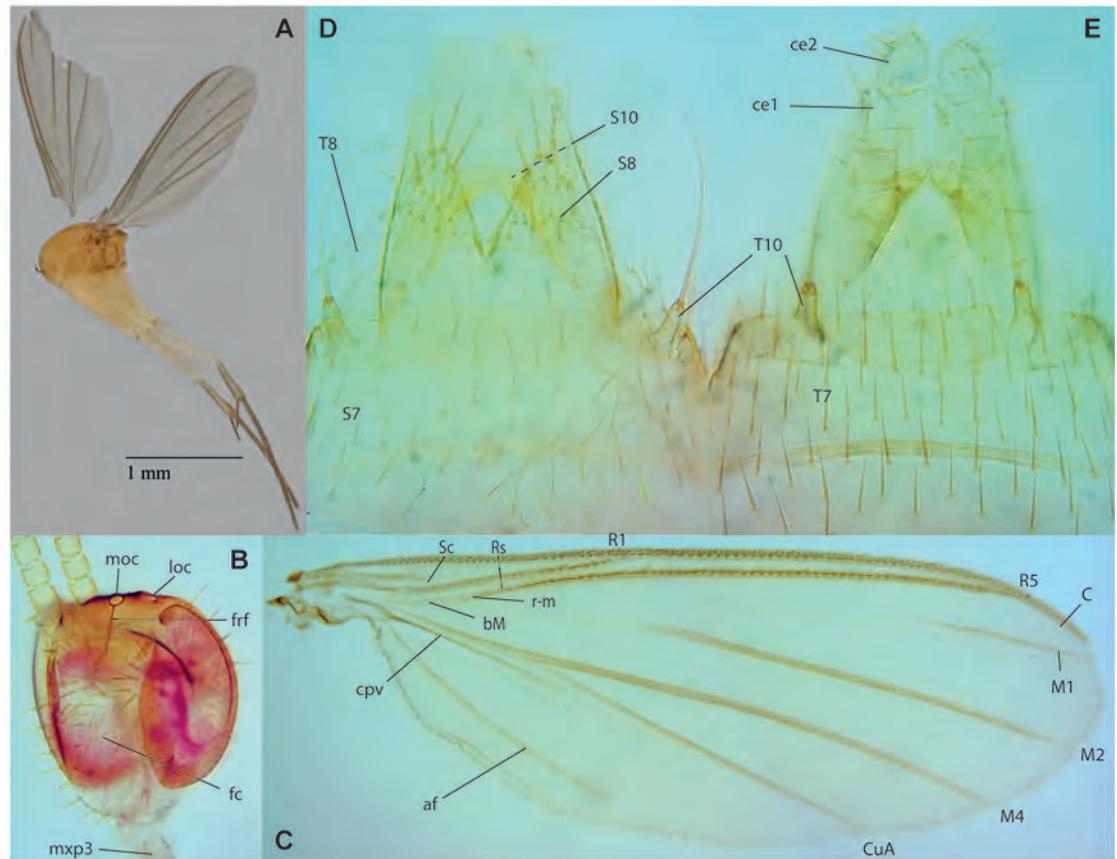


Figure XXA-F. *Manota* sp.n. 14. A. Habitus, ZRCBDP0133440. B. Wing, female holotype. C. Head, same. D. Female terminalia, ventral view, same. E. Female terminalia, dorsal view, same.

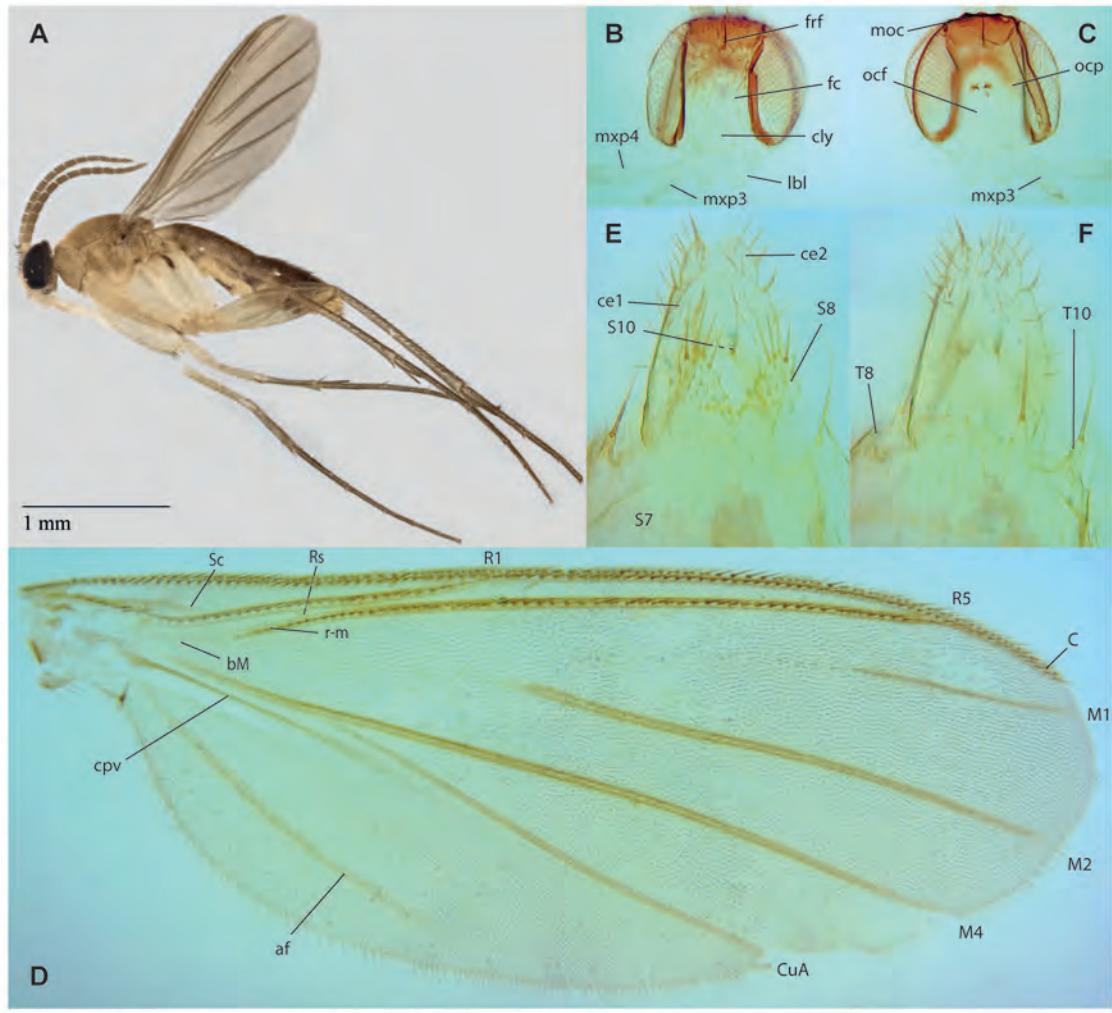


Figure XXA-F. *Manota* sp.n. 18. A. Habitus, ZRCBDP0133440. B. Head, frontal view, female holotype. C. Head, posterior view, same. D. Wing, same. E. Female terminalia, ventral view, same. F. Female terminalia, dorsal view, same.

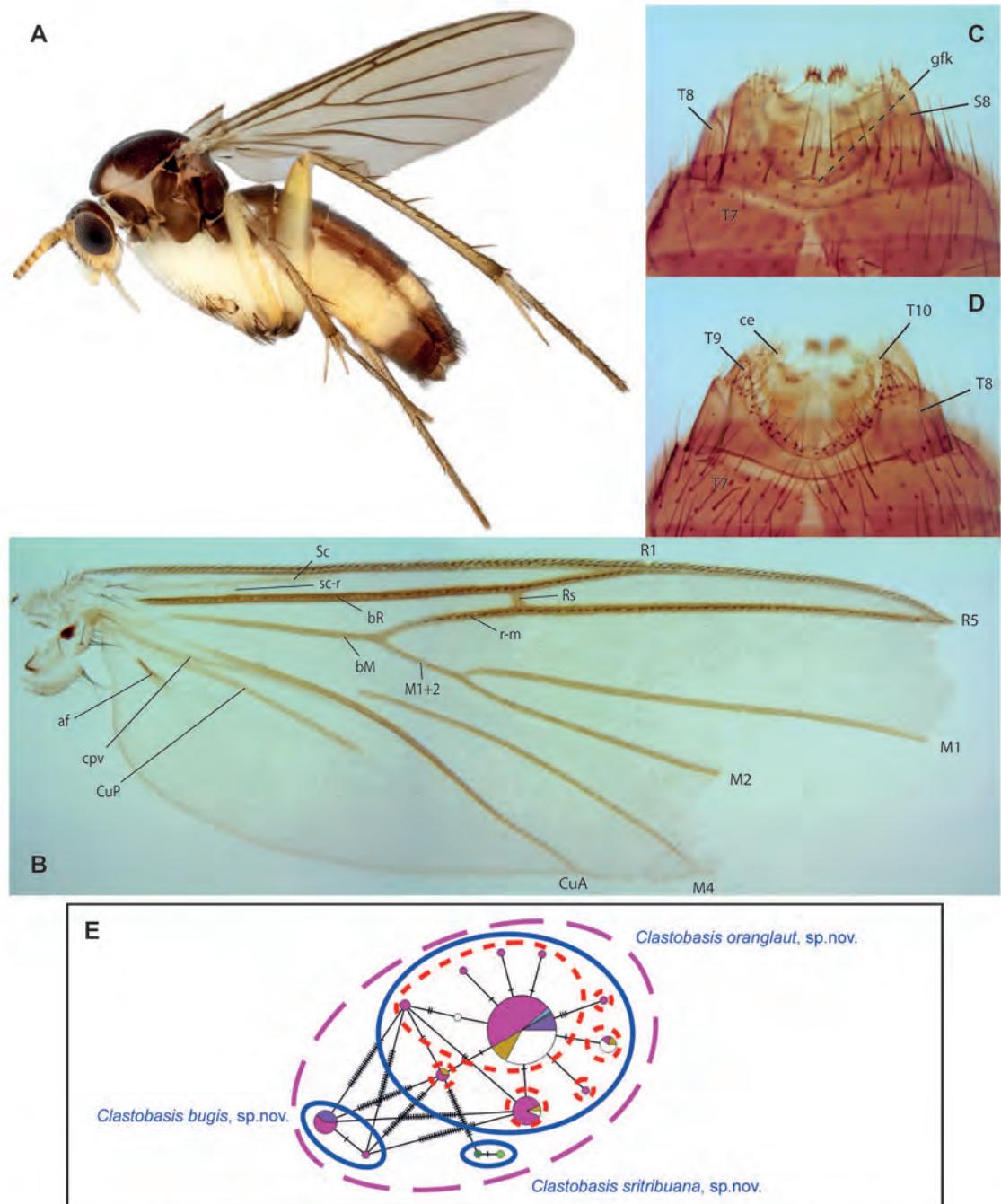


Figure XXA-F. *Clastobasis* sp.nov. 01, female holotype. A. Habitus. B. Terminalia, ventral view. C. Terminalia, dorsal view. D. Wing. E. Haplotype network for *Clastobasis* (see M&M for abbreviations and colors).

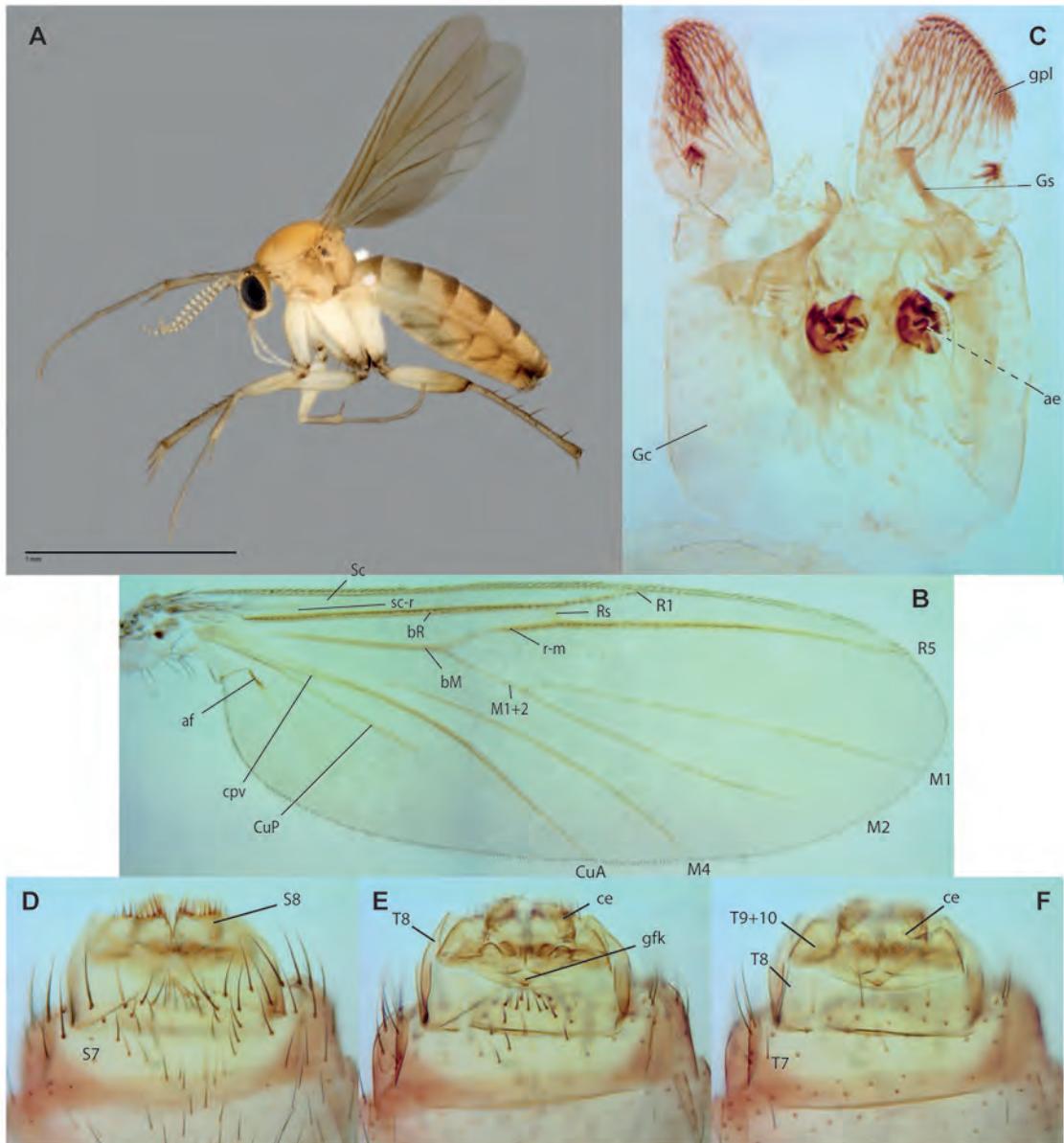


Figure XXA-F. *Clastobasis* sp.nov. 02. A. Habitus, female paratype ZRCBDP0048245. B. Wing. C. Male terminalia, ventral view, holotype. D. Female terminalia, ventral view, paratype ZRCBDP0048242. E. Female terminalia, mid section, same. F. Female terminalia, dorsal view, same.

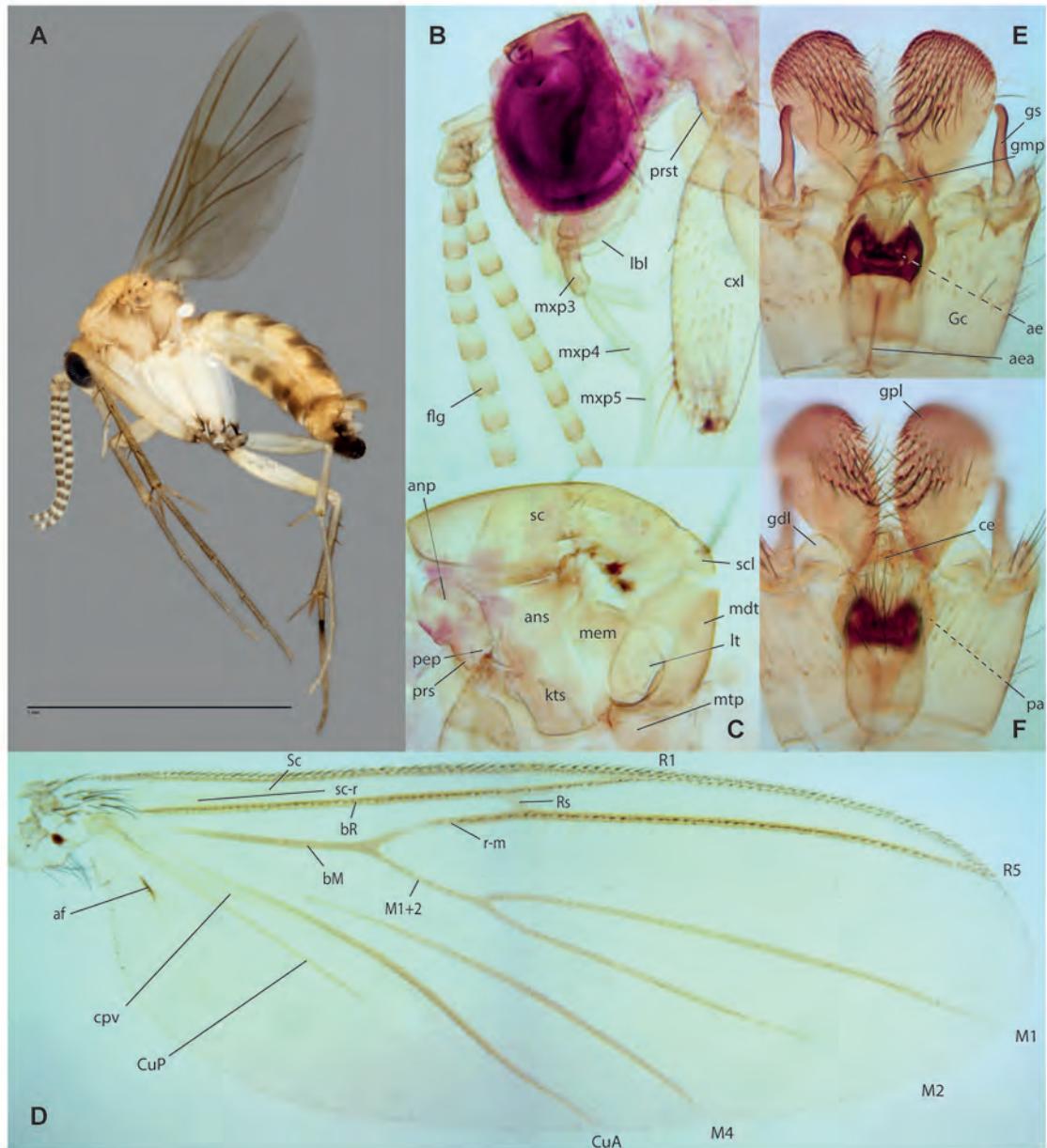


Figure XXA-F. *Clastobasis* sp.nov. 03. A. Habitus, male paratype ZRCBDP0049312. B. Head, male holotype. C. Thorax, same. D. Wing, same. E. Male terminalia, ventral, same. F. Male terminalia, dorsal, same.

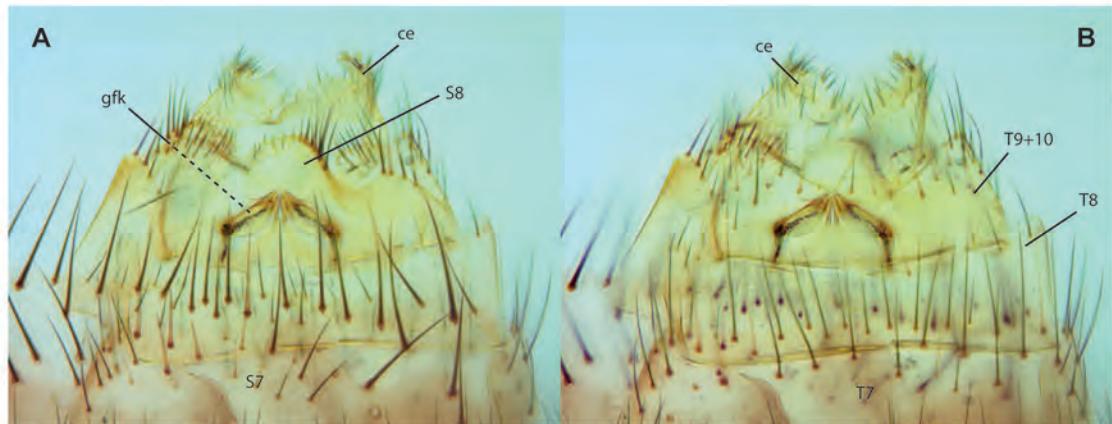


Figure XXA-F. *Clastobasis* sp.nov. 03, female terminalia, paratype ZRCBDP0049336. A. Ventral.  
B. Dorsal view.

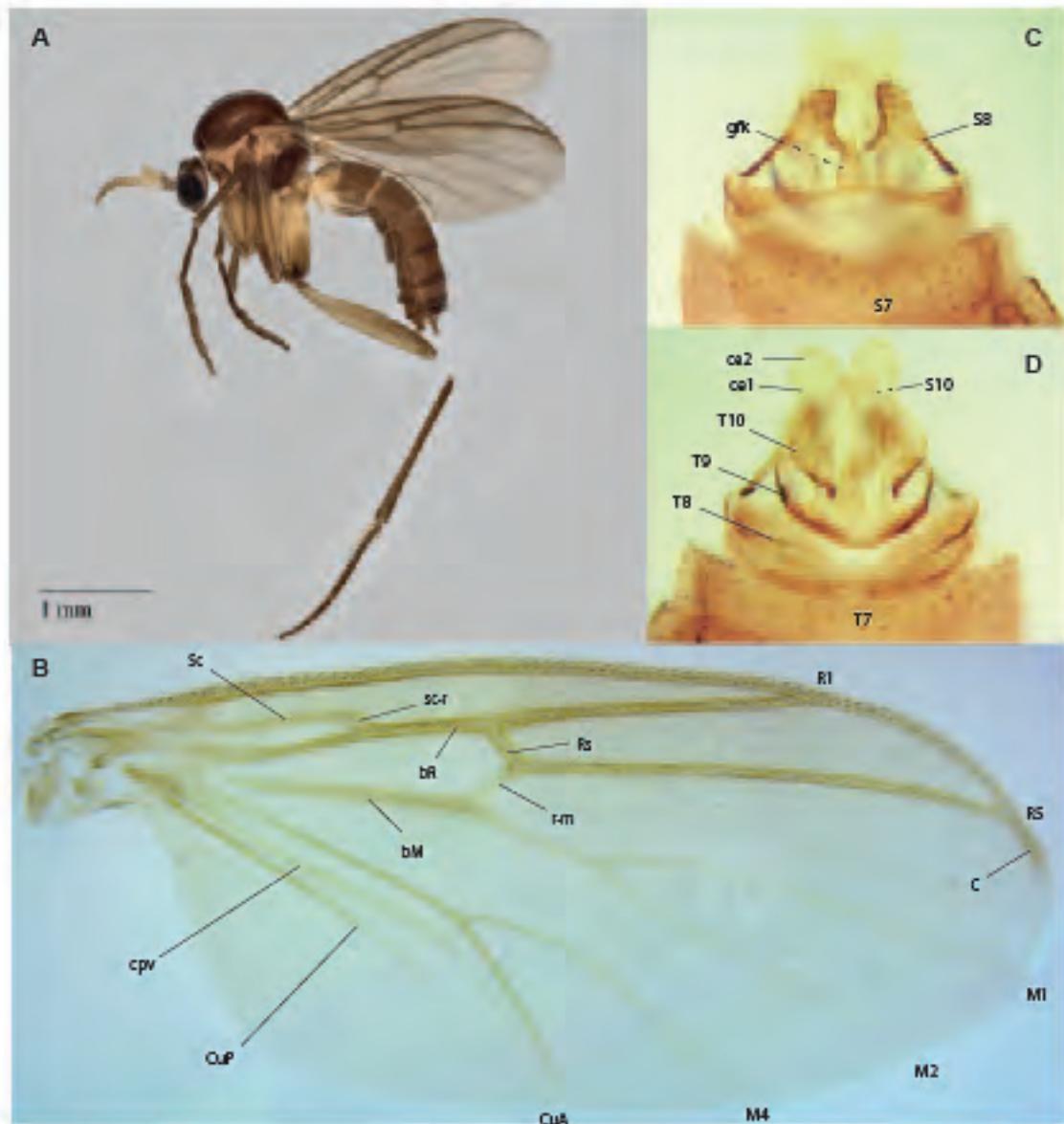


Figure XXA-F. *Dziedzickia nilautama* sp.nov. A. Habitus, female paratype ZRCBDP0143086. B. Head, female holotype. B. Wing, same. D. Terminalia, ventral view, same. E. Terminalia, dorsal view, same. F. Haplotype network for *Dziedzickia*.

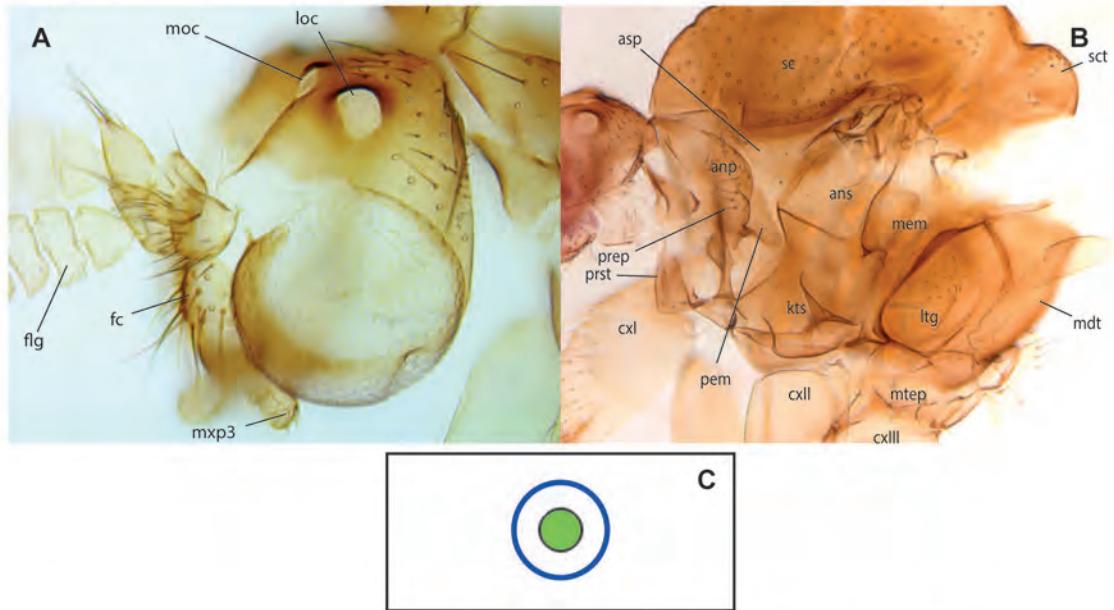


Figure XXA-F. *Dziedzickia nilautama* sp.nov. A. Head, female holotype. B. Thorax, same. C. Haplotype network for *Dziedzickia*.

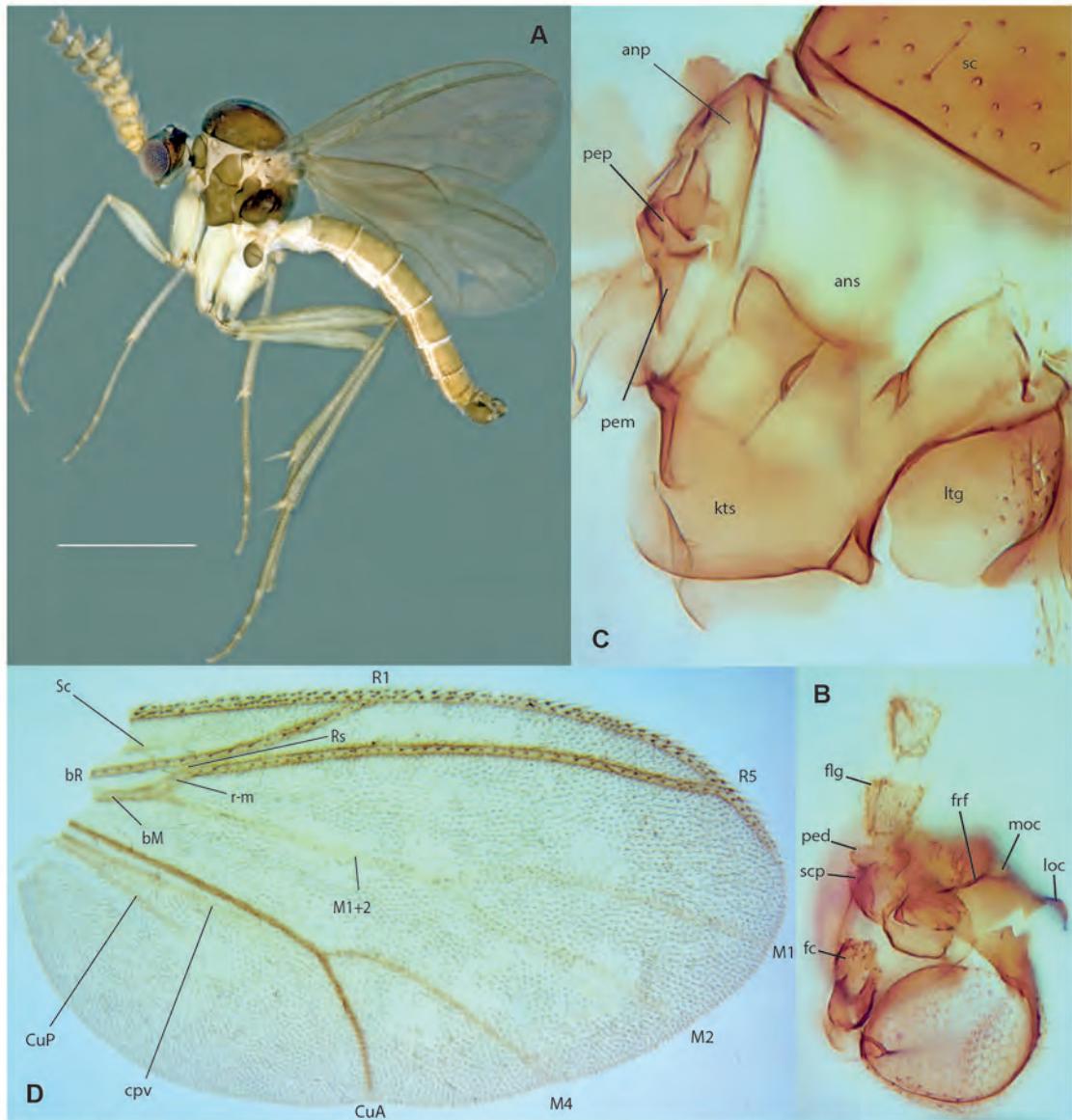


Figure XXA-F. *Metanepsia malaysiana* Kallweit. A. Habitus, male, paratype, ZRCBDP0048531. B. Head, holotype, ZRCBDP0048680, dorso-lateral view. C. Thorax, lateral view, same. D. Wing, same.

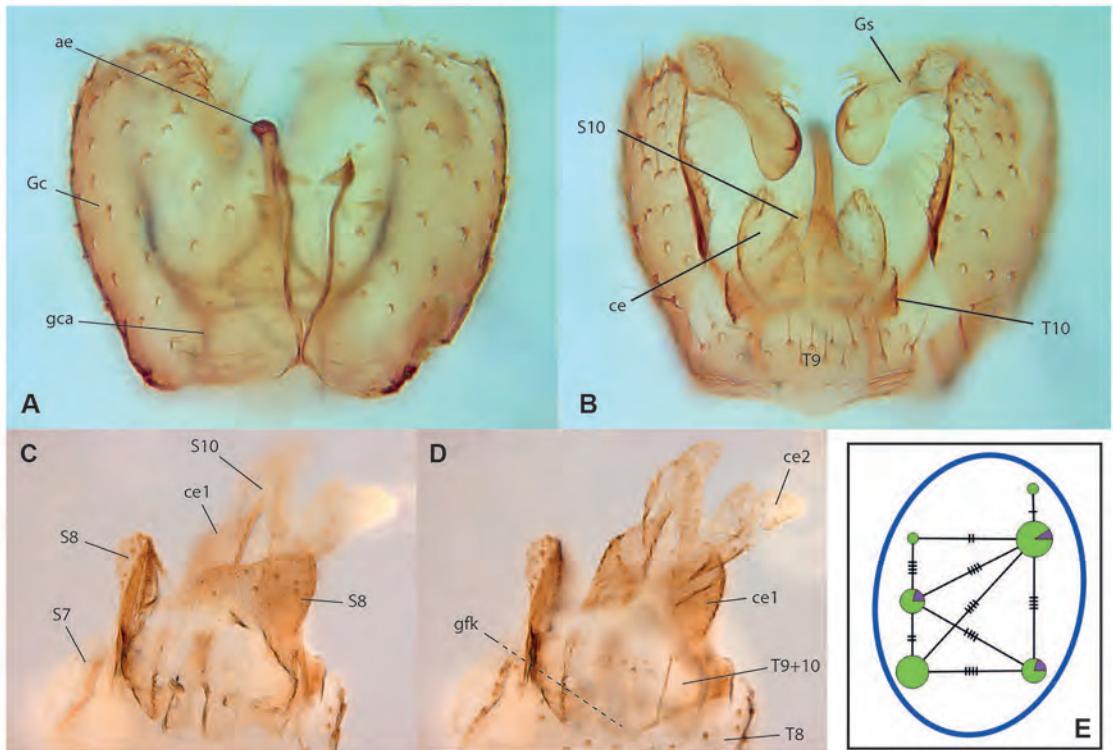


Figure XXA-F. *Metanepsia malaysiana* Kallweit. A. Male terminalia, ventral view, ZRCBDP0048680. C. Male terminalia, dorsal view, same. D. Female terminalia, ZRCBDP0048869, ventral view. E. Female terminalia, dorsal view, same. F. Haplotype network for *Metanepsia*.

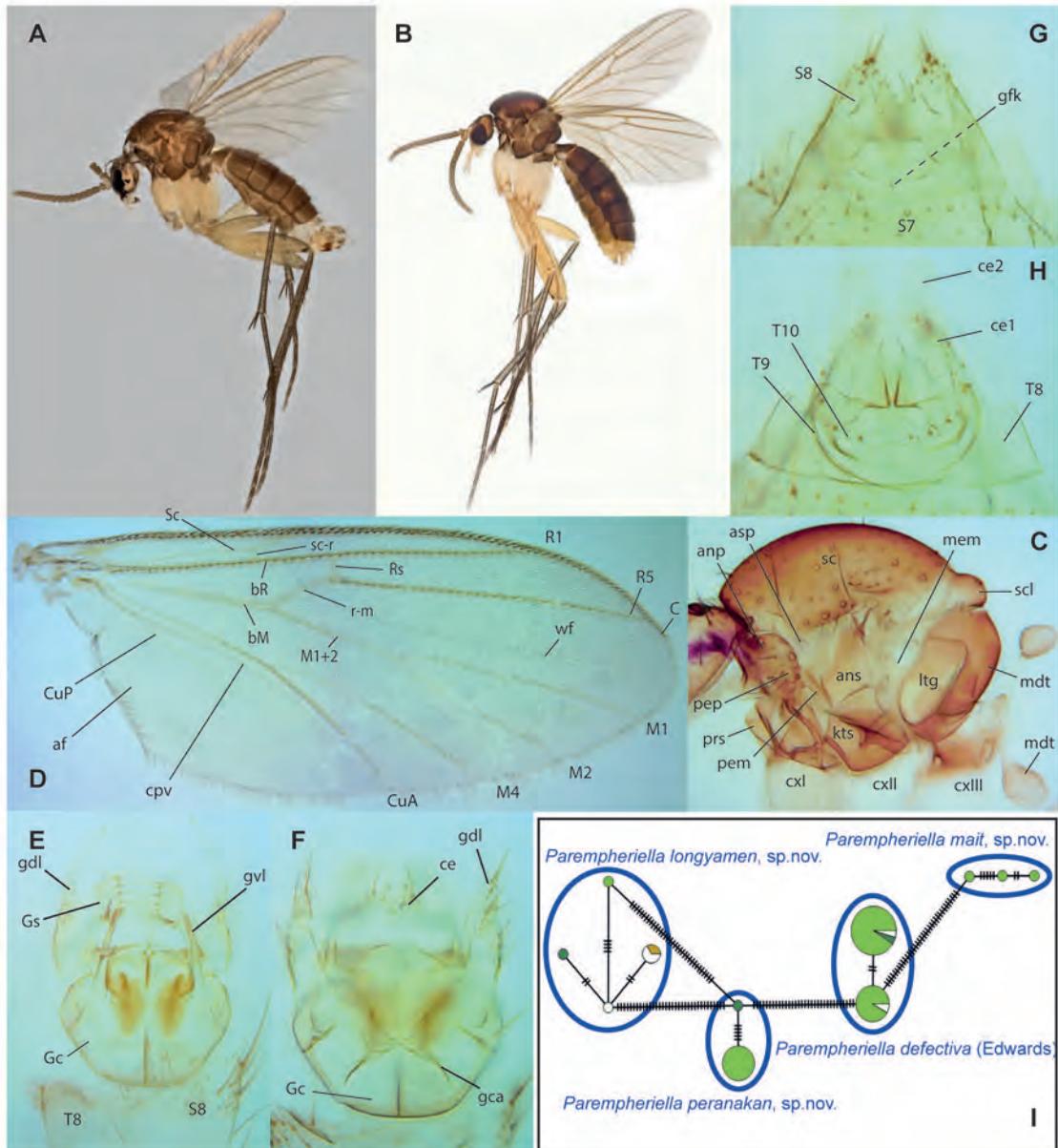


Figure XXA-F. *Saigusaia* sp.n. 01. A. Habitus, male, paratype ZRC\_BDP0155005. B. Habitus, female, paratype ZRCBDP0048556. C. Wing, male, paratype ZRCBDP0048828. D. Thorax, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, paratype ZRCBDP0048556. H. Female terminalia, dorsal view, same. I. Haplotype network for *Saigusaia*.

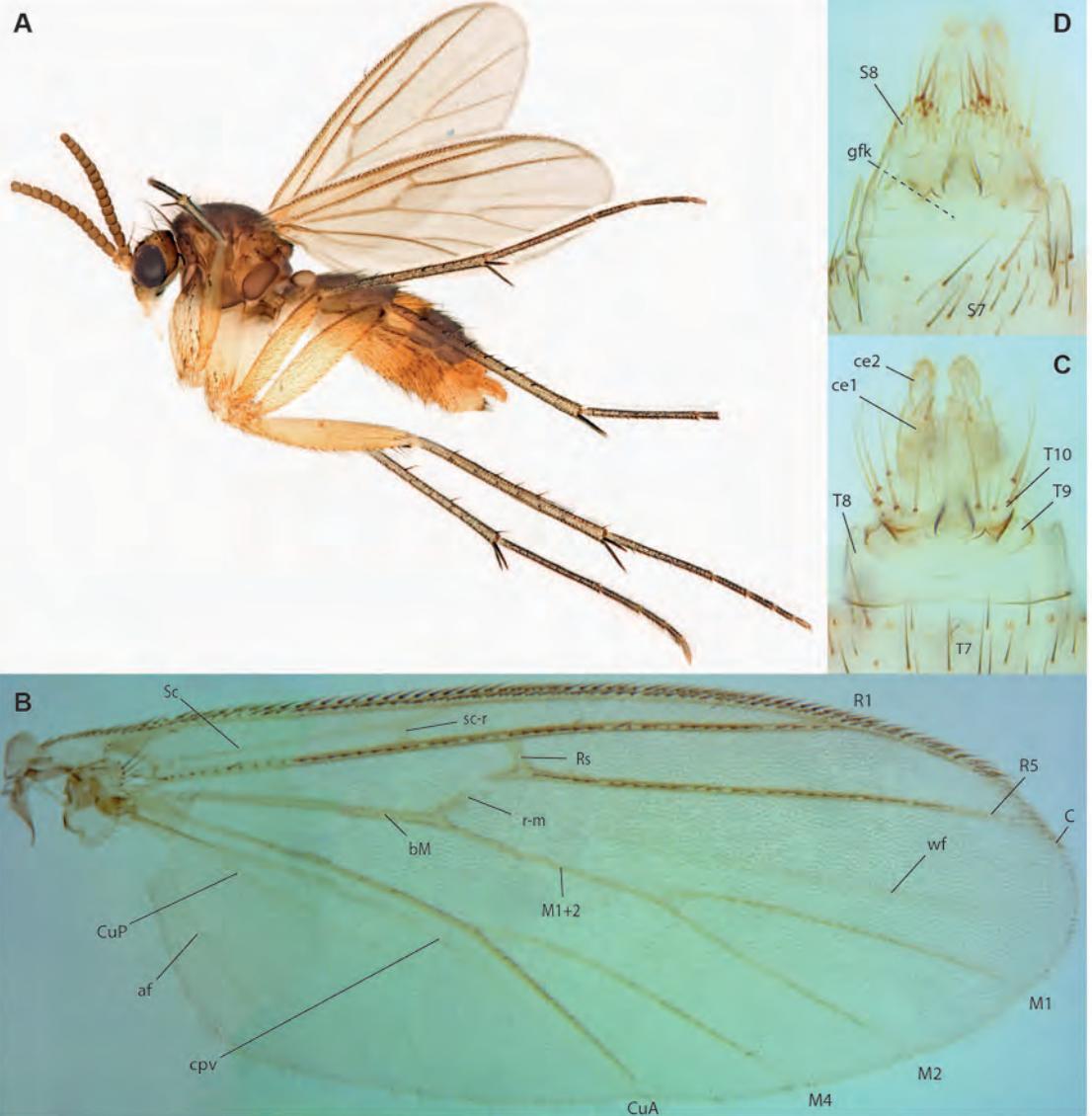


Figure XXA-F. *Parempheriella* sp.n. 04, female paratype ZRCBDP0048559. A. Habitus. B. Wing. C. Terminalia, ventral view. E. Terminalia, dorsal view.

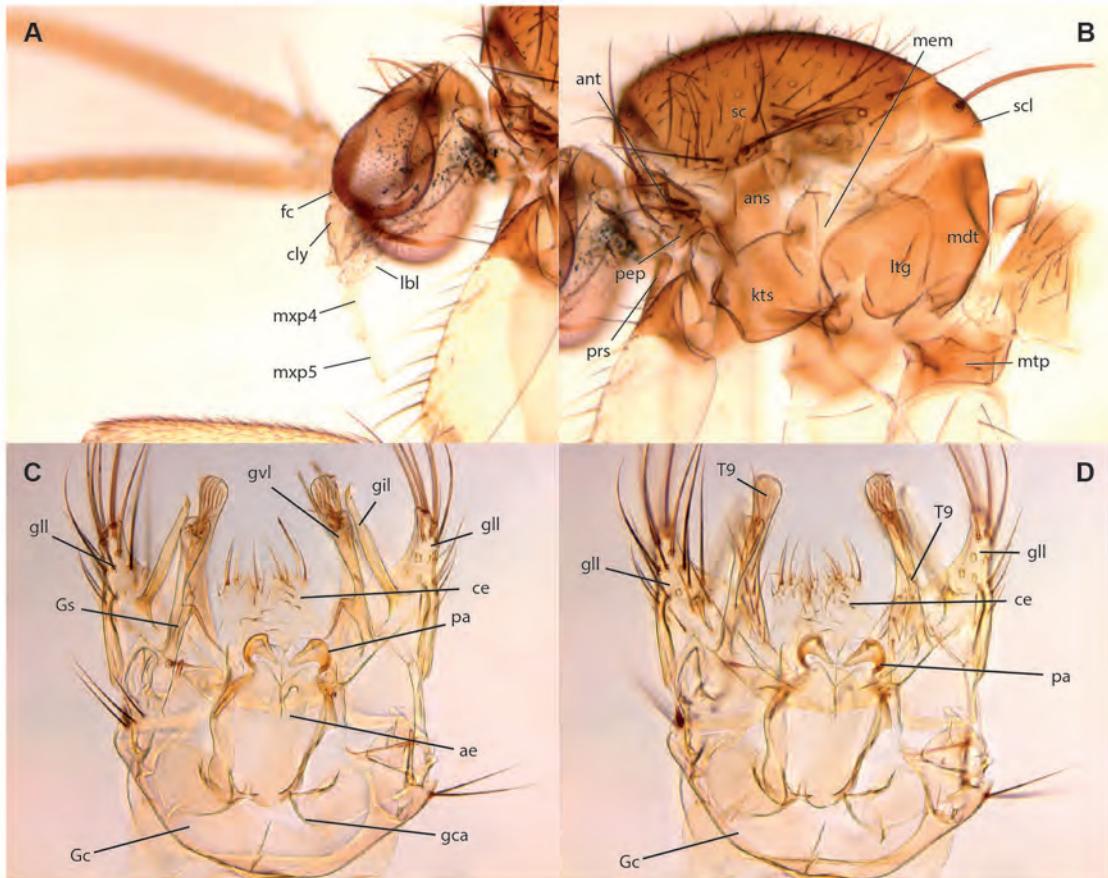


Figure XXA-F. *Parempheriella* sp.n. 04, male holotype. A. Head. B. Thorax. C. Terminalia, ventral view. D. Terminalia, dorsal view.

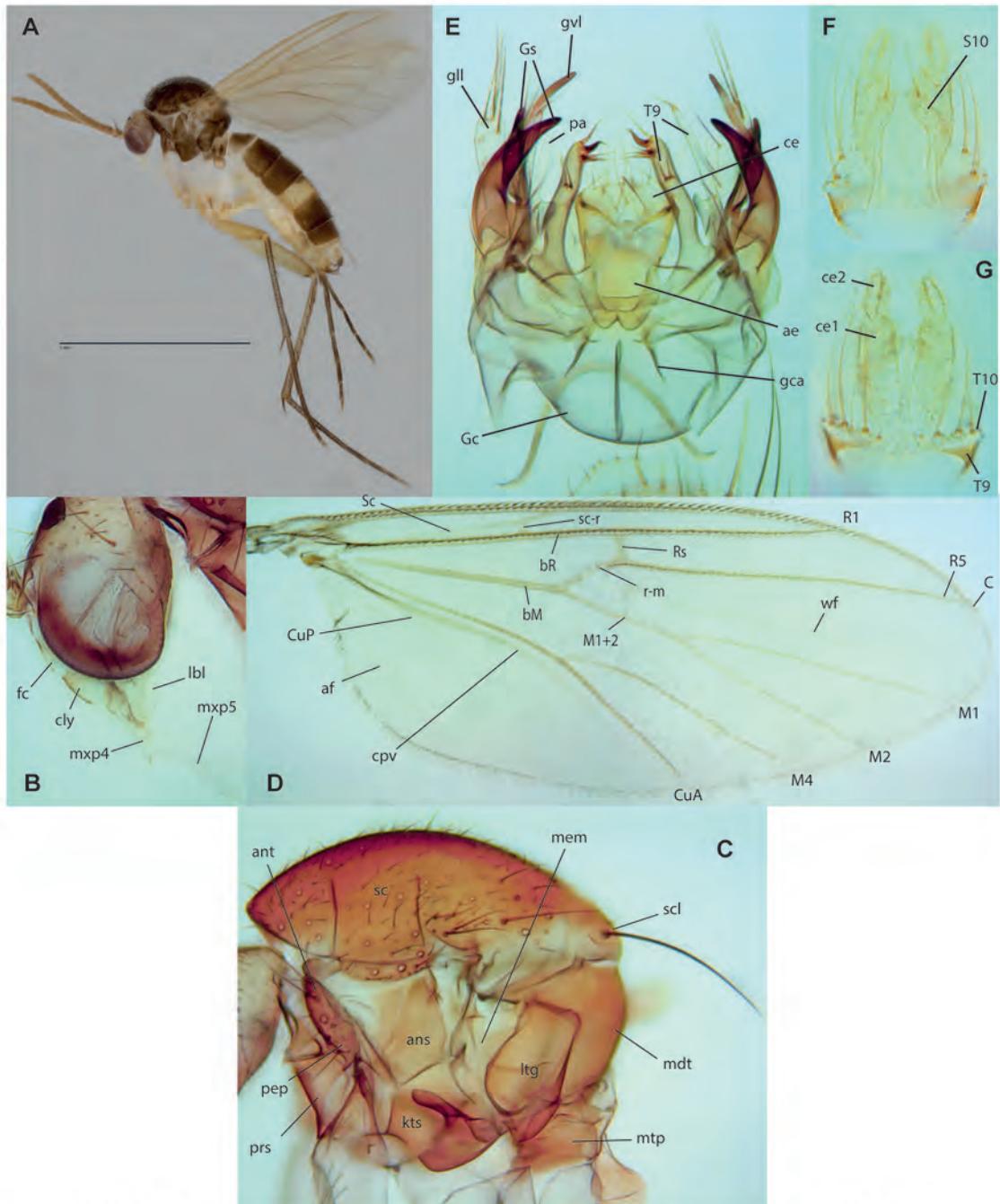
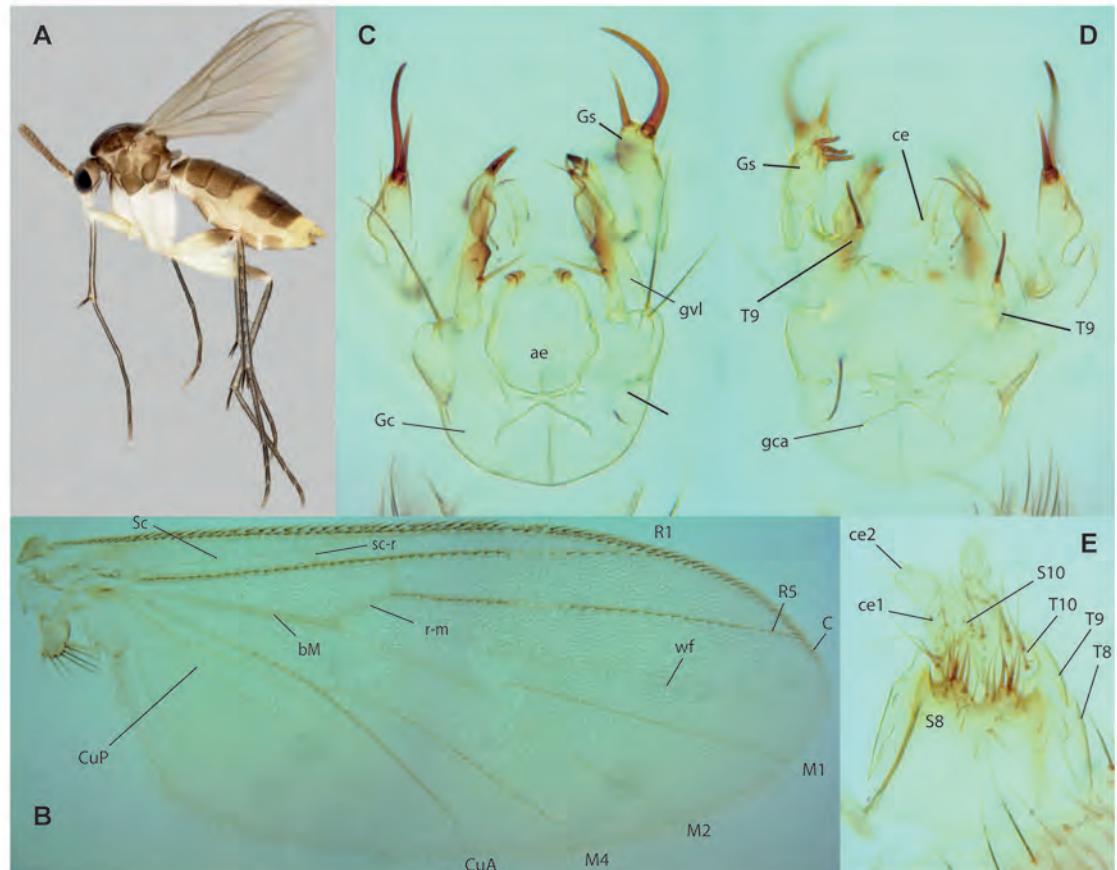


Figure XXA-F. *Parempheriella longyamen* Amorim & Oliveira, sp.n. A. Habitus, male holotype. B. Head, same. C. Thorax, same. D. Wing, same. E. Male terminalia, ventral view, same. F. Female terminalia, ventral view, paratype ZRCBDP0072675. G. Female terminalia, dorsal view, same.



36. Figure XXA-G. *Parempheriella* sp.n. 02. A. Habitus, female, paratype ZRC\_BDP0049227.  
B. Wing, male, paratype ZRCBDP0049222. C. Male terminalia, ventral view, same. D. Male terminalia, dorsal view, same. G. Female terminalia, paratype ZRCBDP0133974.

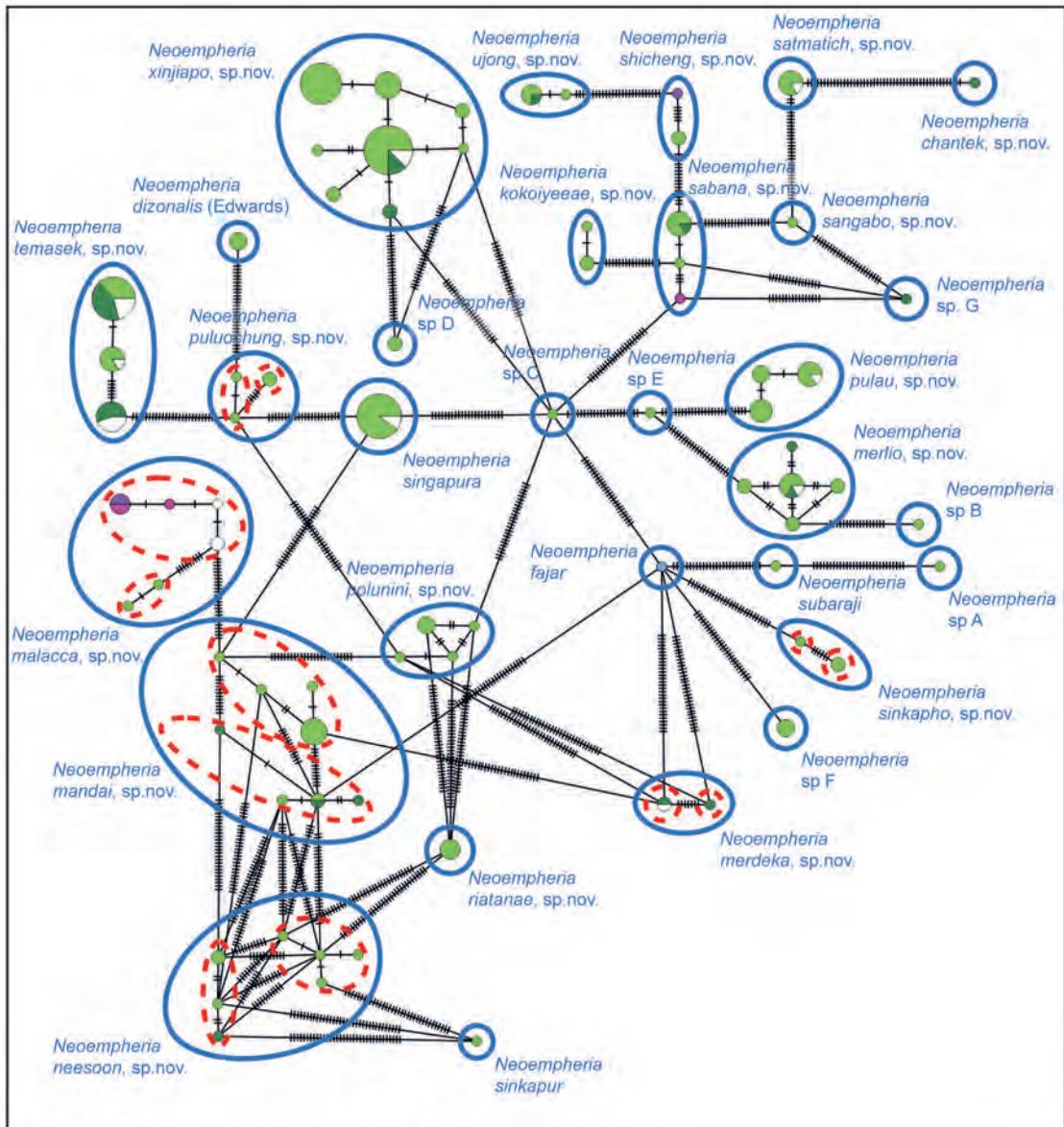


Figure XX. Haplotype network for part of the genus *Neoempheria*.

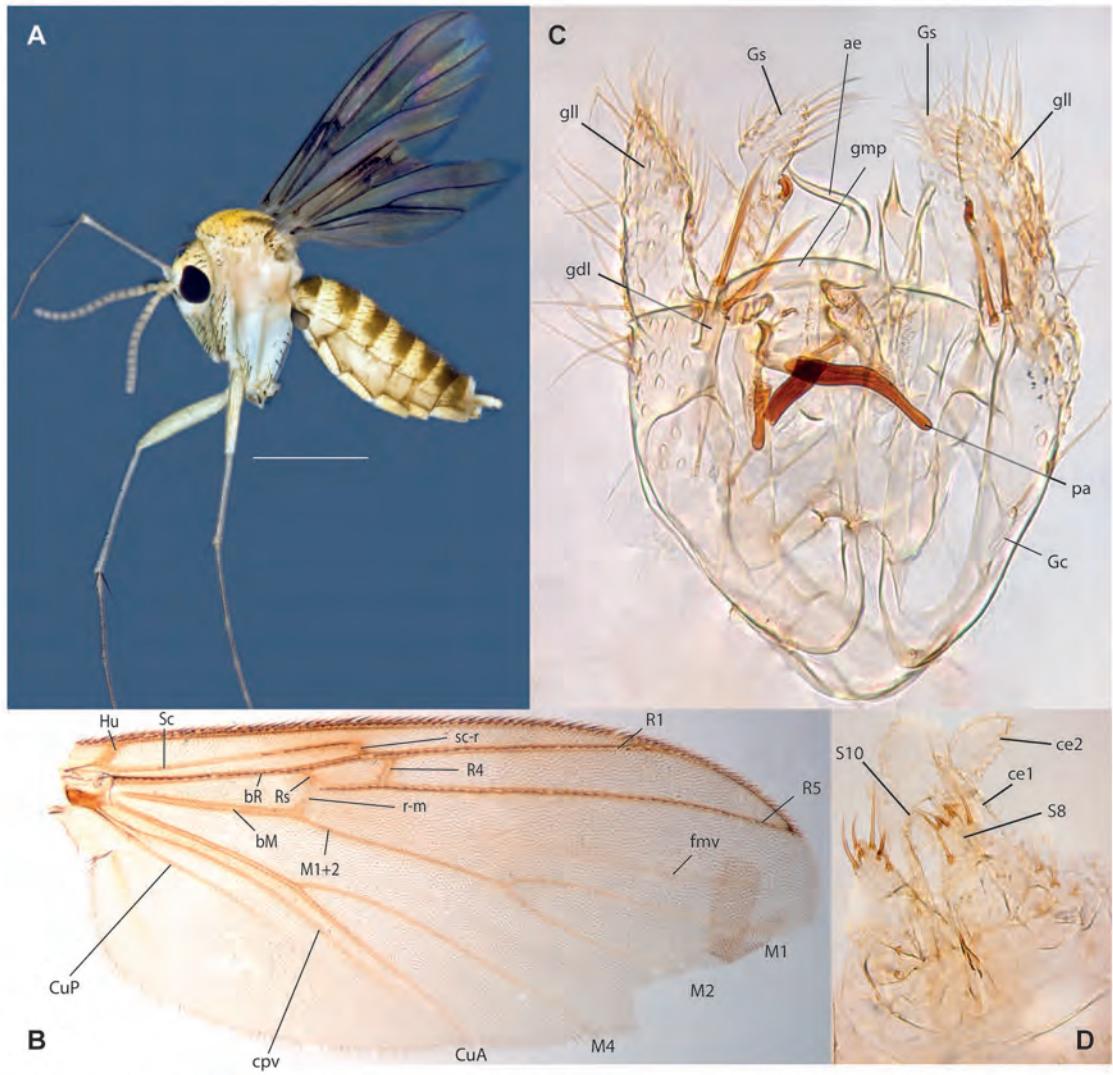


Figure XXA-F. *Neoempheria* sp.n. 9. A. Habitus, female, ZRCBDP0049498. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, ZRCBDP48498.

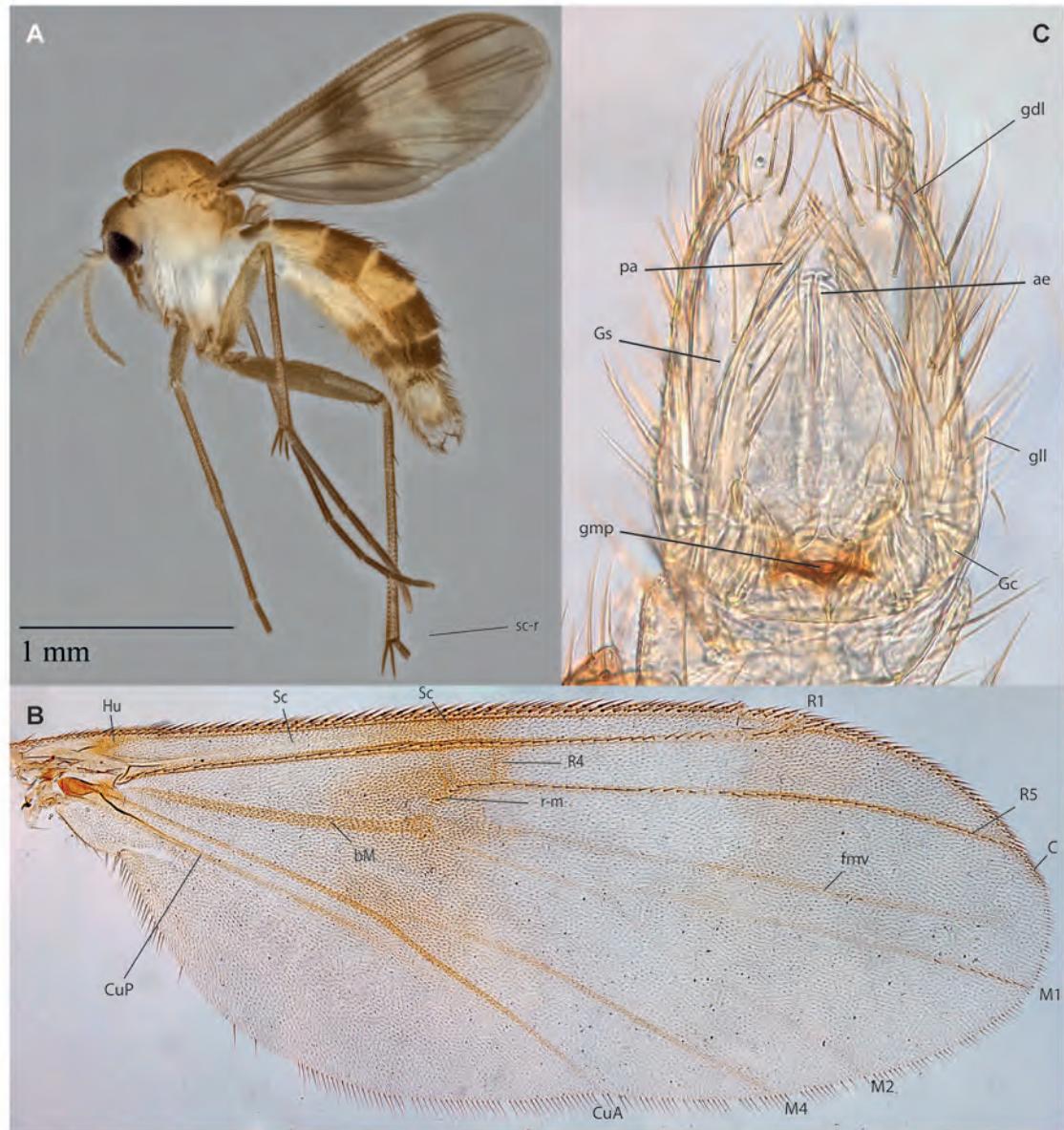


Figure XXA-F. *Neoempheria* sp.n. 2. A. Habitus, male, ZRCBDP155067. B. Wing, female, ZRCBDP0049162. D. Male terminalia, ventral view, holotype.

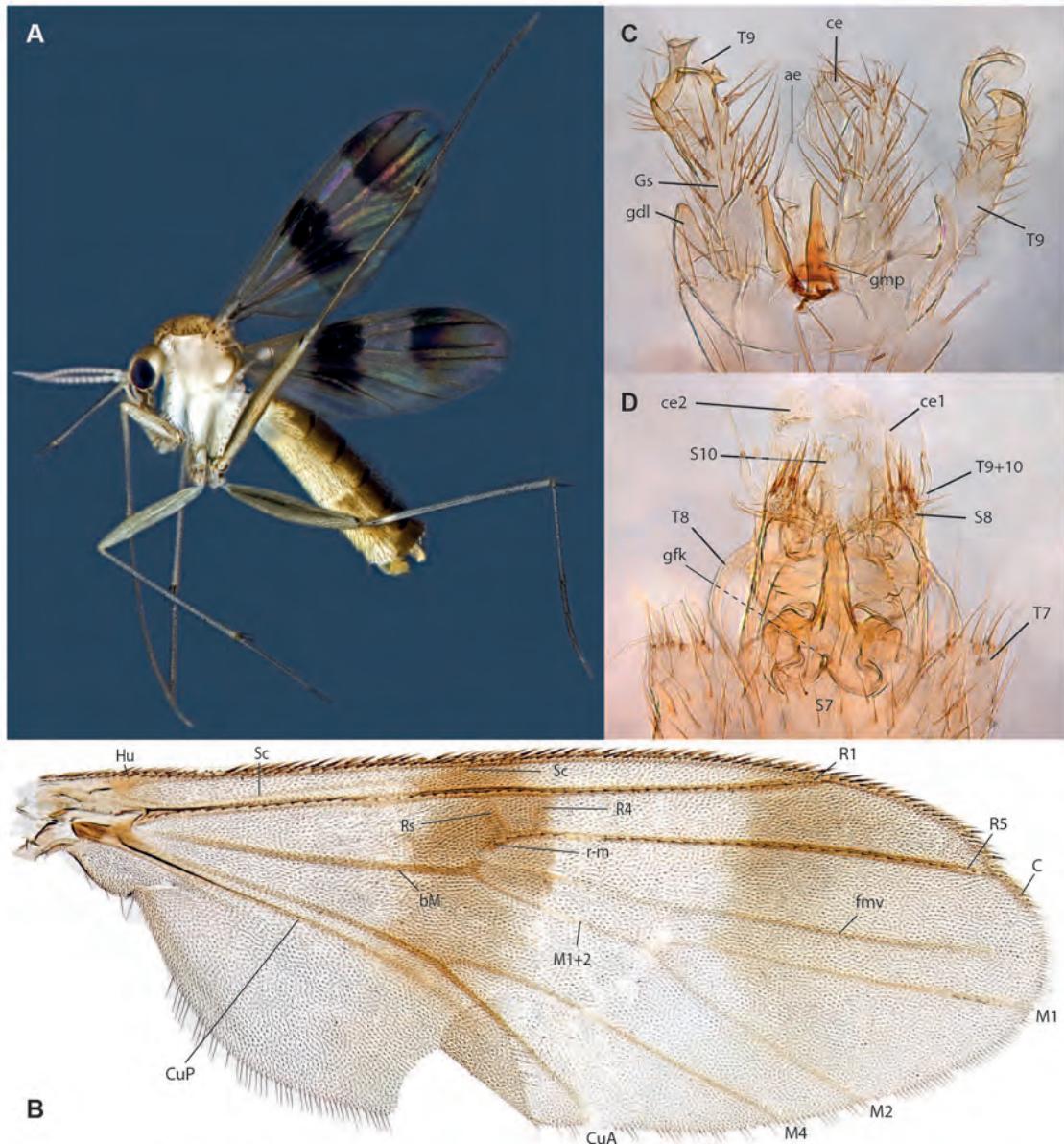


Figure XXA-F. *Neoempheria* sp.n. 7. A. Habitus, female, ZRCBDP0048495. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, female ZRCBDP0047068.

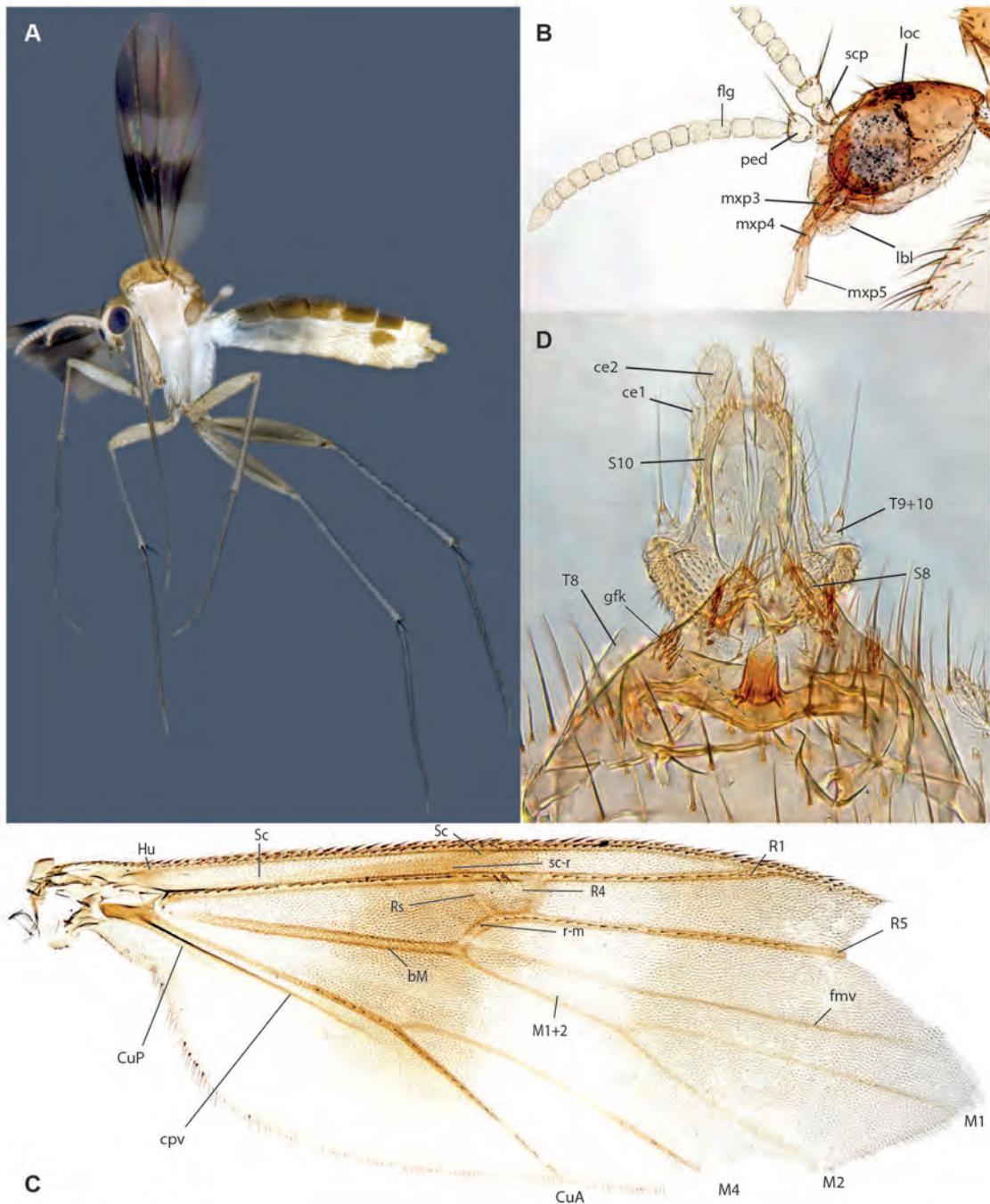


Figure XXA-F. *Neoempheria* sp.n. 8, female holotype. A. Habitus. B. Head. C. Wing. D. Female terminalia, ventral view.

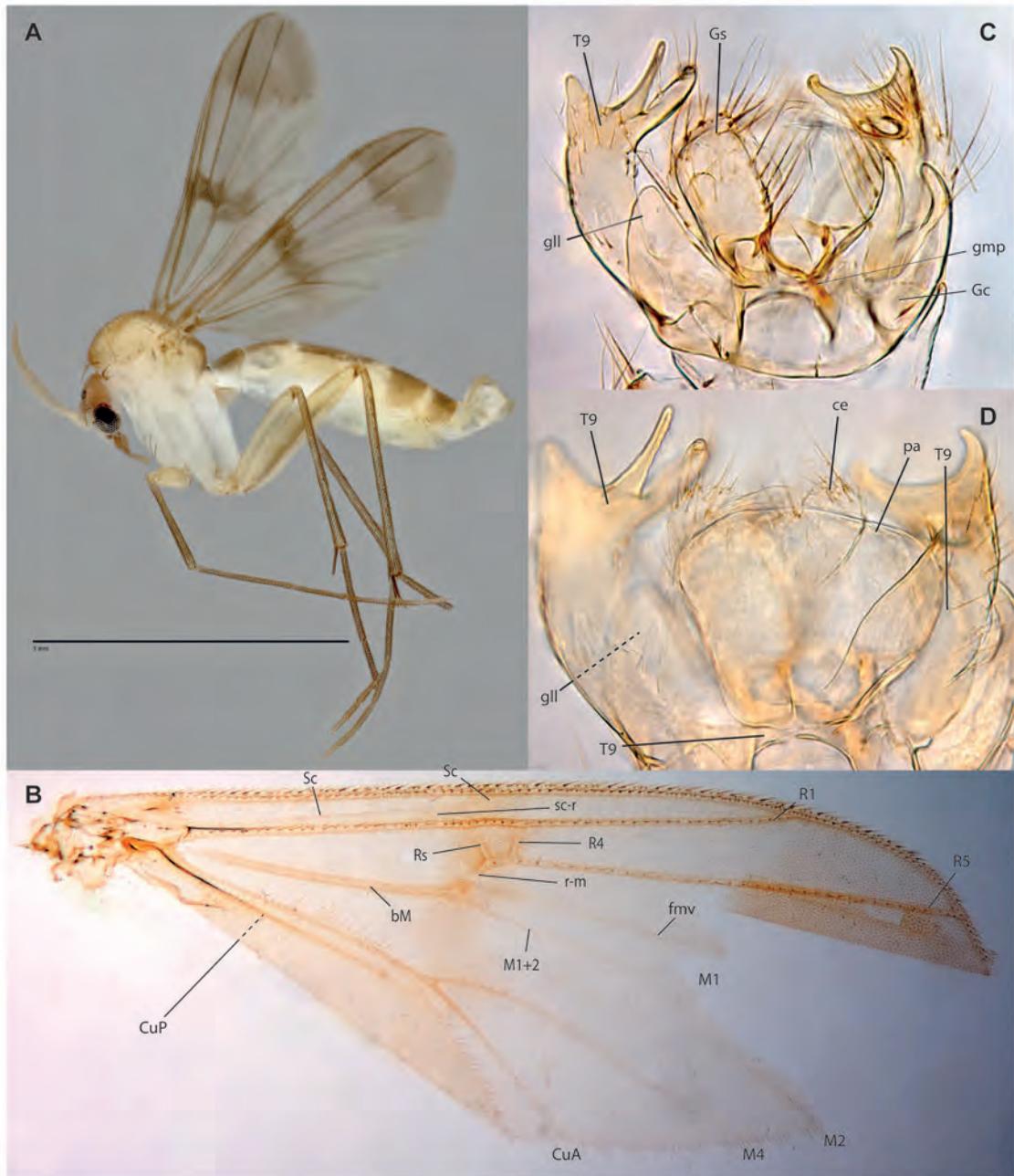


Figure XXA-F. *Neoempheria* sp.n. 11, male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Detail of terminalia, dorsal view.

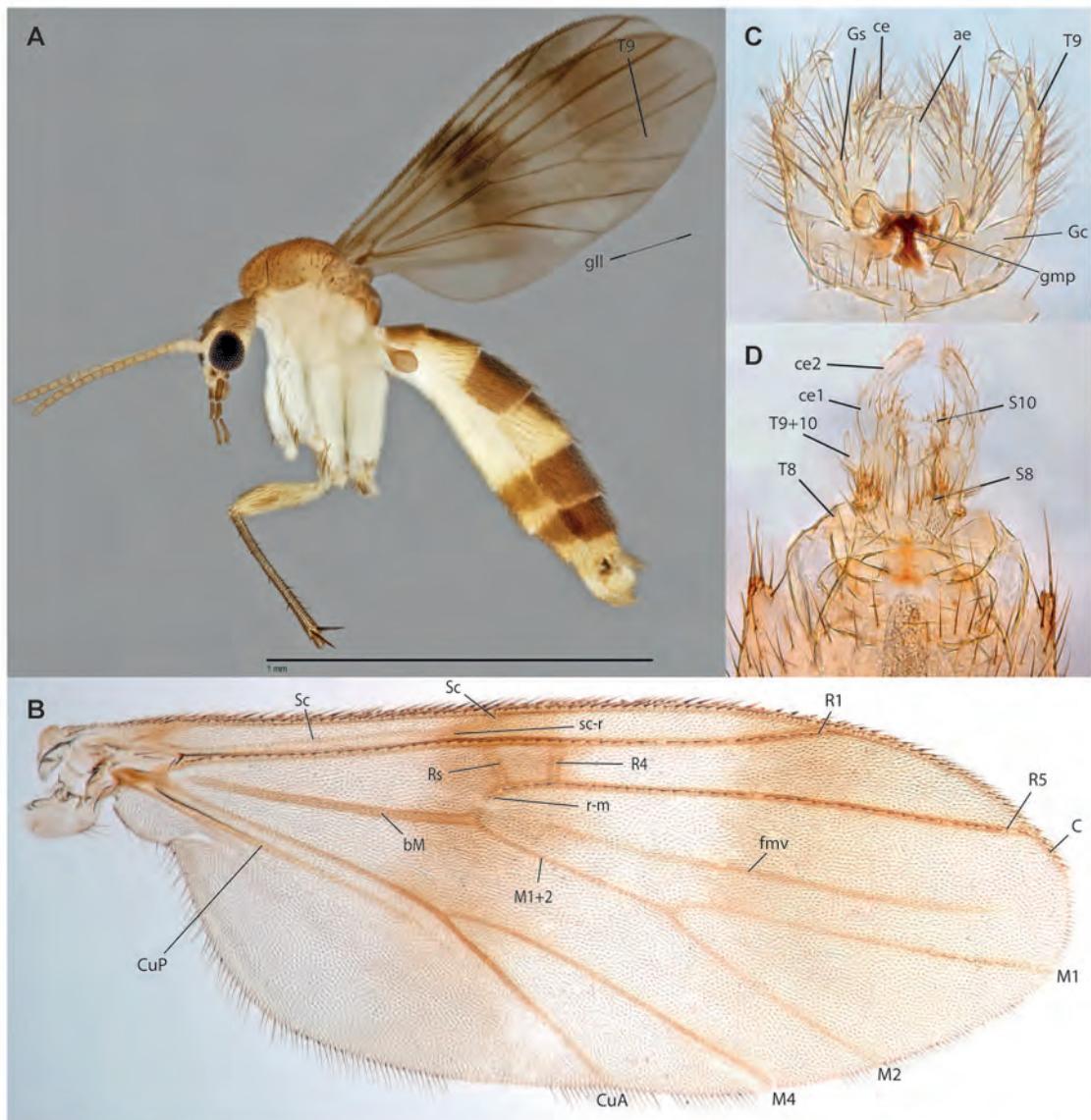


Figure XXA-F. *Neoempheria* sp.n. 12. A. Habitus, male holotype. B. Wing, same. C. Male terminalia, same. D. Female terminalia, ventral view, ZRCBDP0047906.



Figure XXA-D. *Neoempheria* sp.n. 21. A. Habitus, male ZRCBDP0048978. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Male terminalia, mid section, same.

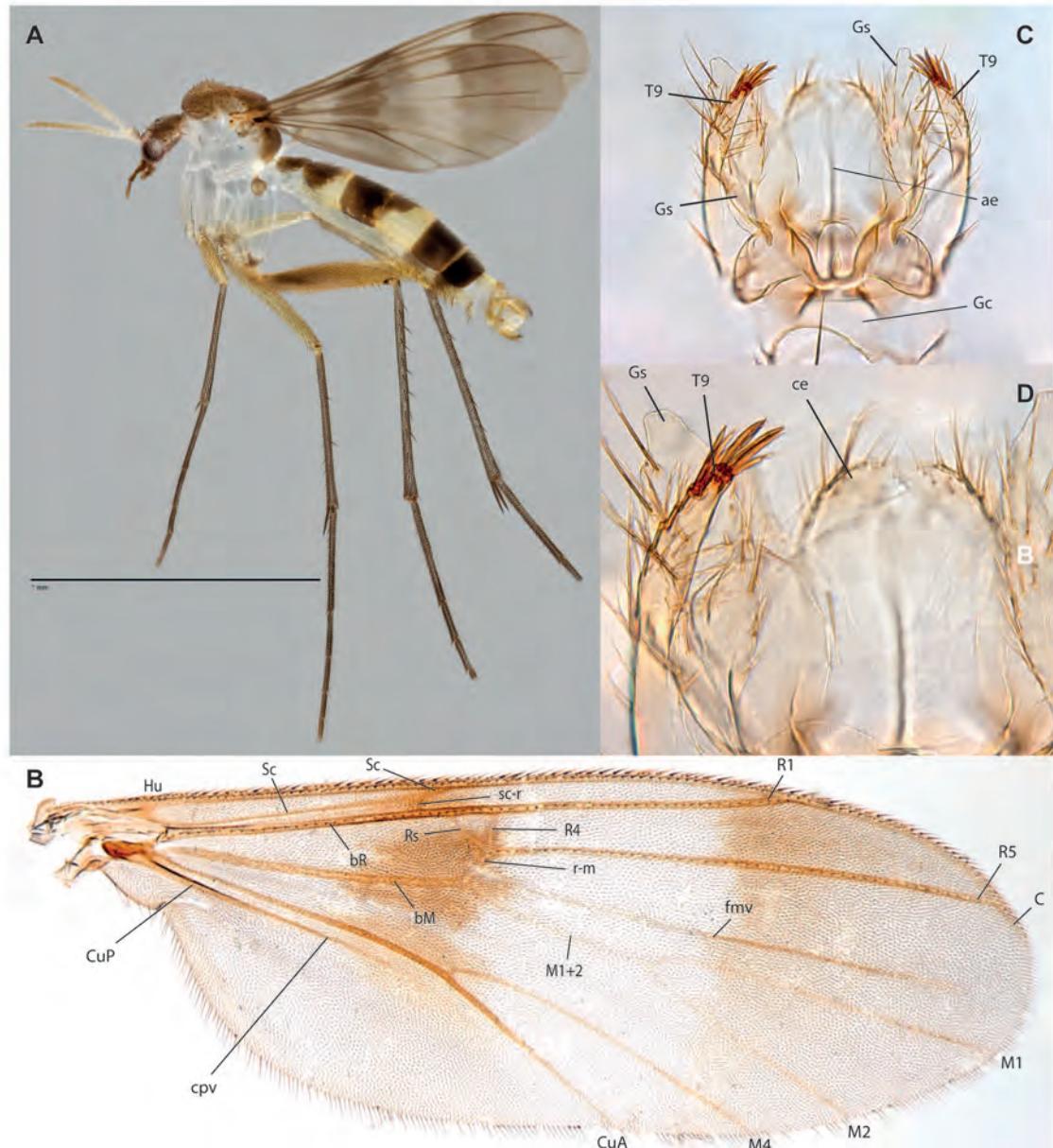


Figure XXA-D. *Neoempheria* sp.n. 24, female holotype. A. Habitus. B. Detail of wing (under phase contrast). C. Female terminalia, ventral view.

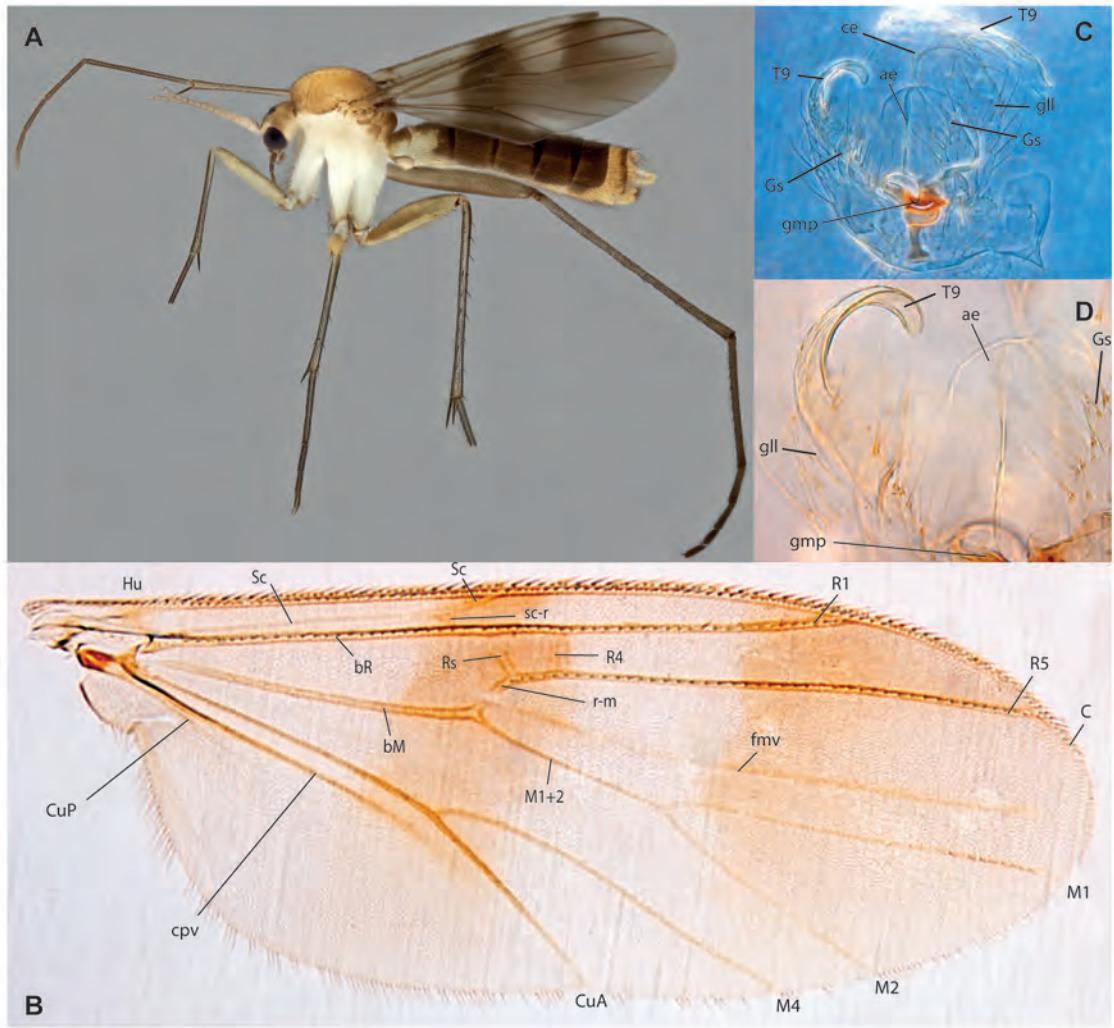


Figure XXA-D. *Neoempheria* sp.n. 28. A. Habitus, female, ZRCBDP0049205. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same.

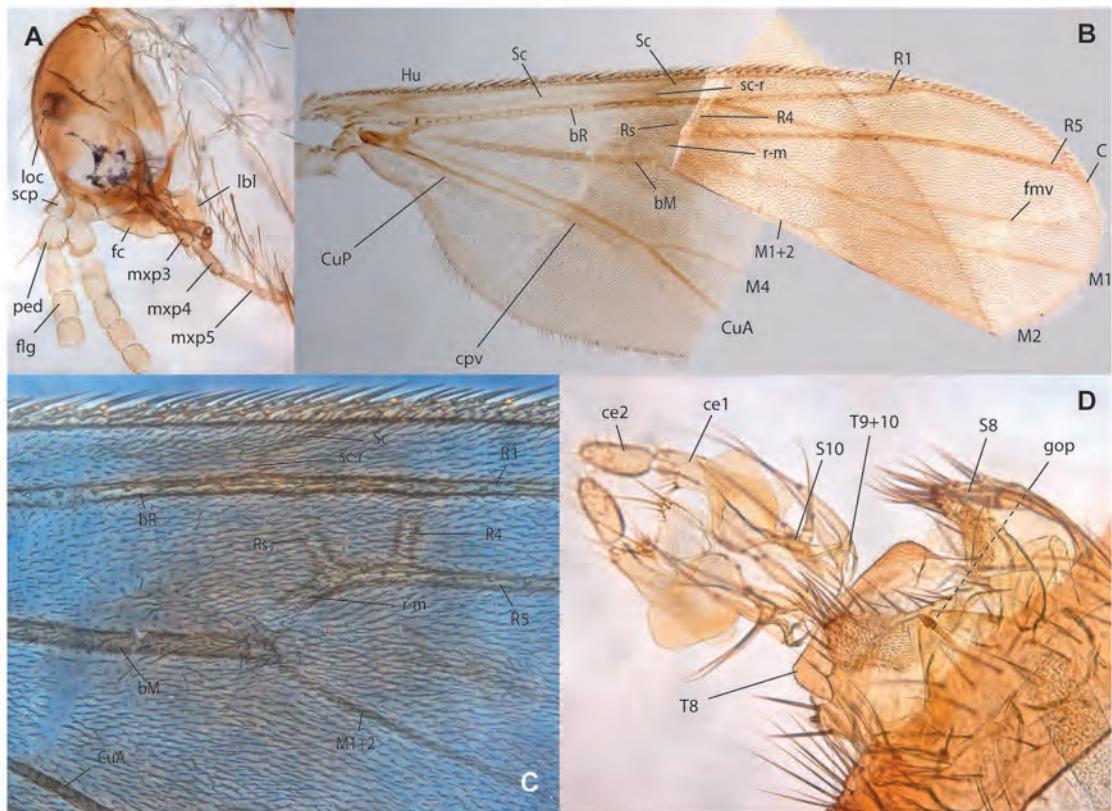


Figure XXA-D. *Neoempheria* sp.n. 34, female holotype. A. Head. B. Wing. C. Detail of wing (under phase contrast) D. Terminalia, ventral view. E. Detail of terminalia, dorsal view.

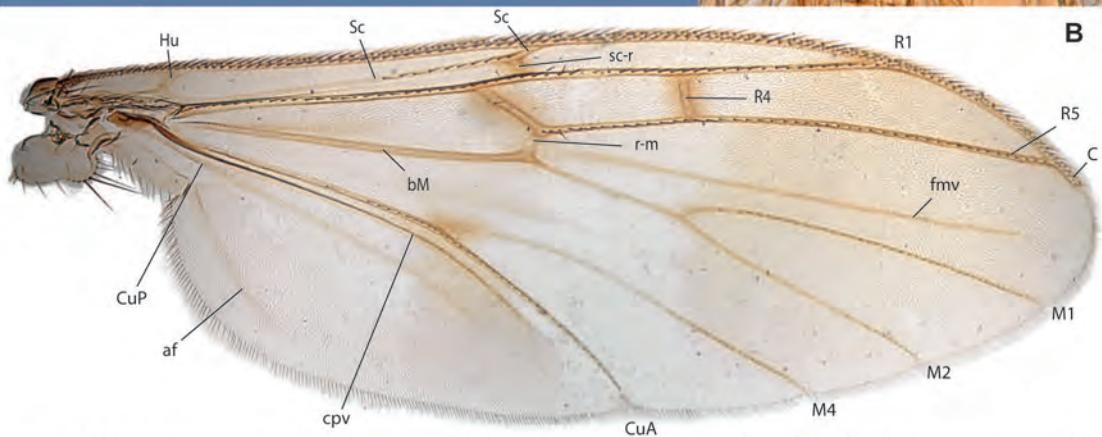
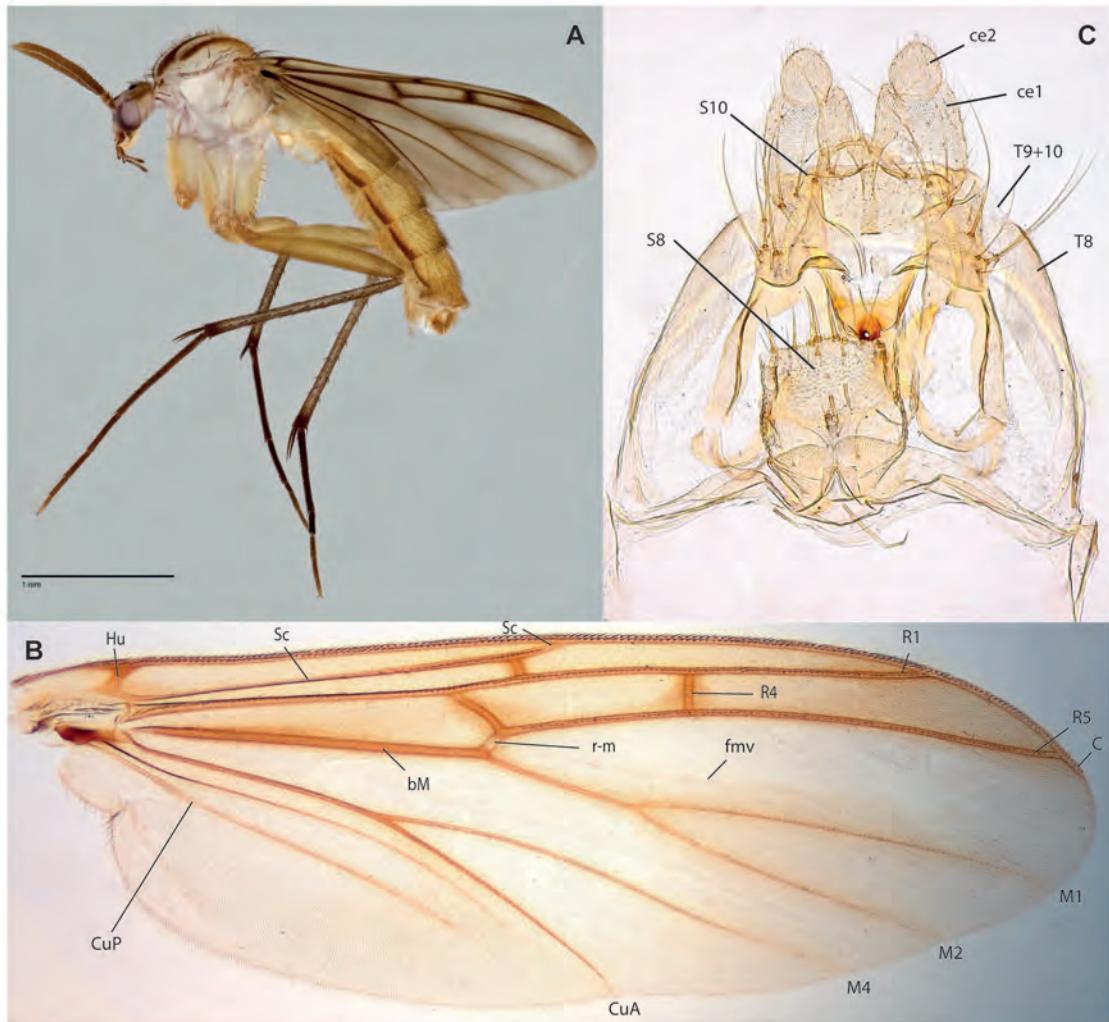


Figure XXA-C. *Neoempheria* sp.n. 1. A. Habitus, female paratype, ZRCBDP0048478. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, paratype ZRCBDP00489962.



62. Figure E17A-C. *Neoempheria malacca* Amorim & Oliveira, sp.nov. A. Habitus, male holotype. B. Wing, same. C. Female terminalia, ventral view, paratype ZRCBDP0048482.

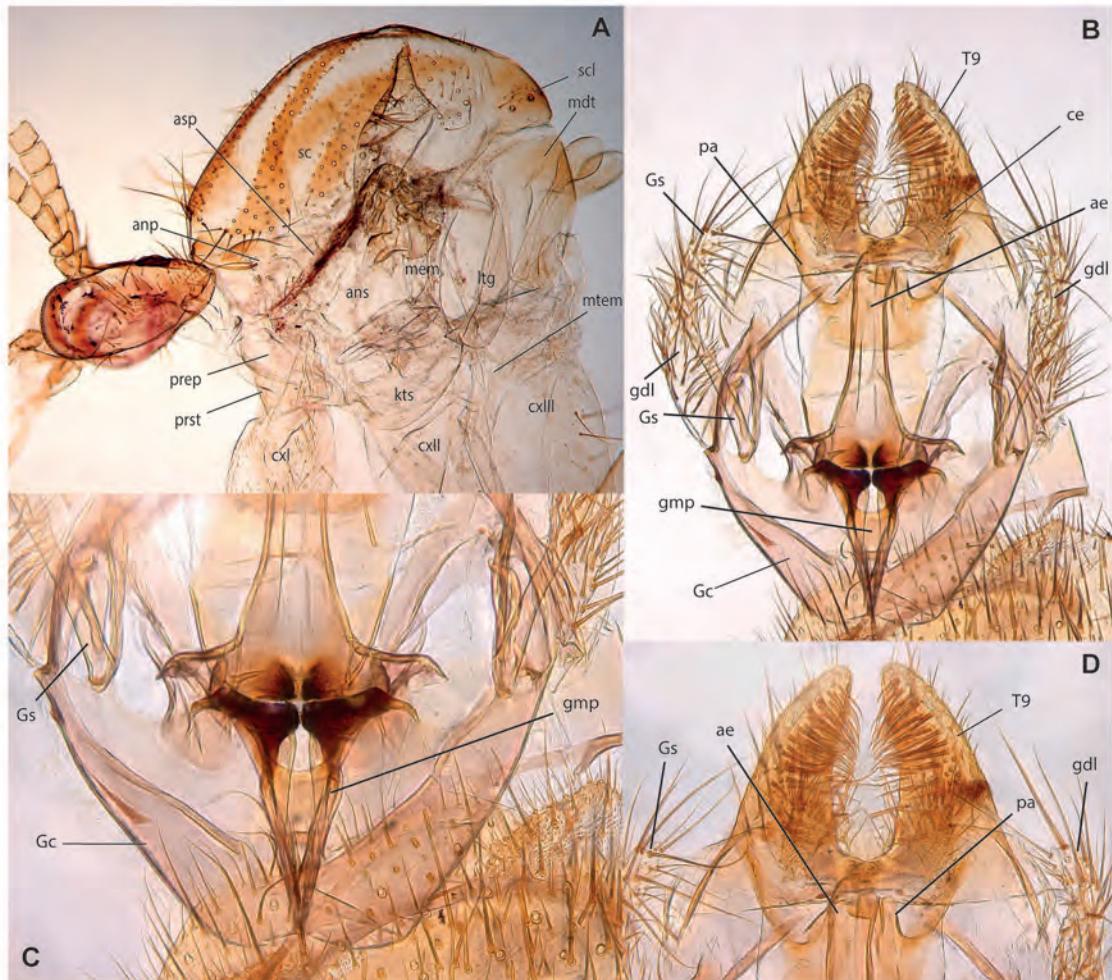


Figure E17A-C. *Neoempheria malacca* Amorim & Oliveira, sp.nov. A. Thorax, female paratype ZRCBDP0048482. B. Male holotype, terminalia, ventral view. C. Same, detail of anterior end. D. Same, detail of posterior end.

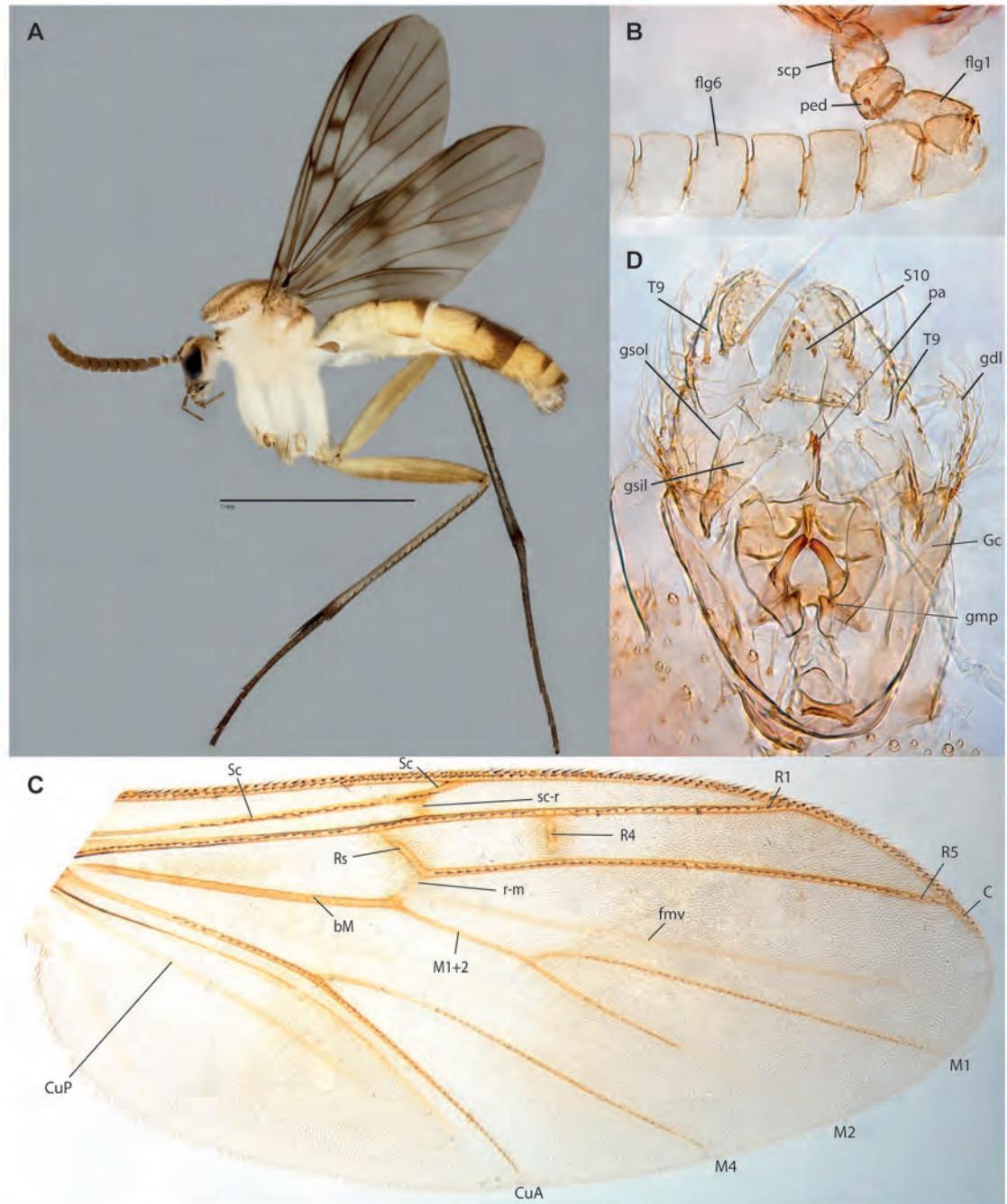


Figure XXA-F. *Neoempheria* sp.n. 13, male holotype. A. Habitus. B. Antenna. C. Wing. D. Male terminalia, ventral view.

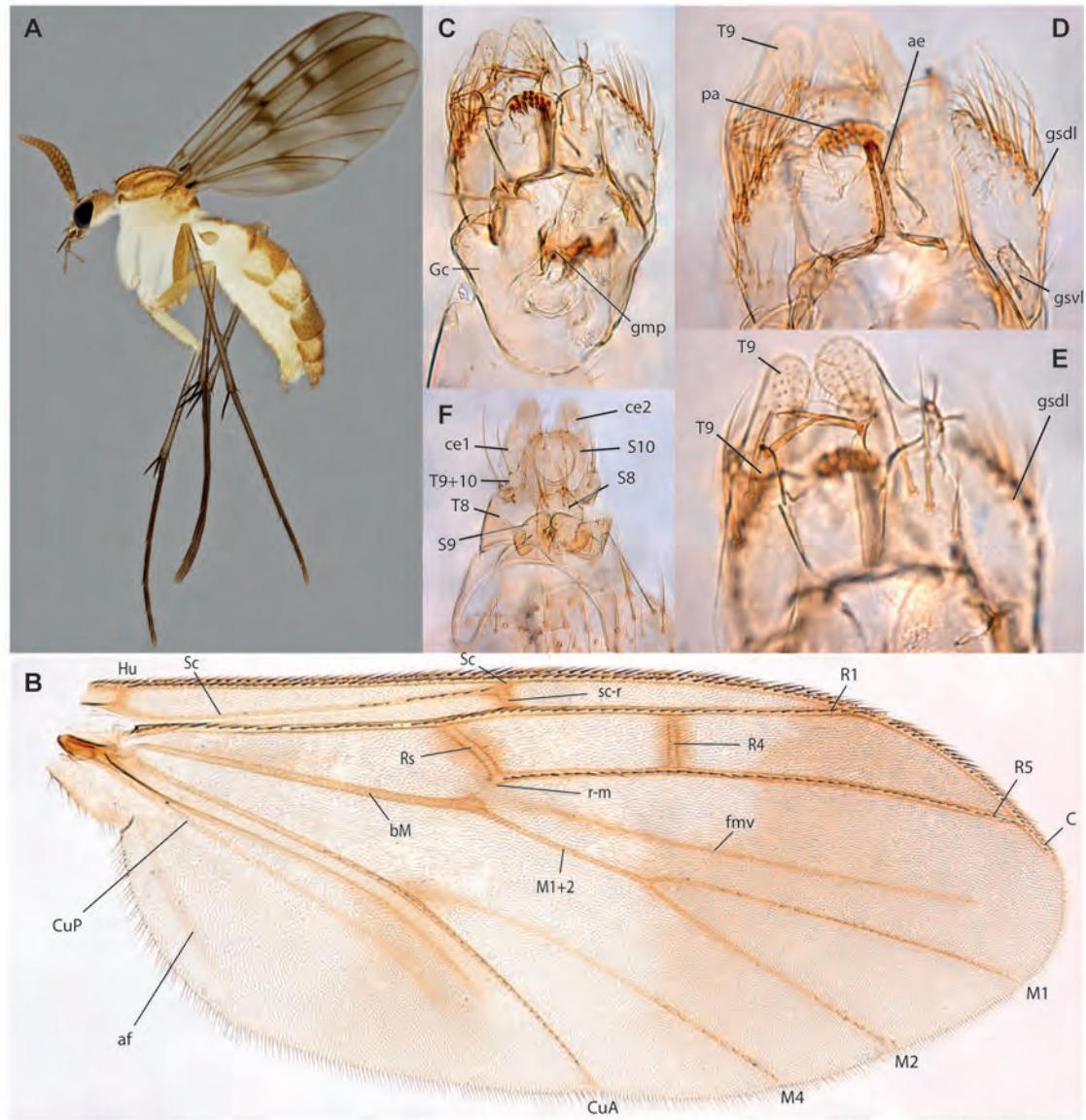


Figure XXA-F. *Neoempheria* sp.n. 15. A. Habitus, female ZRCBDP0047930. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same. E. Detail of male terminalia, dorsal view, same. F. Female terminalia, ventral view, ZRCBDP0047796.

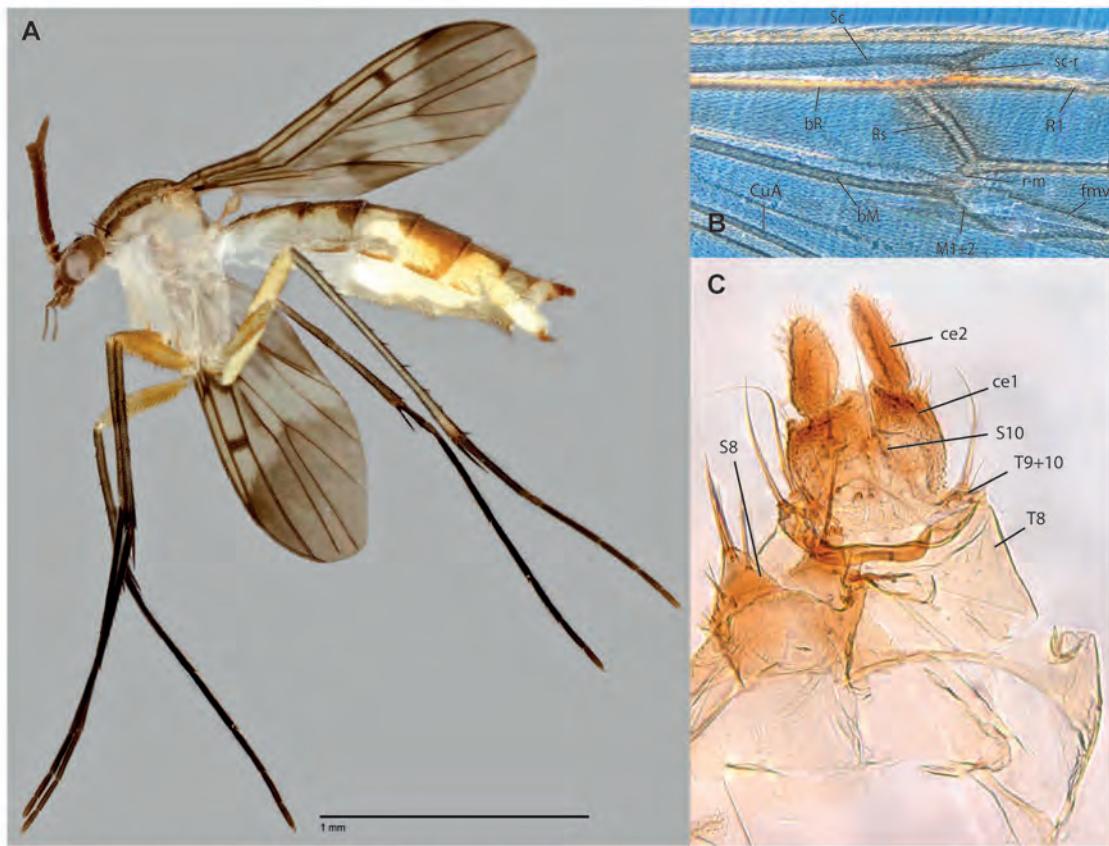


Figure XXA-C. *Neoempheria* sp.n. 17, female holotype. A. Habitus. B. Detail of wing. C. Terminalia, ventral view.

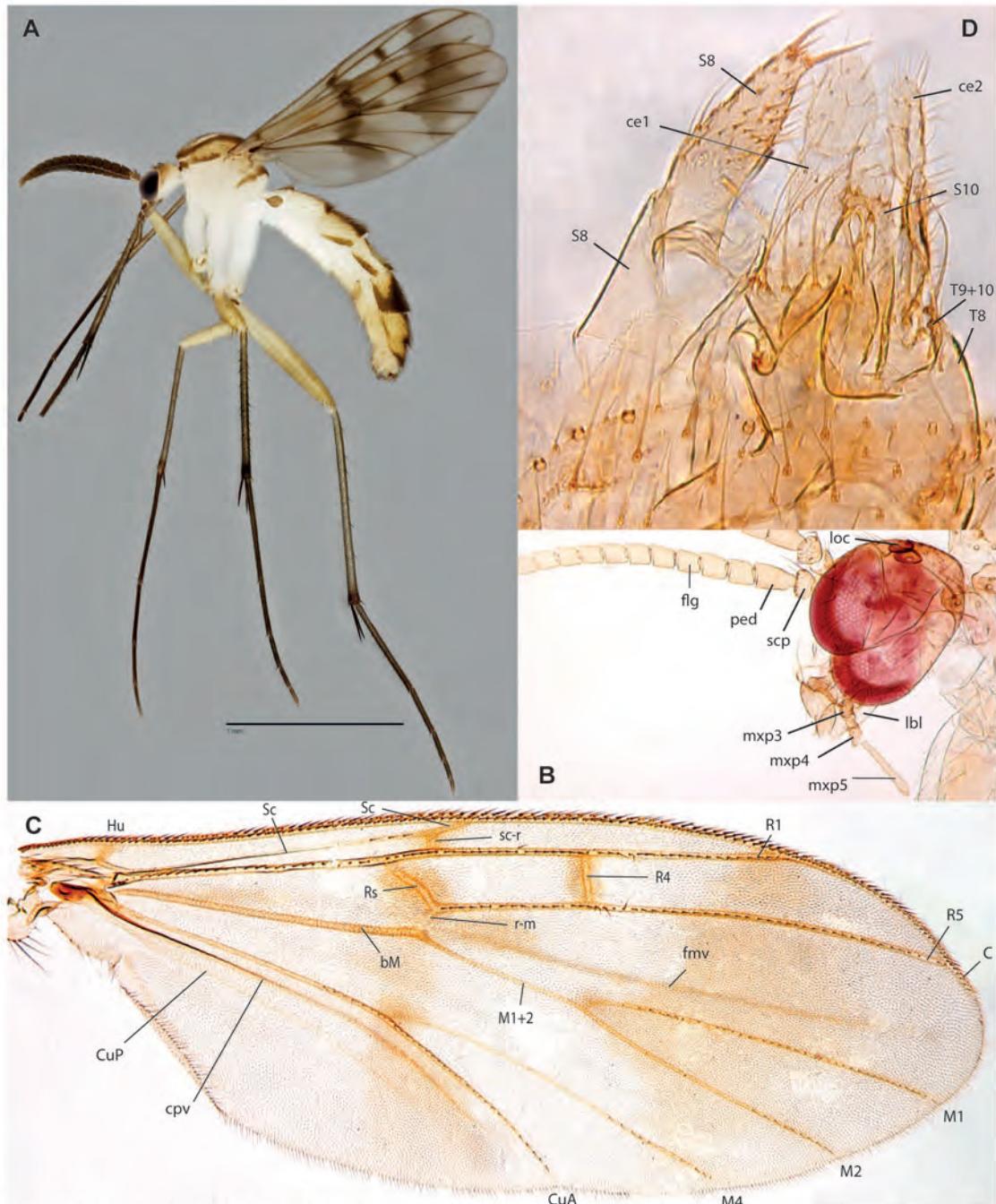


Figure XXA-D. *Neoempheria* sp.n. 20. A. Habitus, male ZRCBDP0048892. B. Head, female holotype. C. Wing, same. D. Female terminalia, ventral view, same.

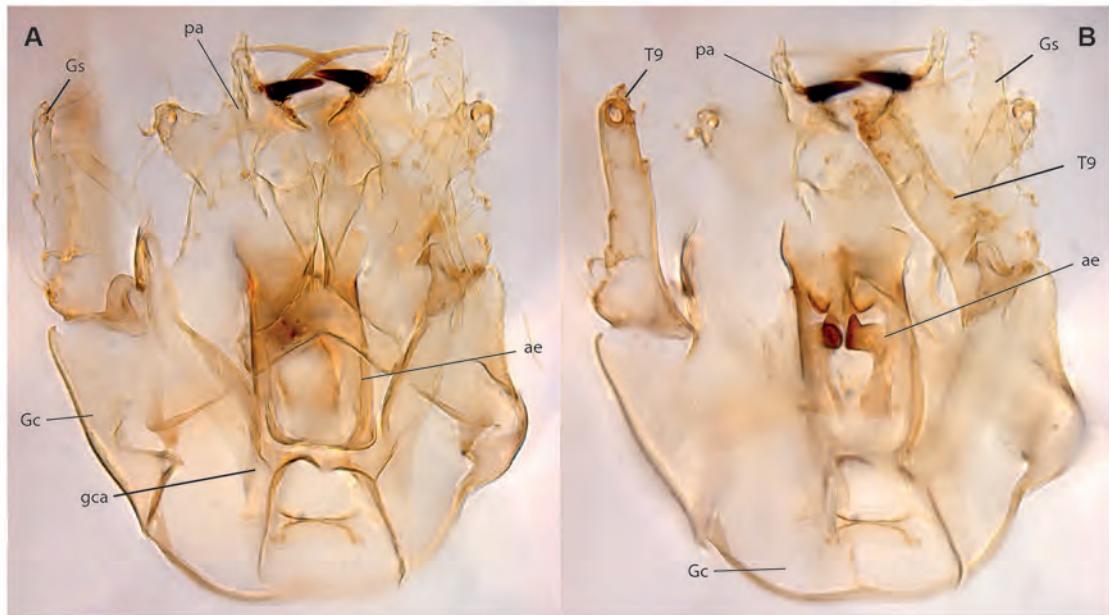


Figure XXA-D. *Neoempheria* sp.n. 20, holotype, male. A. Terminalia, ventral view. B. Terminalia, dorsal view.

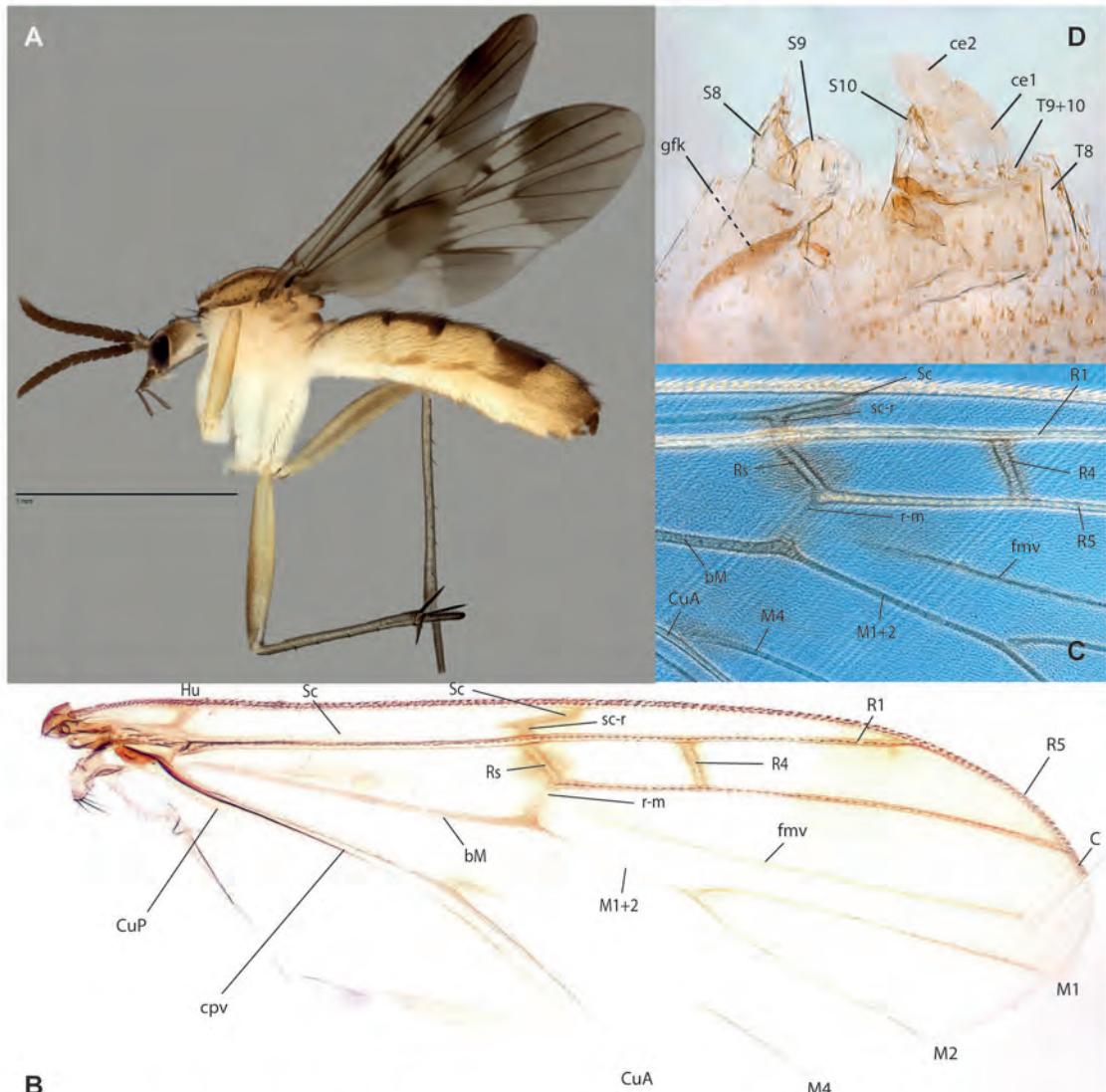


Figure XXA-D. *Neoempheria* sp.n. 22, female holotype. A. Habitus. B. Wing. C. Detail of wing (under phase contrast). D. Female terminalia, lateral view.

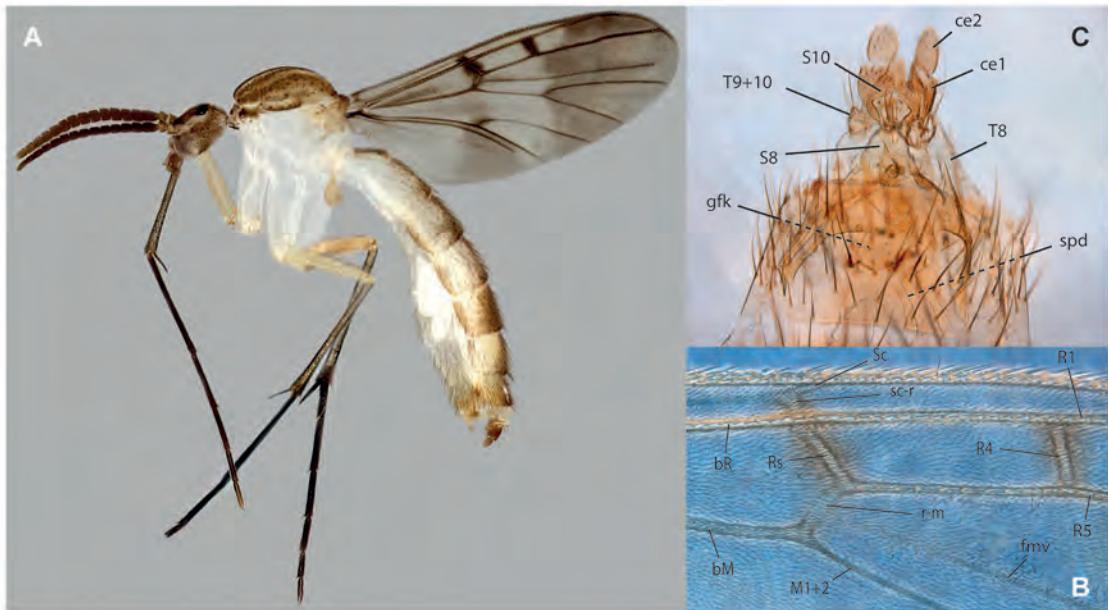


Figure XXA-D. *Neoempheria* sp.n. 23, female holotype. A. Habitus. B. Detail of wing (under phase contrast). C. Female terminalia, ventral view.

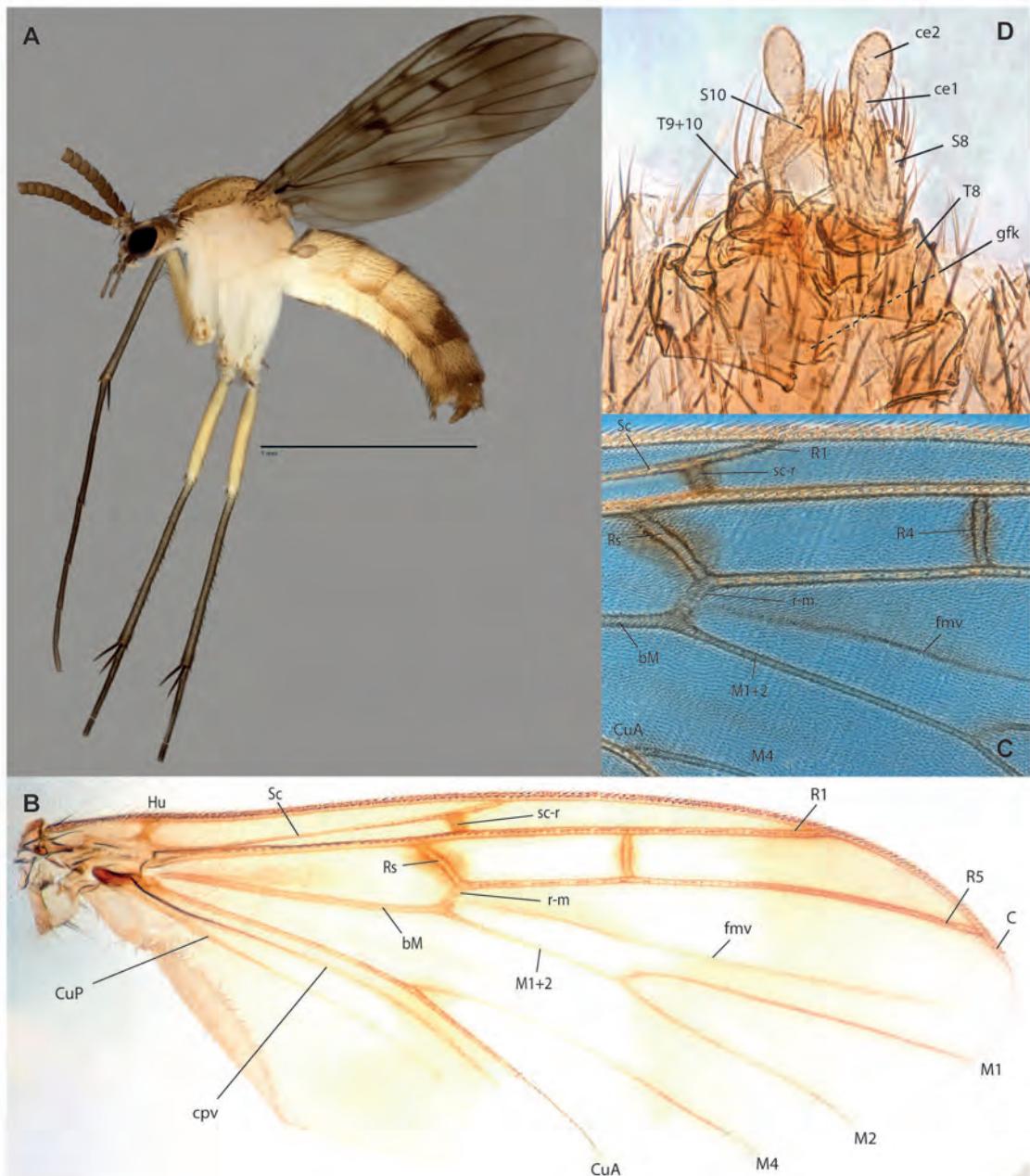


Figure XXA-D. *Neoempheria* sp.n. 26. A. Habitus, female, ZRCBDP0047902. B. Wing, female holotype. C. Detail of wing, same. D. Female terminalia, ventral view, same.

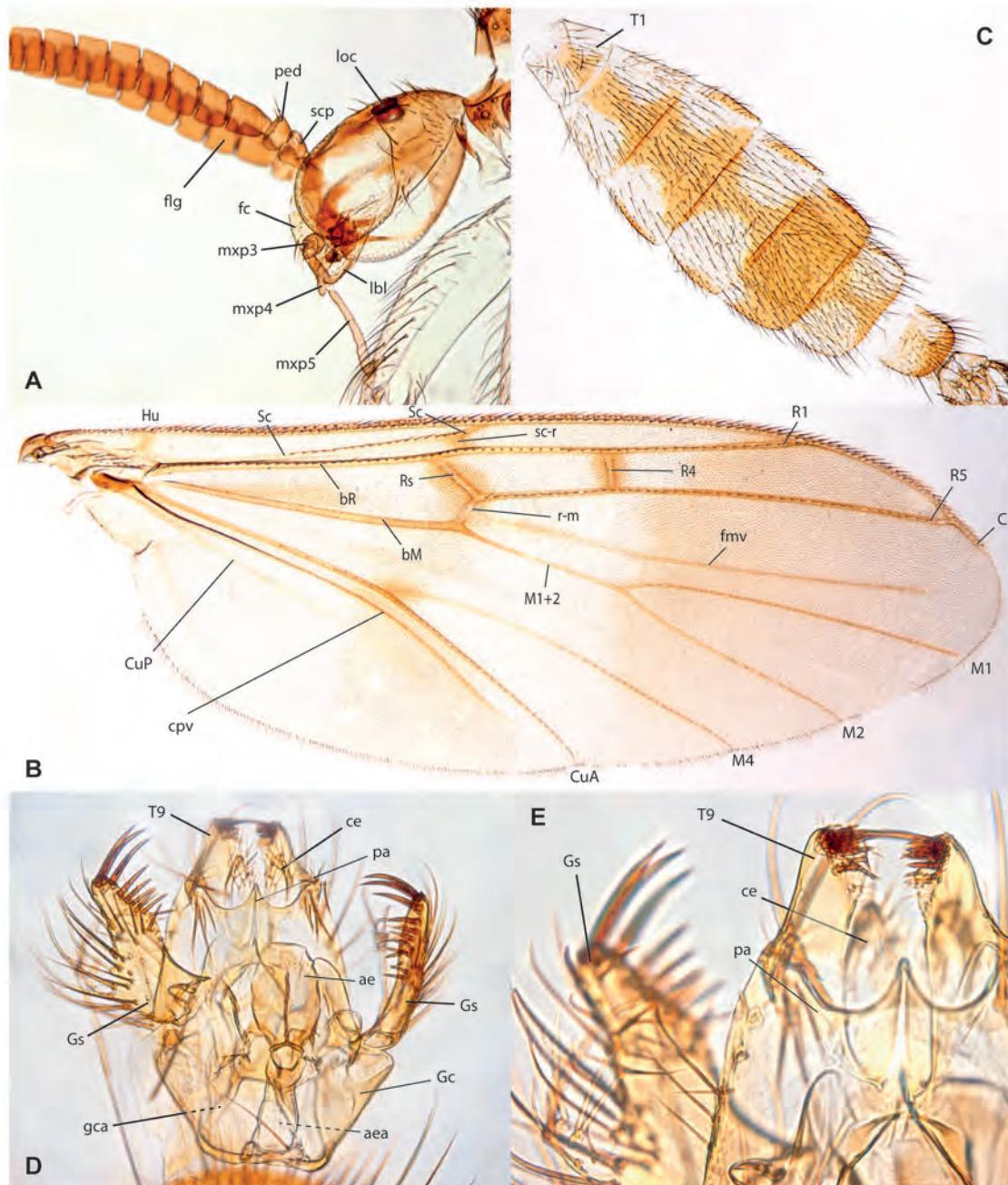


Figure XXA-D. *Neoempheria* sp.n. 29, male holotype. A. Head. B. Abdomen. C. Wing. D. Terminalia, ventral view. E. Detail of terminalia, dorsal view.

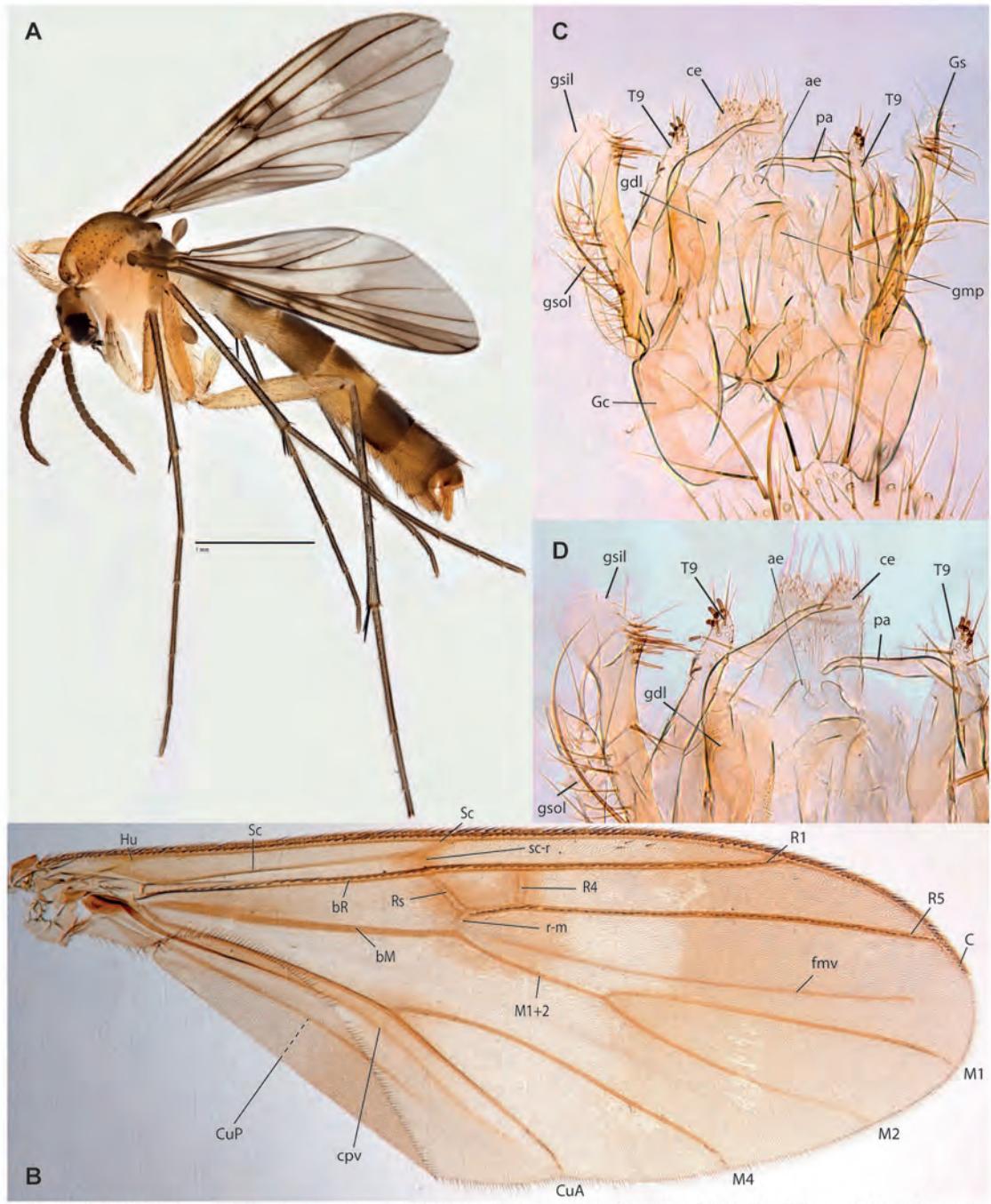


Figure XXA-F. *Neoempheria* sp.n. 6. A. Habitus, female, ZRCBDP0048494. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same.

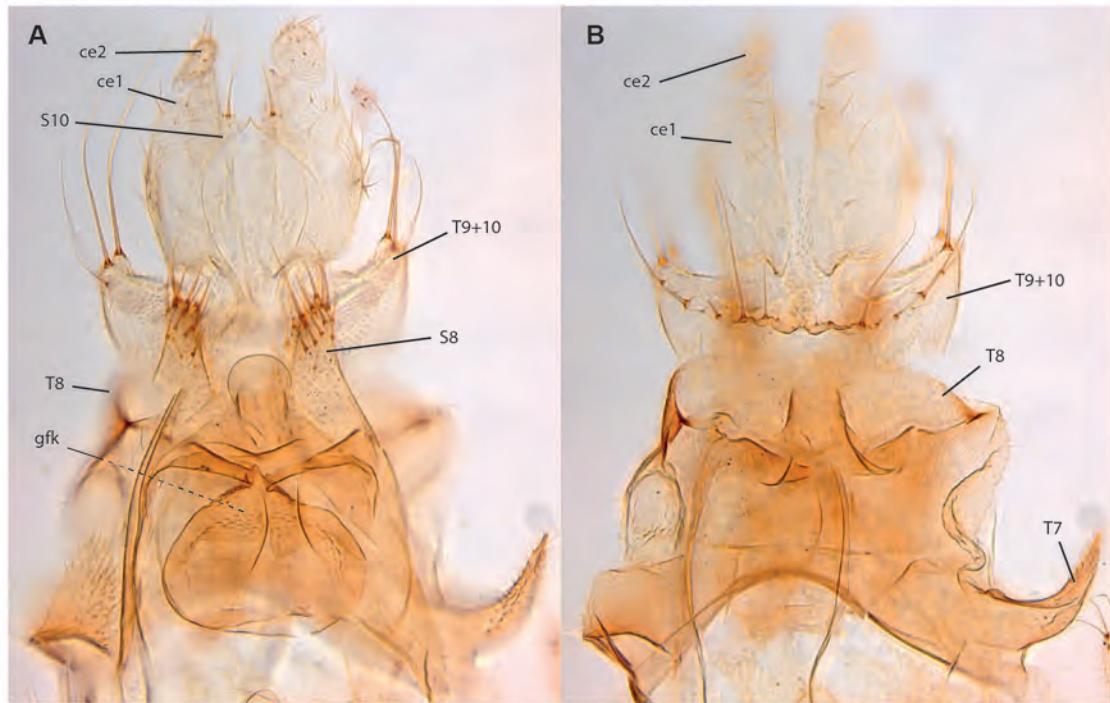


Figure XXA-B. *Neoempheria* sp.n. 6. A. Female terminalia, paratype ZRCBDP0048493, ventral view. B. Female terminalia, dorsal view, same.

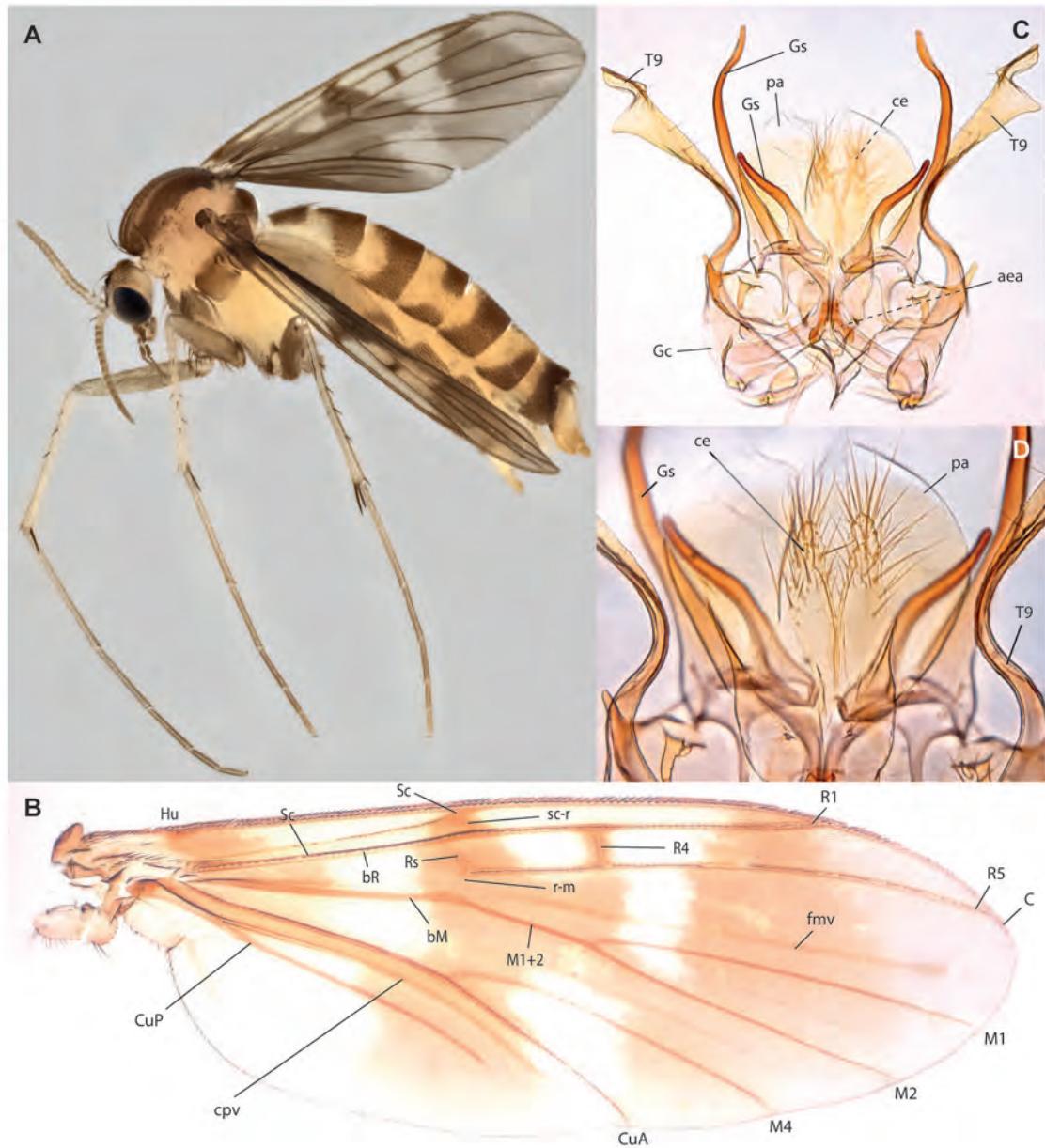


Figure XXA-D. *Neoempheria* sp.n. 30, male holotype. A. Head. B. Abdomen. C. Wing. D. Terminalia. E. Detail of terminalia, dorsal view.

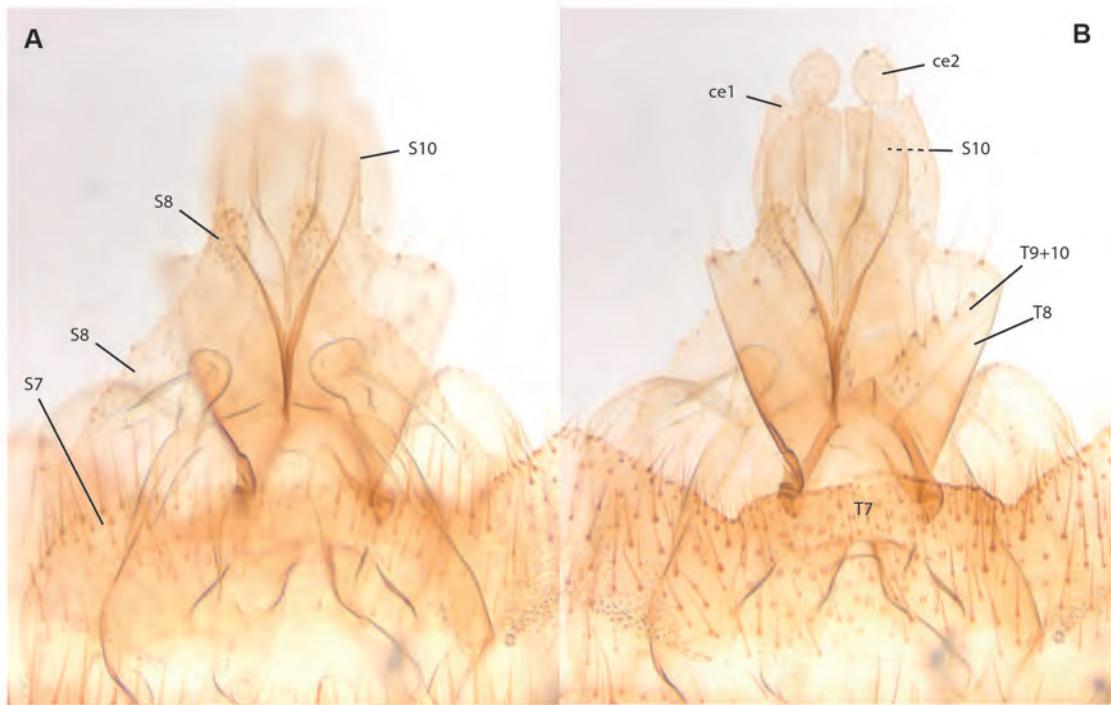


Figure XXA-D. *Neoempheria* sp.n. 30, female paratype ZRCBDP0074035, terminalia. A. Ventral view.  
B. Dorsal view.

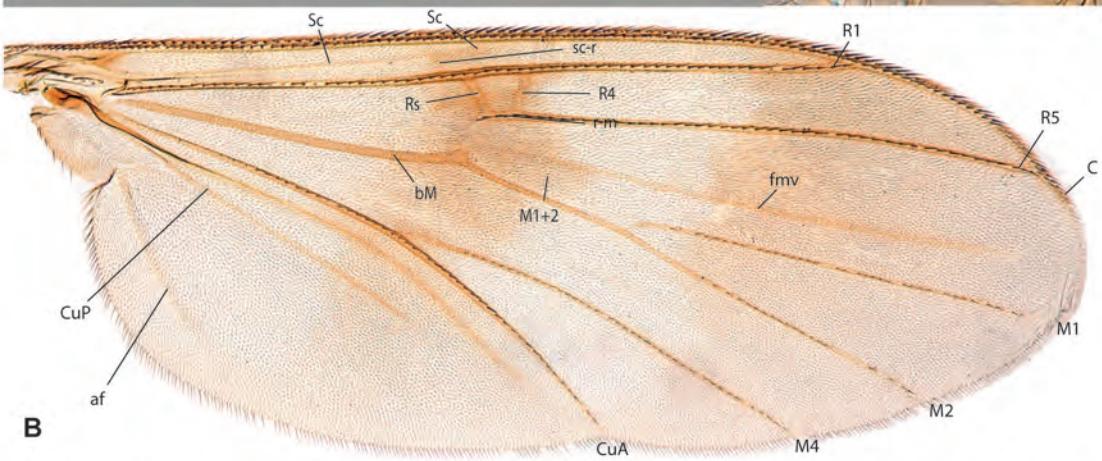
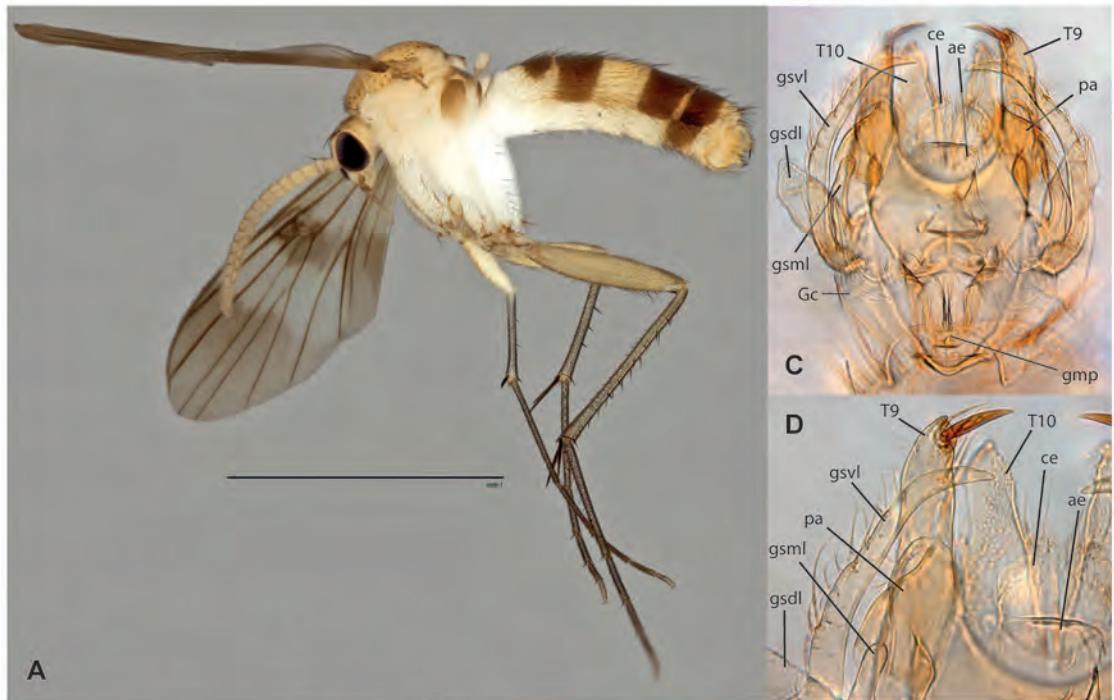


Figure XXA-F. *Neoempheria* sp.n. 14. A. Habitus, male ZRCBDP0047918. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, dorsal view, same.

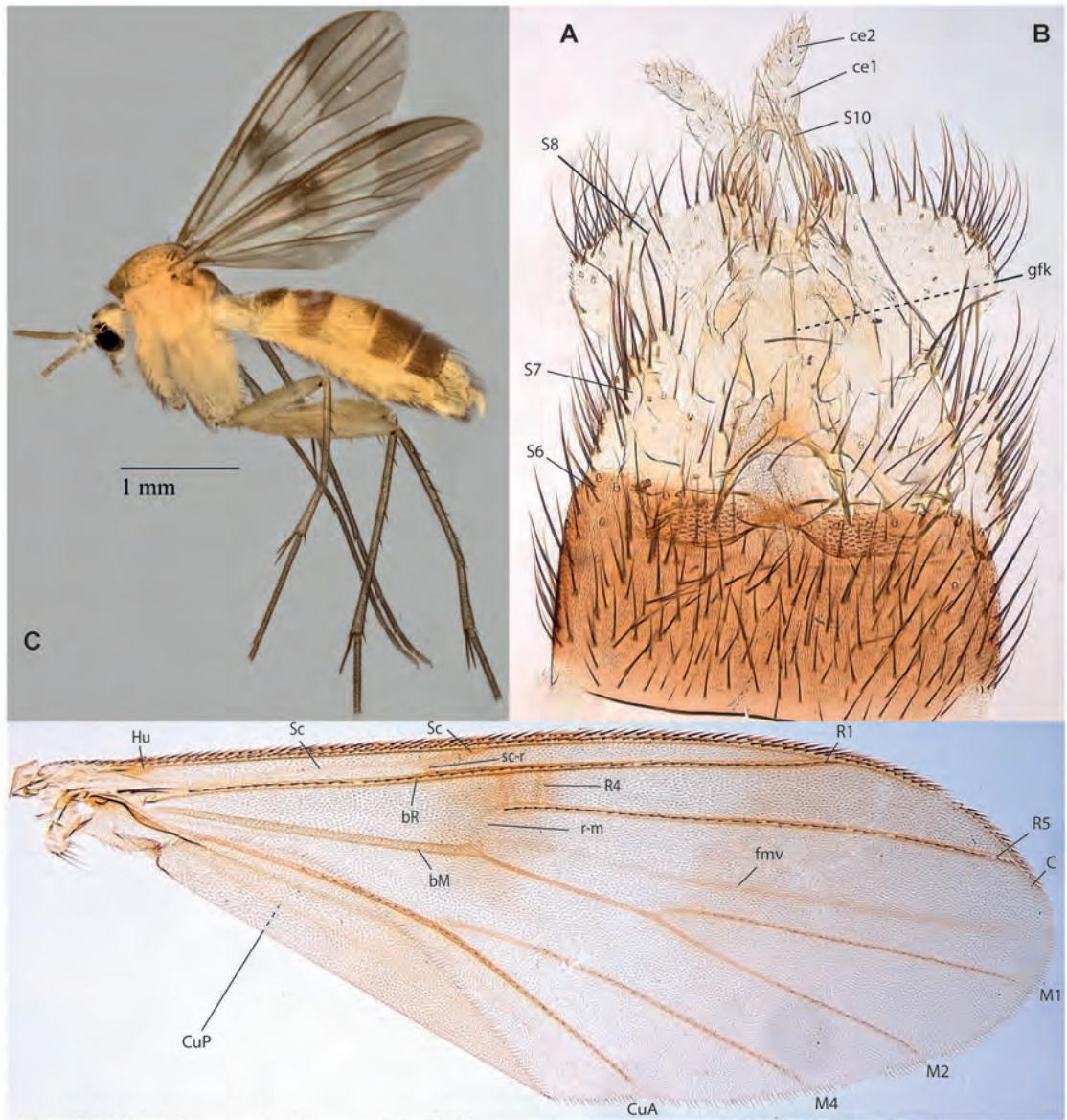


Figure XXA-F. *Neoempheria* sp.n. 4 A. Habitus, male, ZRCBDP0048303. B. Wing, female, ZRCBDP0048482. D. Male terminalia, ventral view, ZRCBDP0048303.

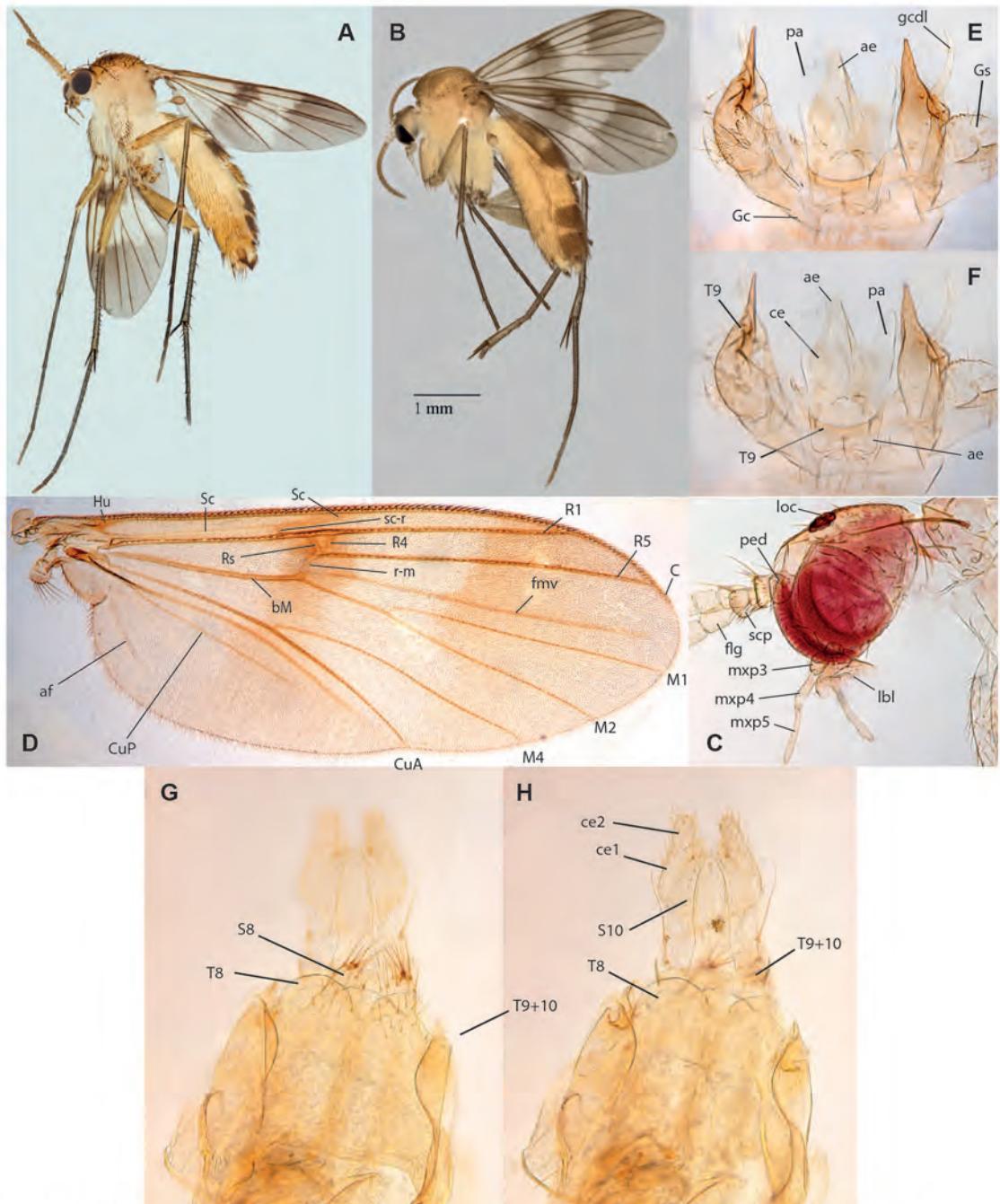


Figure XXA-F. *Neoempheria* sp.n. 5. A. Habitus, male, ZRCBDP0048491. B. Habitus, female, ZRCBDP0155089. C. Head, male holotype. D. Wing, same. E. Male terminalia, ventral view, same. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, ZRCBDP0048485. H. Female terminalia, dorsal view, same.

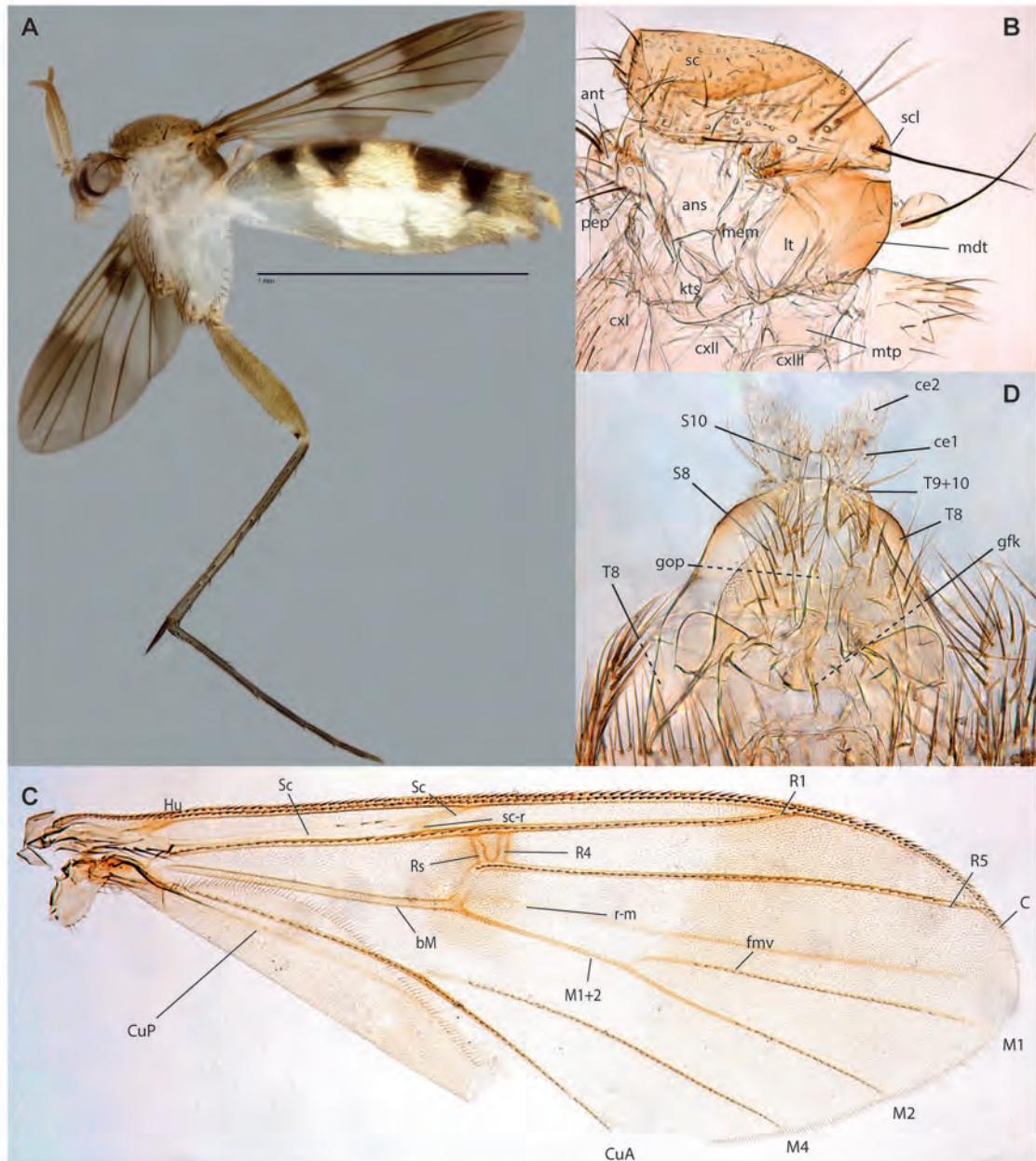


Figure XXA-D. *Neoempheria* sp.n. 18, female holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view.

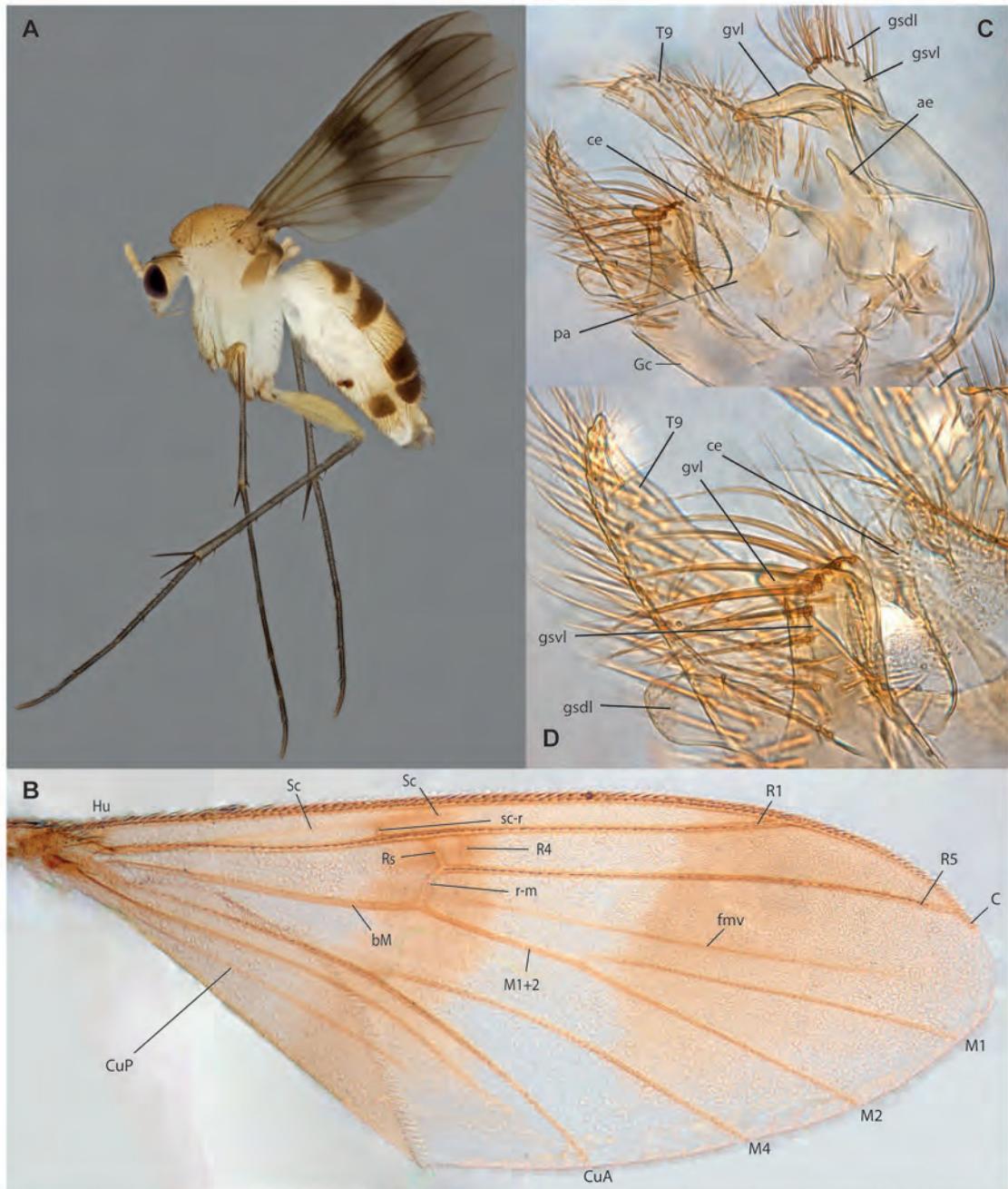


Figure XXA-D. *Neoempheria* sp.n. 19. A. Habitus, male ZRCBDP0048695. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, same.

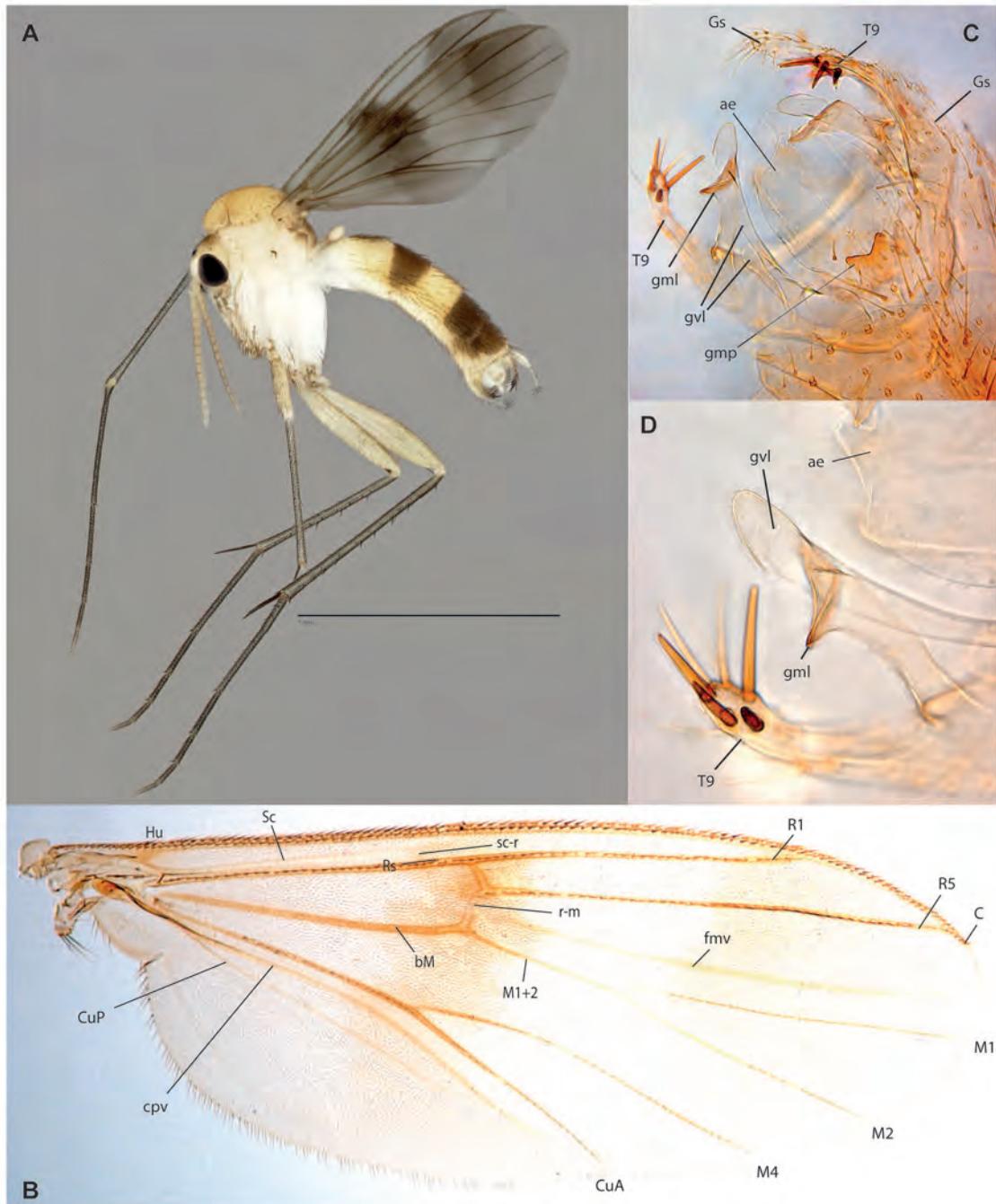


Figure XXA-D. *Neoempheria* sp.n. 25. A. Habitus, male, ZRCBDP0049204. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of terminalia, ventral view, same.

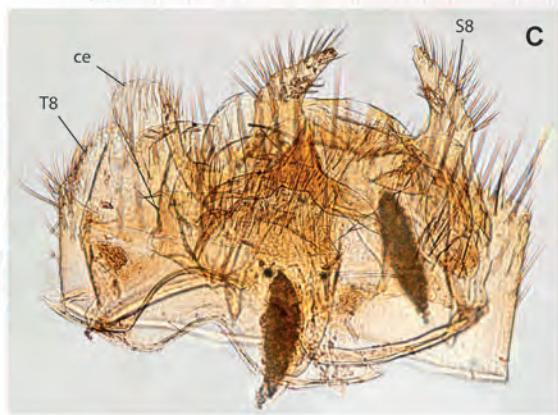
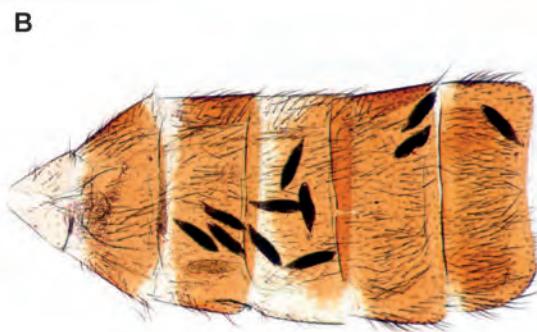
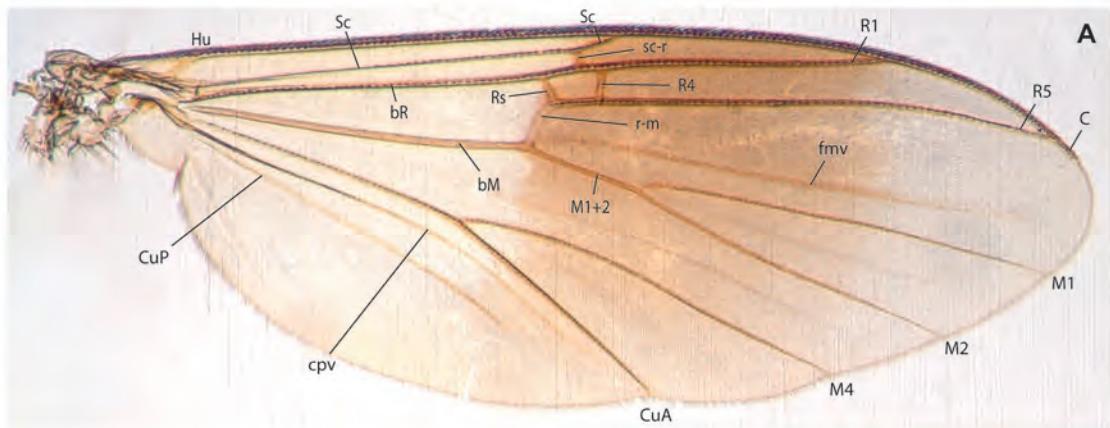


Figure XXA-D. *Neoempheria* sp.n. 36, female holotype. A. Wing. B. Abdomen. C. Terminalia, ventral view.

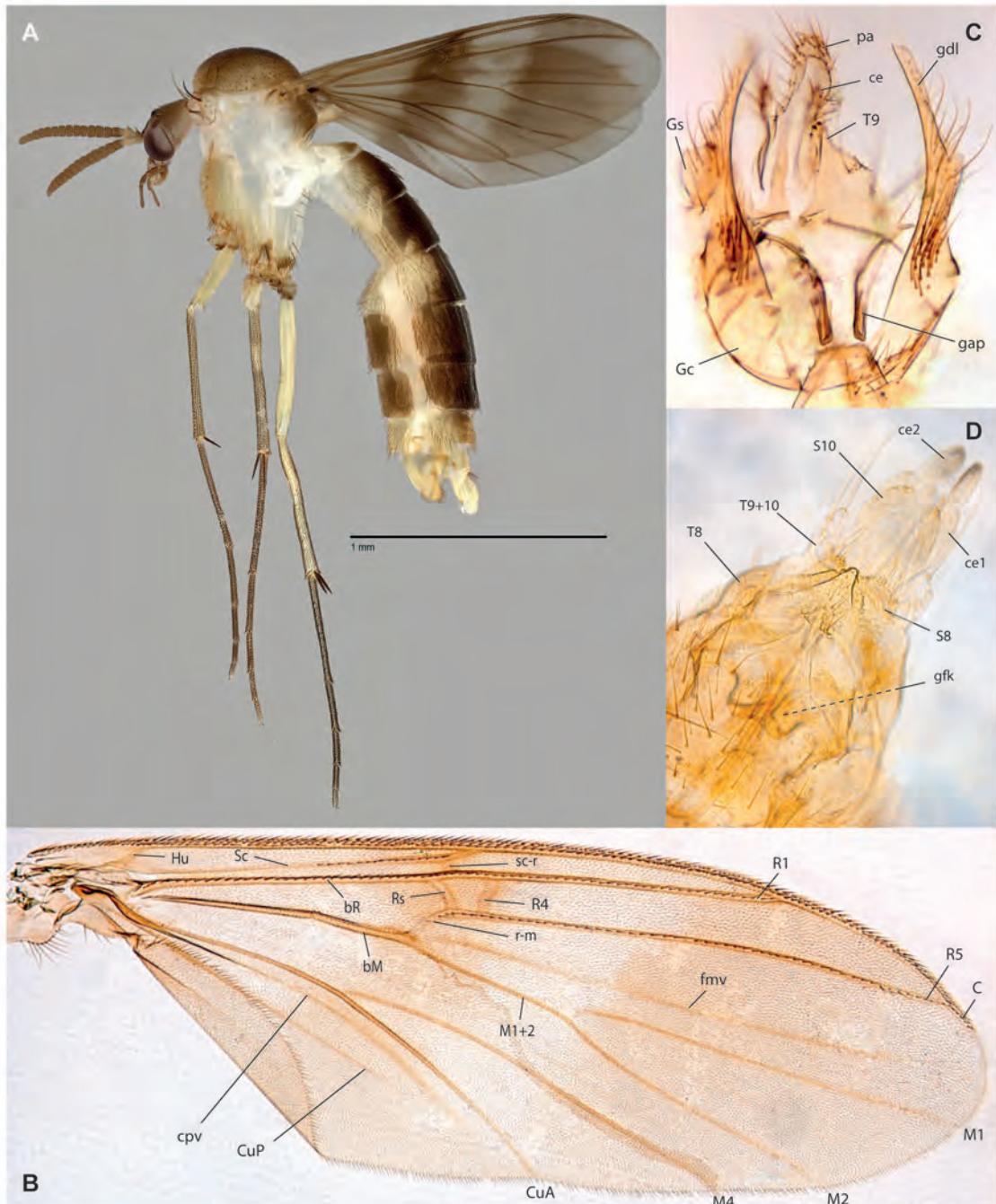


Figure XXA-D. *Neoempheria* sp.n. 27. A. Habitus, female, ZRCBDP0049247. B. Wing, female holotype. C. Male terminalia, dorsal view. D. Female terminalia, ventral view, same.

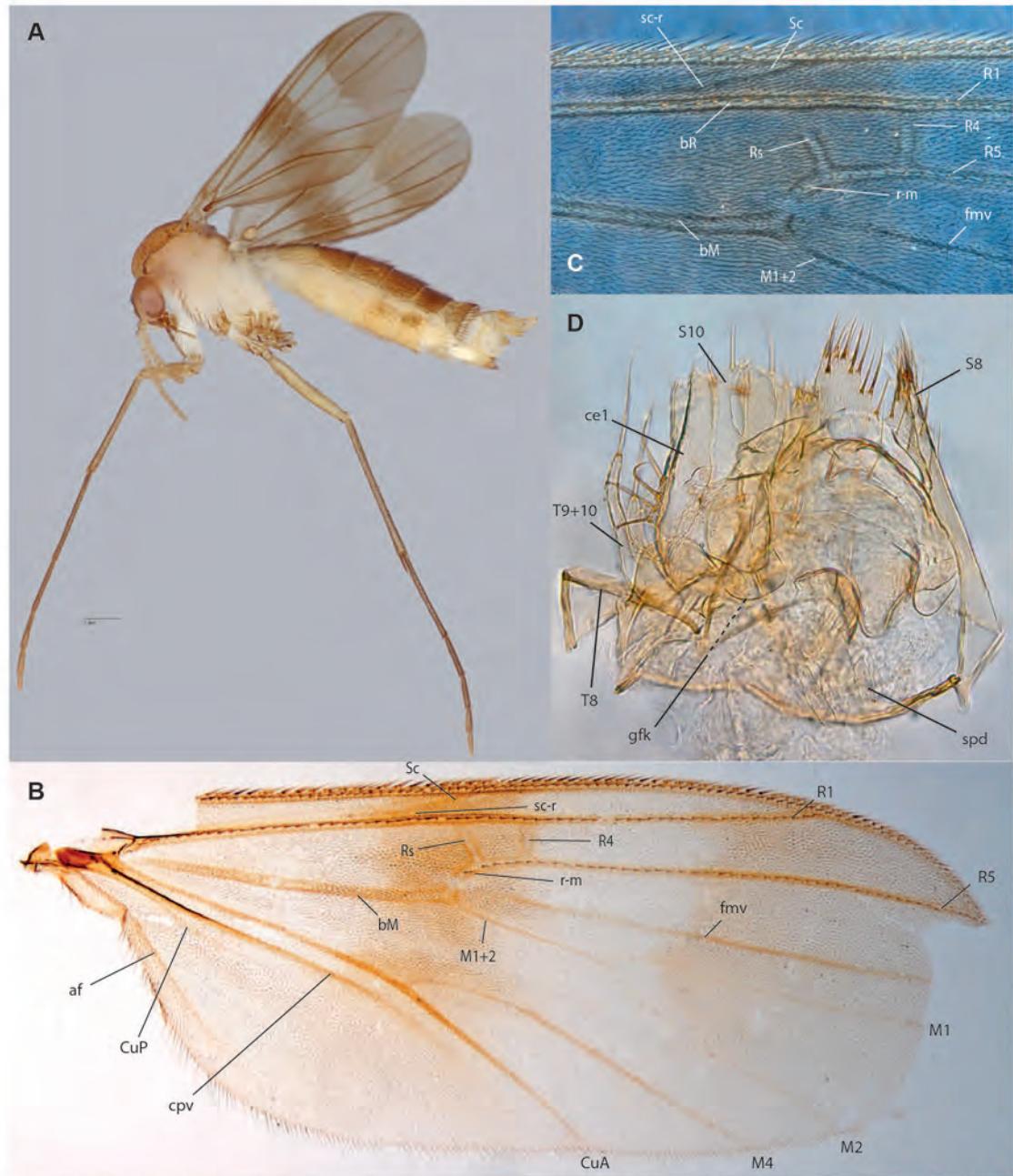


Figure XXA-F. *Neoempheria* sp.n. 10. A. Habitus, female, ZRCBDP0047779. B. Wing, female holotype. C. Detail of anterior margin of wing under phase contrast, same. D. Female terminalia, ventral view, same.

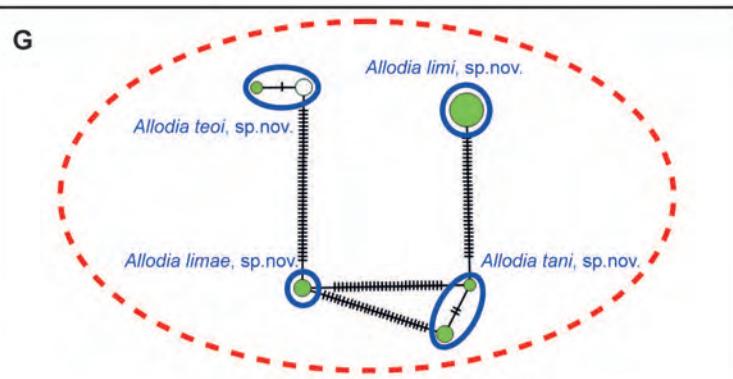
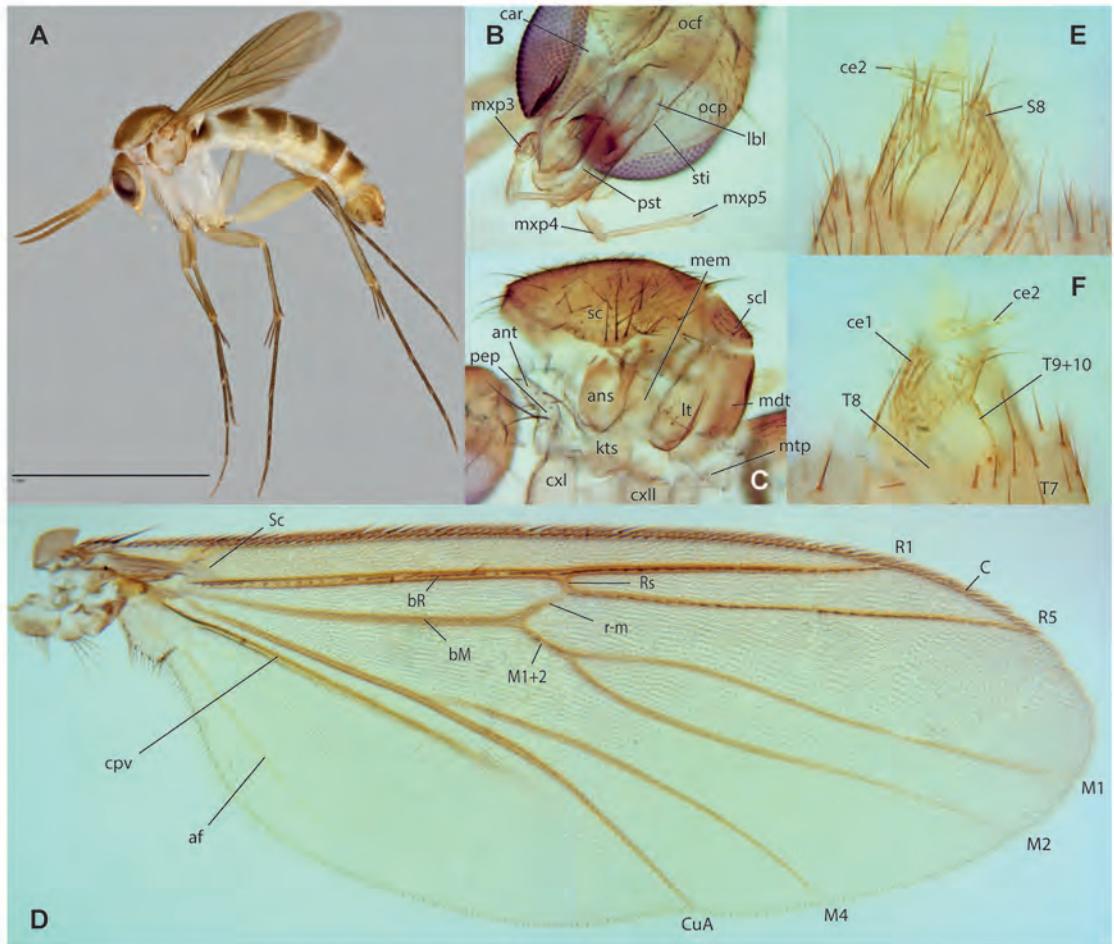


Figure XXA-F. *Allodia* sp.n. 01. A. Habitus, male holotype. B. Head, ventral view, same. C. Thorax, same. D. Wing, same. E. Female terminalia, dorsal view, paratype ZRCBDP0049093. F. Female terminalia, dorsal view, same. G. Haplotype network for *Allodia*.

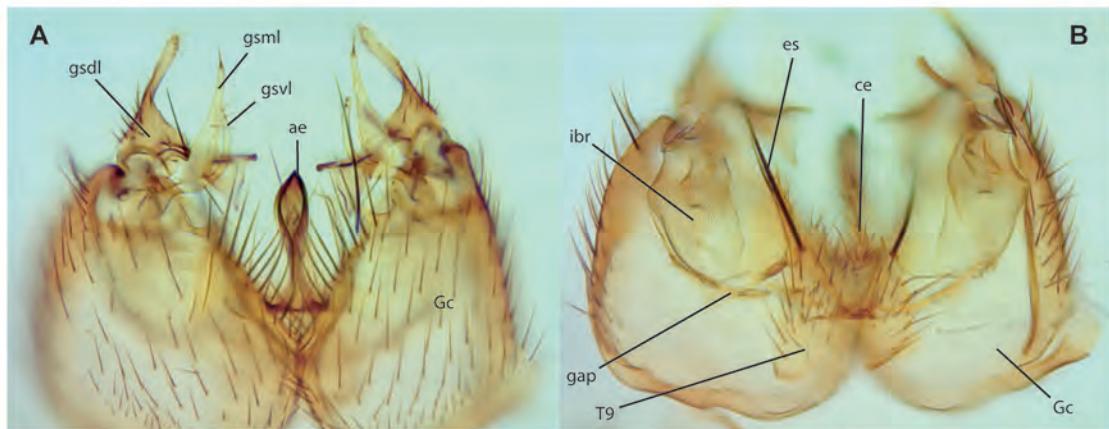


Figure XXA-F. *Allodia* sp.n. 01. A. Male terminalia, dorsal view, holotype. B. Male terminalia, dorsal view, same.

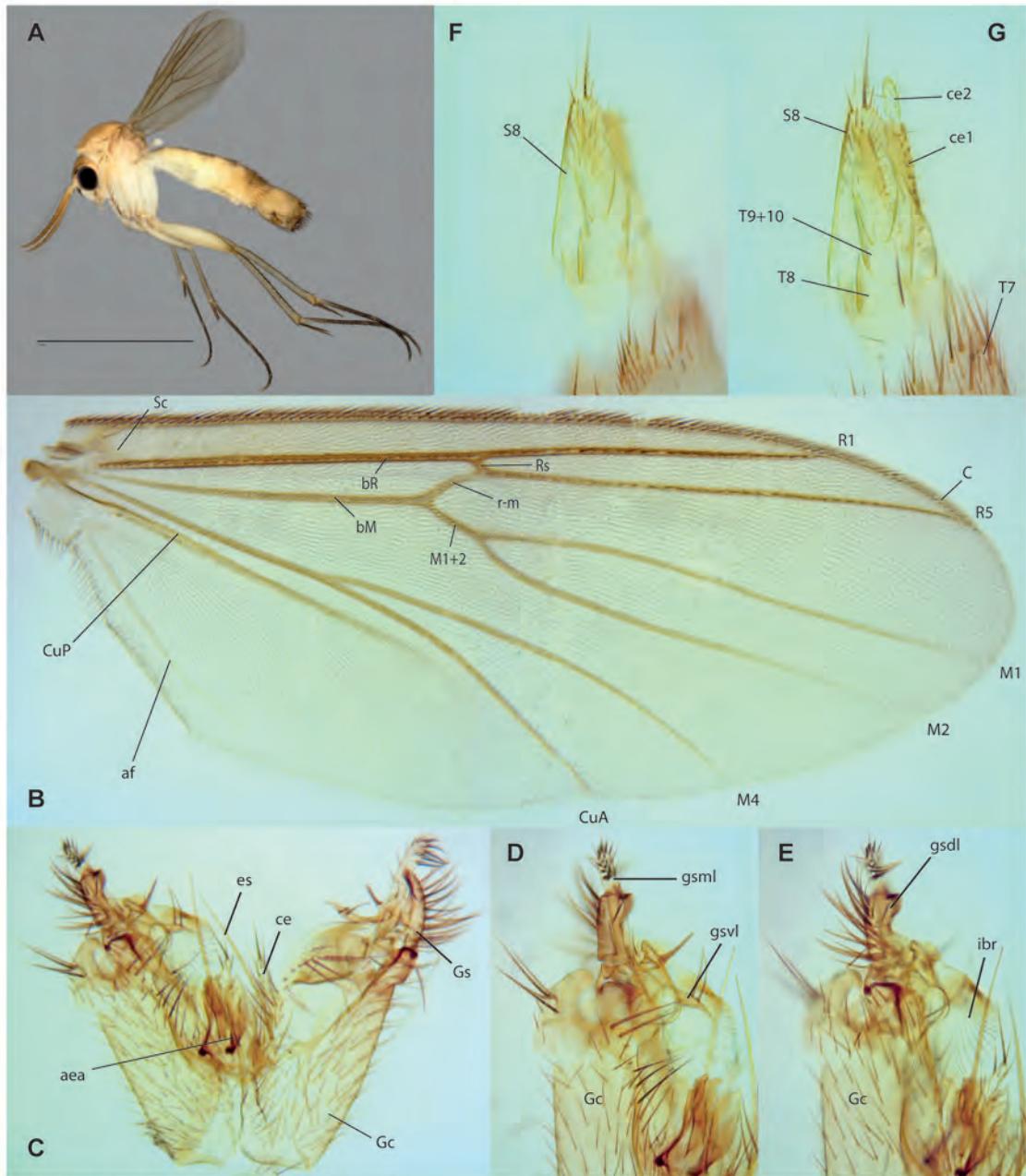


Figure XXA-F. *Allodia* sp.n. 04. A. Habitus, male paratype ZRCBDP0048976. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of gonostyle, ventral view, same. E. Detail of gonostyle, dorsal view, same. F. Female terminalia, ventral view, paratype ZRCBDP0048669. G. Female terminalia, ventral view, same.

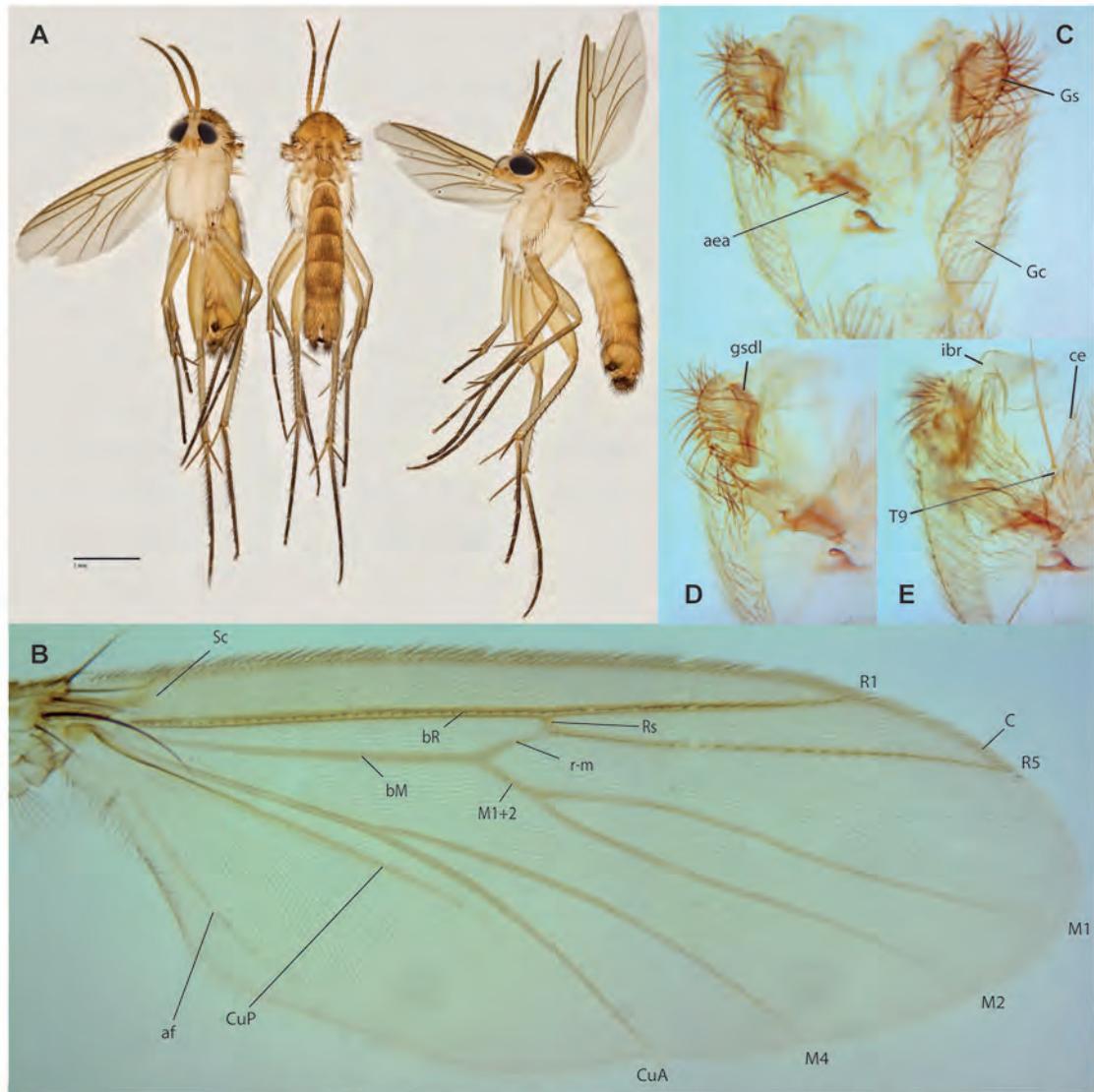


Figure XXA-F. *Allodia* sp.n. 05. A. Habitus, male paratype ZRCBDP0048511. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of gonostyle, ventral view, same. E. Detail of gonostyle, dorsal view, same.

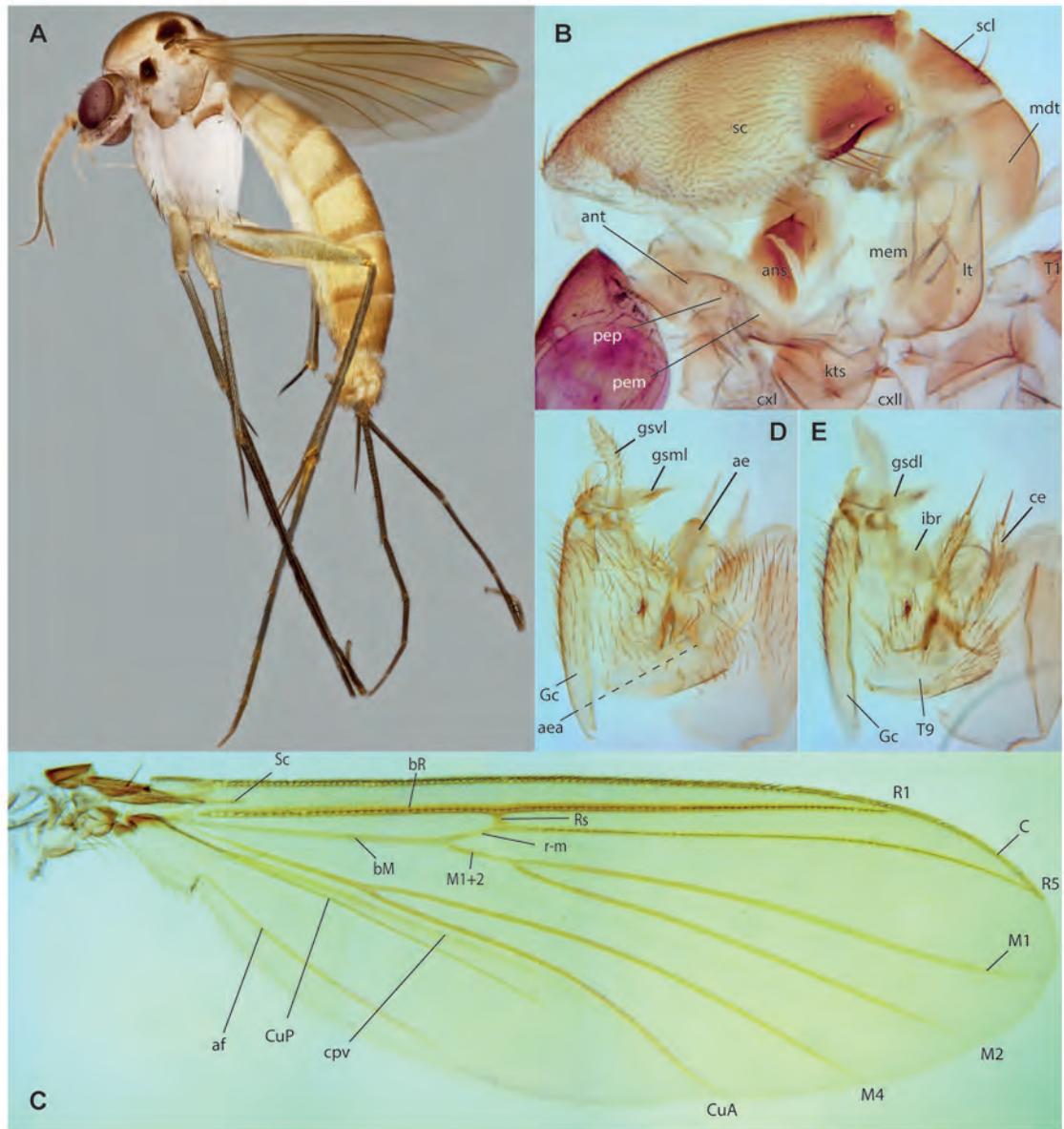


Figure XXA-F. *Allodia* sp.n. 02, male holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.



Figure XXA-F. *Exechia hiani* Amorim & Oliveira, sp.n. A. Habitus, male paratype ZRCBDP0137247. B. Wing, male holotype. C. Female terminalia, ventral view, paratype ZRCBDP0048668.

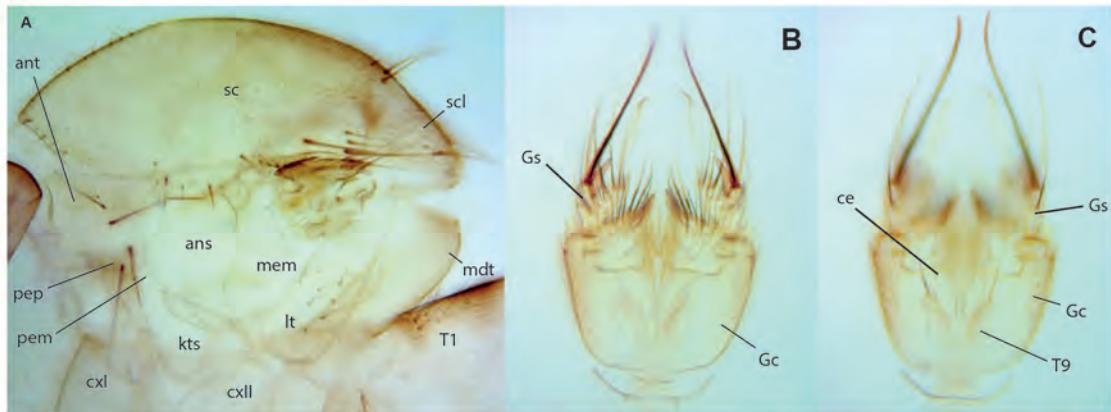


Figure XXA-F. *Exechia hiani* Amorim & Oliveira, sp.n., male holotype. A. Thorax. B. Terminalia, ventral view. C. Terminalia, dorsal view.

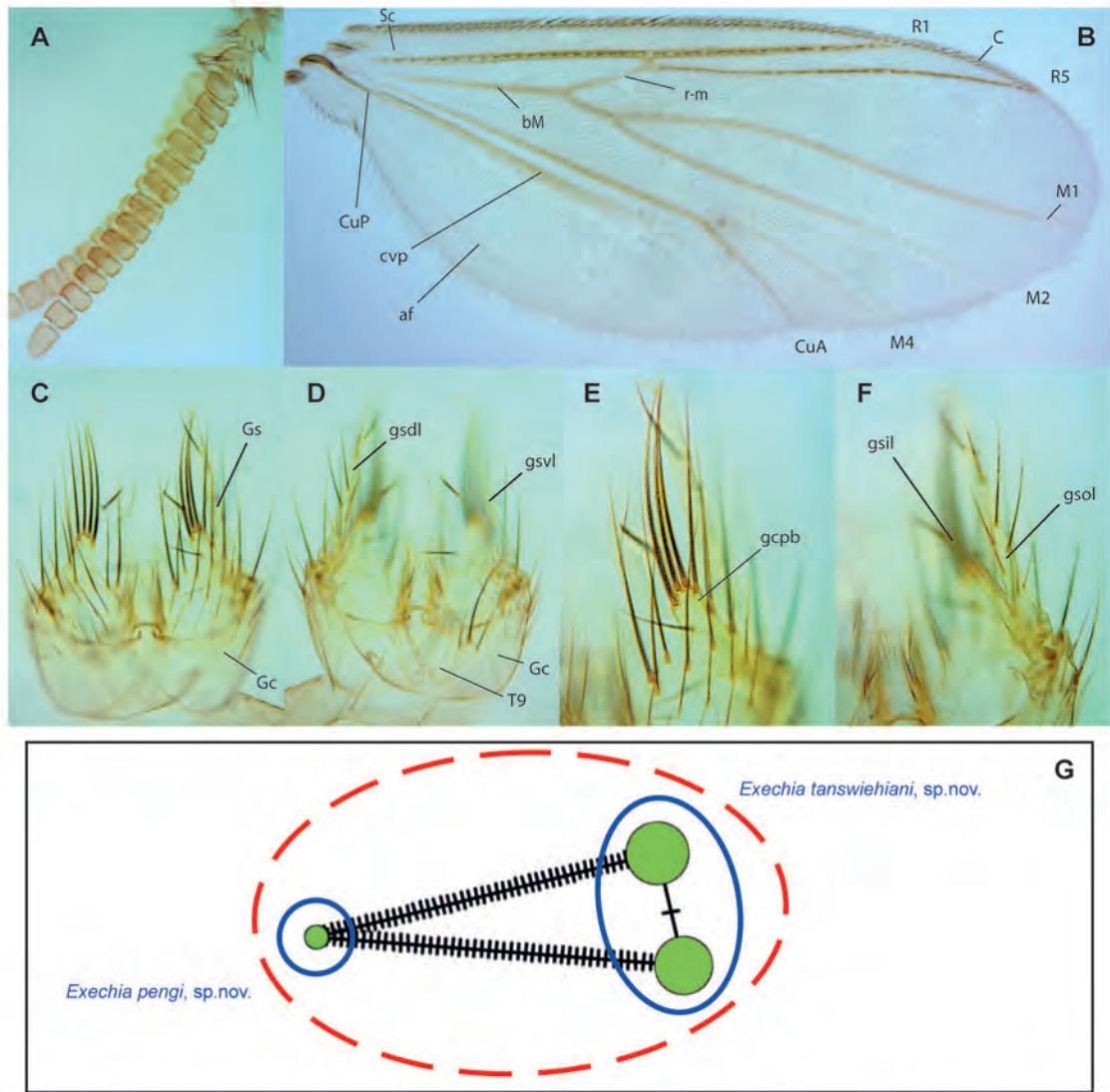


Figure XXA-G. A–F. *Exechia pengi* Amorim & Oliveira, sp.nov., male holotype. A. Antenna. B. Wing. C. Male terminalia, ventral view. D. Gonocoxite posterior margin, ventral view. E. Gonostylus, dorsal view. G. Haplotype network for *Exechia*.

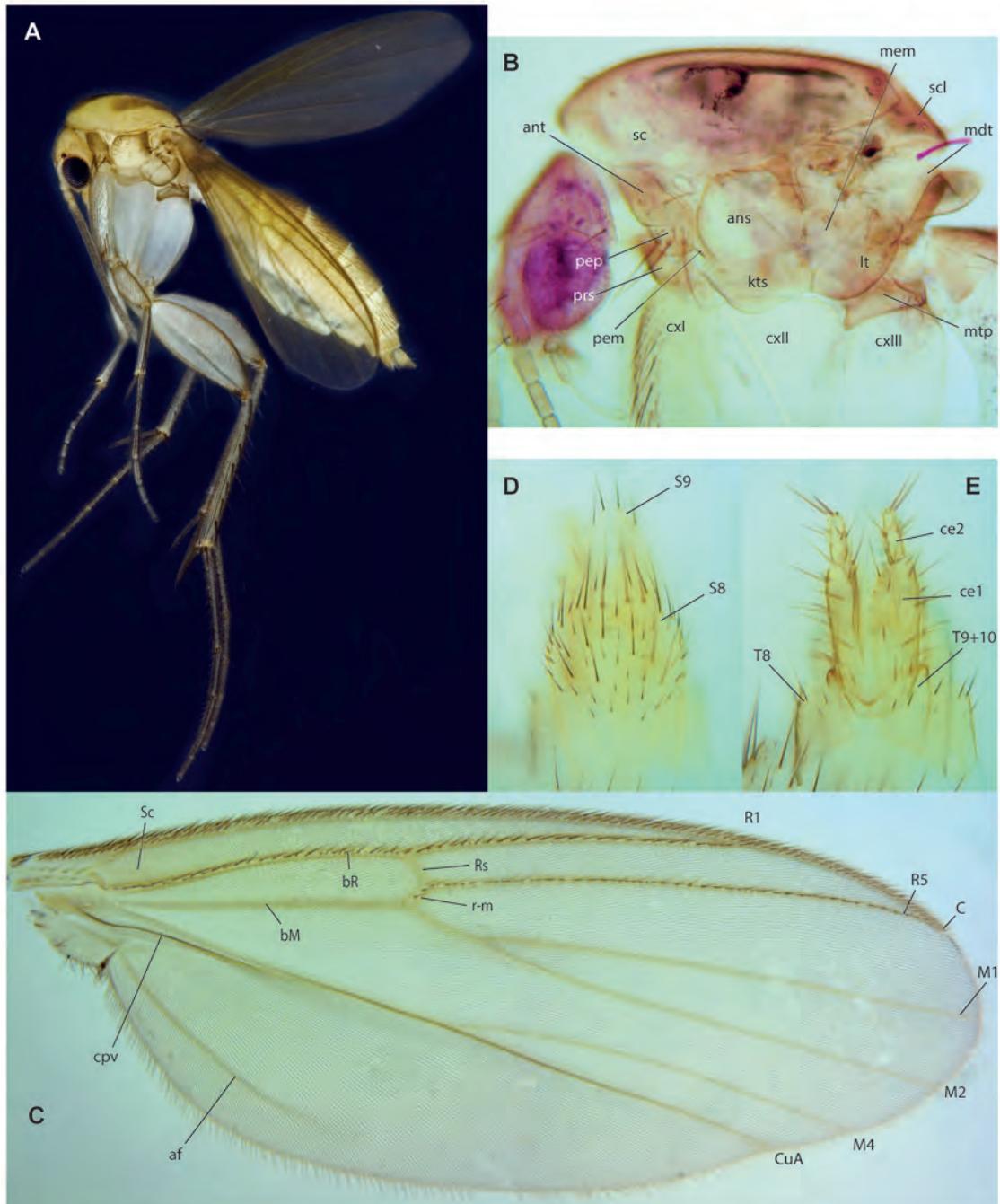


Figure XXA-F. *Mycetophila* sp.n. 01. A. Habitus, female paratype ZRCBDP0048447. B. Thorax, male paratype ZRCBDP0049191. C. Wing, same. D. Female terminalia, ventral view, paratype ZRCBDP0048674. E. Female terminalia, dorsal view, same.

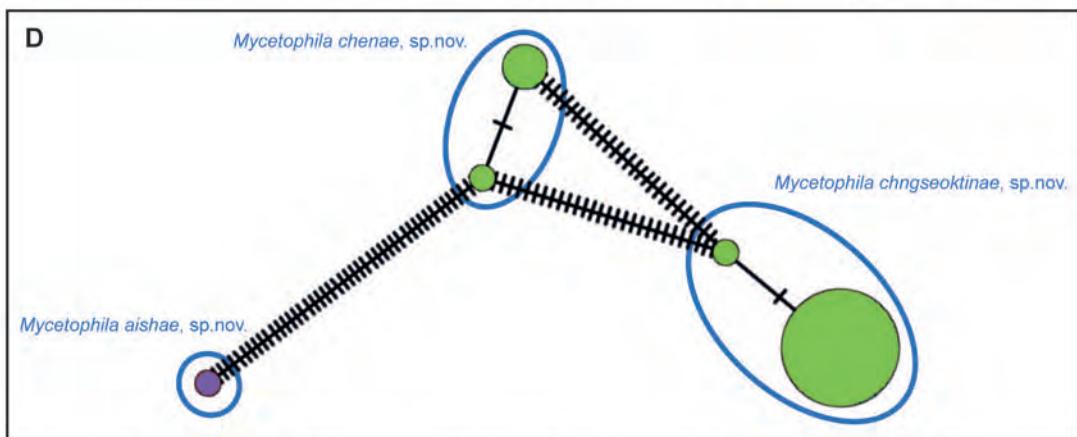
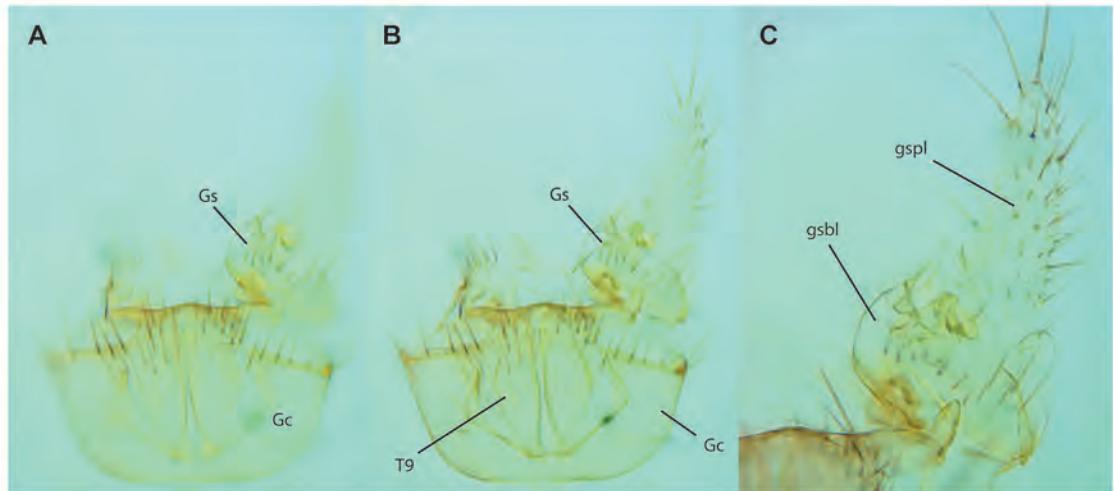


Figure XXA-F. *Mycetophila* sp.n. 01, male paratype ZRCBDP0049191. A. Male terminalia, ventral view. B. Male terminalia, dorsal view. C. Gonostylus, dorsal view. D. Haplotype network for *Mycetophila*.

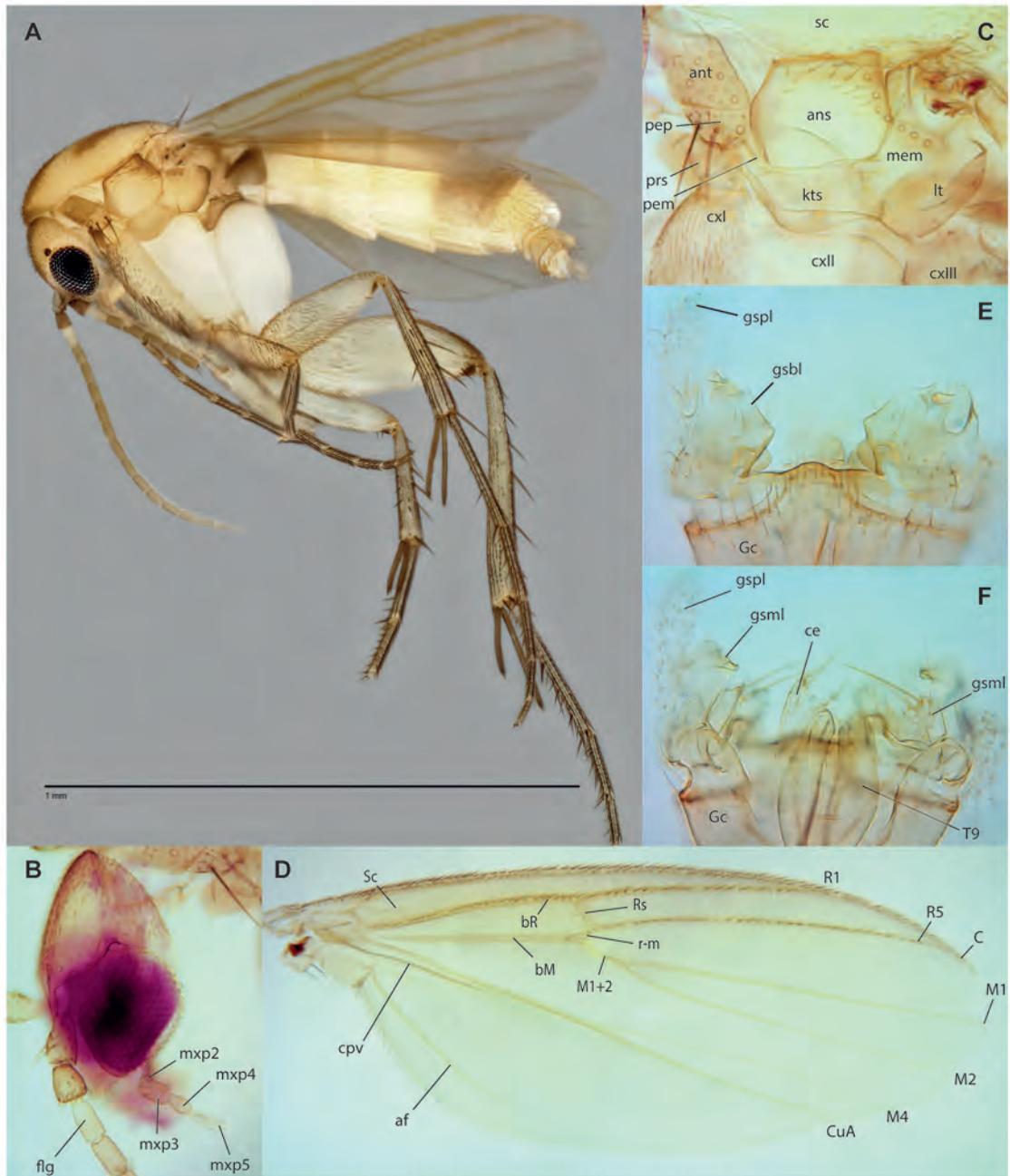


Figure XXA-F. *Mycetophila* sp.n. 02, male holotype. A. Habitus. B. Head. C. Wing. D. Thorax. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.

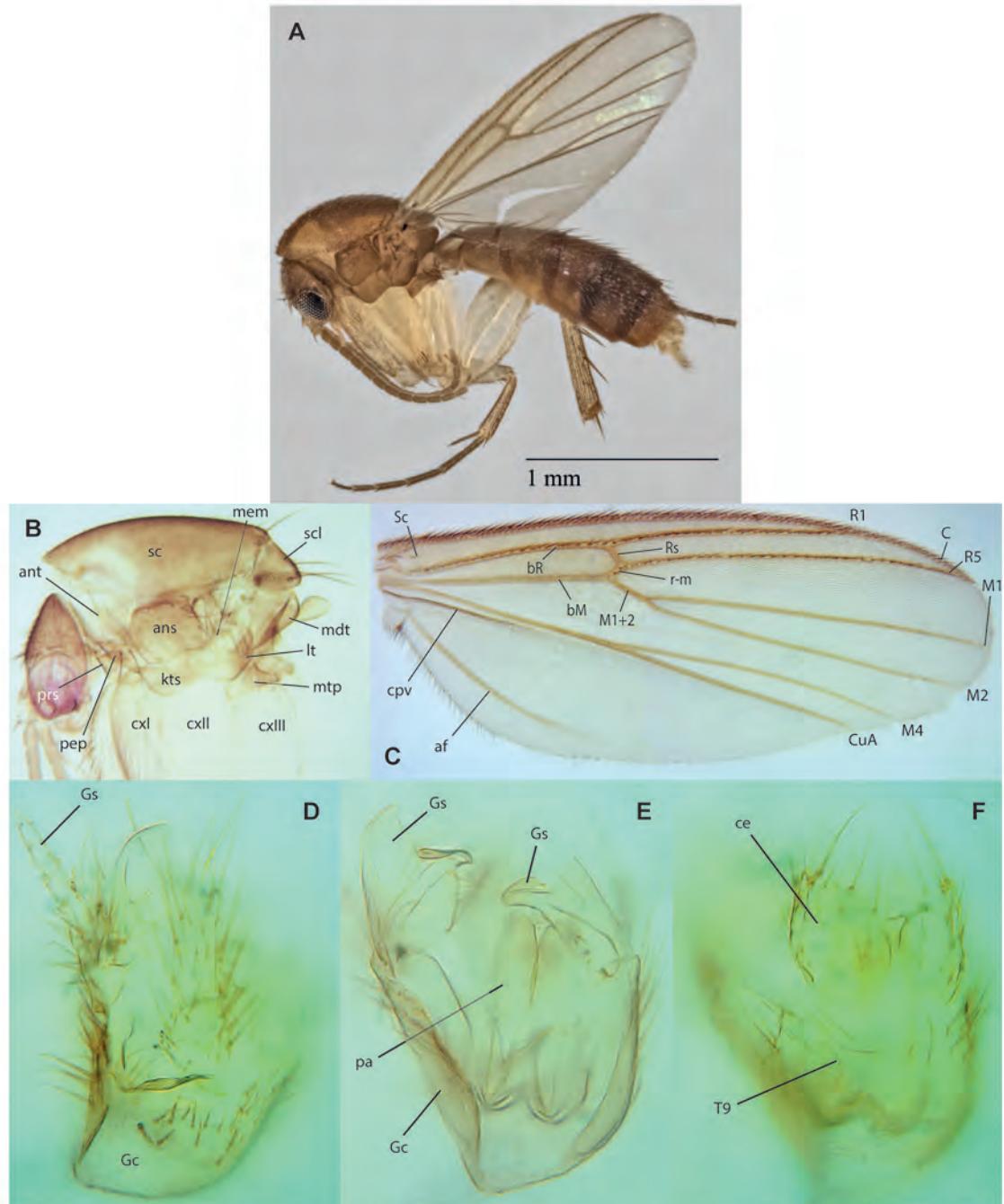


Figure XXA-F. *Mycetophila* sp.n. 03. A. Habitus, male paratype ZRCBDP0133534. B. Thorax, male holotype. C. Wing, same. D. Male terminalia, mid section. E. Male terminalia, ventral view. F. Male terminalia, dorsal view.

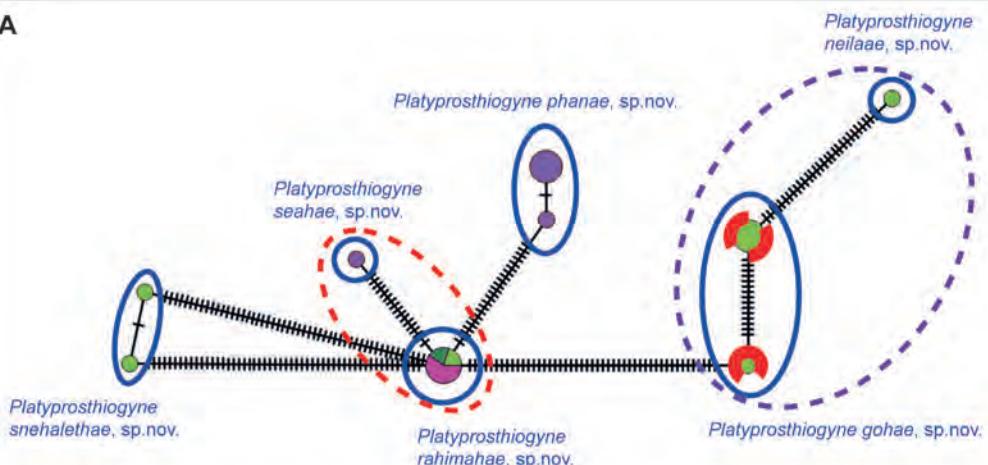
**A**

Figure XXA-F. A. Haplotype network for *Platyprosthiogyne*.

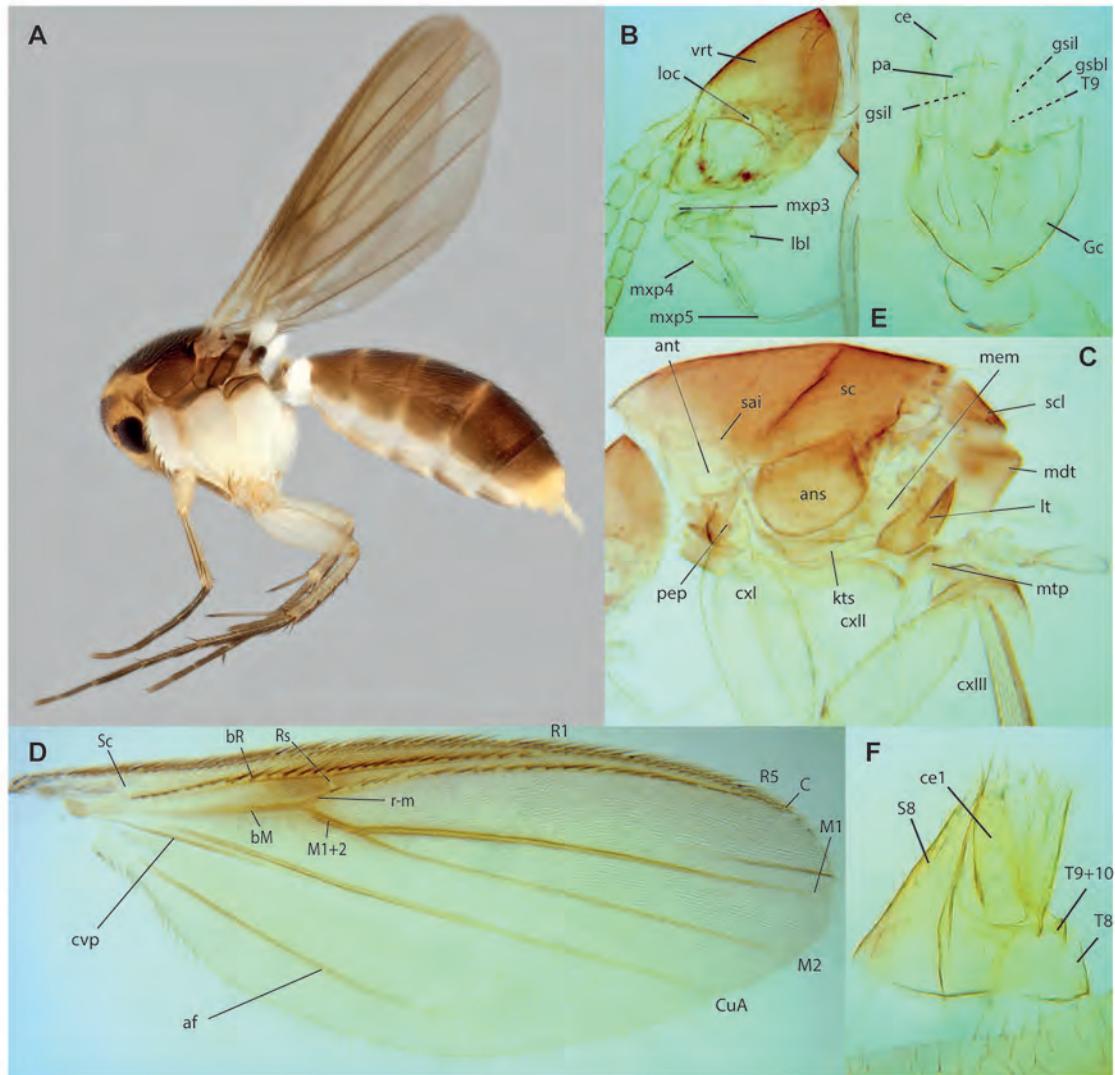


Figure XXA-F. *Platyprosthiogyne* sp.n. 01. A. Habitus, female paratype ZRCBDP0048145. B. Head, male holotype. C. Thorax, same. D. Wing, same. E. Male terminalia, same. F. Feale terminalia, latero-dorsal view, same. G. Female terminalala, dorsal view, paratype ZRCBDP0048144.

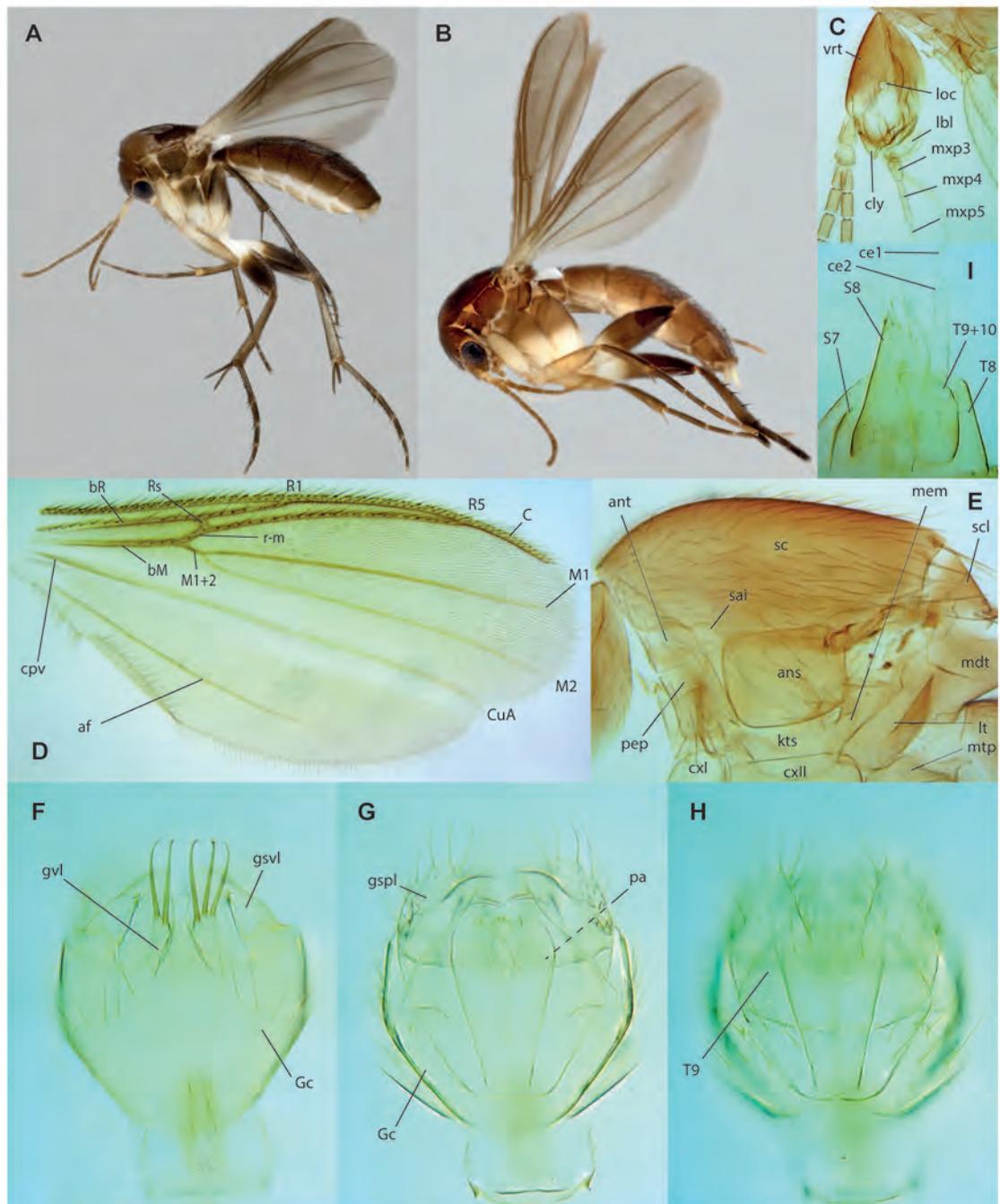


Figure XXA-F. *Platyprosthiogyne* sp.n. 03. A. Wing, male paratype ZRCBDP0048965. B. Thorax, same. C. Male terminalia, ventral view, same. D. Male terminalia, mid section, same. E. Male terminalia, dorsal view, same.

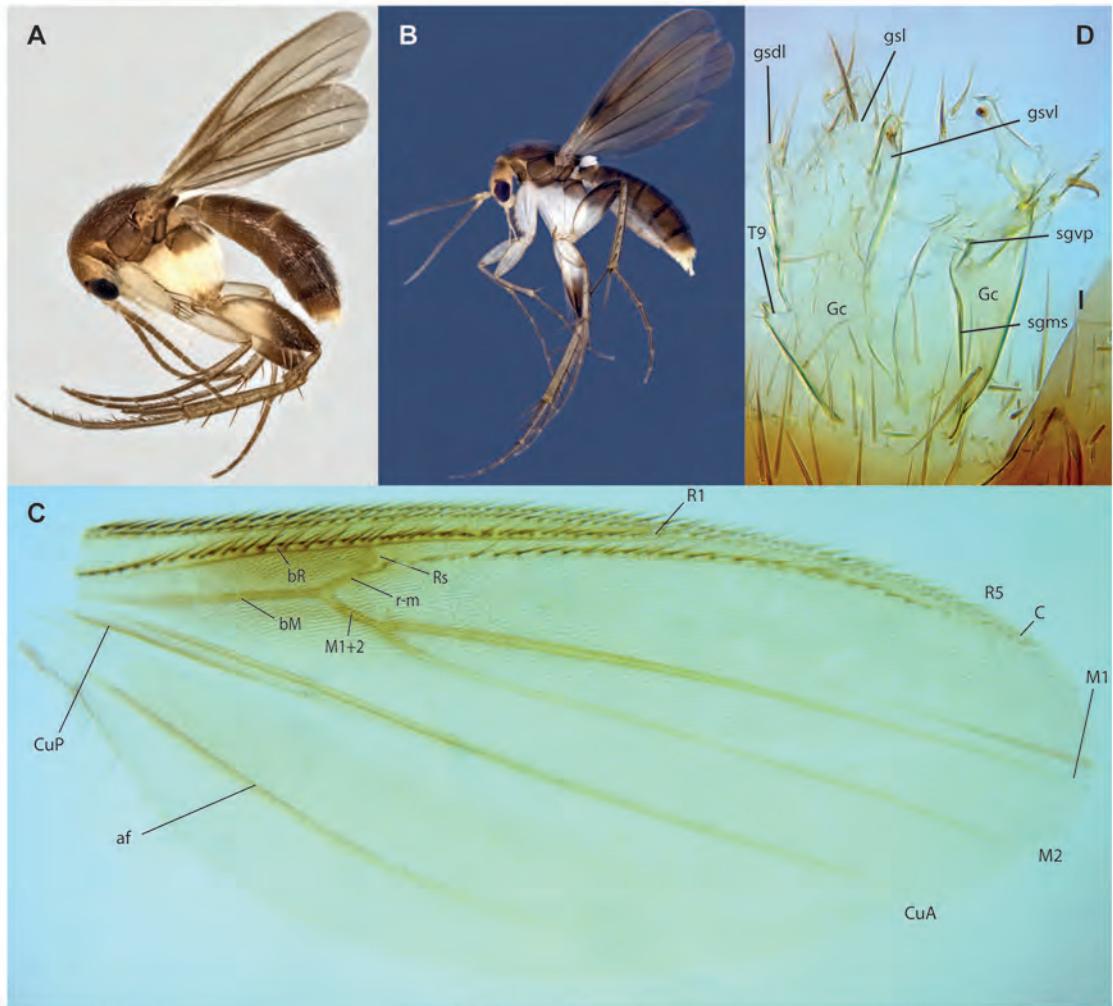


Figure XXA-F. *Platyprosthiogyne* sp.n. 07. A. Habitus, male, paratype ZRCBDP0155018. B. Habitus, female, ZRCBDP0048428. C. Wing, male holotype (fold on wing membrane anteriorly to M1). D. Male terminalia, ventral view, paratype ZRCBDP0049342.

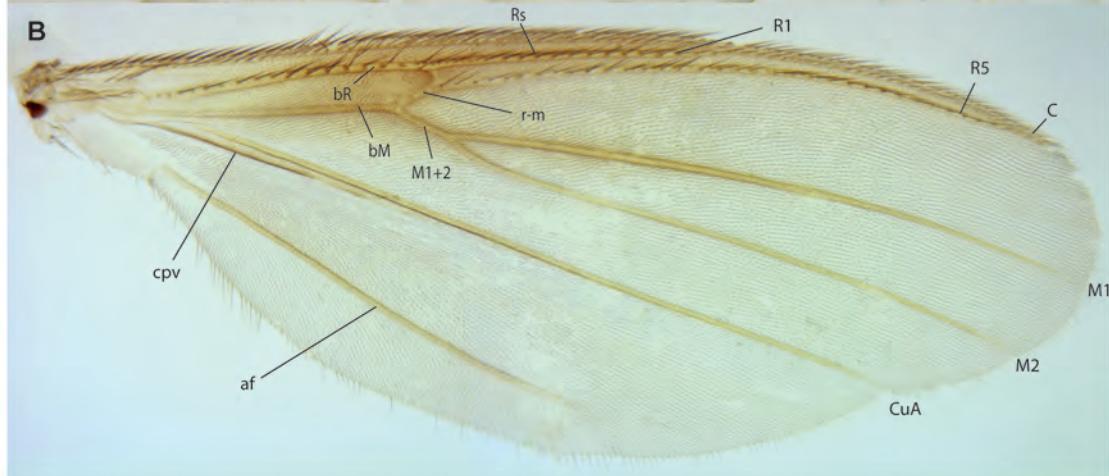
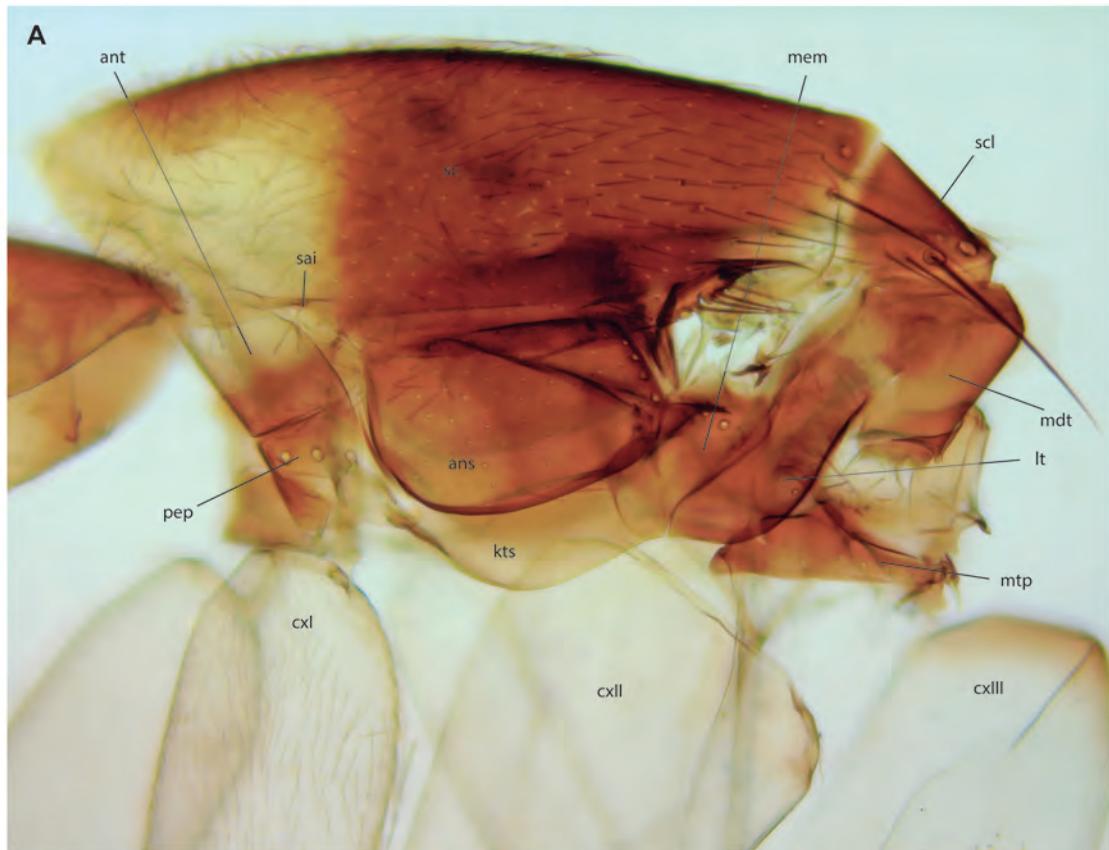


Figure XXA-F. *Platyprosthiogyne* sp.n. 09, holotype. A. Head and thorax, lateral view. B. Wing.

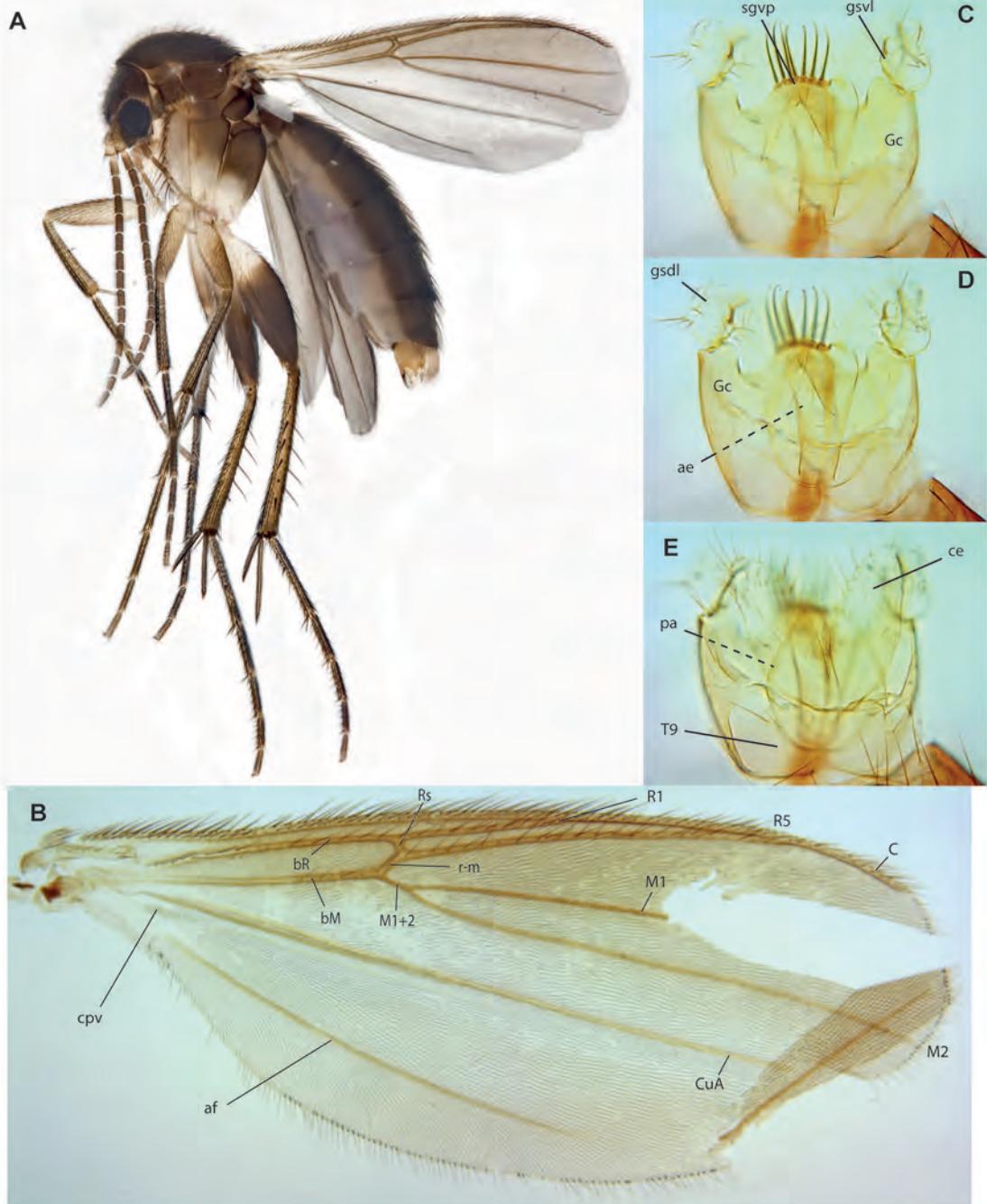


Figure XXA-F. *Platyprosthiogyne* sp.n. 08, male holotype. A. Habitus. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view. E. Terminalia, mid section.

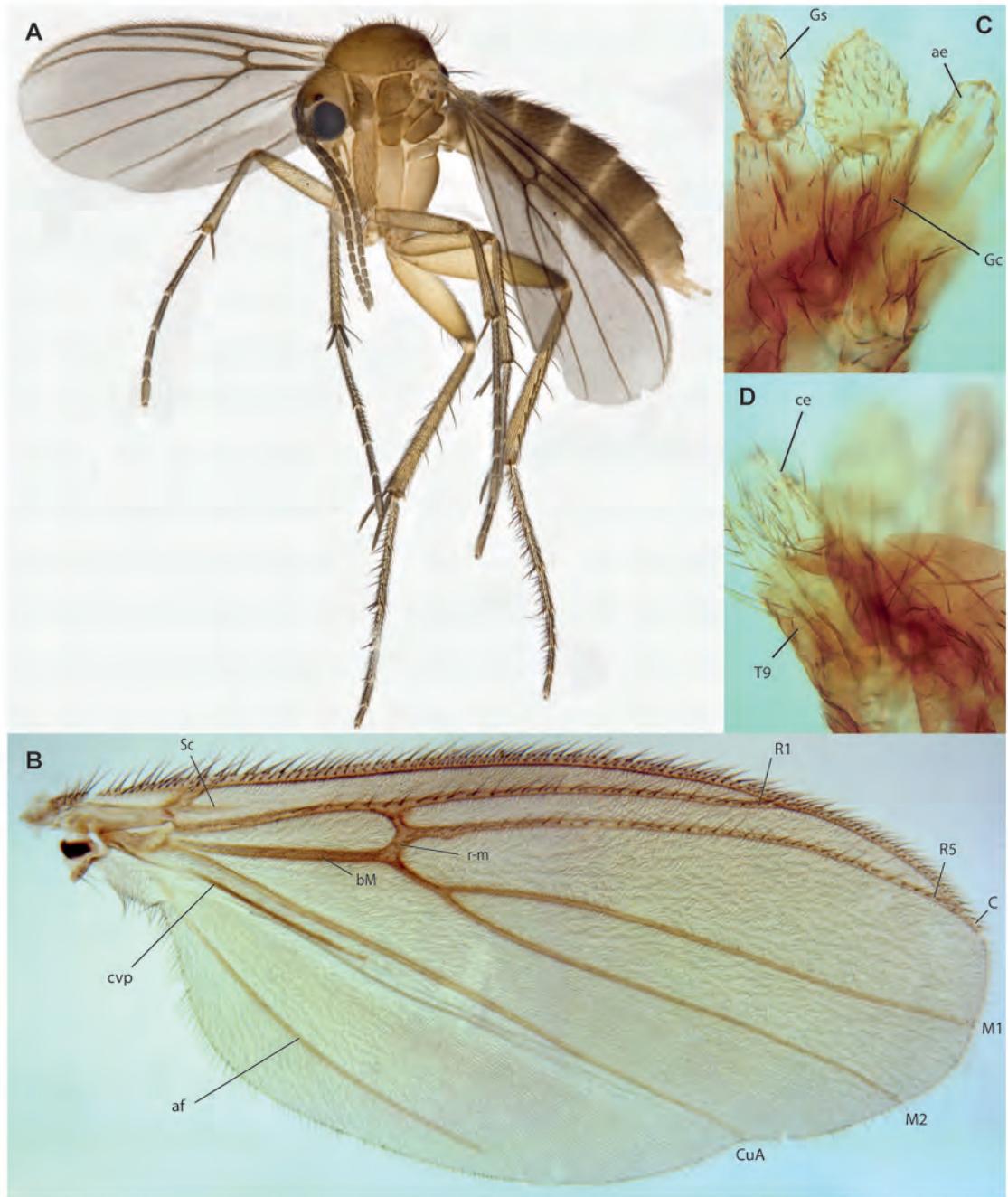


Figure XXA-F. *Platyprosthiogyne* sp.n. 11. A. Habitus, female paratype, ZRCBDP0048566. B. Wing, male holotype. C. Male terminalia, ventro-lateral view, same. D. Male terminalia, dorso-lateral view, same.

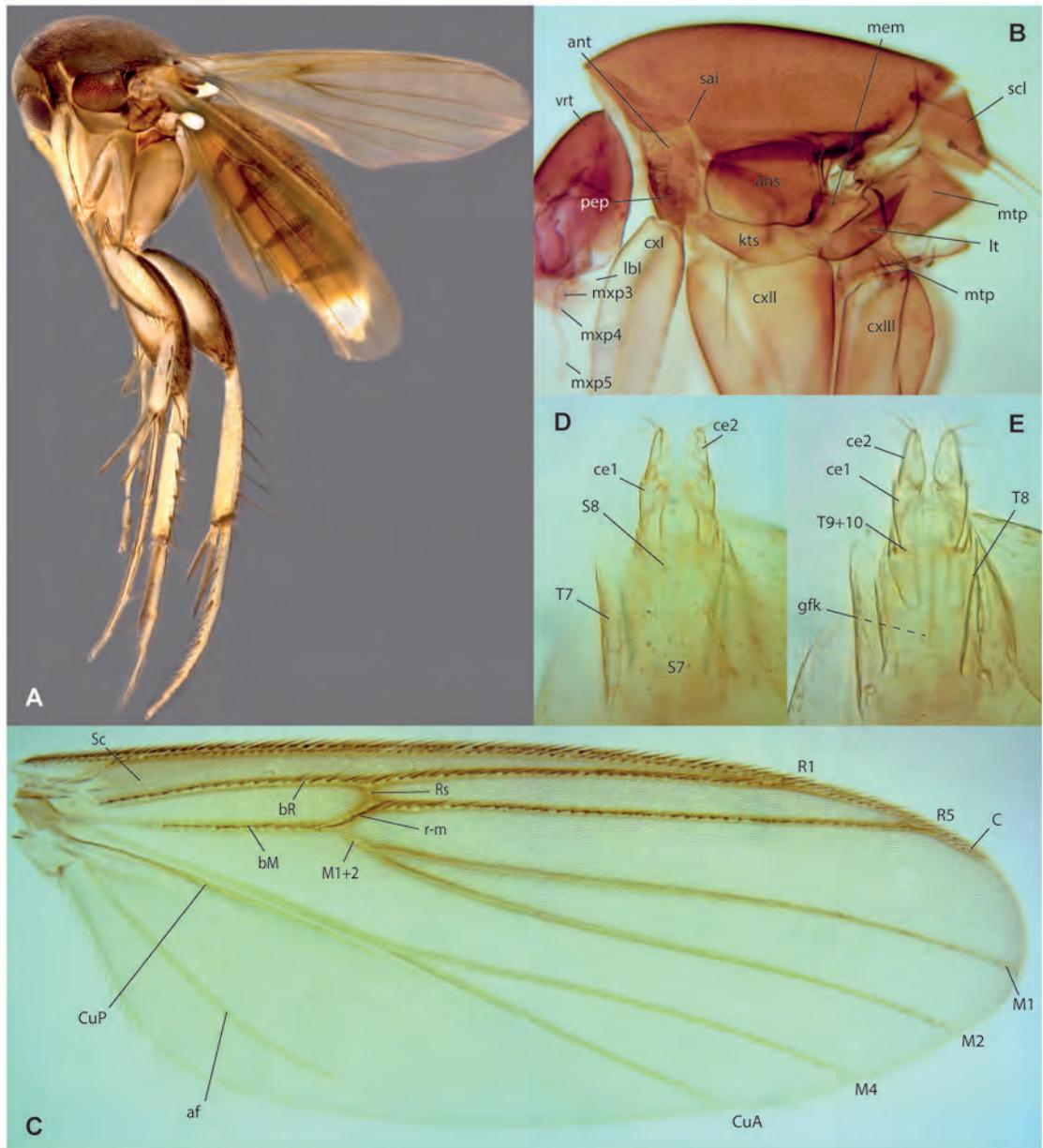


Figure XXA-F. *Platurocypta* sp.n. 08, female. A. Habitus, paratype ZRCBDP0048323. B. Thorax. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.

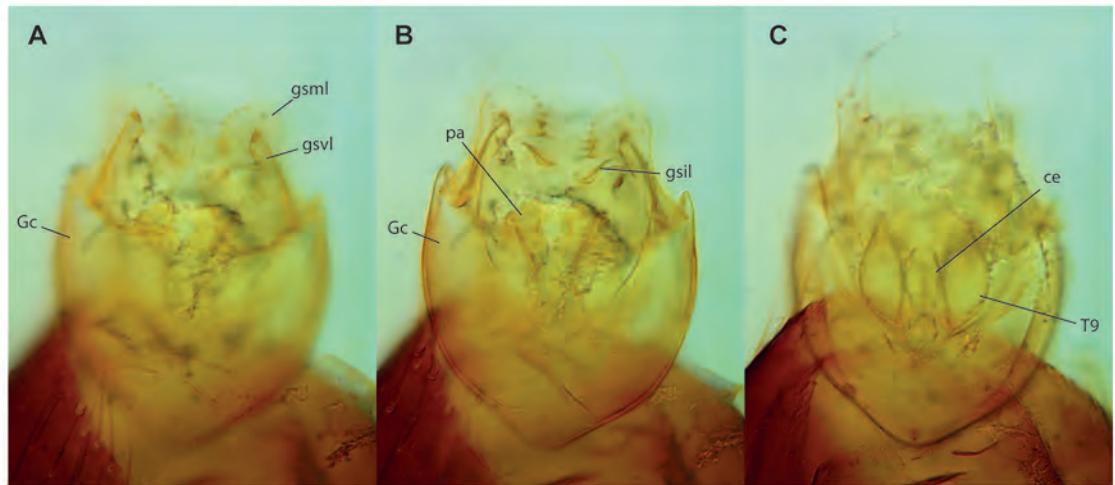


Figure XXA-F. *Platurocypta* sp.n. 08, male holotype, terminalia. A. Ventral view. B. Mid section. C. Dorsal view.

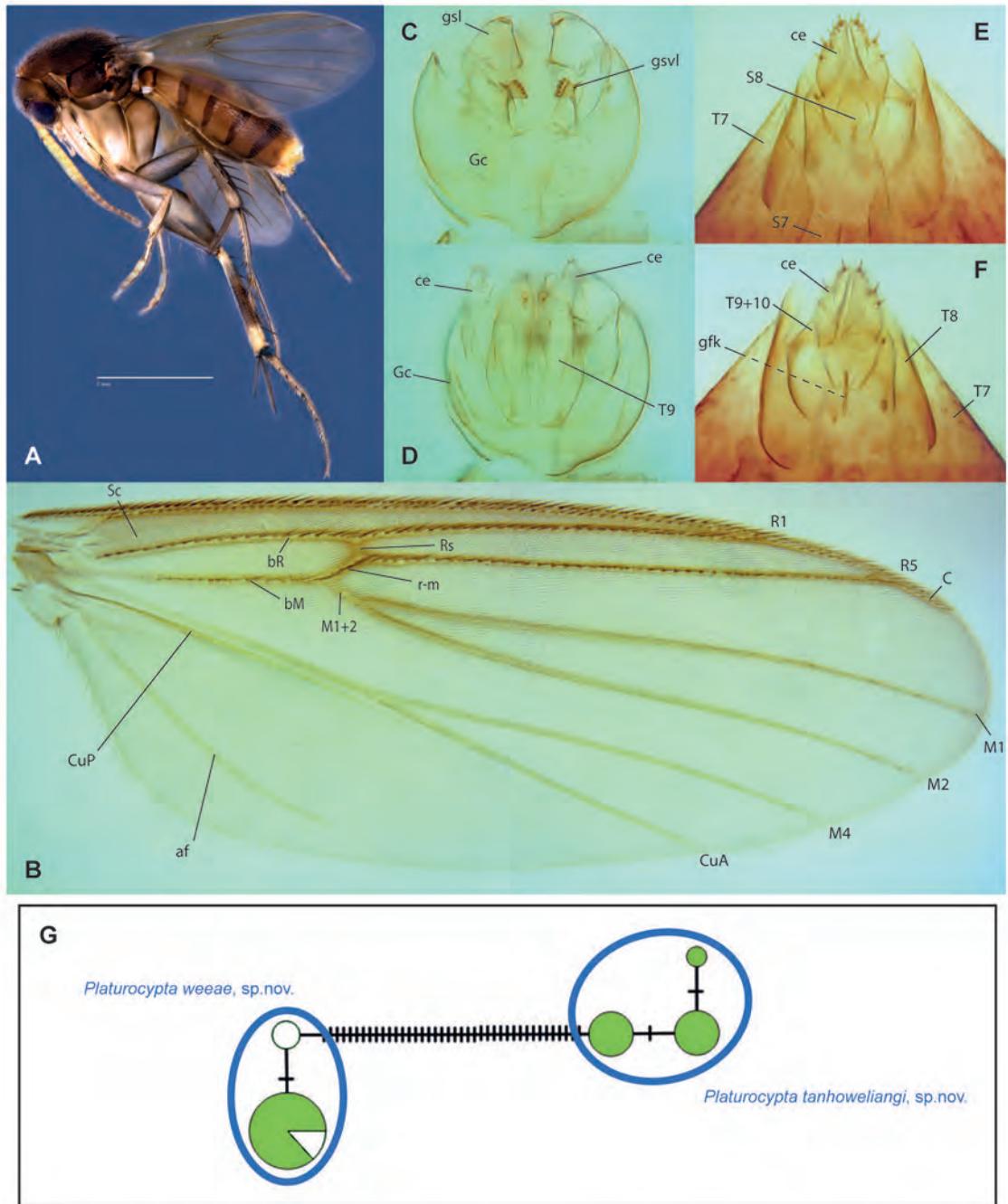


Figure XXA-F. *Platurocypta* sp.n. 04, female. A. Habitus, paratype ZRCBDP0048325. B. Wing, male holotype. C. Male terminalia, ventral view, holotype. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral view, paratype ZRCBDP0047940. F. Female terminalia, ventral view, paratype ZRCBDP0047940.

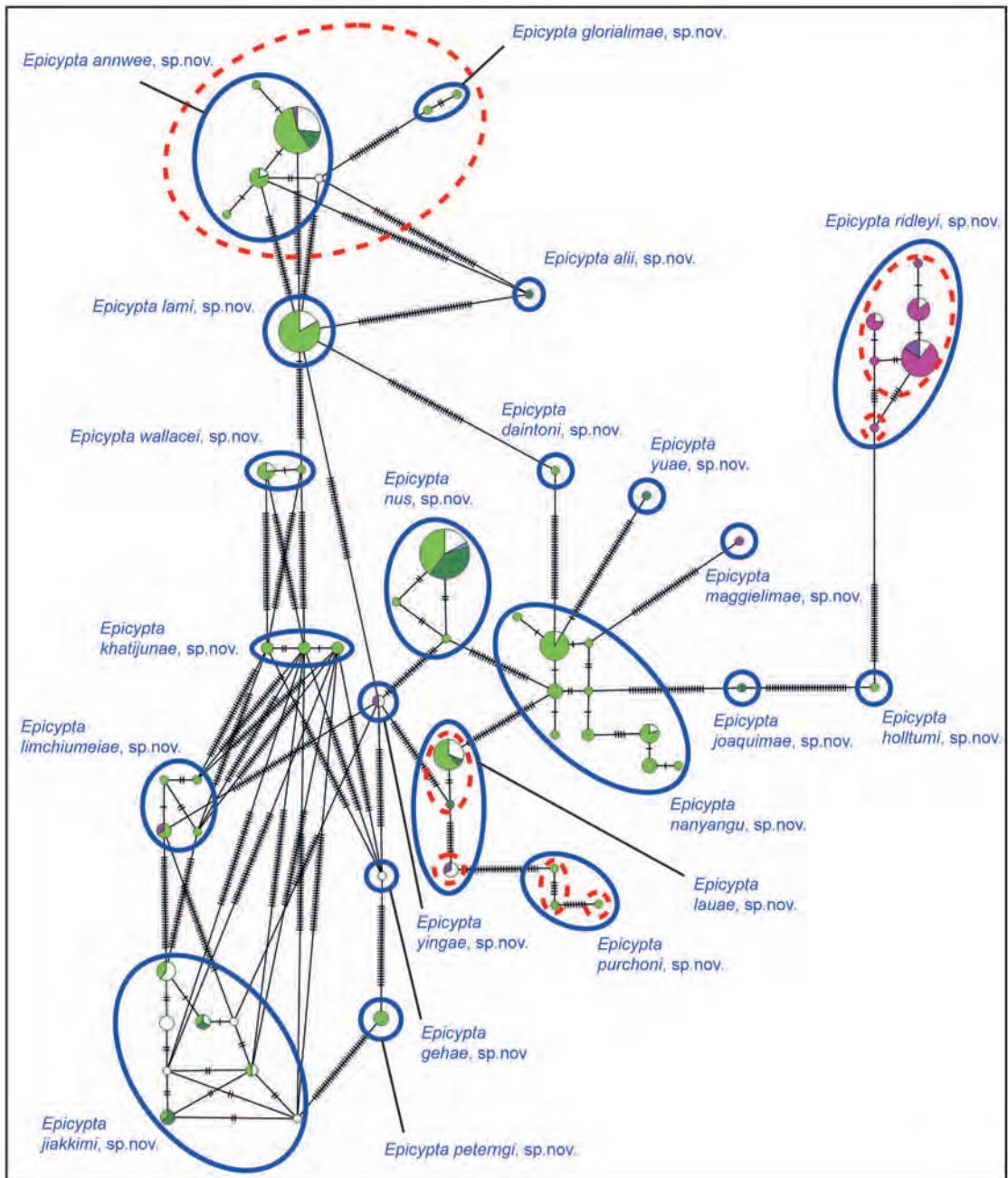


Figure XX. Haplotype network for part of the genus *Epicypta*.

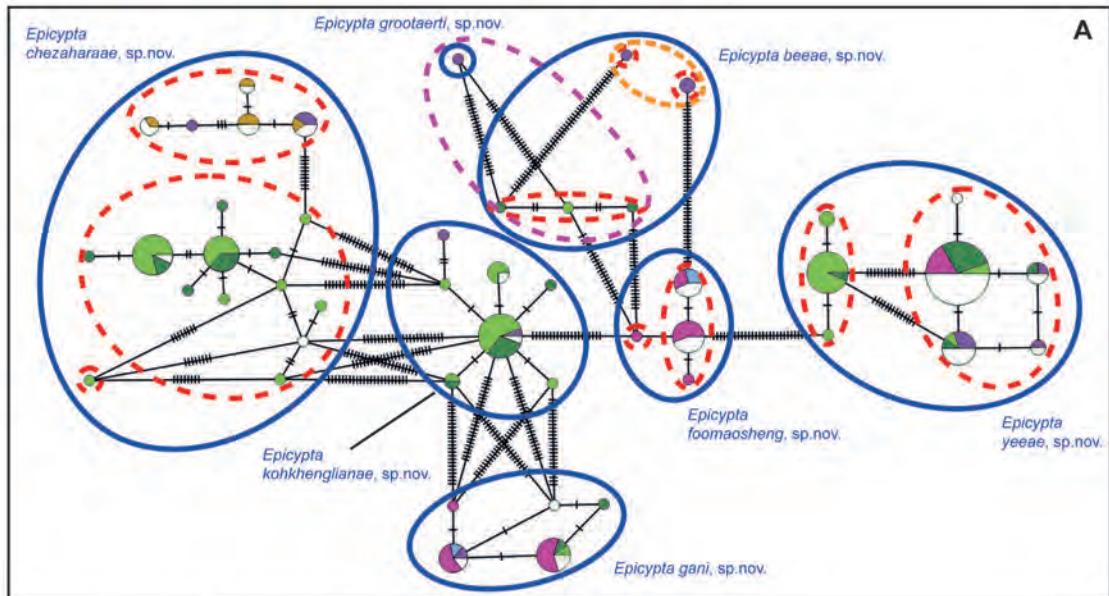


Figure XXA-B. A. Haplotype network for part of the genus *Epicypta*.

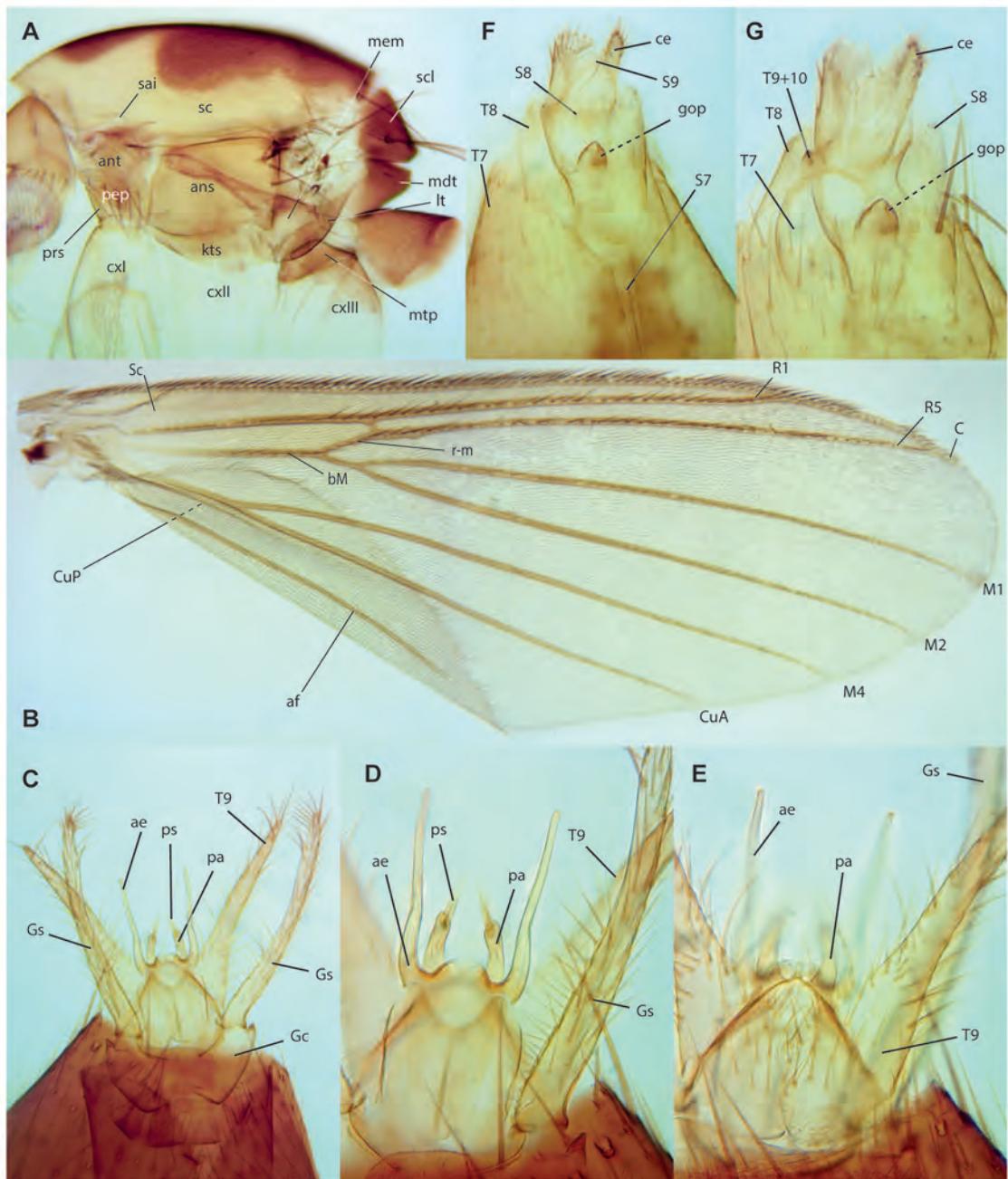


Figure XXA-D. *Epicypta* sp.n. 47. A. Thorax, female paratype, ZRCBDP0278248. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of male terminalia, ventral view, same. E. Detail of male terminalia, dorsal view, same. F. Female terminalia, ventral view, paratype ZRCBDP0278248. G. Female terminalia, dorsal view, ZRCBDP0278248.

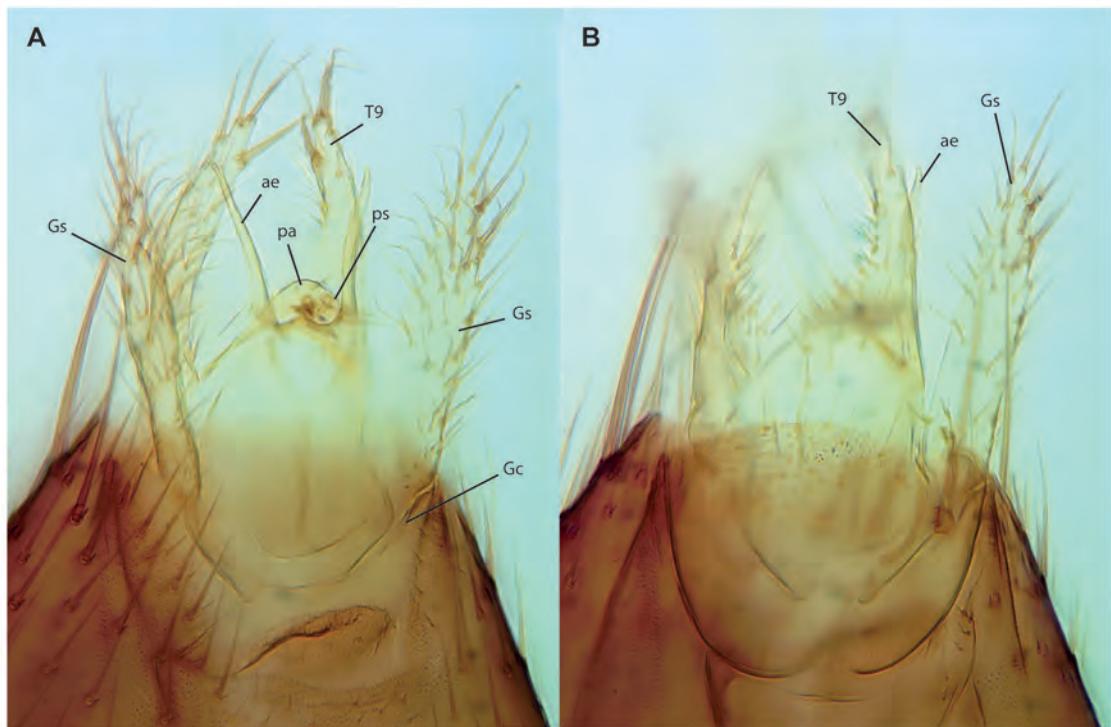


Figure XXA-F. *Epicypta* sp.n. 9, male terminalia, paratype ZRCBDP0278324. A. Ventral view.  
B. Dorsal view.

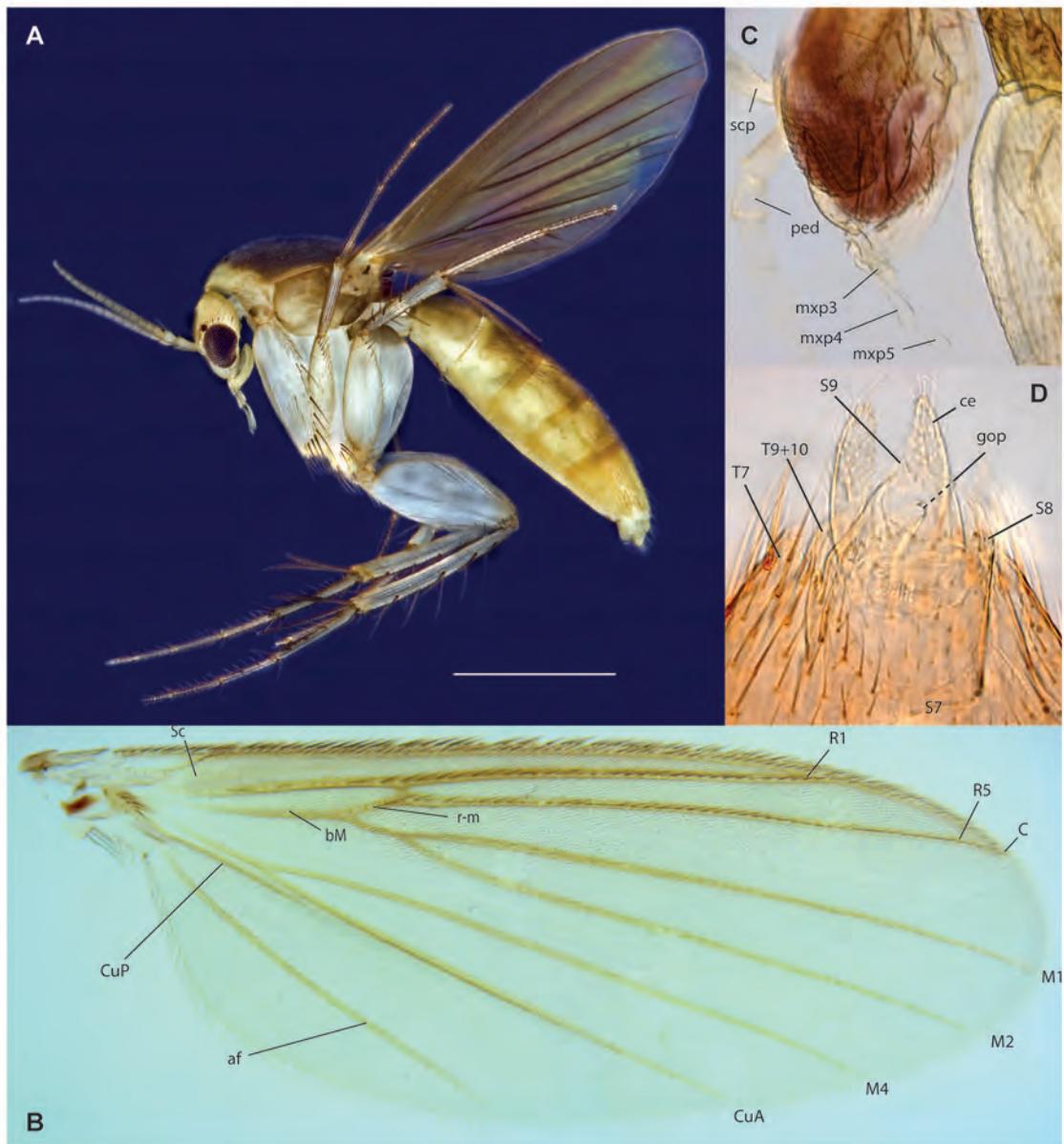


Figure XXA-F. *Epicyppta* sp.n. 9. A. Habitus, female paratype, ZRCBDP0048438. B. Head, female holotype. C. Wing, female paratype, ZRCBDP0048797. D. Female terminalia, ventral view, holotype. E. Female terminalia, dorsal view, female holotype.

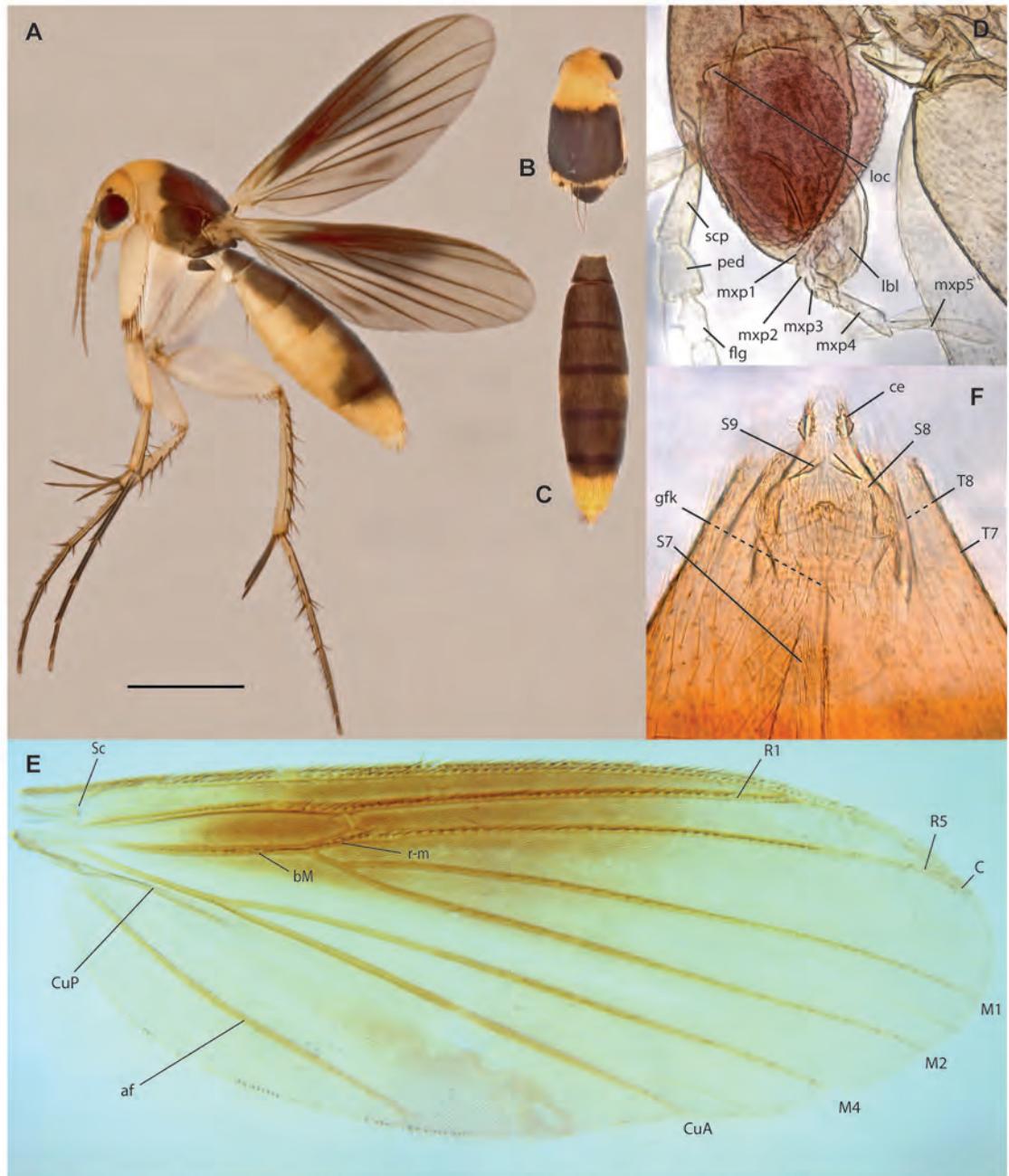


Figure XXA-F. *Epicypta* sp.n. 1. A. Habitus, female paratype, ZRCBDP0048320. B. Thorax, dorsal view, same. C. Abdomen, dorsal view, same. D. Head, female holotype. E. Wing, same. F. Terminalia, ventral view, same.

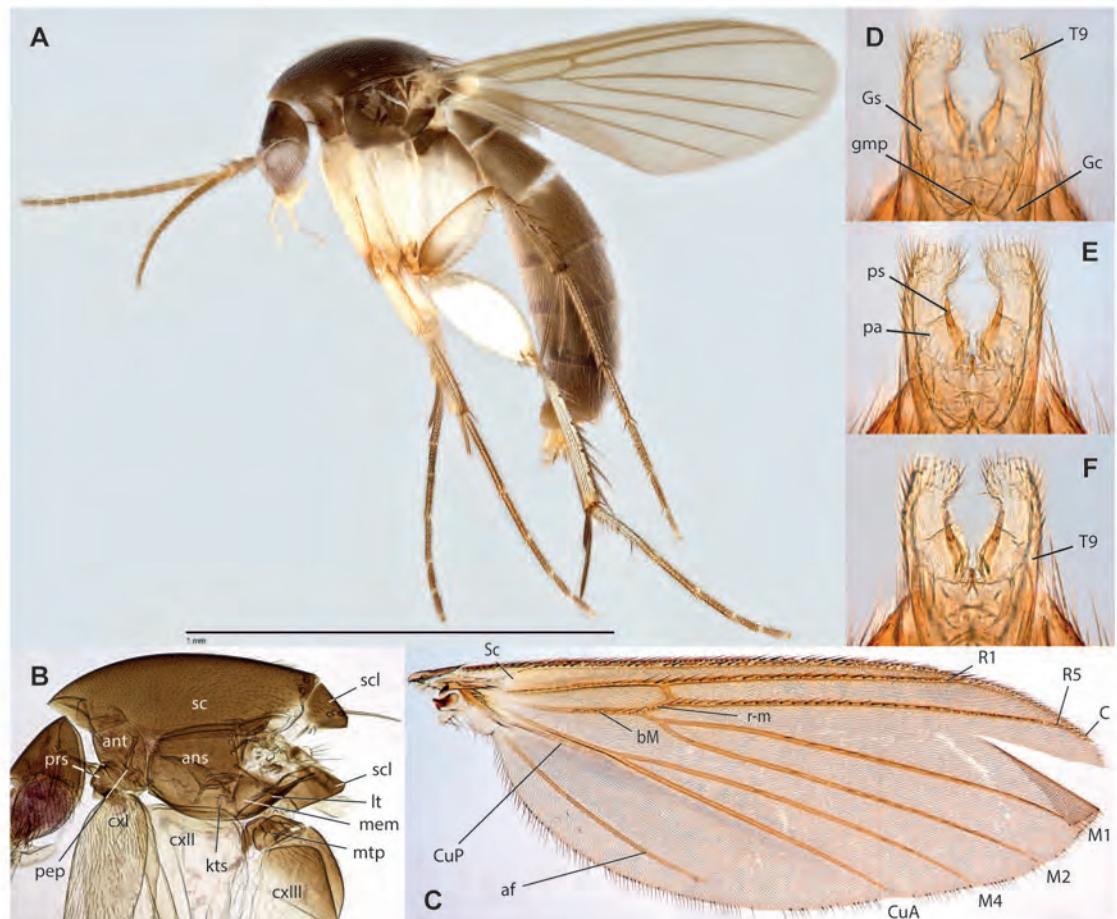


Figure XXA-F. *Epicypta* sp.n. 7. A. Habitus, male paratype, ZRCBDP0048909. B. Wing, male holotype. C. Thorax, same. D. Male terminalia, ventral view, paratype ZRCBDP0072666. E. Same, mid section. F. Same, dorsal view.

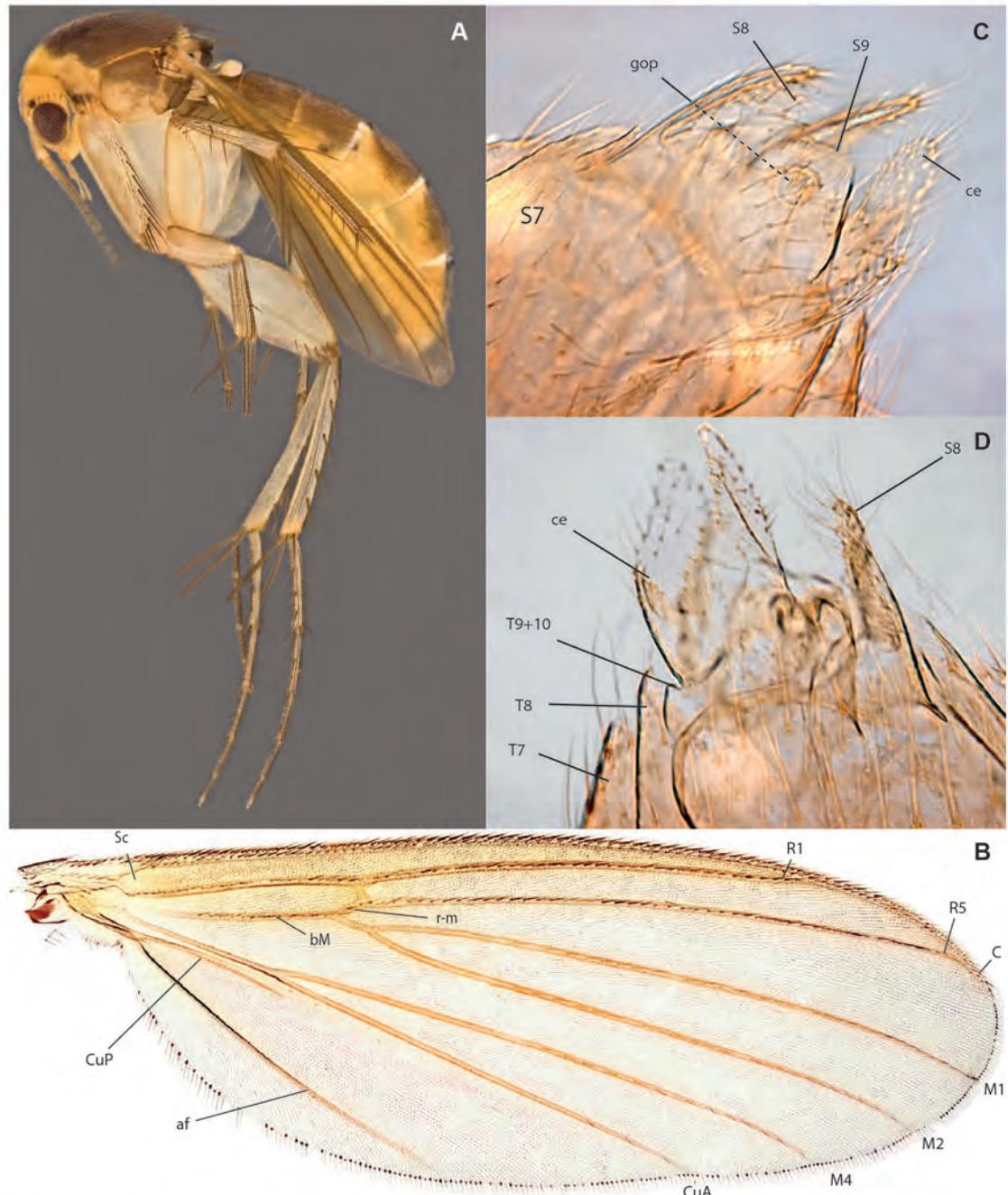


Figure XXA-F. *Epicypta* sp.n. 8. A. Habitus, female paratype, ZRCBDP0048433. B. Wing, same. C. Female terminalia, ventral view, paratype ZRCBDP0049101. D. Female terminalia, dorsal view, paratype ZRCBDP\_0047782.

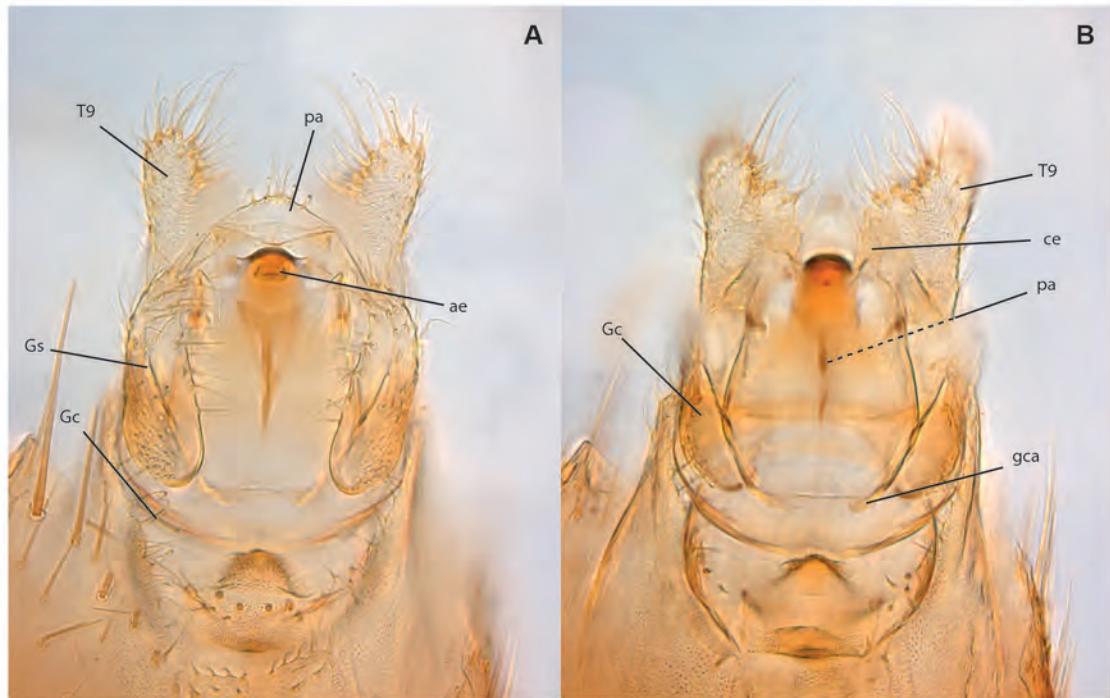


Figure XXA-F. *Epicypta* sp.n. 8, male holotype, terminalia. A. Ventral view. B. Dorsal view.

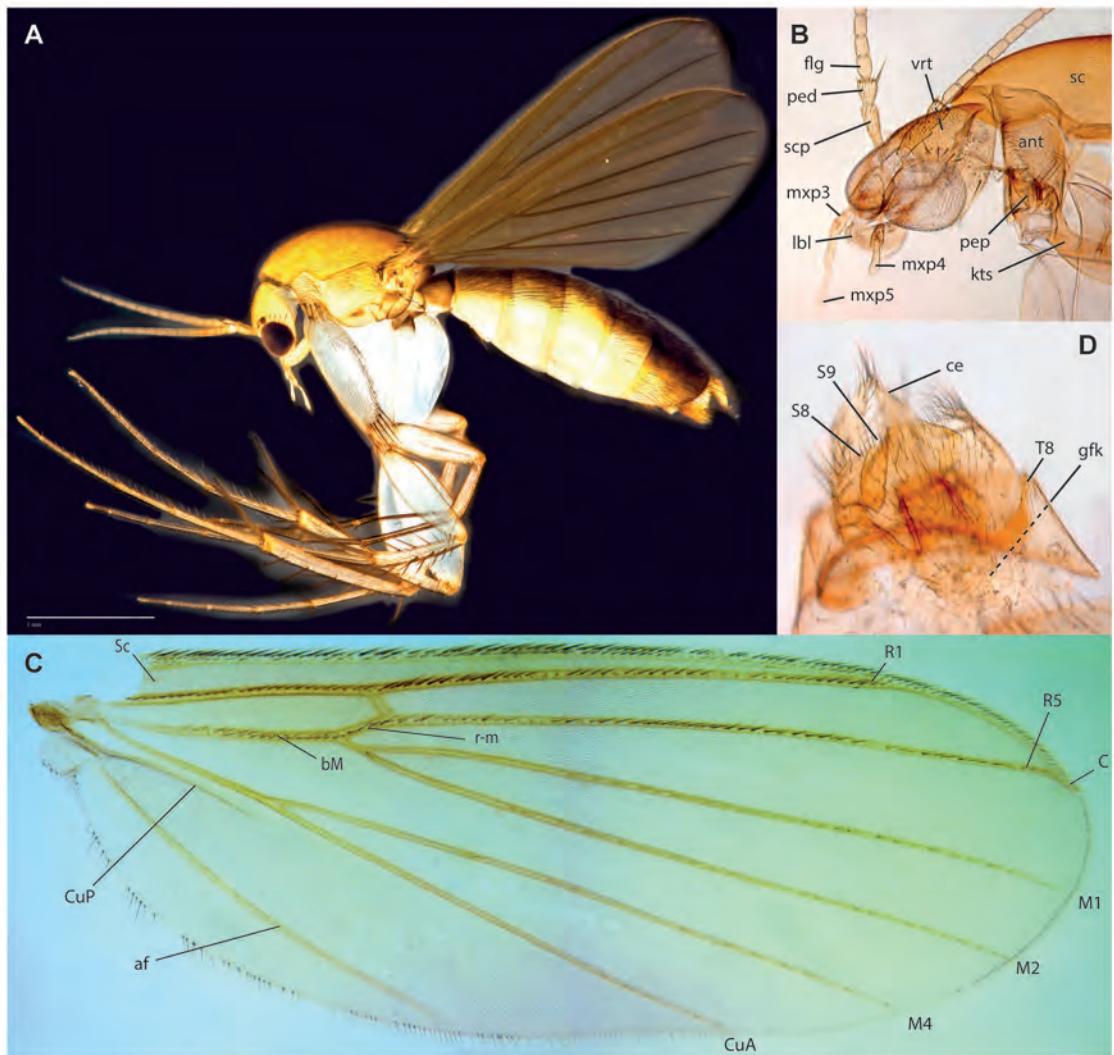


Figure XXA-D. *Epicypta* sp.n. 15, female holotype. A. Habitus. B. Head. C. Wing. D. Female terminalia, ventral view.

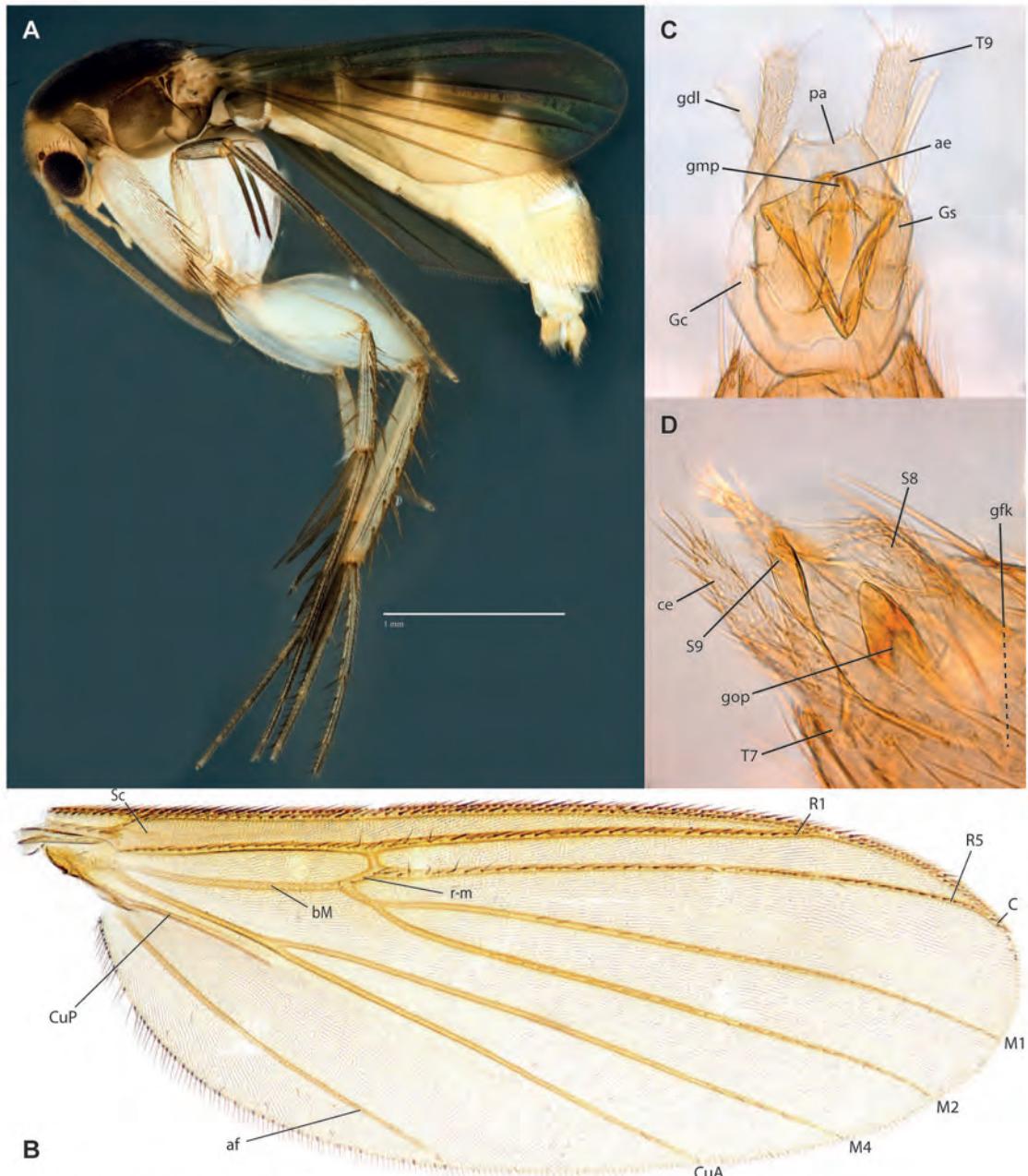


Figure XXA-D. *Epicypta* sp.n. 19. A. Habitus, female paratype ZRCBDP0048471. B. Wing, male holotype. C. Male terminalia, same. D. Female terminalia, ventral view, same.

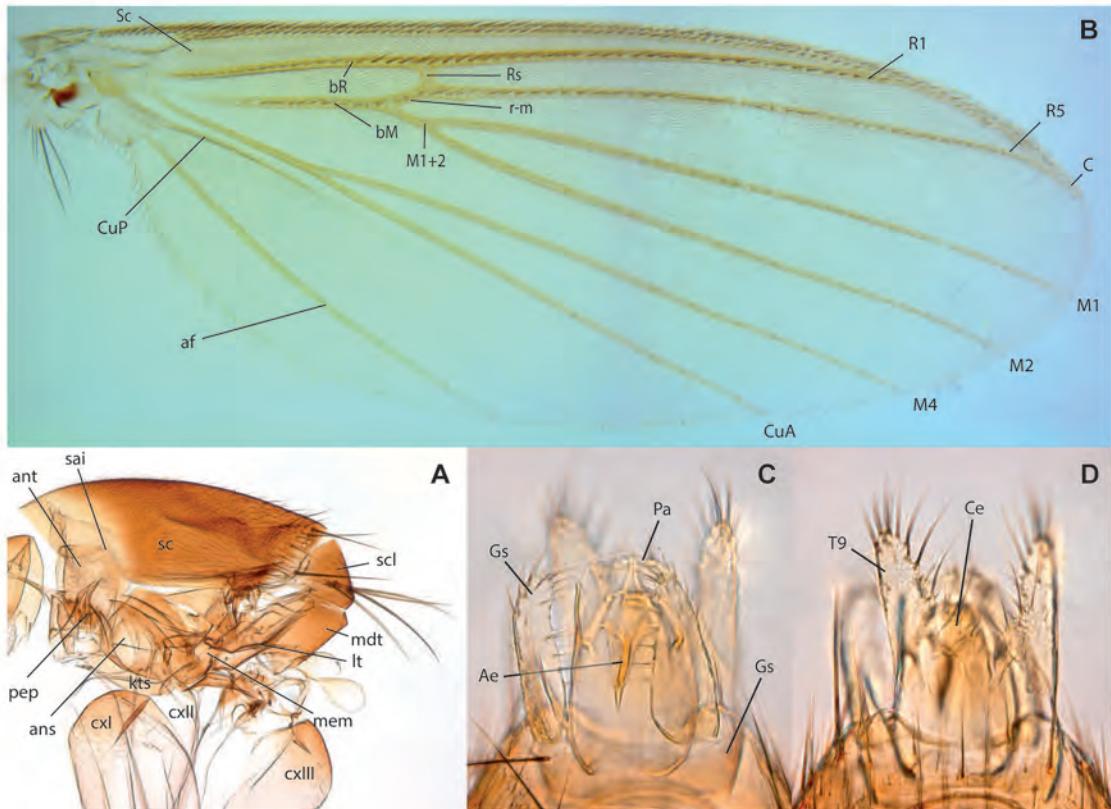


Figure XXA-D. *Epicypta* sp.n. 26, male holotype. A. Wing. B. Thorax. C. Terminalia, ventral view. D. Terminalia, dorsal view.

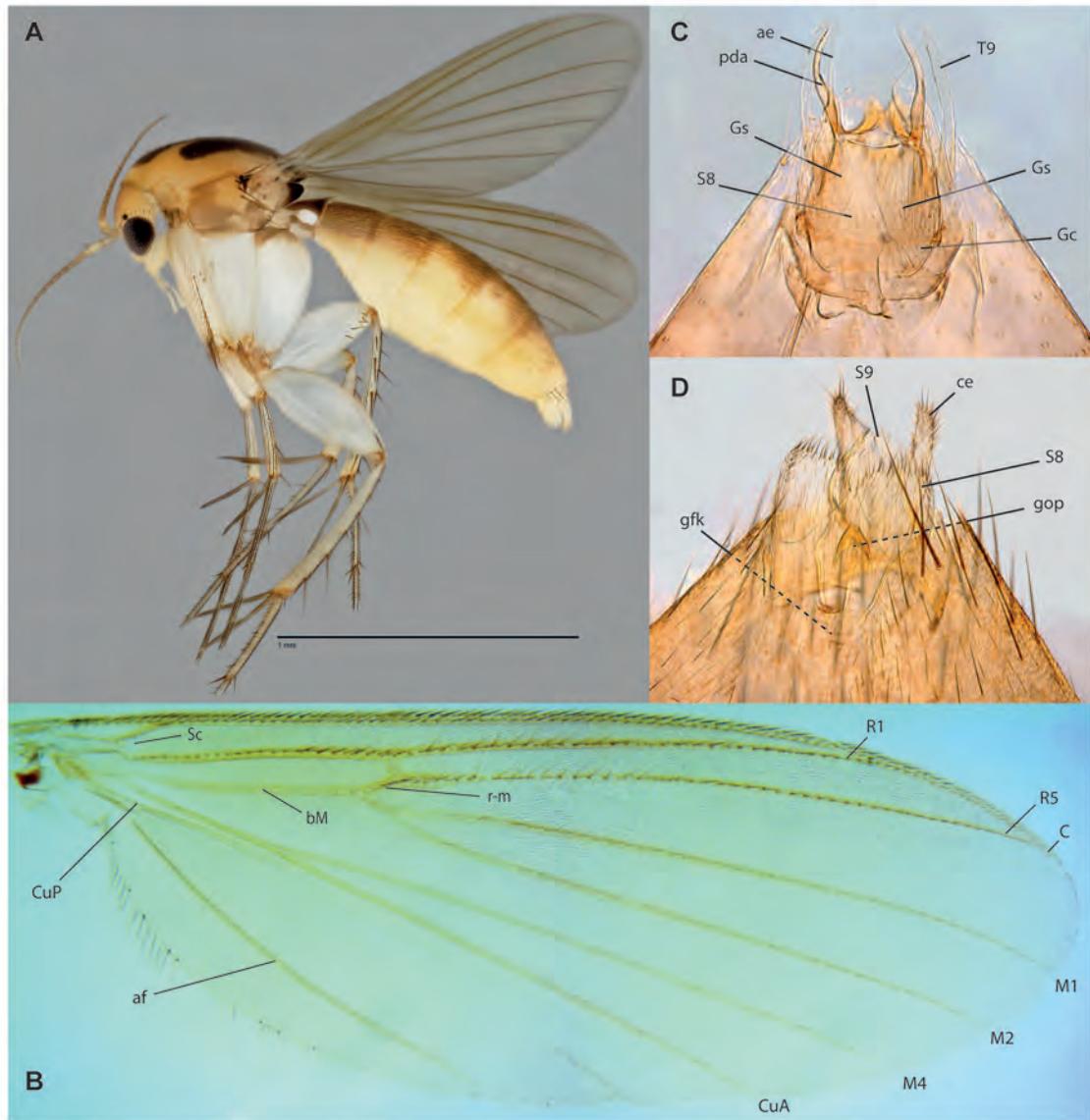


Figure XXA-D. *Epicypta* sp.n. 29, female paratype, ZRCBDP0049152. A. Habitus. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRCBDP0049062.

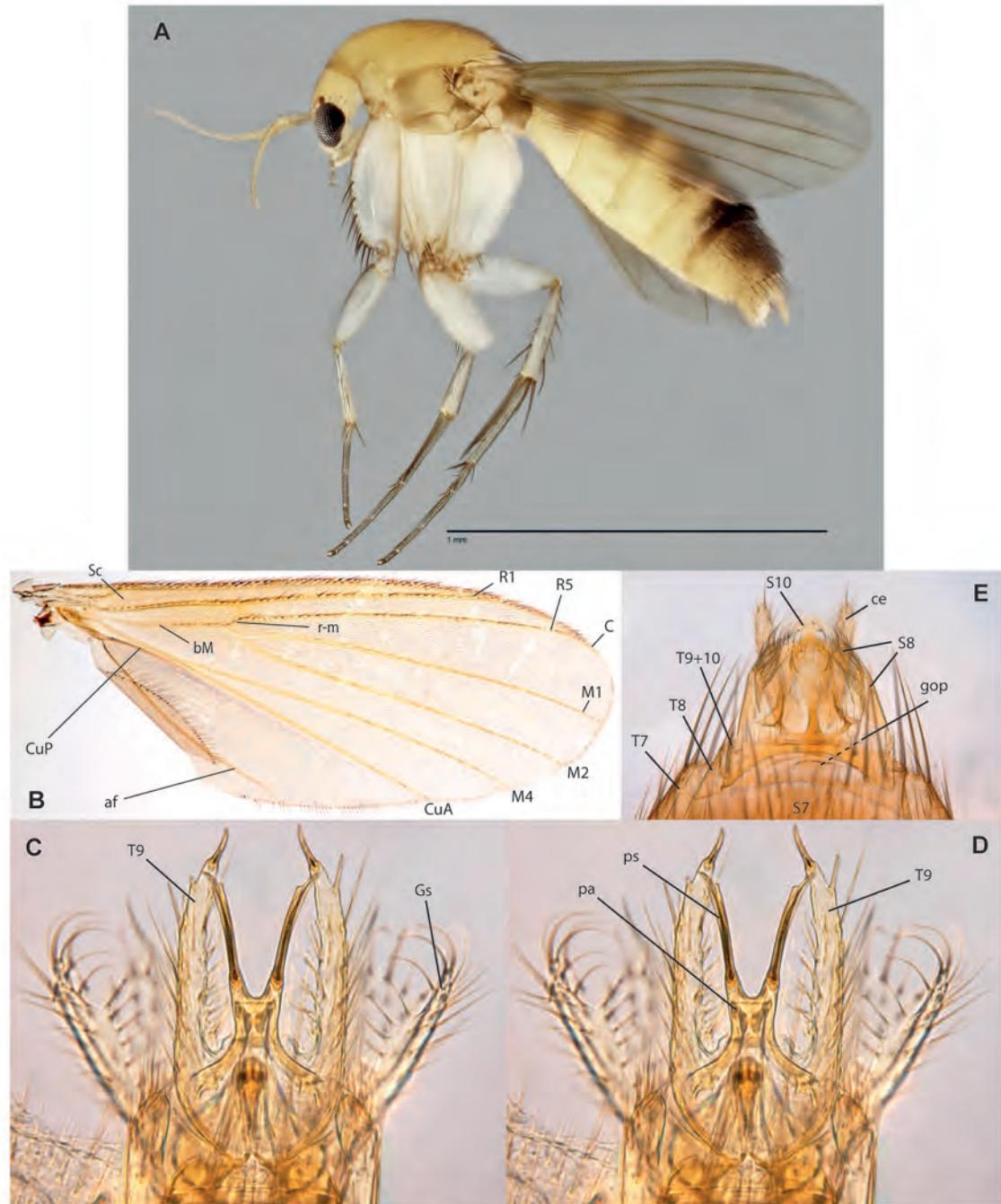


Figure XXA-F. *Epicypta* sp.n. 10. A. Habitus, female paratype, ZRCBDP0048442. B. Wing, female paratype ZRCBDP0154856. C. Male terminalia, ventral view, holotype. D. Male terminalia, dorsal view, same. E. Female terminalia, ventral view, paratype ZRCBDP0048120.

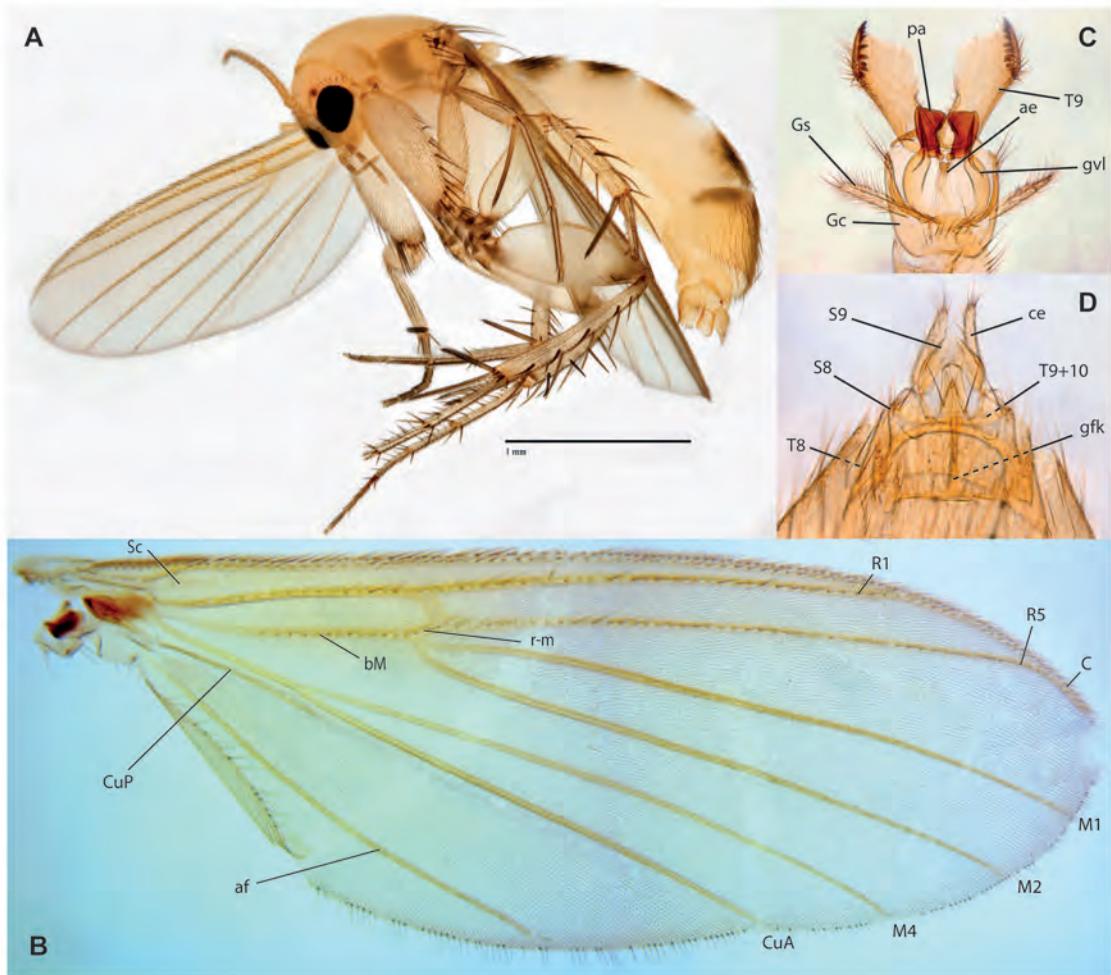


Figure XXA-D. *Epicypta* sp.n. 13. A. Habitus, female paratype, ZRCBDP0048452. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRCBDP0047866.

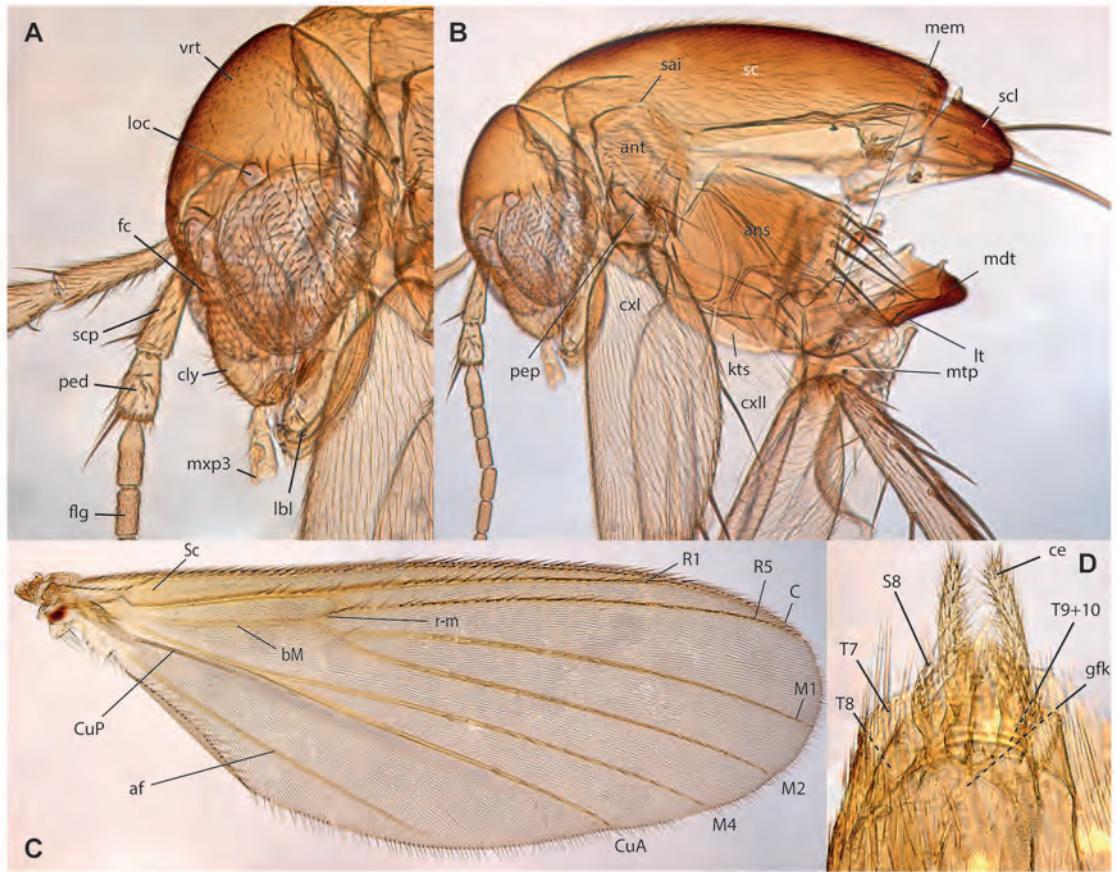


Figure XXA-D. *Epicypta* sp.n. 45. A. Habitus, female paratype ZRCBDP0137314. B. Thorax, female holotype. C. Wing, same. E. Female terminalia, ventral view, same.

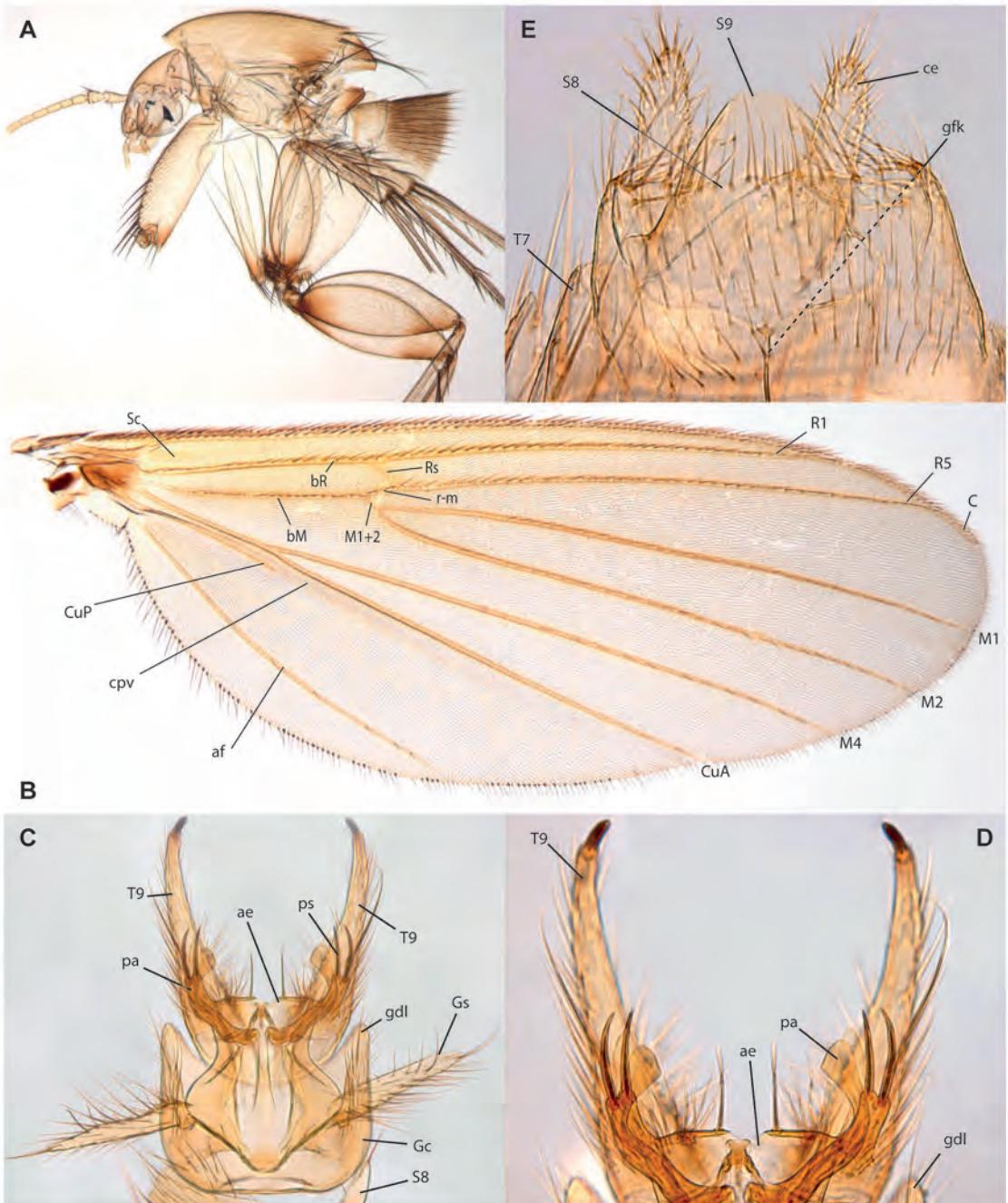


Figure XXA-D. *Epicypta* sp.n. 46. A. Thorax and head, male holotype. B. Wing, same. C. Male terminalia, ventral view, same. D. Male terminalia, distal end, ventral view, same. E. Female terminalia, paratype ZRCBDP0284204.

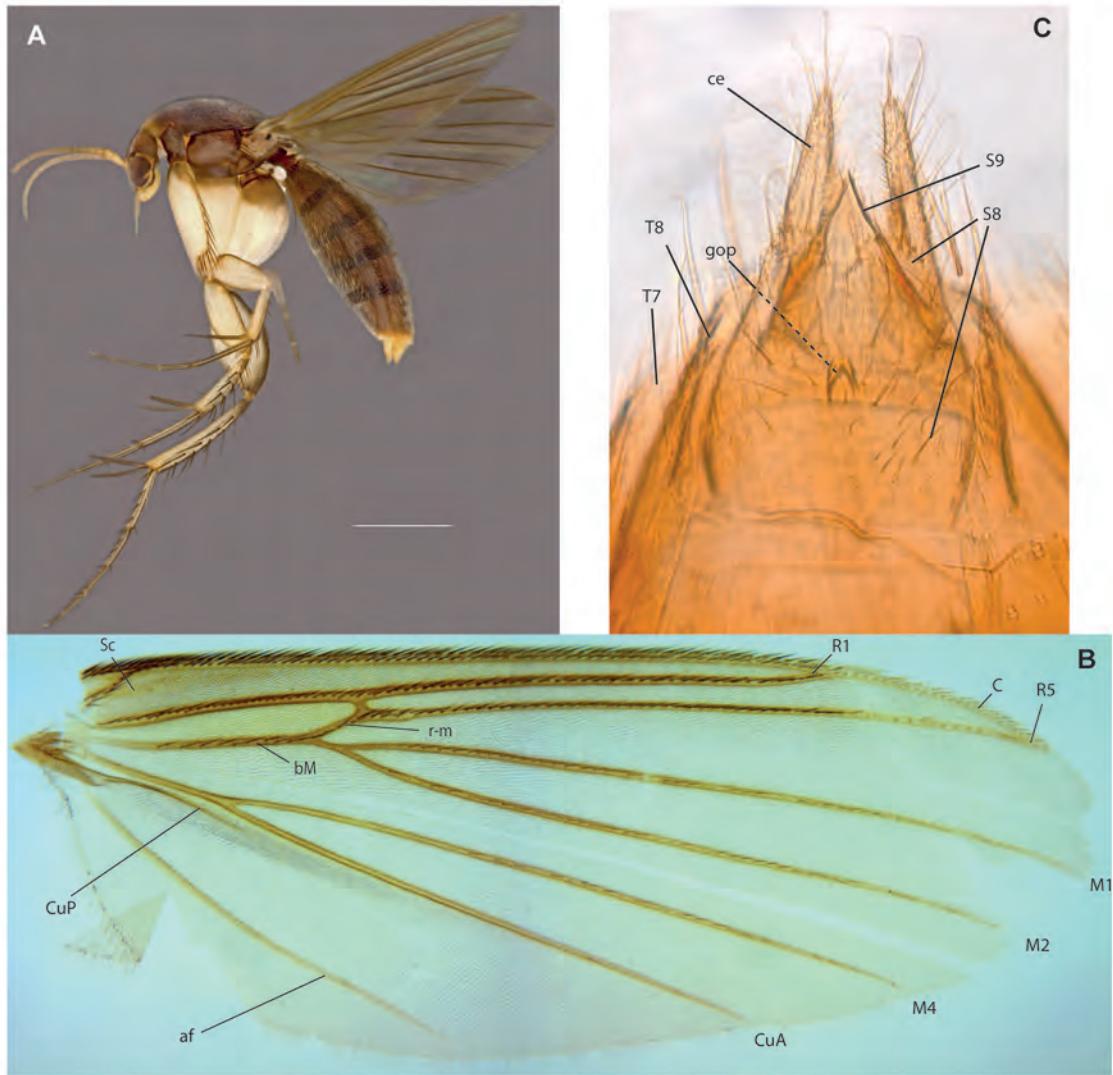


Figure XXA-F. *Epicypta* sp.n. 2. A. Habitus, female paratype, ZRCBDP0048431. B. Wing, male holotype. C. Female terminalia, ventral view.

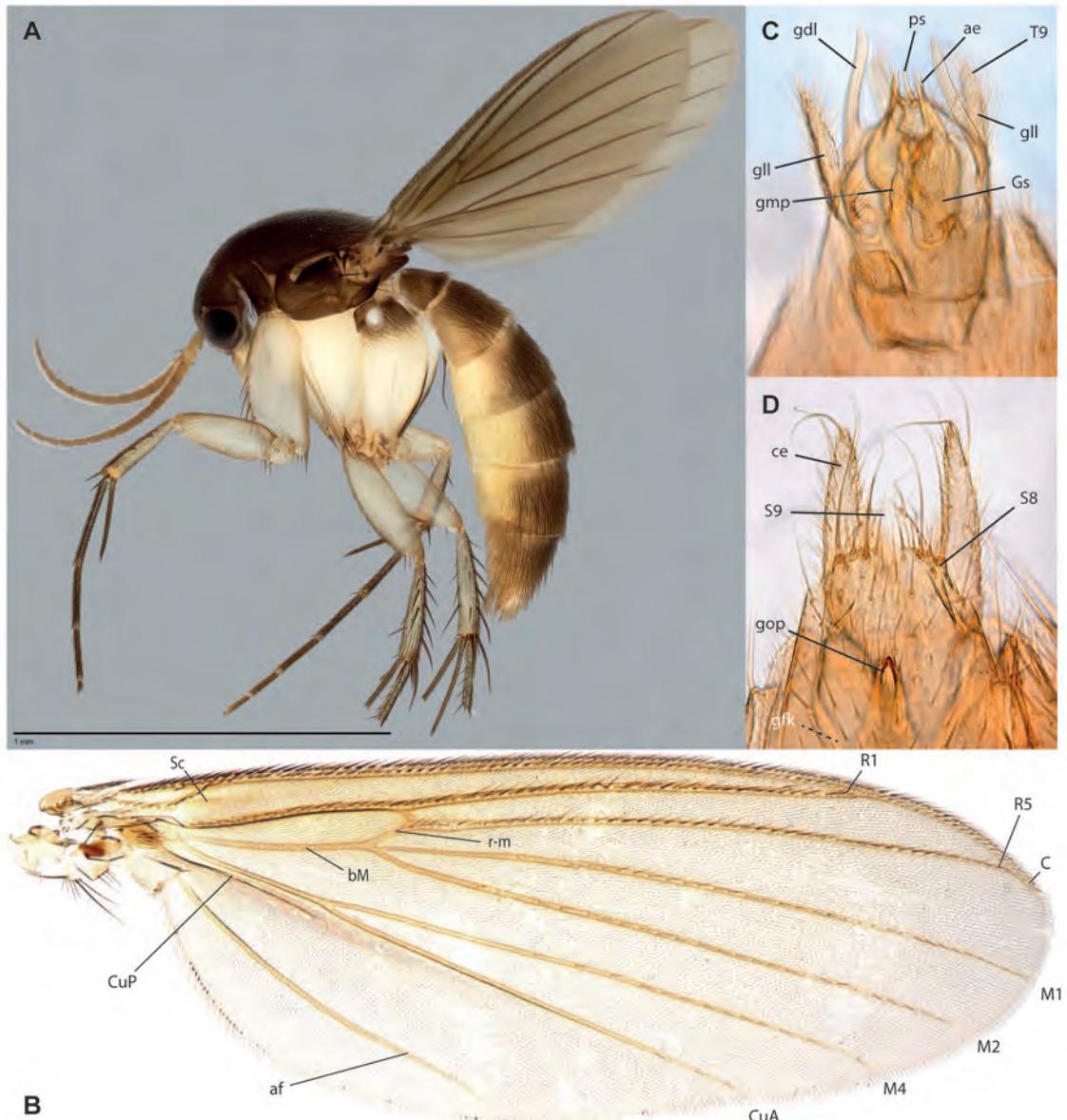


Figure XXA-D. *Epicypta* sp.n. 20. A. Habitus, female paratype ZRCBDP0047857. B. Wing, male holotype. C. Male terminalia, same. D. Female terminalia, ventral view, ZRCBDP0047813.

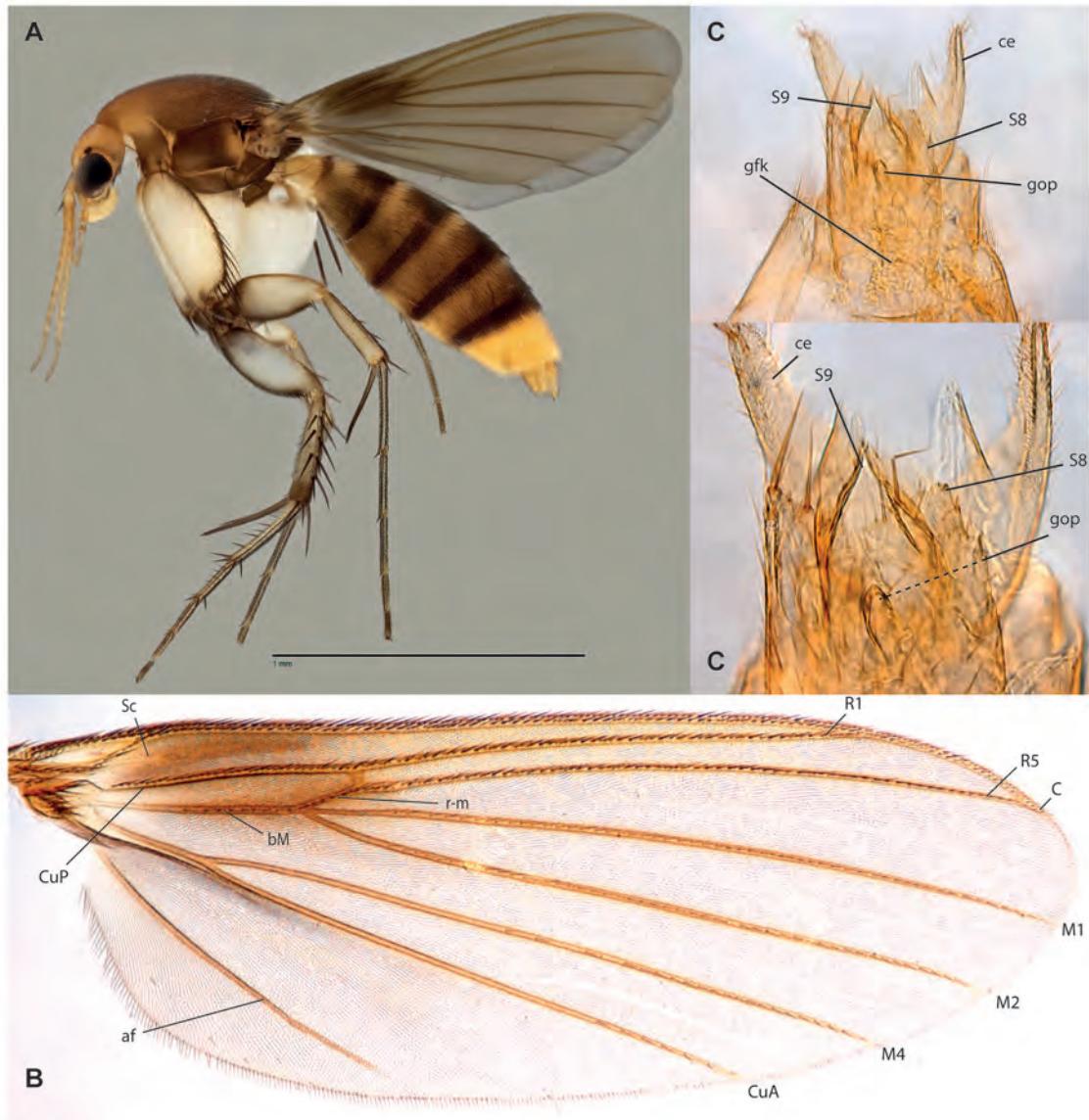


Figure XXA-D. *Epicypta* sp.n. 27, female holotype. A. Habitus. B. Wing. C. Thorax. D. Terminalia, ventral view.

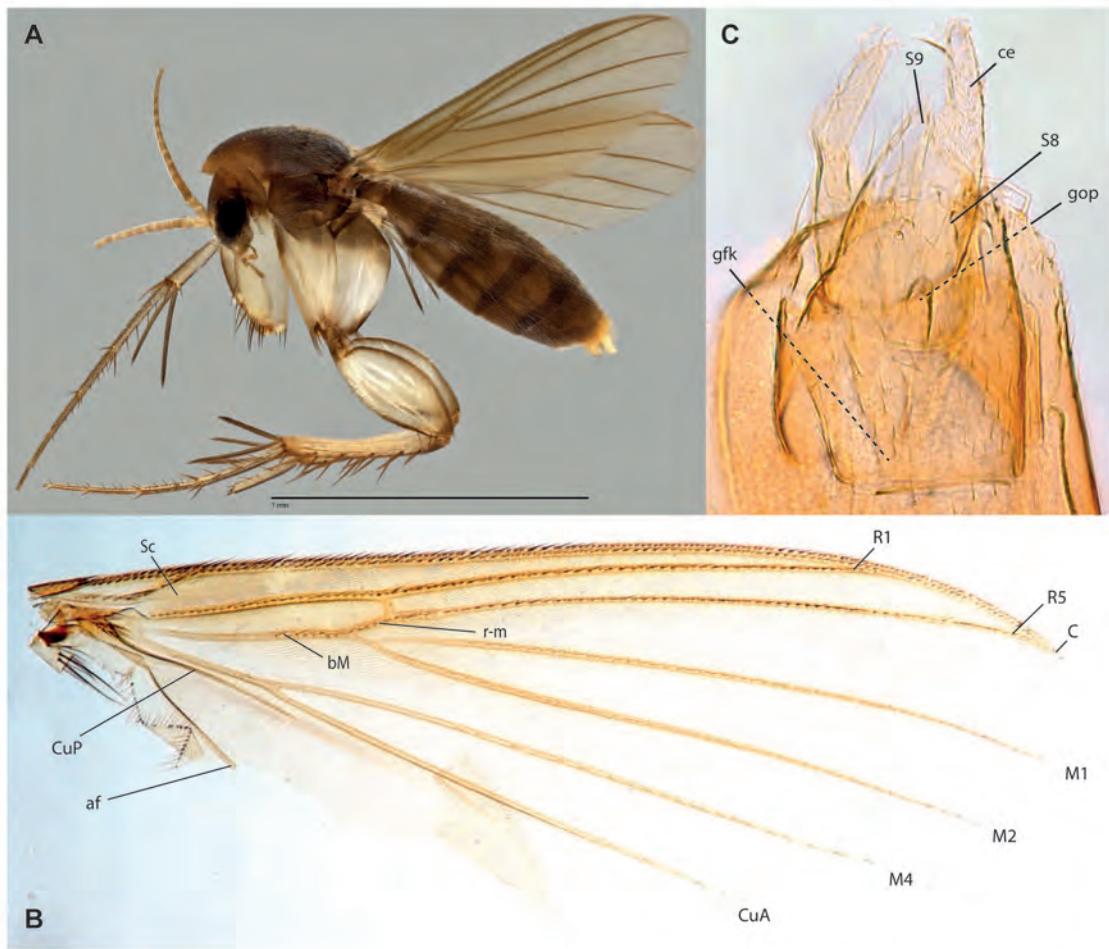


Figure XXA-D. *Epicypta* sp.n. 30, female holotype. A. Habitus. B. Wing. C. Terminalia, ventral view.

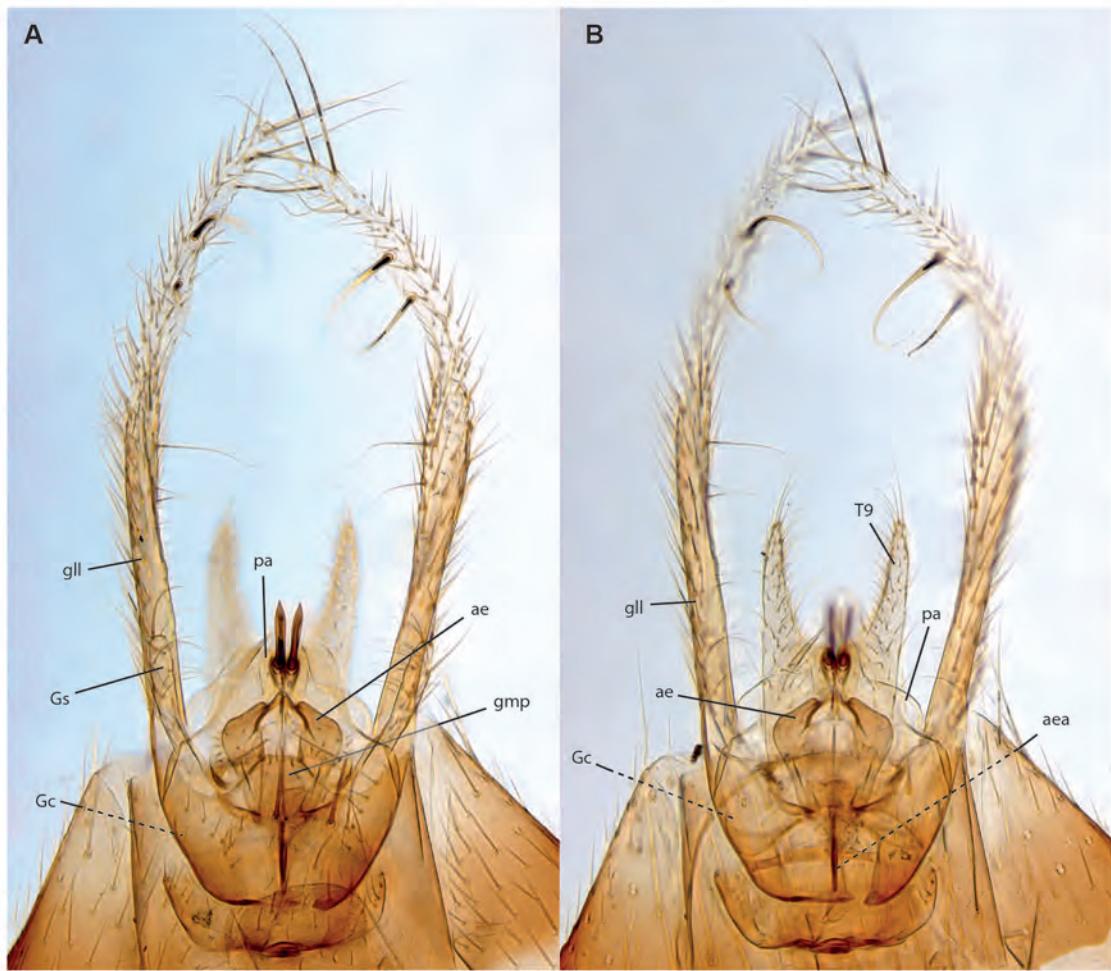


Figure XXA-D. *Epicypta* sp.n. 30, male holotype, terminalia. A. Ventral view. B. Dorsal view.

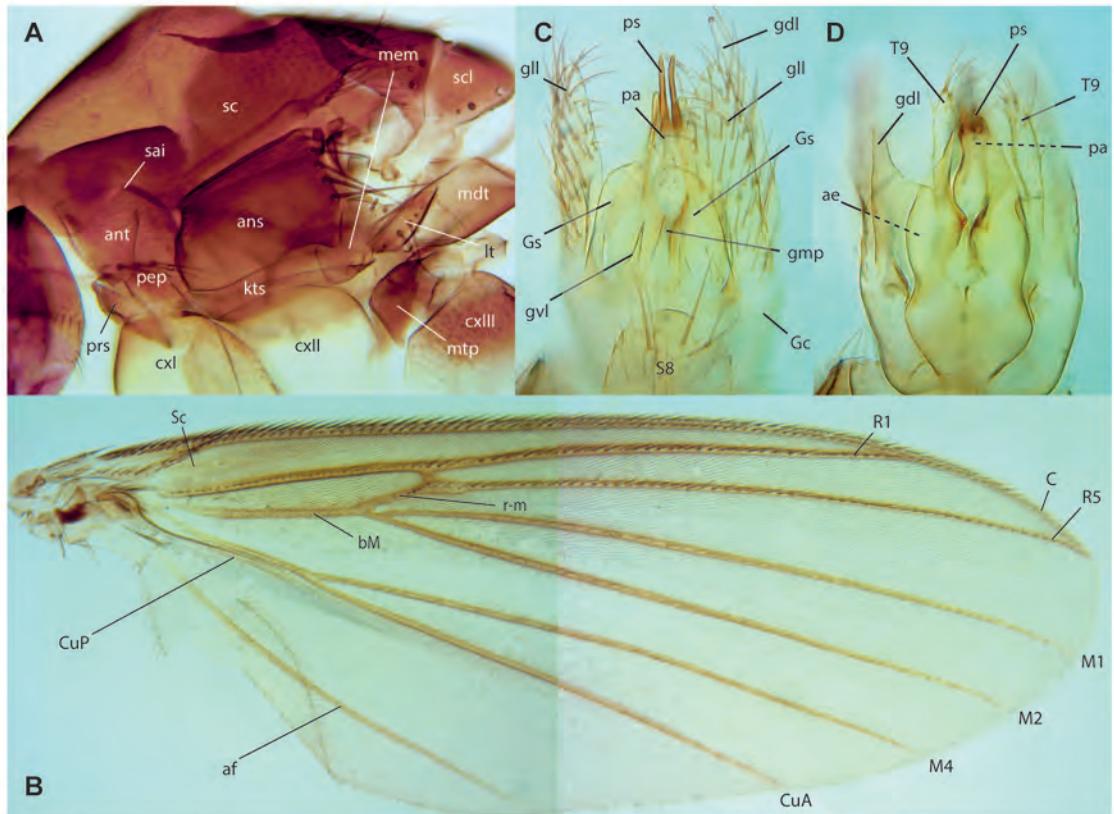


Figure XXA-D. *Epicypta* sp.n. 49, male holotype. A. Thorax. B. Wing. C. Terminalia, ventral view. D. Terminalia, dorsal view.

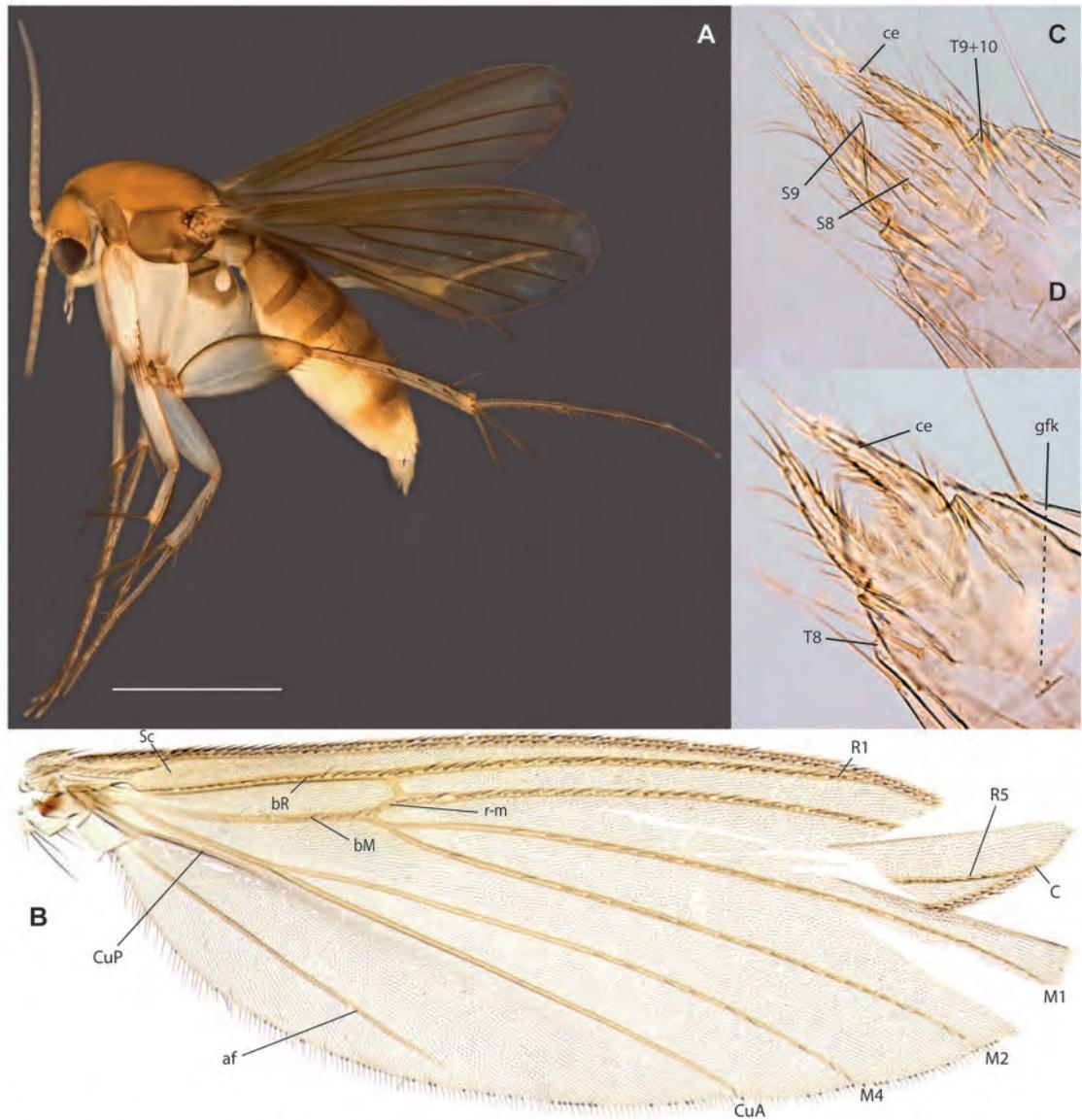


Figure XXA-D. *Epicypta* sp.n. 14. A. Habitus, female paratype, ZRCBDP0048455. B. Wing, female holotype. C. Female terminalia, ventral view, same. D. Female terminalia, dorsal view, same.

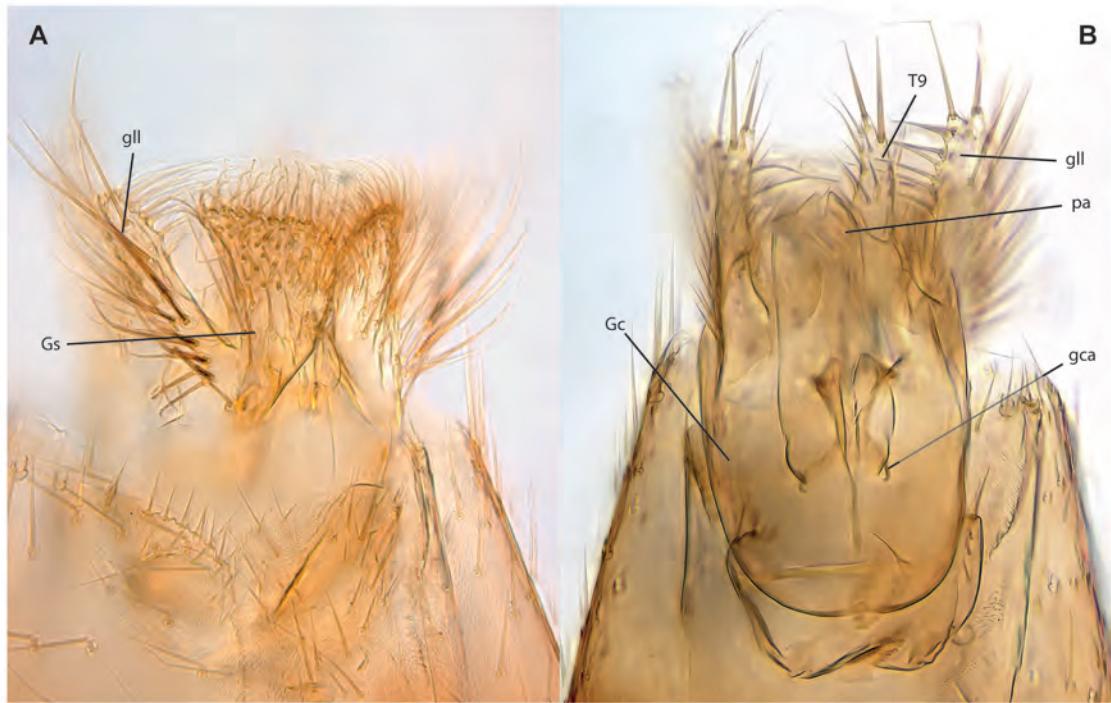


Figure XXA-D. *Epicypta* sp.n. 14, male terminalia. A. Ventral view, paratype ZRCBDP0048864. B. Dorsal view, paratype ZRCBDP0049088.

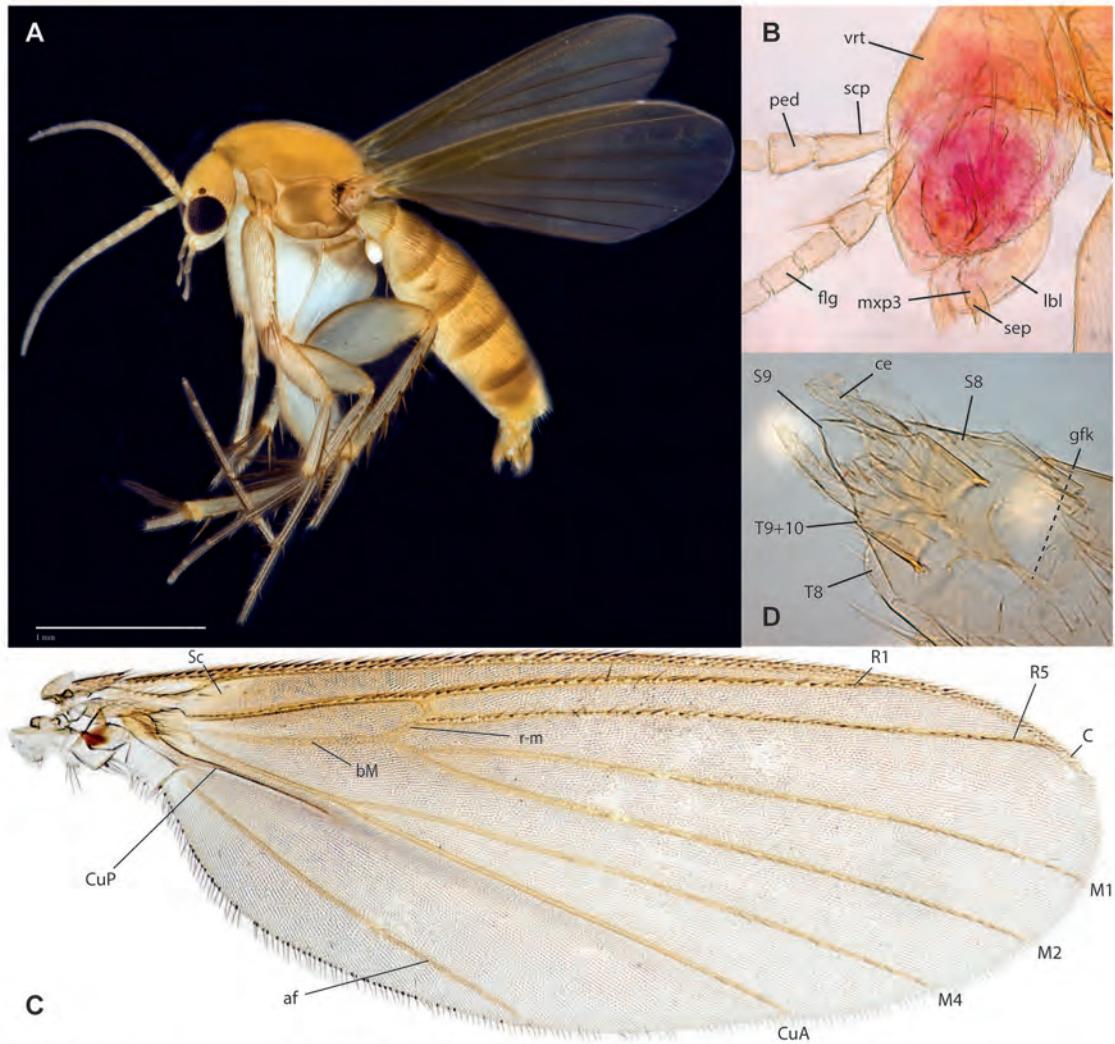


Figure XXA-D. *Epicypta* sp.n. 18. A. Habitus, female paratype ZRCBDP0048469. B. Head, female paratype ZRCBDP0048900 (maxillary palpomeres 4–5 missing). C. Wing, same. D. Female terminalia, ventral view, same.

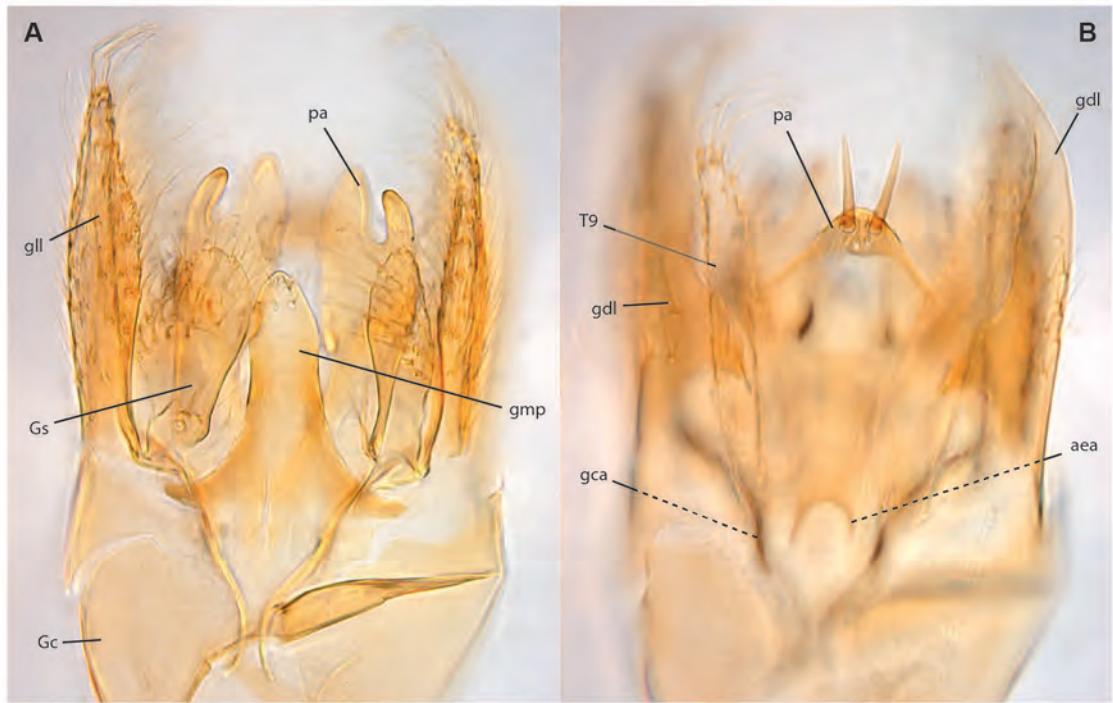


Figure XXA-D. *Epicypta* sp.n. 18, male terminalia, paratype ZRCBDP0048469. A. Ventral view.  
B. Dorsal view.

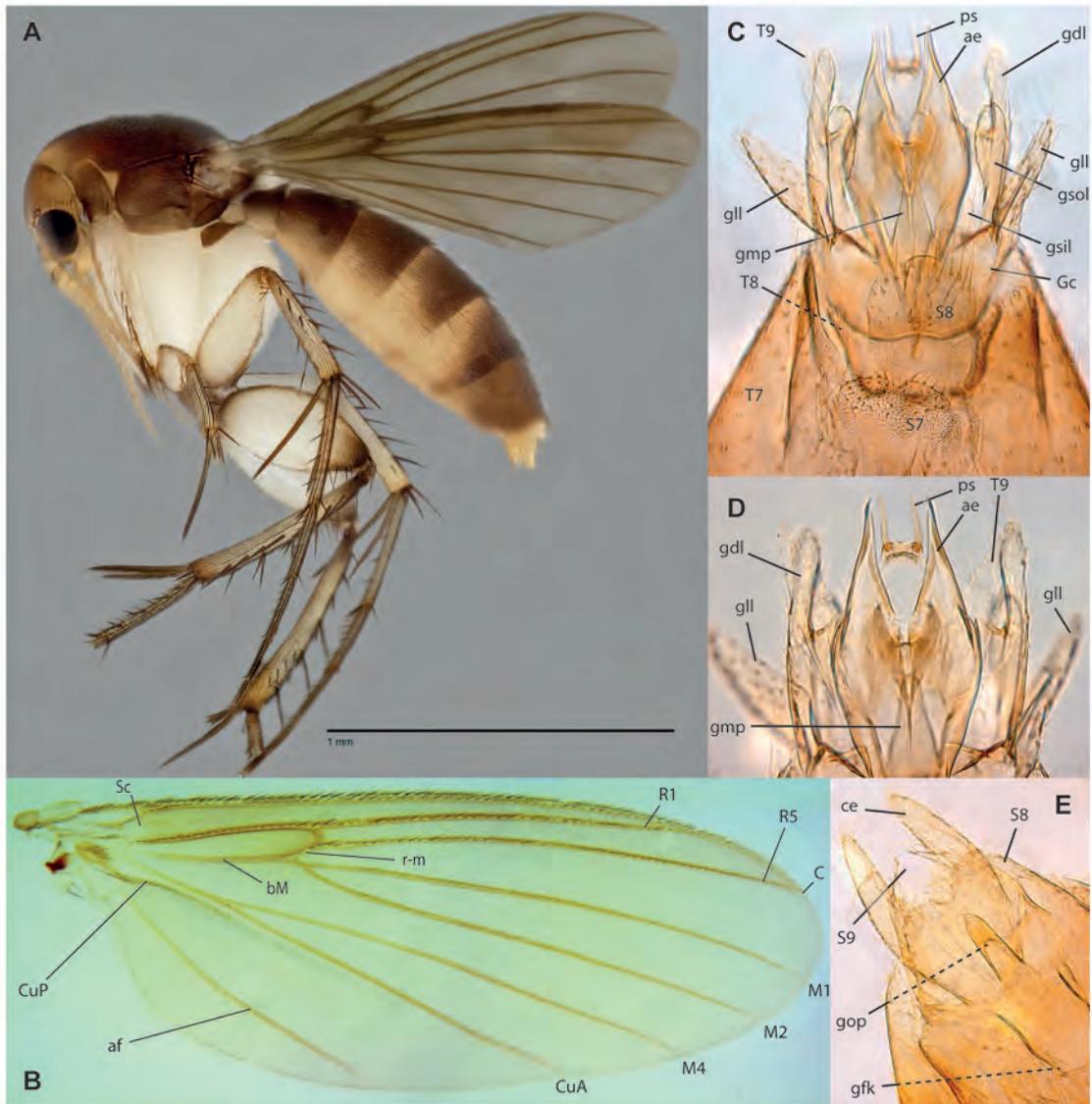


Figure XXA-D. *Epicypta* sp.n. 21. A. Habitus, female paratype ZRCBDP0047927. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of distal end of male terminalia, same. E. Female terminalia, ventral view, ZRCBDP0047927.

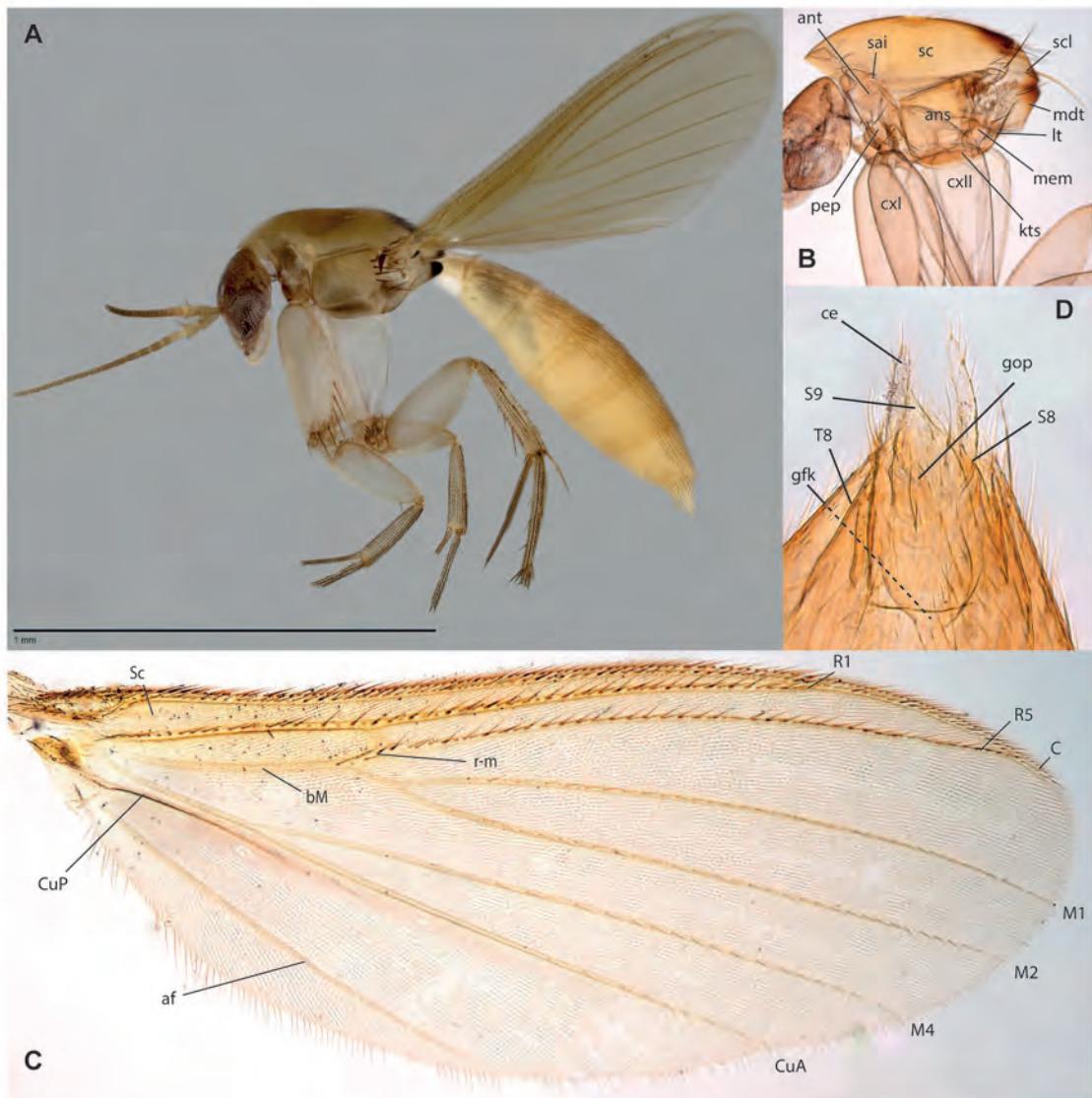


Figure XXA-D. *Epicypta* sp.n. 25, female holotype. A. Habitus. B. Wing. C. Thorax. D. Terminalia, ventral view.

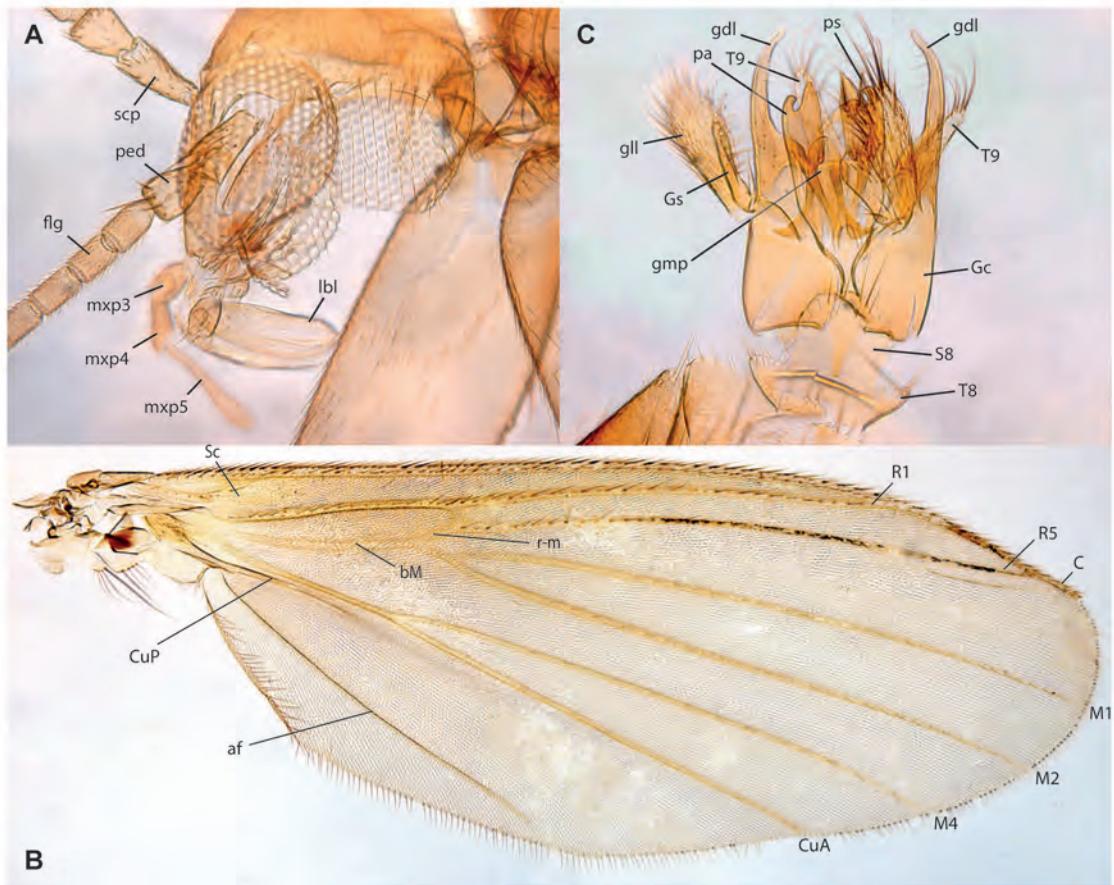


Figure XXA-D. *Epicypta* sp.n. 33, male holotype. A. Head. B. Wing. C. Male terminalia, ventral view.

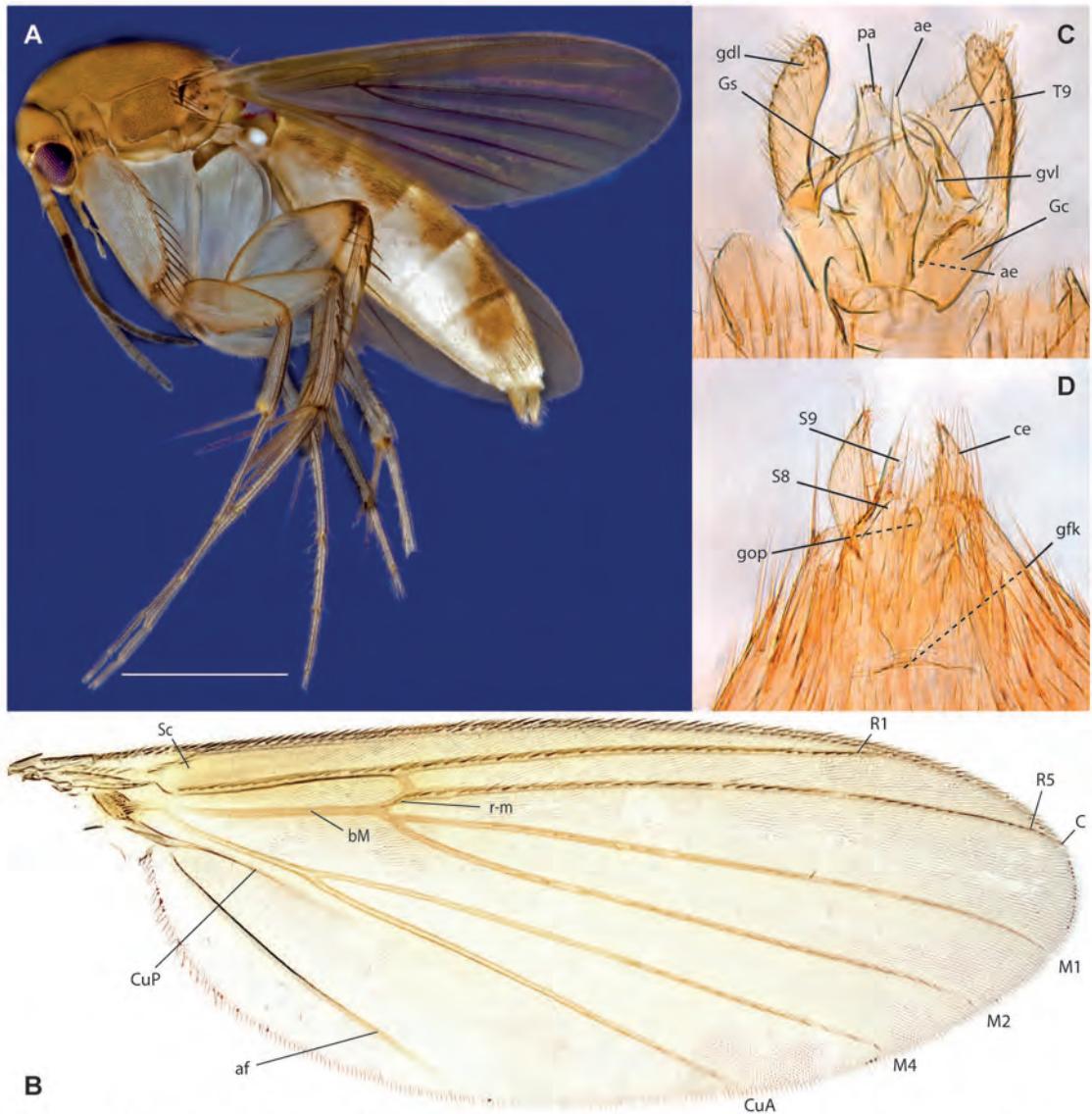


Figure XXA-D. *Epicypta* sp.n. 11. A. Habitus, female paratype, ZRCBDP0048446. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Female terminalia, ventral view, paratype ZRCBDP0047917.

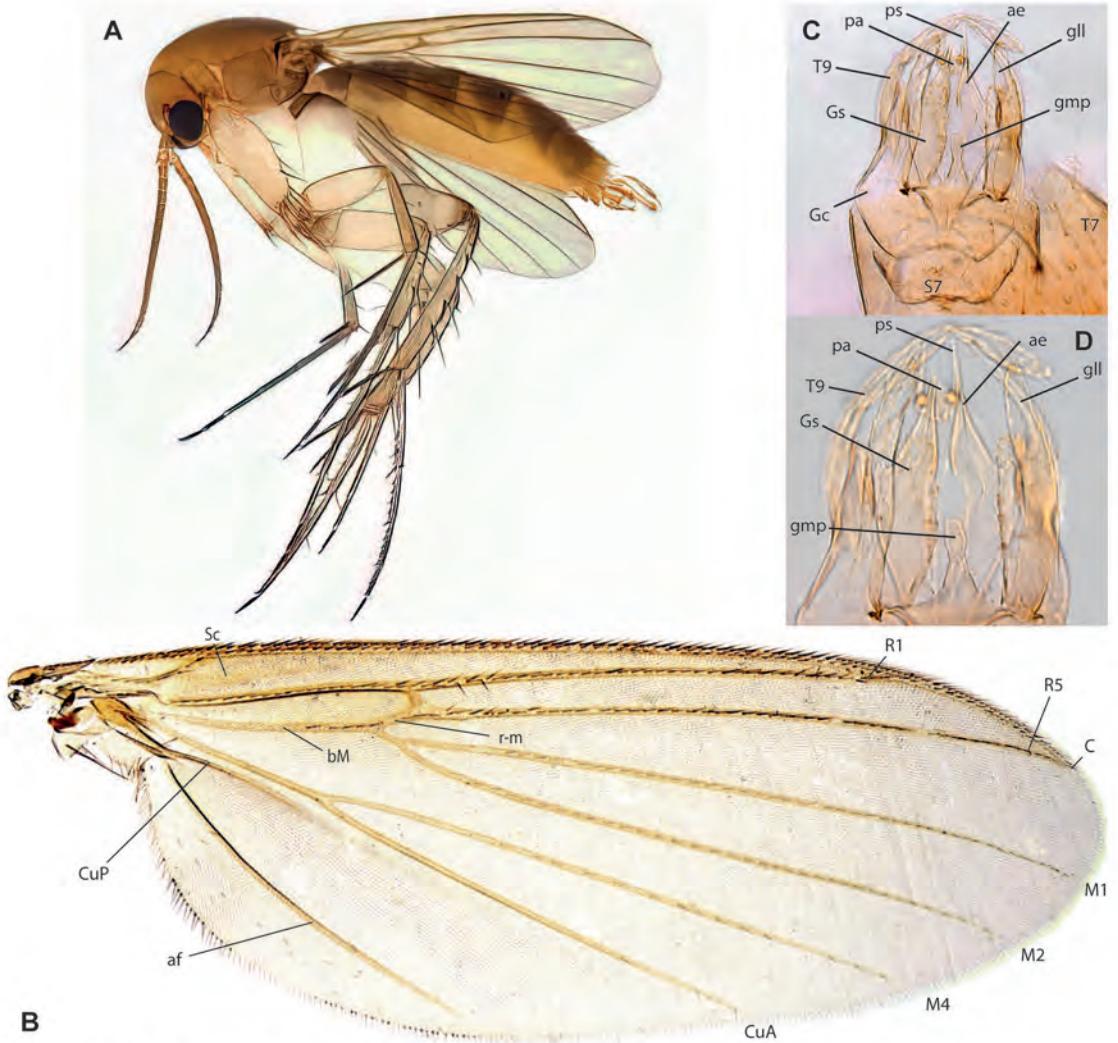


Figure XXA-D. *Epicypta* sp.n. 16. A. Habitus, male paratype ZRCBDP0048465. B. Wing, male holotype. C. Male terminalia, ventral view, same. D. Detail of distal end of male terminalia, same.

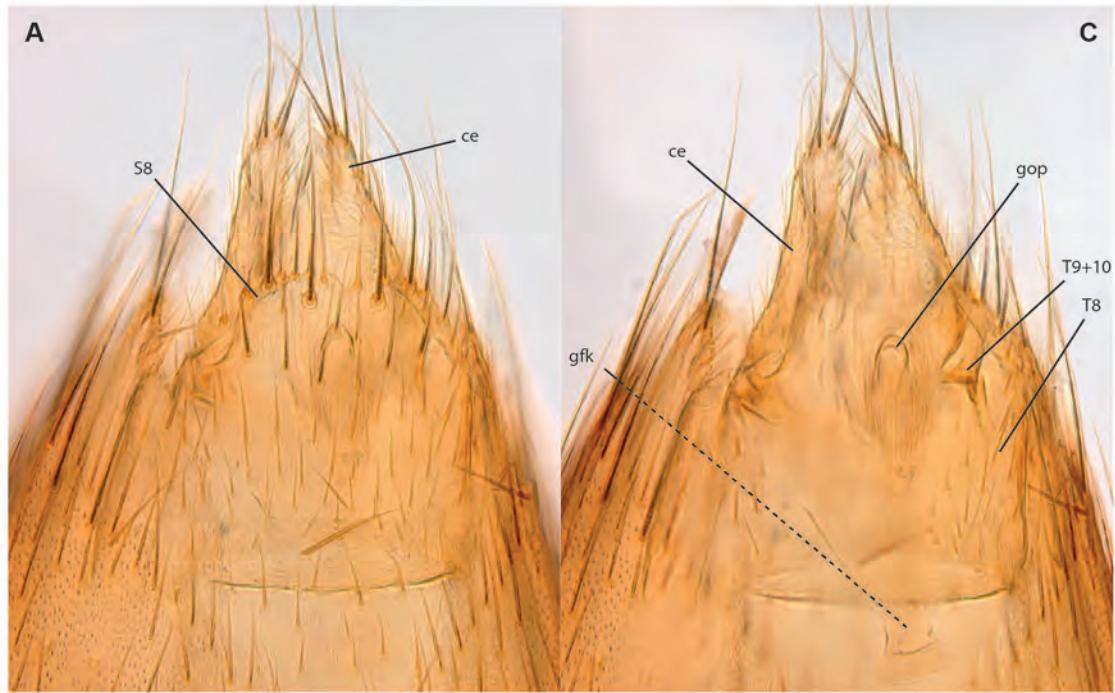


Figure XXA-D. *Epicypta* sp.n. 16, female terminalia, paratype ZRCBDP0048868. A. Ventral view.  
B. Dorsal view.

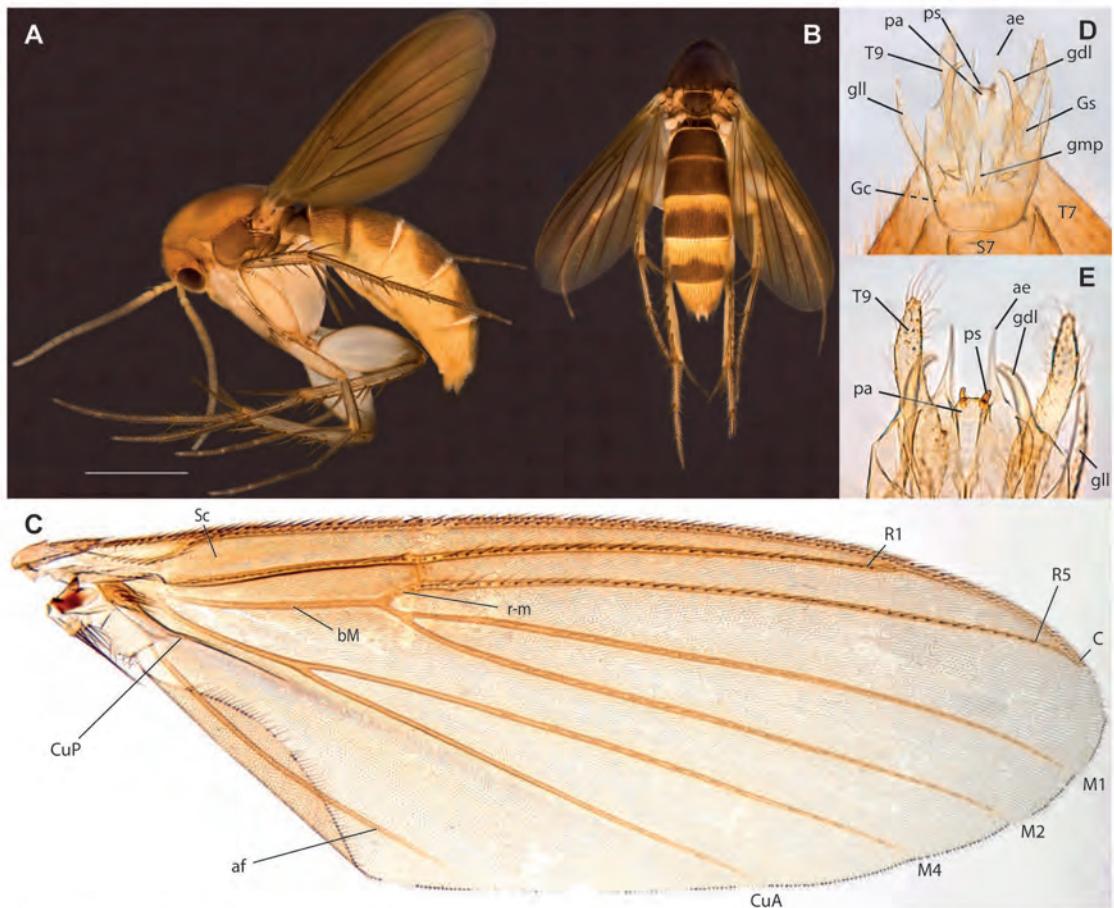


Figure XXA-D. *Epicypta* sp.n. 17. A. Habitus, lateral view, female paratype ZRCBDP0048440. B. Same, dorsal view. C. Wing, female holotype. D. Female terminalia, ventral view, same. E. Detail of distal end of female terminalia, same.

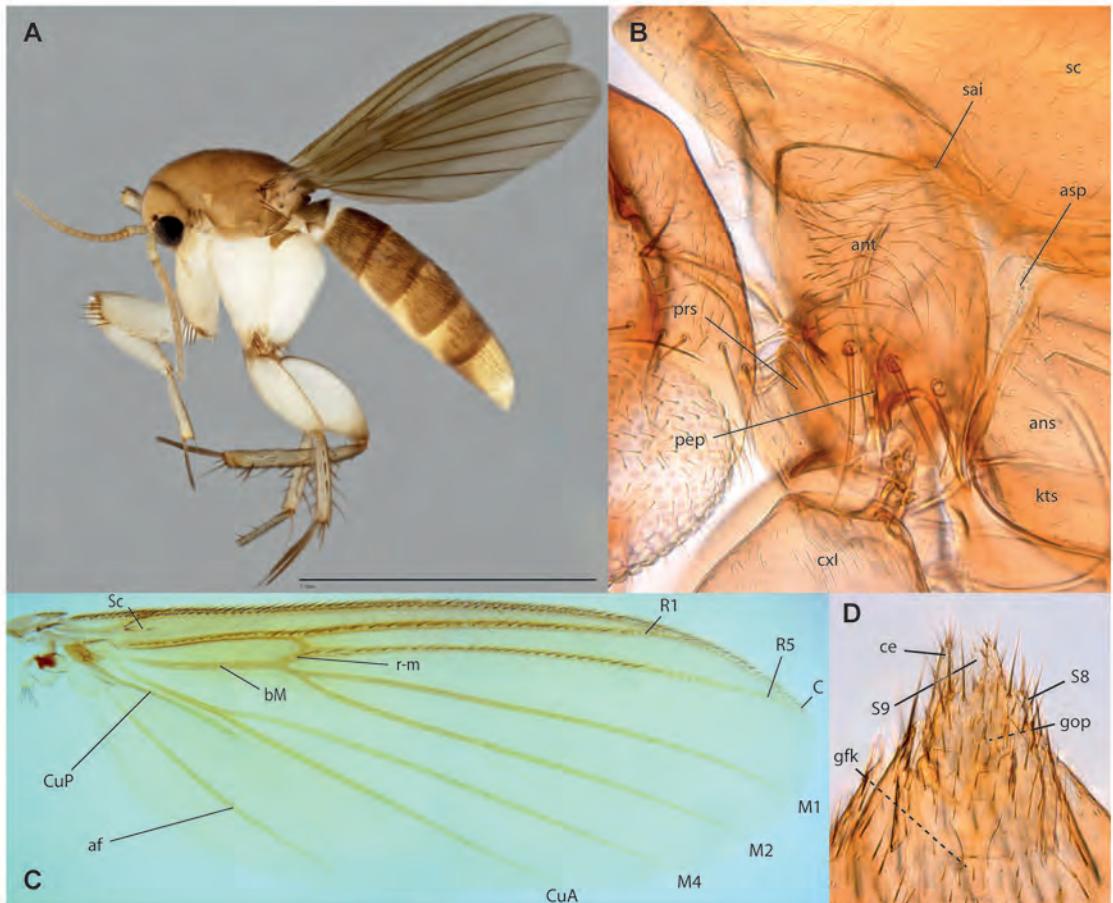


Figure XXA-D. *Epicypta* sp.n. 22. A. Habitus, female paratype ZRCBDP0048062. B. Anterior end of thorax, lateral view, female holotype. C Wing, same. C. Female terminalia, ventral view, same.

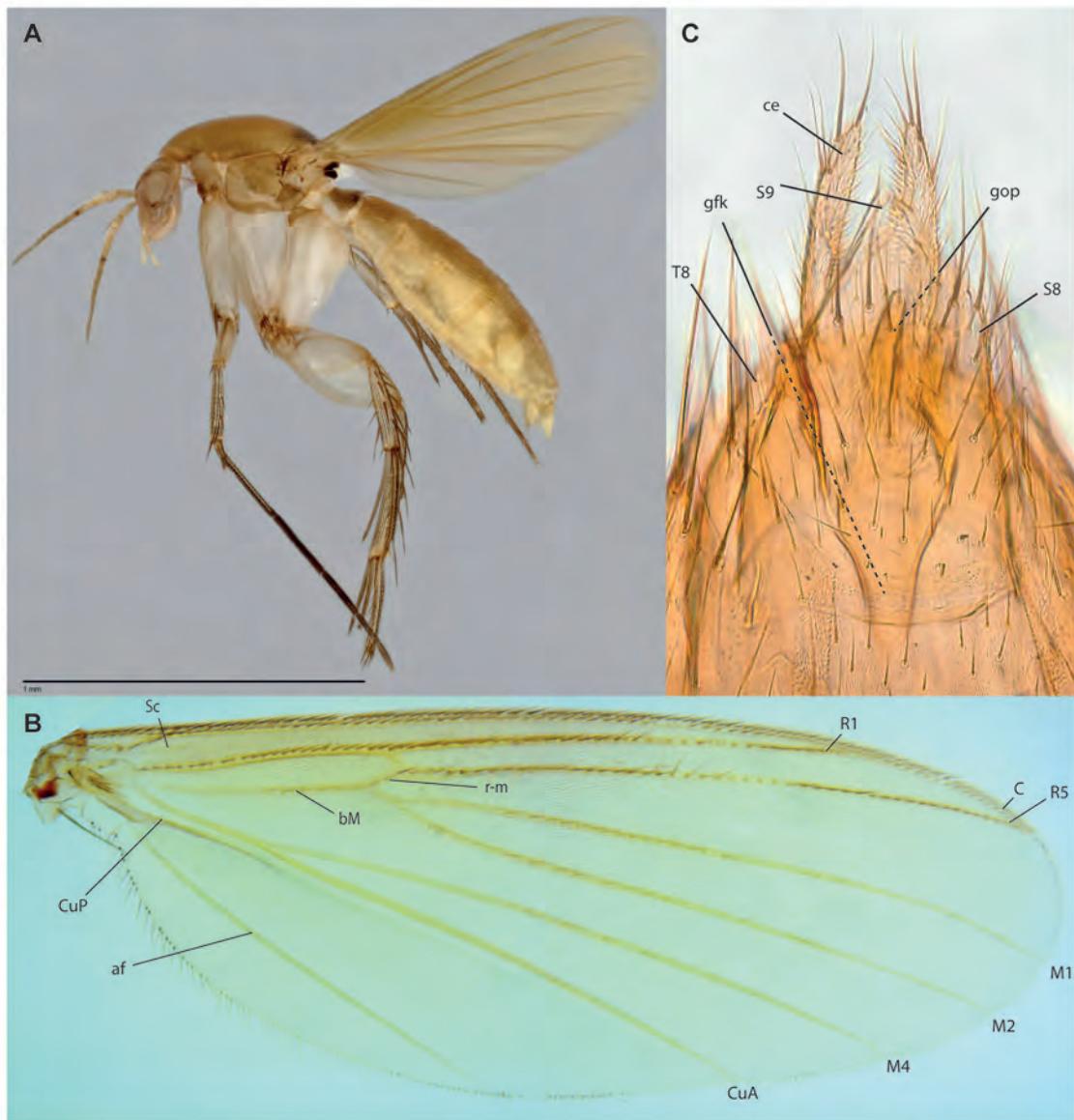


Figure XXA-D. *Epicypta* sp.n. 23. A. Habitus, female holotype. B. Wing, same. C. Female terminalia, ventral view, same.

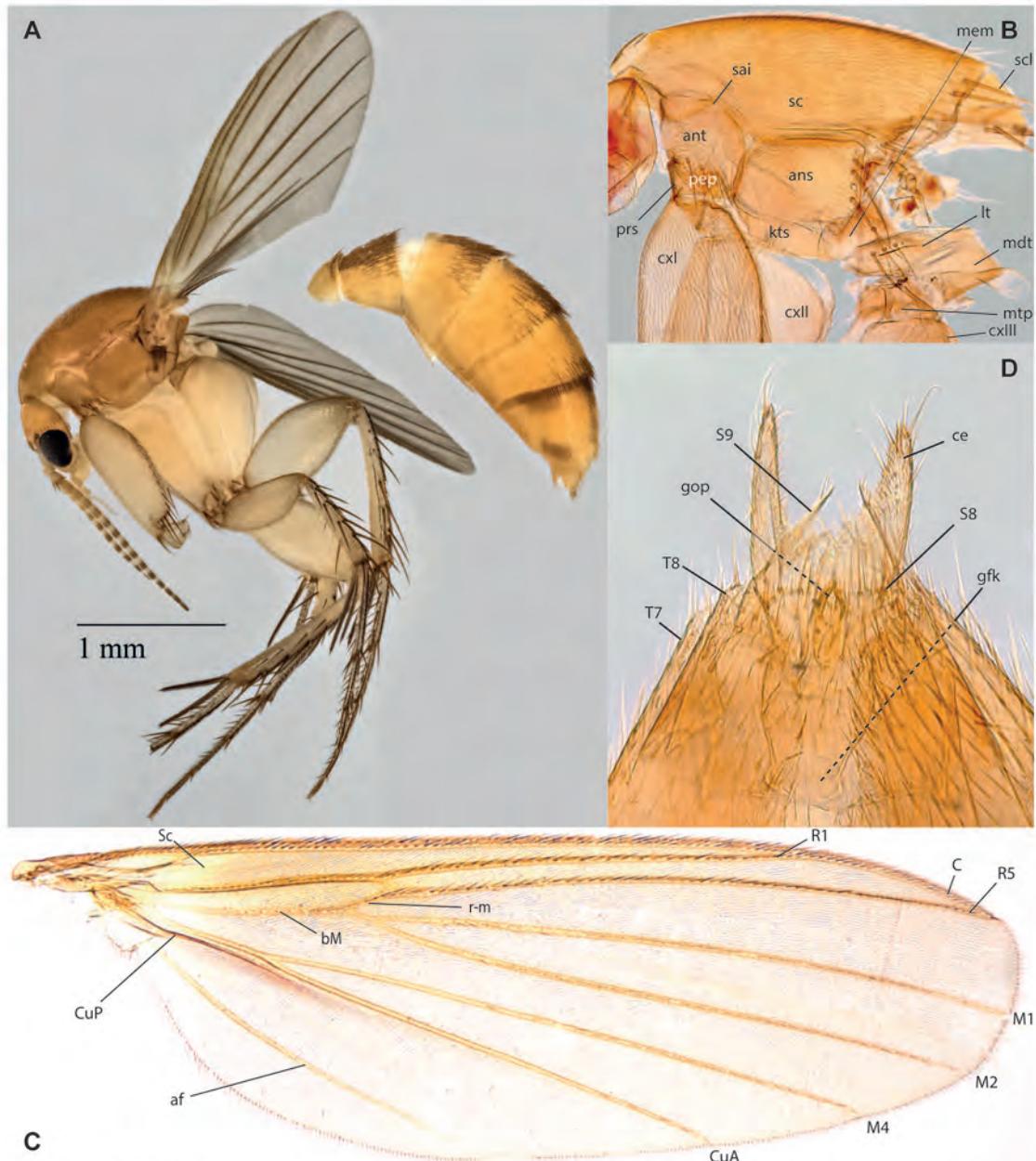


Figure XXA-D. *Epicypta* sp.n. 44. A. Habitus, female paratype ZRCBDP0137314. B. Thorax, female holotype. C. Wing, same. E. Female terminalia, ventral view, same.

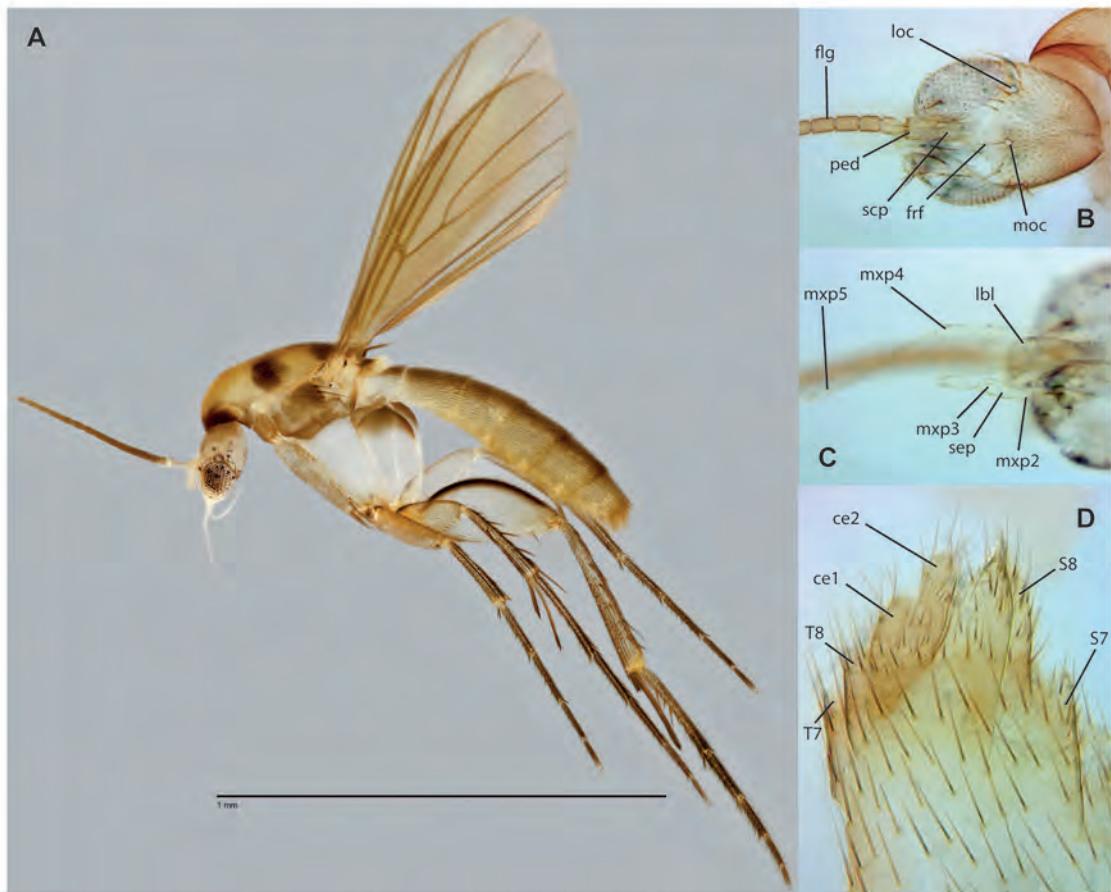


Figure XXA-F. *Aspidionia* sp.n. 01, female holotype. A. Habitus. B. Head, dorsal view. C. Head, ventral view. D. Terminalia, lateral view.

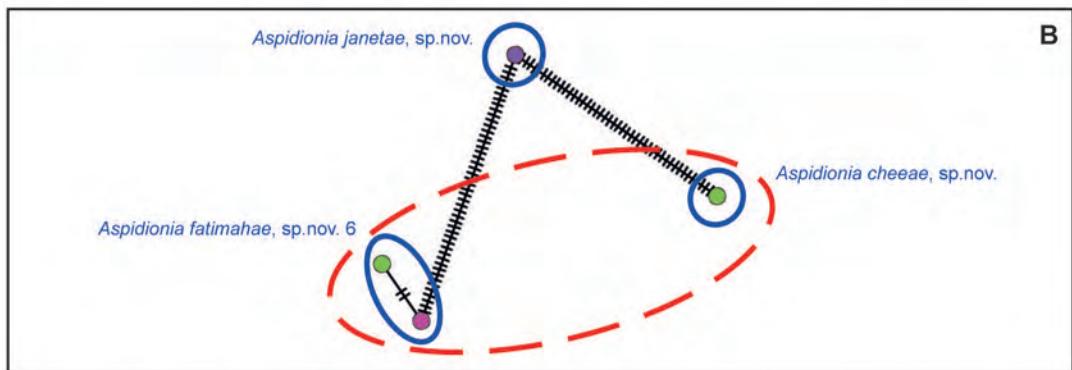


Figure XXA-B. A. *Aspidionia* sp.n. 01, wing, female holotype. B. Haplotype network for *Aspidionia*.

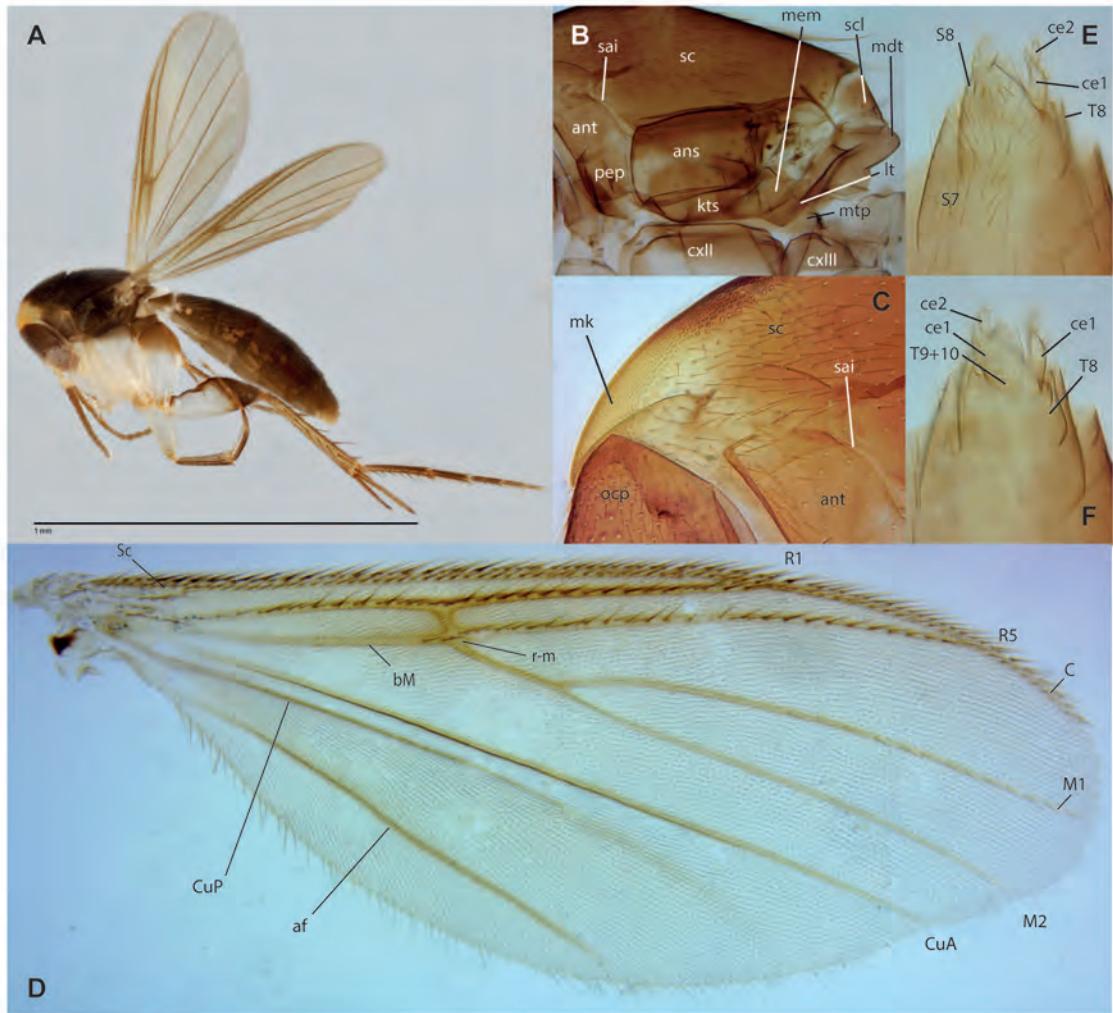


Figure XXA-F. *Aspidionia* sp.n. 02, female holotype. A. Habitus. B. Thorax. C. Anterior end of scutum. D. Wing. E. Terminalia, ventral view. F. Terminalia, dorsal view.

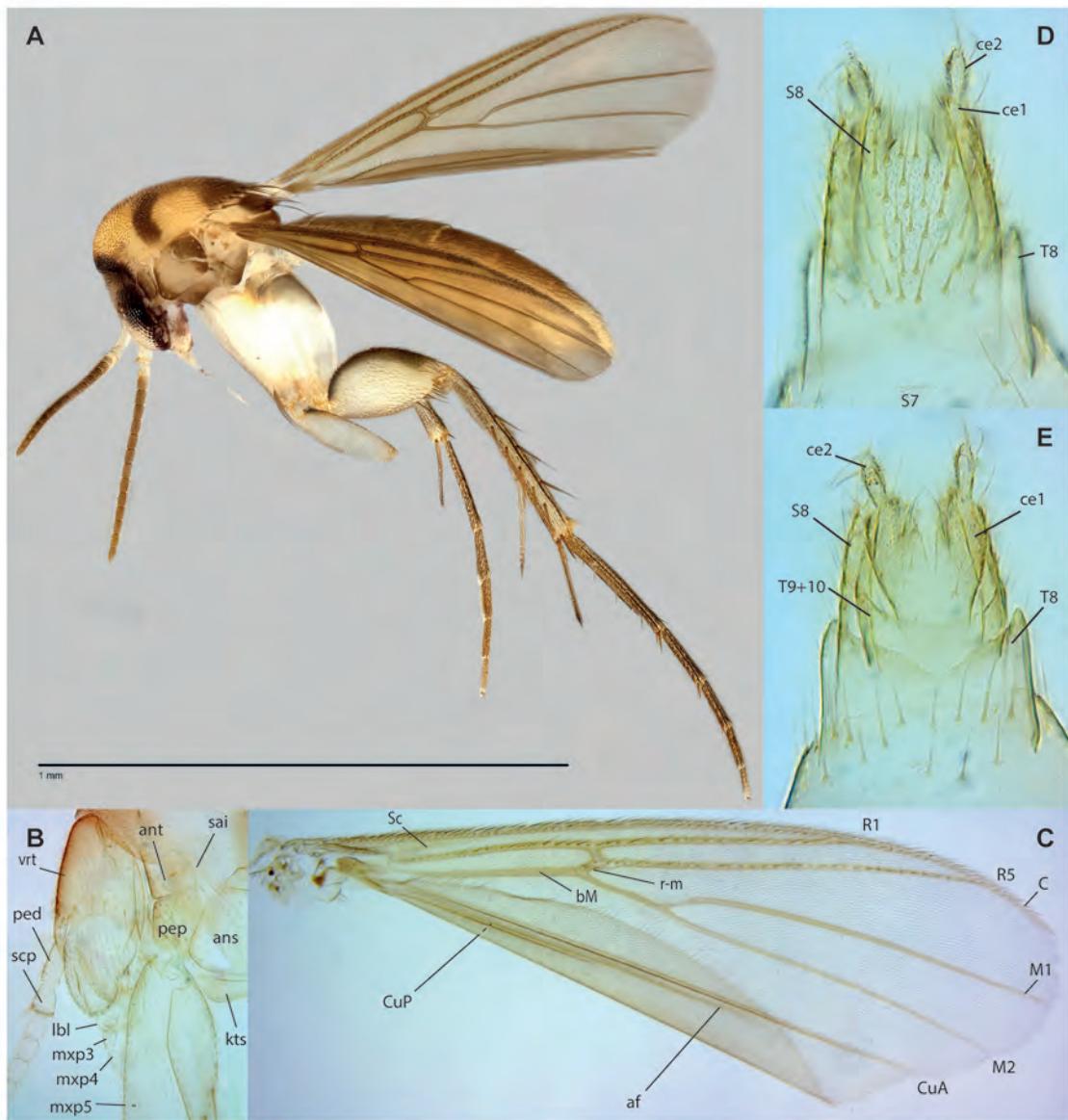
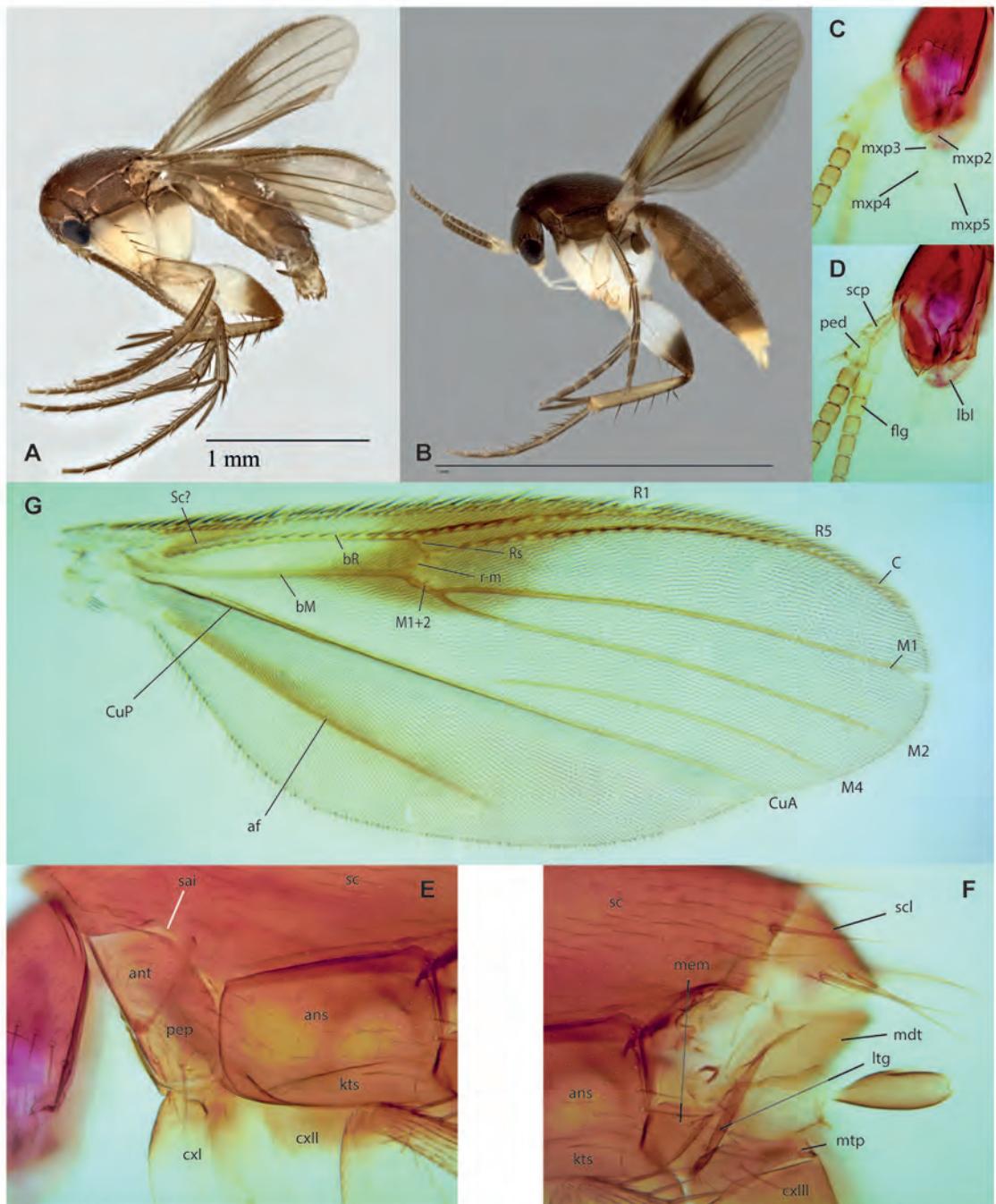


Figure XXA-F. *Aspidionia* sp.n. 03, female holotype. A. Habitus. B. Head. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.



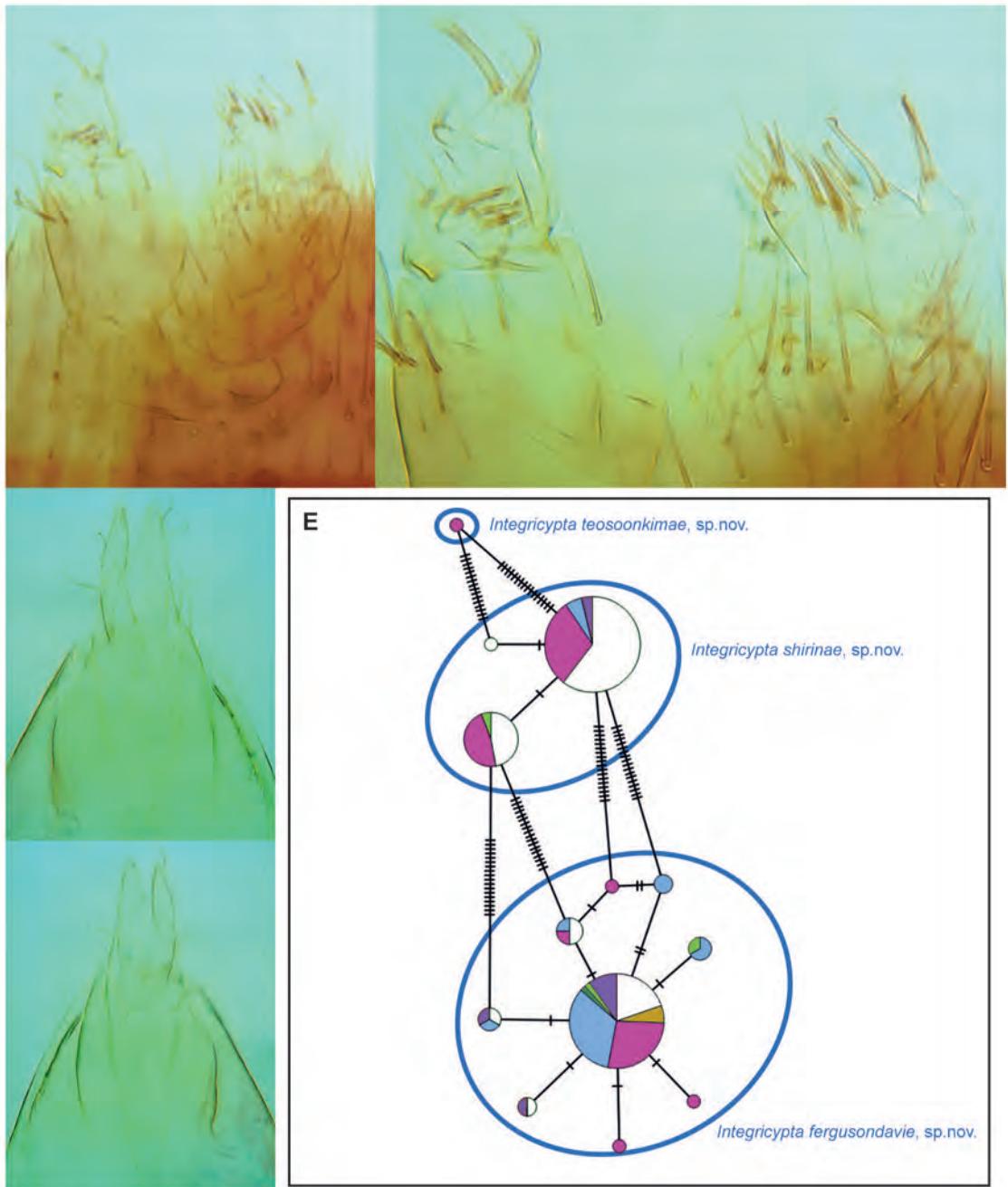


Figure XXA-F. *Integricypta* sp.n. 01. A. Male terminalia, ventral view, holotype. B. Male terminalia, dorsal view, same. C. Female terminalia, ventral view, paratype ZRCBDP0049314. D. Female terminalia, ventral view, paratype ZRCBDP0049314. E. Haplotype network for *Integricypta*.

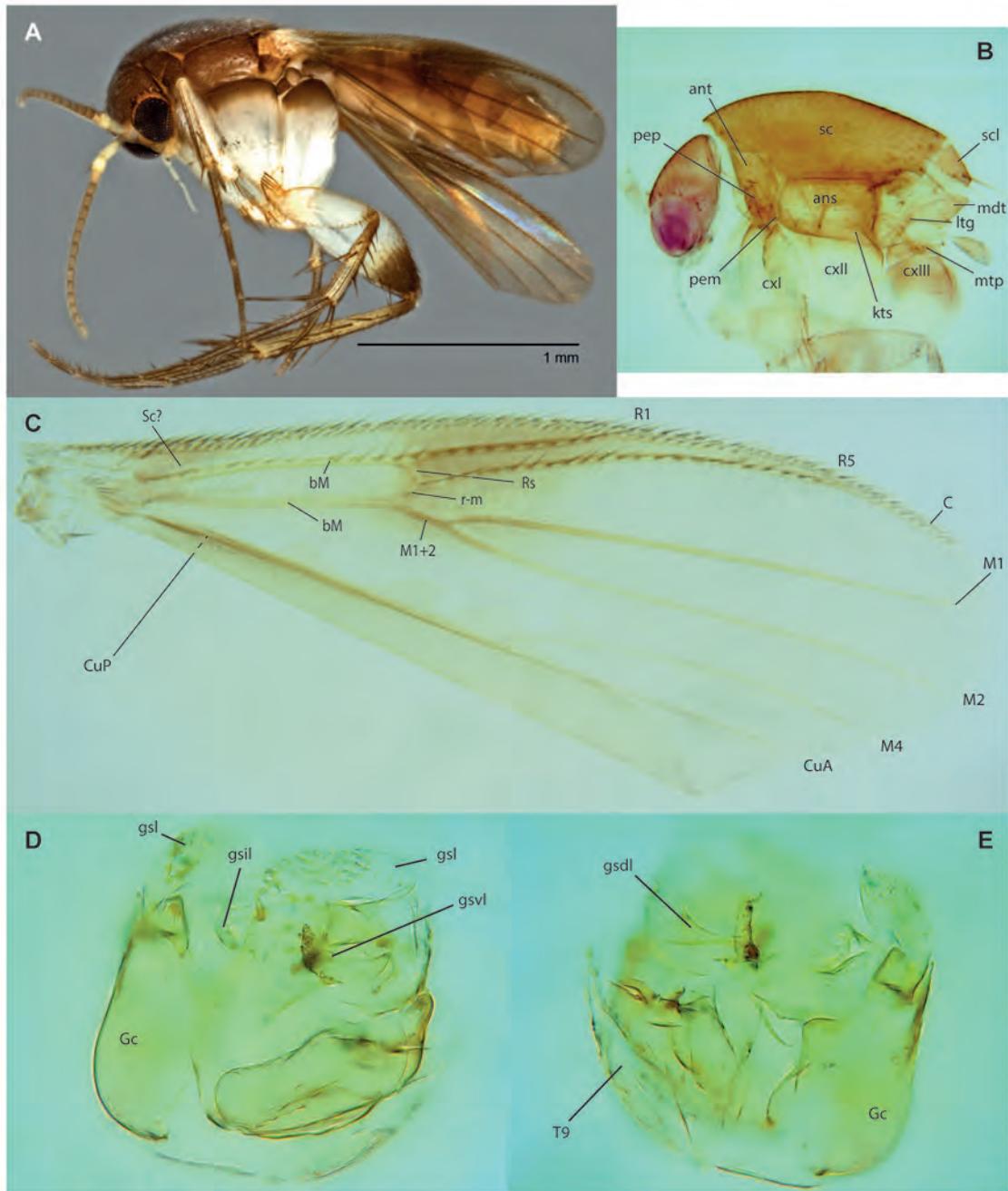


Figure XXA-F. *Integricypta* sp.n. 02, male holotype. A. Habitus. B. Thorax. C. Wing. D. Terminalia, ventral view. E. Terminalia, dorsal view.

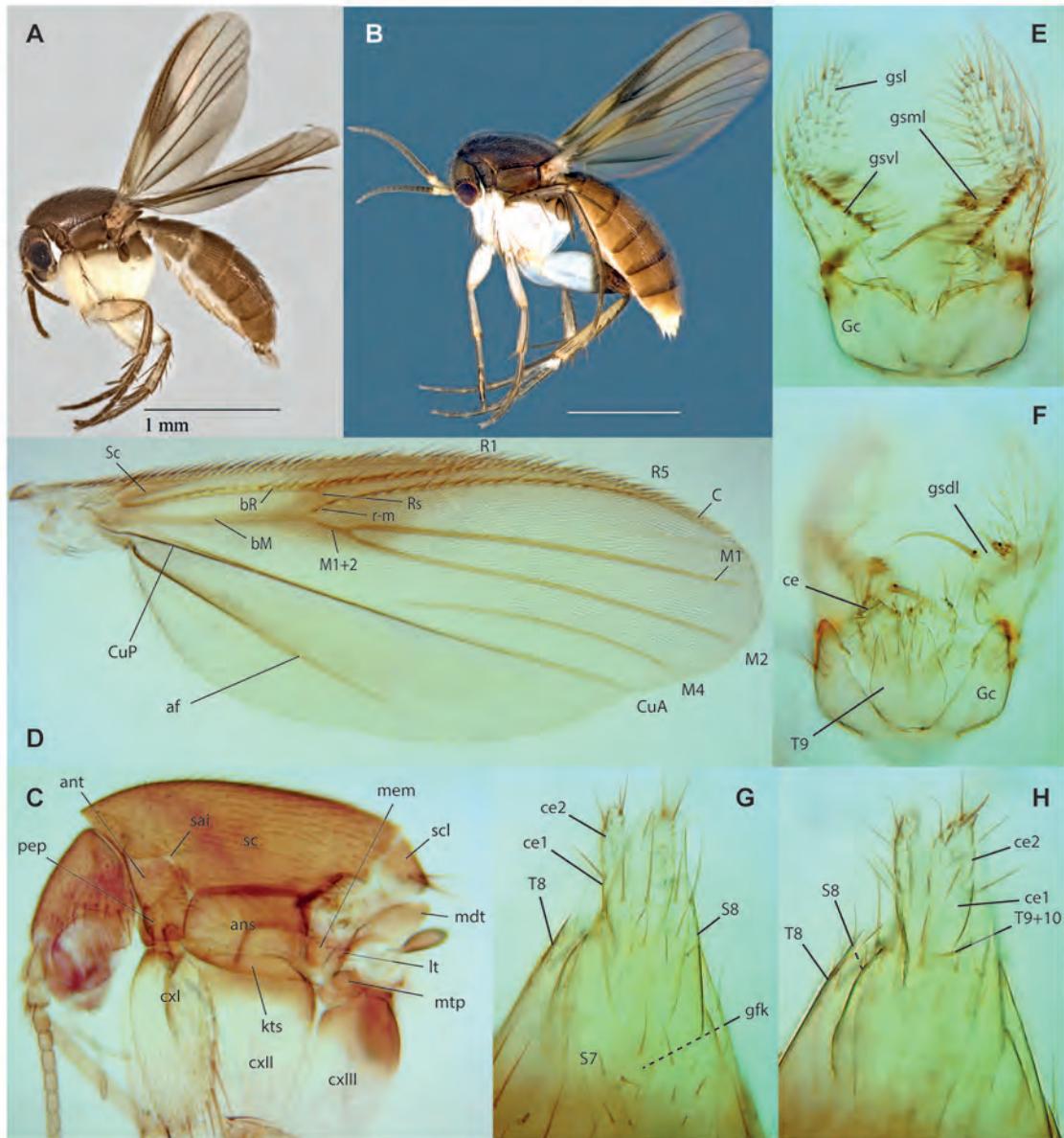


Figure XXA-F. *Integricypta* sp.n. 03. A. Habitus, male, paratype ZRCBDP0133375. B. Habitus, female, paratype ZRCBDP0048427. C. Wing, male holotype. D. Thorax, male holotype. E. Male terminalia, ventral view, holotype. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, paratype ZRCBDP0049345. H. Female terminalia, dorsal view, same.

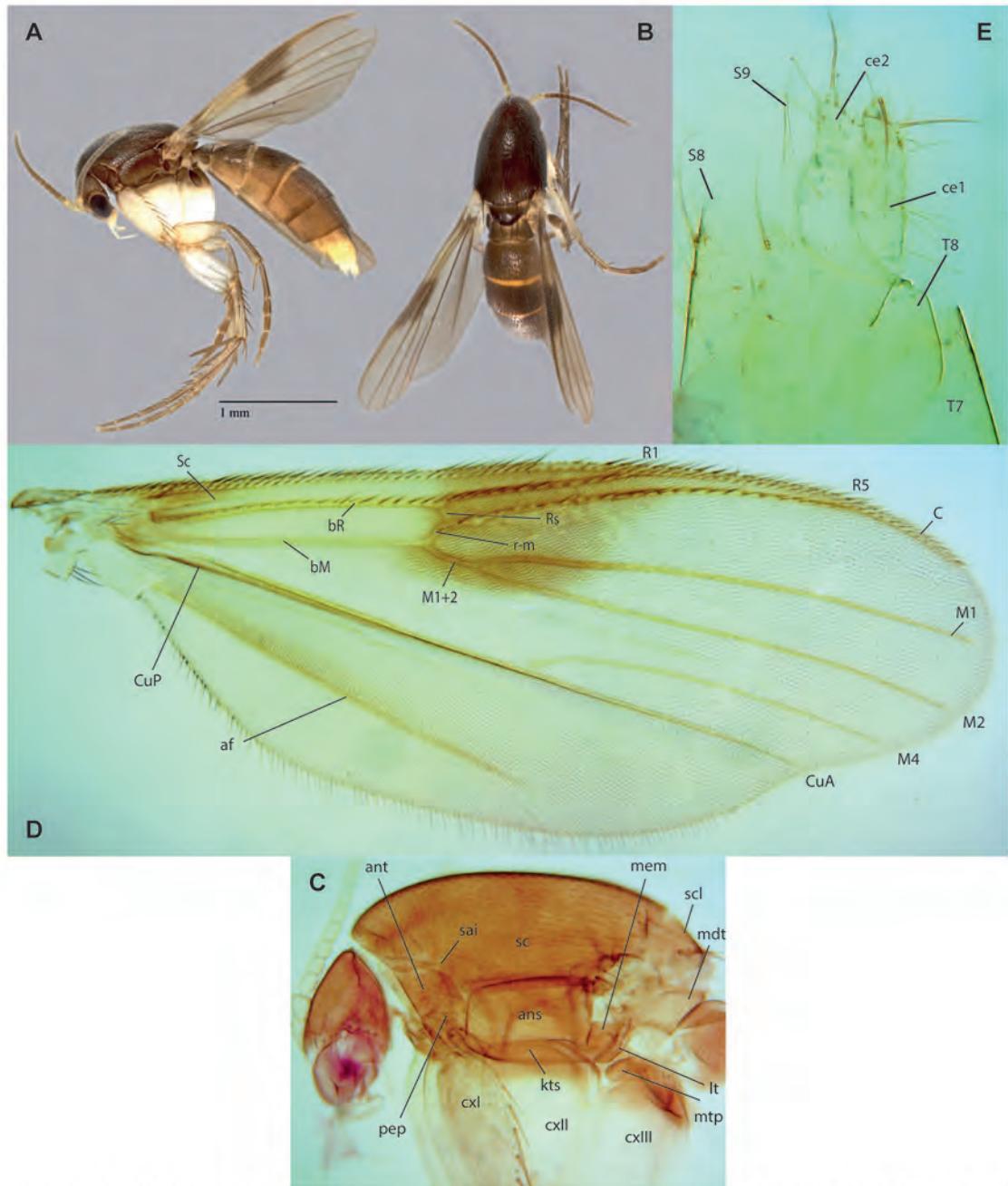


Figure XXA-F. *Integricypta* sp.n. 04. A. Habitus, male, paratype ZRCBDP0133375. B. Habitus, female, paratype ZRCBDP0048427. C. Wing, male holotype. D. Thorax, male holotype. E. Male terminalia, ventral view, holotype. F. Male terminalia, dorsal view, same. G. Female terminalia, ventral view, paratype ZRCBDP0049345. H. Female terminalia, dorsal view, same.

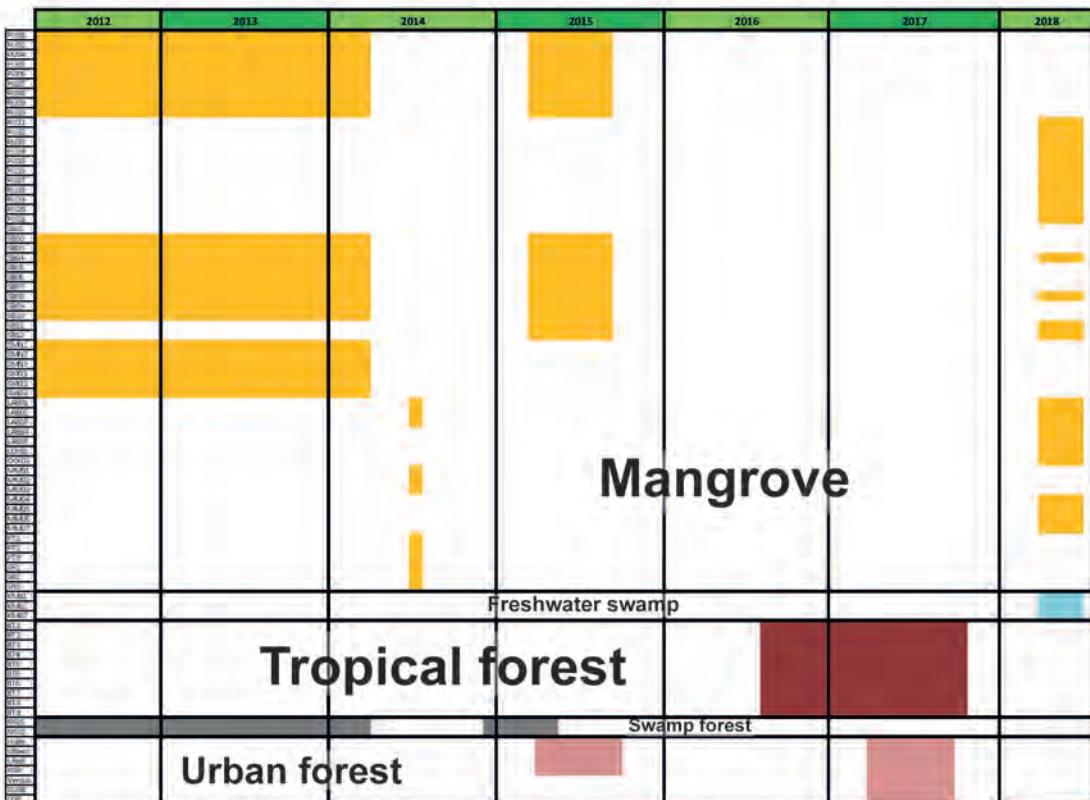


Figure H01. Sampling effort on the various types of environment along the project between 2012 and 2018.