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Preliminary Results of the 2016 International Taiwan Expedition on SYRPHIDAE (DIPTERA)

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ABSTRACT

In May and June 2016, an international **SYRPHIDAE** expedition was held in Taiwan, visiting several major habitats in order to obtain further knowledge of the current state of the biodiversity of this country. The participants were from several different countries and most were specialized in **SYRPHIDAE**. The co-operation with the Department of Entomology of the National Taiwan University was established in early 2015 and collecting permits and Nagoya protocol requirements were arranged through this department. In total 20 localities were visited, each of which is discussed and habitat information is given. A preliminary list of collected material is presented. A key to the species of *Allobaccha* Curra, 1928, *Asarkina* Macquart, 1834, *Episyrphus* Matsumura & Adachi, 1917 and *Meliscaeva* Frey, 1946 collected during this expedition is provided. In total 136 species were collected of which 33 were new faunal records and possibly even undescribed species. In the discussion, the potential of the fauna and possible forthcoming papers dealing with more detailed systematics are mentioned. The identity of several specimens was checked by studying types in various museums, which led to a lectotype being designated for *Zelima armipes* Sack, 1922.

Key words: distribution, habitat, key, new records, *Allobaccha*, *Asarkina*, *Episyrphus*, *Meliscaeva*

Introduction

The family of **SYRPHIDAE** are worldwide in distribution and are major pollinators as adults. The larvae, showing a wide range of feeding modes, are in several cases valuable as natural enemies of agricultural pests like aphids, thistles, and other invasive plants. They are also used as decomposers of, i.e., coffee pulp (Rotheray and Gilbert, 2011). Following short collecting trips in connection with the International Symposium on **SYRPHIDAE** in Spain and Finland and expeditions in Serbia (van Steenis *et al*., 2015), the Russian Far East (Mutin *et al*., 2016) and the Altai (Smit, 2014), an international expedition was planned for 2016. In 2014 contacts were established with potential partners in Taiwan and in late 2015, the co-operation of students of the National Taiwan University and collecting permits were arranged. Based on a variety of published information (Shiraki, 1930; Emmel and Heppner, 1990; Schacht, 2000), an itinerary was organized.

The knowledge of **SYRPHIDAE** of Taiwan is limited and mostly based on Shiraki (1930) dealing with the entire Taiwanese fauna. Since the 2016 expedition reviews of *Sphegina* Meigen, 1822 (van Steenis *et al*., 2018) and *Platycheirus* Lepeletier & Serville, 1828 (van Steenis *et al*., 2019a) have been published, including descriptions of several new.

Material and Methods

Collecting was conducted in mainland Taiwan from May 15th to June 4th. The route followed the east coast from North to South and from the 31st of May a similar return route was followed. The expedition started and ended in Taipei with a visit to the collection of the National Taiwan University. On the 1st of June, the collection of the National Museum of Natural Sciences in Taichung was also visited.

Diptera were collected by hand net from early morning to late afternoon, with most specimens collected between 7.00 am and 3.00 pm. Before 7.00 am, the vegetation was often too wet or there was no sunshine and the **SYRPHIDAE** needed to warm up before starting to fly or feed. After 2.00 pm, the temperature was often too high and the flowers and other vegetation became too dry to collect **SYRPHIDAE**. On the cloudy days or at higher altitude, the timeline shifted by about 1 hour later. Several wet gullies in dense forest were visited and surprisingly many specimens and species were flying here, even after 2.00 pm, despite the warmth and lack of flowers. On the mid and high elevations, e.g., at Mingchih (明池) and Hehuanshan (合歡山), **SYRPHIDAE** were active during cold and wet periods as well, especially the genera *Sphegina*, *Platycheirus* and *Melanostoma* Schiner, 1860. In some of the sites, leaves were sprayed with a mixture of alcohol, water and honey to attract **SYRPHIDAE**. This was done with varying success. Larvae and puparia were searched for in aphid colonies, decaying and rotting plant material, live rootstocks and diverse saprophagous habitats like open and closed rotholes and sap streams on live trees.

The identification of the specimens are based on Shiraki (1930), which is the outdated standard on the Taiwanese fauna. To better understand the Taiwnese fauna, Brunetti (1923) and Shiraki (1968a, b) have also been used. The following literature was used for further identification of specific genera and species: *Asiobaccha* Violovitsh, 1976 (Mengual, 2016); *Chalcosyrphus* (*Syrittoxylota*) Hippa, 1978 (Hippa, 1985); *Citrogramma* Vockeroth, 1969 (Mengual, 2012); Eristalina (Thompson, 2003); Microdontinae (Reemer and Ståhls, 2013); *Milesia* Latreille, 1804 (Hippa, 1990); *Paragus* Latreille, 1804 (Stuckenberg, 1954; Thompson and Ghorpade, 1988; Sorokina and Cheng, 2007); *Platycheirus* (van Steenis *et al*., 2019a); *Pseudovolucella* Shiraki, 1930 (Reemer and Hippa, 2008); *Sphegina* (Hippa *et al*., 2015; van Steenis *et al*., 2018); *Syritta* Lepeletier & Serville, 1828 (Lyneborg and Barkemeyer, 2005); Syrphini (Ghorpade, 1994, 2009); Xylotini (Hippa, 1978). A key to the species of *Allobaccha*, *Asarkina*, *Episyrphus* and *Meliscaeva* collected during this expedition is provided.

Photos of the habitat were taken with a Nikon Coolpix P510. The pictures of the pinned adults were taken with a Canon EOS D6 and a Canon MP-E 1-5 x macro objective with a

Yongnuo ring flash mounted on a Cognisys stacking rail. Several photos for each picture were stacked with Zerene Stacker 1.04 and further edited with GNU Image Manipulation Program (GIMP 2.8.14).

Plant names are from eFloras (2008) and The Plant List (2013).

The material is deposited in the collections of the participants and part of it will also be deposited in NTU (National Taiwan University, Taipei, Taiwan) and NMNS (National Museum of Natural Science, Taichung, Taiwan). Data for some additional material from FSCA (Florida State University collection, USA) and SMNS (Staatliches Museum für Naturkunde, Stuttgart, Germany) is also incorporated. Several types deposited in NHM (Natural History Museum, London, United Kingdom), SDEIM (Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany) and SDEIF (Senckenberg Deutsches Entomologisches Institut, Frankfurt am Main, Germany) were consulted.

Locality descriptions

In total 20 areas were visited of which Yangmingshan (陽明山), Hehuanshan, Fuyuan (富源) and Dongyan (東源) were visited more than once. During most visits, the group split up and wandered around in the various collecting areas at each side of marked trails, roads, etc., sometimes covering several kilometers. Mostly these different areas were grouped together, especially if the researched macro habitat was similar, like at Mingchih, where the road verges and the lakeshore are both grouped under "Mingchih Forest recreation area" (locality no. 3a). For each locality, this is further explained.

1. Taipei (台北)

1a Beitou (北投), city park with a road along the river, close to Atami hotel (熱海大飯店) at 35m a.s.l., 15th of May, 25°08' N 121°30' E. The narrow park bordered the river and was almost completely paved. Only one species was collected here, hovering in the shade under the canopy.

1b Bailing, South riverside park (百齡河濱公園南側). This park is dominated by gravel and grass fields for baseball and other sports activities. Between the different fields and along the river hedgerows were present. Here only one species was collected, flying along one of the fences. 7m a.s.l., 2nd of June, 25°05' N 121°30' E.

2. Yangmingshan

2a Datun mountain (大屯山) at 980-1068 m a.s.l. 15th of May, 25°10' N 121°31' E with Bamboo-Sedge (*Pseudosasa japonica* (Steud.) Makino (日本矢竹) and *Miscanthus floridulus* (Labill.) Warb. ex K. Schum. & Lauterb. (五節芒) vegetation along a steep mountain trail (Fig. 1A). Flowering plants were *Angelica hirsutiflora* Tang S. Liu, C. Y. Chao & T. I. Chuang (濱當歸) (Fig. 2B), *Astilbe longicarpa* (Hayata) Hayata (長果落新婦), *Cirsium japonicum* (Thunb.) Fisch. ex DC. (薊) (Fig. 2A), *Prunella vulgaris* L. (夏枯草), *Valeriana fauriei* Briq. (纈草) (Fig. 6A) and small white Apiaceae (繖形科).

2b Jhuzihhu road (竹子湖路) at 330m a.s.l. 15th of May and 3rd of June, 25°11' N 121°34' E. River valley with the main river in a very deep ravine and one side river along the road. A wide bridge crossing the deep valley. Flowering *Bidens pilosa* L. (鬼針草) was the main food source for the **SYRPHIDAE** collected here.

2c Mt Shamao Dapu trail (紗帽山大埔步道) (Fig. 1B, 7D) at 450-630m a.s.l., 4th of June, 25°08' N 121°32' E. Mountain top and steep mountain forest: *Machilus* spp. (楨楠屬), *Liquidambar formosana* Hance (楓香), *Acer oliverianum* Pax (五裂槭), *Prunus campanulata* Maxim. (山櫻花) and *Cleyera japonica* Thunb. (紅淡比) with abundant dead wood with flowering *Callicarpa formosana* Rolfe (杜虹花), *Sambucus javanica* Blume (接骨木) and other high trees with abundant white flowers (Fig. 8D).

2d Cingsi road (青溪路), 250m a.s.l., 4th of June, 25°13 N 121°31' E. River valley with small brook and drainage ditch along the roadside.

3. Mingchih (明池)

3a Forest recreation area at 980-1180m a.s.l., 17th of May and 1st of June, 24°38' N 121°27' E, with *Sphegina* collected on small white umbels in rather cold and misty weather (Fig. 3A). Lakeshore vegetation and forest clearings and roadside vegetation in the forest. Flowering plants were white Apiaceae, *Oenanthe javanica* (Blume) DC. (水芹菜) (Fig. 6B), yellow *Ranunculus* spp. (毛茛屬), and ruderal vegetation on the parking lot with *Plantago lanceolata* L. (長葉車前草) shaded by trees.

Fig. 1. Collecting sites. A. Datun mountain, Yangmingshan. B. Dapu trail, Mt Shamao, Yangmingshan, forest track. C. Hui-Sun hilltop. D. Jhihben forest recreation area.

3b Beiheng road (北橫公路) at 970-1020m a.s.l., 1st of June, 24°38' N 121°27' E. Flowering *Melanolepis multiglandulosa* (Reinw. ex Blume) Rchb. & Zoll (蟲屎). tree along road and river in the sun, *Prunus buergeriana* Miq. (布氏稠李), rich fern vegetation in forest, big rocks in a valley and wet forest track.

4. Yingchih resort (英仕山莊)

At 300m a.s.l., 18th of May, 24°37' N 121°32' E. Roadside vegetation in a wide river valley with agricultural fields nearby.

5. Chilan (棲蘭)

At 360-600m a.s.l., 18th of May, 24°35' N

Fig. 2. Flowers visited by **SYRPHIDAE**. A. *Cirsium japonicum*, Datun mountain, Yangmingshan. B. *Angelica hirsutiflora*, Datun mountain, Yangmingshan. C. *Astilbe longicarpa*, Siangyang Forest Recreation Area, with *Melanostoma* spp. D. *Rhododendron* spp., Siangyang Forest Recreation Area.

121°29' E. A brook and ravine with subtropical rainforest rich in ferns. Forest recreation area with several senescent trees and dead trunks (Fig. 3B, 3C). Flowering *Areca catechu* L. (檳榔) and shrub with large white-yellow flowers (Fig. 8C).

6. Yousheng river bed (有勝溪河床)

At 1850-1950m a.s.l., 18th of May, 24°23' N 121°20' E. Gravel river bed on the dry banks with shrubs, single bushes of *Rosa sambucina* Koidz. (山薔薇) and several flowering low herbs (Fig. 3D).

Fig. 3. Collecting sites. A. Mingchih forest recreation area. B. Chilan forest recreation area, flowering Palm tree. C. Chilan forest recreation area, central forested part. D. Yousheng river bed.

7. Hehuanshan (合歡山)

7a Two mountaintops (Fig. 4A) at 3355-3417m a.s.l., 19th and 31st of May, 24°08' N, 121° 16' E, with flowering *Rhododendron rubropilosum* Hayata (紅毛杜鵑), *R. pseudochrysanthum* Hayata (玉山杜鵑) (Fig. 6C) and *Salix fulvopubescens* Hayata (褐毛柳).

7b Pass and ascent at 3340-3350m a.s.l., 19th and 31st of May, 24°08' N 121°16' E. Scree below the road with male flowering *Salix fulvopubescens* (Fig. 6D) and low bamboo vegetation.

7c River meadow (Fig. 4B) at 3070m a.s.l., 19th and 31st of May, 24°08' N 121°16' E. Spring bog with *Primula miyabeana* T. Ito & Kawak. (玉山櫻草), *Pedicularis* spp. (馬先蒿屬) and yellow *Ranunculus* spp., adjacent 1m high bamboo vegetation.

7d Flowering *Trochodendron aralioides* Siebold & Zucc. (昆欄樹) tree in mountain cloud forest margin, at 2200m a.s.l., 22nd of May, 24°10' N 121°24' E.

8. Huisun (惠蓀)

8a Hotel surroundings at 500-650m a.s.l., 20th of May, 24°05' N 121°02' E. Small valley with a brook, forest edge with *Bidens pilosa*, *Thalictrum* spp. (唐松草屬).

8b Entrance at 500m a.s.l., 20th and 21st of May, 24°05' N 121°02' E. Coffee plantation (Fig. 4C) and forest and open ruderal vegetation with *Bidens pilosa*.

8c Forest trails and hilltop (Fig. 1C) at 700-790m a.s.l., 20th and 21st of May, 24°05' N 121°02' E, with *Cunninghamia* spp. (杉木屬), *Chamaecyparis obtusa* (Siebold & Zucc.) var. *formosana* (Hayata) Hayata (臺灣扁柏), *Schima wallichii* Choisy (西南木荷), *Calocedrus formosana* (Florin) Florin (台灣肖楠) and flowering *Quercus* spp. (櫟屬).

9. Matai'an wetland (馬太鞍濕地)

At 120m a.s.l., 22nd and 30th of May, 23°39' N 121°24' E. Lotus (*Nelumbo nucifera* Gaertn., 蓮) ponds and adjacent wetland vegetation (Fig. 4D) with *Eichhornia crassipes* (Mart.) Solms (布袋蓮) and *Bidens pilosa*.

10. Fuyuan Butterfly resort (富源蝴蝶谷)

At 200-650m a.s.l., 23rd, 24th and 30th of May, 23°35' N 121°21' E. Subtropical rainforest

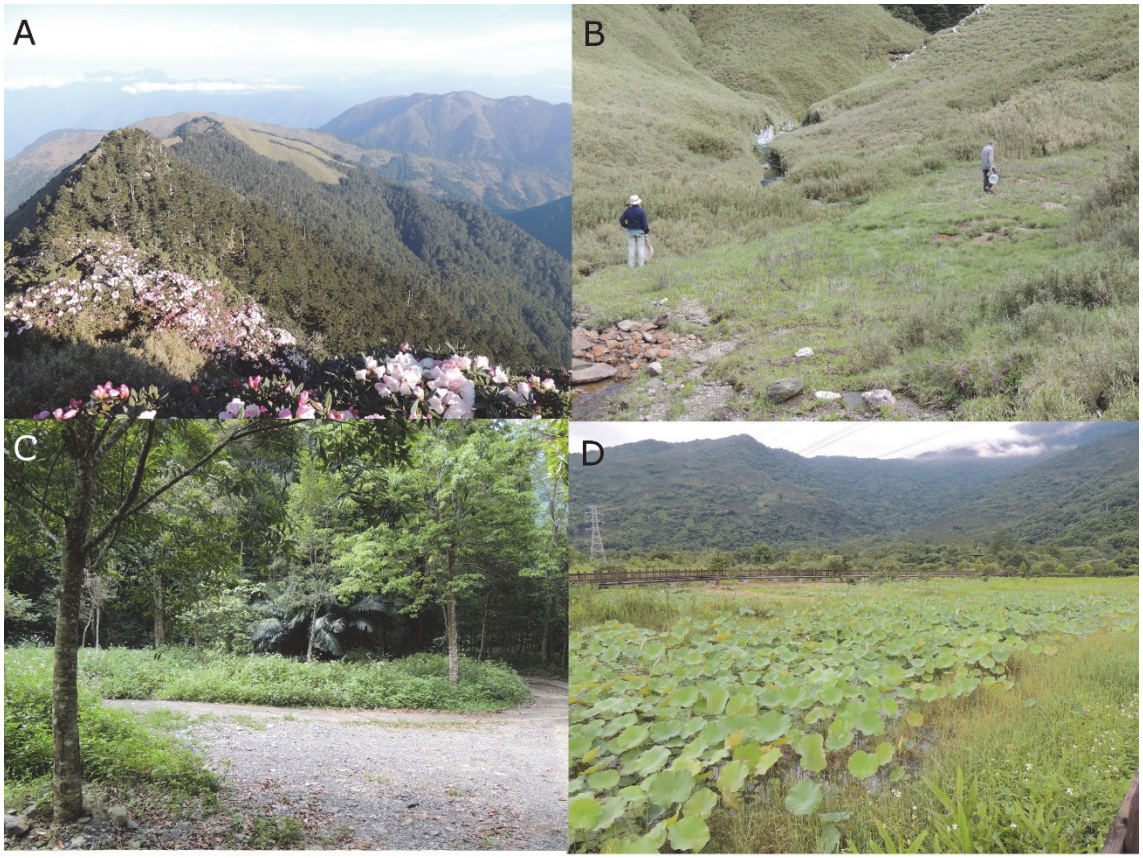

Fig. 4. Collecting sites. A. Hehuanshan hilltop, *Rhododendron* flowers. B. Hehuanshan mountain. C. Hui-Sun entrance. D. Matai'an wetland, Lotus pond.

with Campher plantations (*Cinnamomum camphora* (L.) J. Presl, 樟樹) and natural forest (*Broussonetia papyrifera* (L.) L'Hér. ex Vent. (構樹), *Machilus japonica* Siebold & Zucc. (大葉楠), *Lagerstroemia subcostata* Koehne (九芎) and *Liquidambar formosana* Hanse with forest trails, deep ravines and small to large rivers (Fig. 5A, B) with flowering *Begonia* spp. (秋海棠屬), *Sambucus javanica*, *Bidens pilosa*, *Hydrangea paniculata* Siebold (水亞木) and *Koelreuteria elegans* subsp *formosana* (Hayata) F.G. Mey (台灣欒樹).

11. Antong Traversing trail (安通古道)

At 270-600m a.s.l., 24th of May, 23°16' N 121°21' E. Hillside slopes with Catechu-palm (*Areca catechu*) plantations, *Bidens pilosa* vegetation at roadside, and forest remnants with flowering *Cyclospermum leptophyllum* (Pers.) Sprague (薄葉芹菜) and small white Apiaceae.

12. Jhihben forest recreation area (知本森林遊樂區)

At 150-250m a.s.l., 25th of May, 22°41' N 120°59' E. Lowland *Fraxinus griffithii* C.B. Clarke forest (白雞油) (Fig. 1D).

13. Coast 3 km ENE Fengping (豐濱海岸)

At sea level, 26th of May, 22°36' N 121°02' E. Coastal cliff with flowering *Bidens pilosa* and the invasive *Carpobrotus* spp. (莫邪菊屬) (Fig. 5C).

14. Shizi, forest road 12 km NE of Mutan (獅子牡丹交界, 199 縣道 12 公里處)

At 340-370m a.s.l., 26th of May, 22°13' N 120°52' E. Roadside margins with tree-ferns along forest with bee-keeping close-by.

15. Dongyuan wetland (東源濕地)

At 290-310m a.s.l., 26th and 28th of May, 22°12' N 120°51' E. Freshly mown ginger (*Hedychium coronarium* J. Koenig, 穗花山奈) fields and wet decaying organic matter, non-native trees with sapstream. Pond with waterlilies (*Nymphaea* spp., 睡蓮屬), and lakeshore with flowering *Bidens pilosa* (Fig. 5D).

16. Nanrenshan (Kenting NP) 南仁山 (墾丁國家公園)

At 200-340m a.s.l., 27th of May, 22°05' N

Fig. 5. Collecting sites. A. Fuyuan Butterfly resort, forest track. B. Fuyuan Butterfly resort, outskirts with large spiders. C. Fengping coast. D. Dongyuan wetland.

120°51' E. Boggy humid grassland vegetation (Fig. 7A) with *Melastoma malabathricum* L. shrubs (基尖葉野牡丹), *Bidens pilosa*, *Valeriana* spp. (纈草屬) and purple flowering shrub (Fig. 8B).

17. Cikong (七孔)

At 350-610m a.s.l., 28th of May, 22°02' N 120°47' E. Wet ravine with waterfall and forest stream, only flowering plants were some *Sambucus javanica* shrubs (Fig. 7B).

18. Siangyang Forest Recreation Area, Yakou area (向陽森林遊樂區, 啞口)

18a Recreation area at 2310-2820m a.s.l., 29th of May, 23°14' N 120°59' E. Mainly older *Pinus taiwanensis* Hayata (臺灣二葉松) afforestation, and streams and a small brook (Fig. 7C) with flowering *Anemone vitifolia* Buch.-Ham. ex DC. hybrid "*japonica*" (小白頭翁), *Astilbe longicarpa* (Fig. 2C), *Erigeron annuus* (L.) Pers. (白頂飛蓬) (Fig. 8A), *Rhododendron breviperulatum* Hayata (南澳杜鵑) (Fig. 2B) and another white flowering pilose plant.

18b Road to the recreation area at 2120-2230m a.s.l., 29th of May, 23°14' N 120°59' E. Small rivulet and brook with *Astilbe longicarpa*.

19. Rongsing / Ren'ai (榮興 / 仁愛)

At 1980m a.s.l., 31st of May, 24°12' N 121°16' E. Roadside with overhanging rocks with crevices and lichens, above cloud forest, and forest opening along the river.

20. Along the road to Rongsing (榮興)

Road construction works with rocky slopes and dripping water along the road. At 1930m a.s.l., 31st of May, 24°14' N 121°15' E.

Results

Larval habitats

The investigated rotholes were not productive, neither the "open" ones in branchforks nor the "closed" ones in the tree trunk itself. About eight sap runs were searched on diverse deciduous trees where *Monoceromyia similis* (Kertész, 1913) males were patrolling nearby or had females in attendance but no larvae or pupae were found. However, in

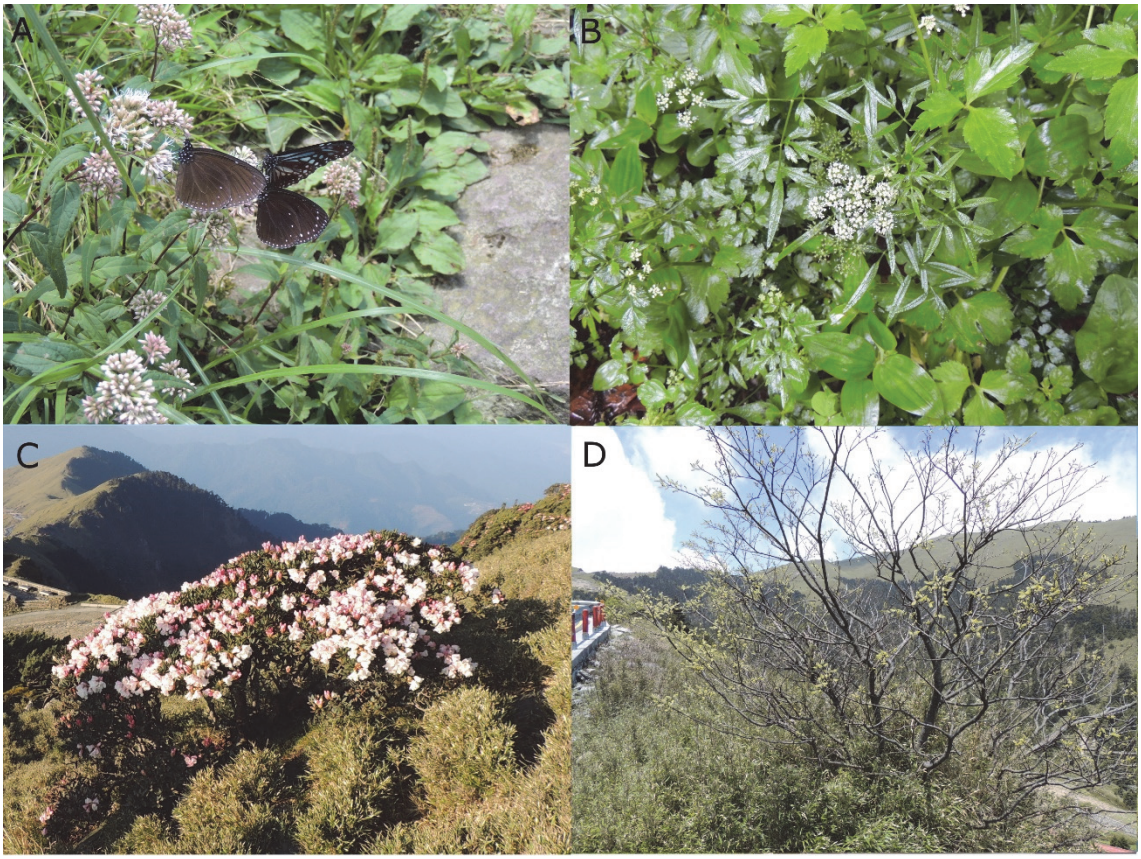

Fig. 6. Flowers visited by **SYRPHIDAE**. A. *Valeriana fauriei*, Datun mountain, Yangmingshan. B. *Oenanthe javanica*, Mingshi forest recreational area. C. *Rhododendron rubropilosum* and *R. pseudochrysanthum*, Hehuanshan hilltop. D. *Salix* spp., Hehuanshan.

Hueisun (8b), a female *Tigridomyia curvigaster* (Macquart, 1842) was collected near a tree trunk rot hole and several empty pupae of Eristalini were found on one very large sap run, where two *Monoceromyia similis* and one *Tigridomyia curvigaster* adults were collected.

In Fuyuan (10), about a dozen rotting plant roots of "Elephant ear" (*Colocasia* spp., 芋屬) were searched as females of *Graptomyza dolichocera* Kertész, 1914 had been seen flying around these roots. Only one larva was found, possibly belonging to the previously mentioned species of *Graptomyza*. Roots of thistles were dug out and cut open to find larvae or old larval traces but none were found.

Aphid colonies were very scarce and only in Hueisun (8b) were several found with females of *Dideopsis aegrota* (Fabricius, 1805) exhibiting oviposition behavior. No larvae, pupae or larval excrement in or close to the aphid colonies were found, indicating that no larvae were present during the time we were there.

Preliminary species list

The species list is in alphabetical order of genus and species. The genus and species names follow the most recent nomenclature used in the papers mentioned in the material and methods section. For each species, the collecting sites and numbers of collected specimens are listed. Short notes on identification and biology are provided.

The genus *Allobaccha* is in need of revision and it is highly likely several name changes and new names will occur.

The genus *Asarkina* is in need of revision and several undescribed species are to be expected. The names used here are based on a combination of Shiraki (1930), Thompson (in litt.), Mengual (pers. comm.) and the study of specimens in the collection of the Natural History Museum in London. Shiraki (1930) mentions 5 species, one of which most likely is *Eupeodes*. Here we list 6 species, of which at least 2 will be new for Taiwan. The identity of the species is not clear and thus nothing will be speculated on which species are new to the fauna.

Fig. 7. Collecting sites. A. Nanrenshan lake. B. Cikong ravine. C. Siangyang Forest Recreation Area. D. Dapu trail, Mt Shamao, Yangmingshan, trail start.

The genus *Episyrphus* is in need of a thorough revision, both species names and discriminating characters are unclear. The color of the pile on the frons and scutellum and the abdominal color have been used to separate species, but these turned out to be temperature-dependent (Wright and Skevington, 2013). Other characters, especially the shape, size and placement of the black maculae on sternum II are considered as discriminating characters between species, not only in *Episyrphus* (Wright and Skevington, 2013) but also in *Dasysyrphus* (Doczkal, 1996) and *Eupeodes* (Dusek and Laska, 1973). DNA data from our material suggests the occurrence of at least three species of *Episyrphus* in Taiwan, i.e., *E. arcifer*, *E. balteatus* and *E. viridaureus* (Jeffrey Skevington pers. comm.). In the other material studied, for which no DNA data are present, there are two additional species morphologically distinguishable from the three DNA species. The presence of *E. balteatus* in Taiwan is, however, doubtful. In European and East Palaearctic specimens of *E. balteatus*, tergum II is either entirely yellow or, in most cases, has one medial elongate-triangular black macula, while in the Taiwanese specimens they have two medio-lateral rounded-triangular black maculae or a black fascia with broad triangularly expanded lateral margin. This strongly suggests the Palaearctic and Taiwanese specimens belong to two different species (Jeroen van Steenis pers. comm.. As we did not study all types of material, the names applied are mostly based on Shiraki (1930) in which *E. nectarinus* is the most common species, after that *E. balteatus* and finally *E. alternans*. The concepts of these species are not clear and it is not possible to consign any of the here-studied Taiwanese specimens to one of the names used by Shiraki (1930). It is supposed that *E. balteatus* was a misidentification (Shiraki, 1930) and that these specimens in fact belong to *E. nectarinus*.

Besides these three species, Shiraki (1930) also mentions *E. arcifer* and *E. divertens* for which the species concepts are the same as used here.

The concepts of Thompson (unpublished

Fig. 8. Flowers visited by **SYRPHIDAE**. A. *Erigeron annuus*, Siangyang Forest Recreation Area. B. *Melastoma malabathricum*, Nanrenshan lake. C. *Koelreuteria elegans* subsp *formosana*, Fuyuan Butterfly resort. D. *Callicarpa formosana*, Dapu trail, Mt Shamao, Yangmingshan, forest track, with *Kertesziomyia formosana*.

preliminary key to Oriental **SYRPHIDAE**) and those of Ghorpade (1994) are not always clear, so especially in *Meliscaeva* it is difficult to address correct names to the specimens. The **SYRPHIDAE** names and interpretations used here are, therefore, mostly based on Shiraki (1930).

1. *Allobaccha amphithoe* (Walker, 1849)
Figs 9A, 9B
Records. **16**: 2♂.
Distribution. Oriental from Sri Lanka, India and Taiwan south to the island of Flores, also Japan (Evenhuis and Pape, 2021).
Identification. Yellow scutellum and otherwise also extensively yellow-colored species with shiny (non-pollinose) face and thorax.
Biology. Found in Southern Taiwan, hovering in a tropical lowland forest within the vicinity of a vast wetland area, at an altitude of 200-340m a.s.l.
Remarks. The holotype of *A. amphithoe* (NHM) was studied and is similar to the Taiwanese specimens.

2. *Allobaccha nigricoxa* (Curran, 1928)
Figs 9C, 9D
New record for Taiwan.
Records. **2a**: 1♀; **3b**: 2♂.
Distribution. Penninsular Malaysia (Evenhuis and Pape, 2021), Taiwan.
Identification. Black face and scutellum; predominantly dark-brown to black legs; tergum I black; pleurae black with golden-green reflection with some yellow pollinosity on anepisternum; wing with dark macula apically and the rest slightly darkened.
Biology. Found in Northern Taiwan in mid-elevation forests at an altitude of 970-1068m a.s.l. Collected while flying through and flower-visiting on *Melanolepis multiglandulosa*.
Remarks. Three syntypes of *A. nigricoxa* (NHM) were studied and found similar to the Taiwanese specimens. This species was not mentioned by Shiraki (1930) and is recognized as new for Taiwan.

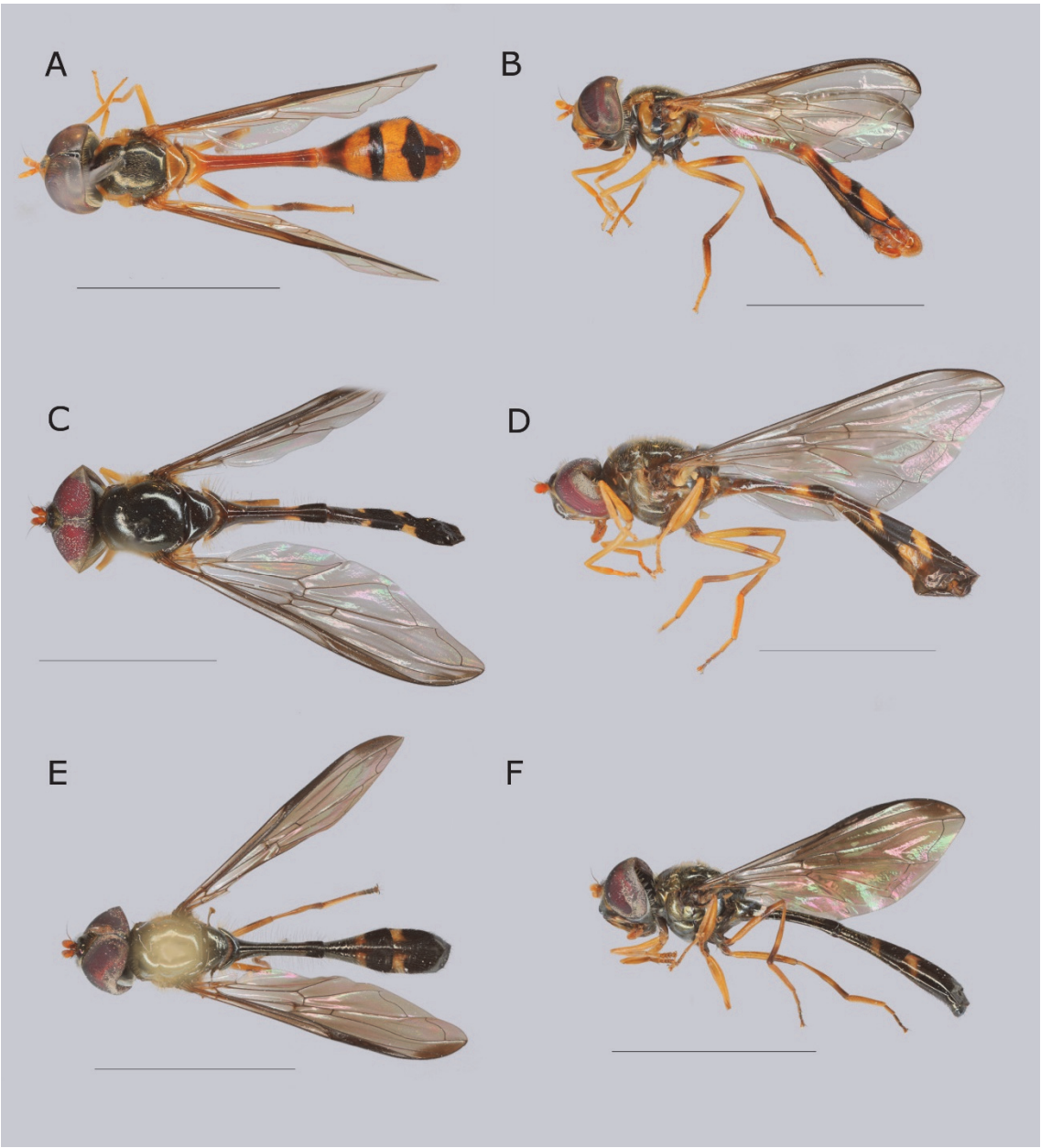

Fig. 9. Adult habitus of *Allobaccha* species, A, C, E, dorsal view; B, D, F, lateral view. A, B. *A. amphitoe*, male, Nanrenshan. C, D. *A. nigricoxa*, male, Mingshih. E, F. *A. porphyra*, male, Siangyang. Scale 5.0 mm.

3. *Allobaccha porphyra* (Curran, 1928)
Figs 9E, 9F
New record for Taiwan.
Records. **3b**: 1♂; **6**: 1♂; **18a**: 2♂; **19**: 1♀.
Distribution. Borneo and Penninsular Malaysia (Evenhuis and Pape, 2021), Taiwan.
Identification. Black face and scutellum; predominantly dark-brown to black legs; tergum I black and anterolateral corner with golden sheen; pleurae black with golden-green reflection without yellow pollinosity; terga III and IV with vague brown-yellow squarish maculae; wing entirely dusky, with black macula apically.
Biology. Found throughout Taiwan and collected in wet mid-elevation forest gully at an altitude of 970-1068 m a.s.l. and high-elevation areas like a moist mountain *Pinus taiwanensis* afforestation and a wide river bed overgrown with small shrubs at altitudes of 1850-2820 m a.s.l.
Remarks. The syntype series of *A. porphyra* (NHM) was studied and found similar to the Taiwanese specimens. No type material of *A. nigricosta* (Brunetti, 1907) nor *A. apicalis* (Loew, 1858) has been studied, so the possible synonym of these species with *A. porphyra* could not be established here. This species was not

mentioned by Shiraki (1930) and is considered as a new record for Taiwan.

4. *Allobaccha pulchrifrons* (Austen, 1893)
Fig. 10A
Records. **1a**: 1♂; **3b**: 20♂, 5♀; **16**: 1♂; **19**: 1♀.
Distribution. Sri Lanka (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. Face laterally yellow; metaleg with dark-brown color; tergum I yellow; anepisternum with extensive yellow pollinosity; tergum V (almost) entirely black; cell BM covered for 50% in microtrichia, in female wing cell BM almost entirely bare. Several males were found with frontal pollinosity slightly more extended; wings more dark basally; cell BM covered for 95% in microtrichia.
Biology. Found throughout Taiwan and flower-visiting on *Melanolepis multiglandulosa* and *Prunus* spec (梅屬), also found flying through wet forest gully at mid-elevation at altitudes of 200-1980 m a.s.l.
Remarks. The two different morphs were collected in Mingchih flying together around the same tree. Further research and the study of relevant type material is needed to see if these morphs are different species.

5. *Allobaccha umbrosa* (Brunetti, 1923)
= *A. sapphirina* sensu Shiraki, 1930
Figs 10E, 10F
Records. **2a**: 1♂.
Distribution. India, Taiwan (Evenhuis and Pape, 2021).
Identification. Entirely black species; wing membrane predominantly greyish; vague mica colored maculae on abdomen.
Biology. Found in North Taiwan, hovering in between trees in a mid-elevation mixed forest at an altitude of 980m a.s.l.
Remarks. The holotype of *A. umbrosa* (NHM) was studied and found similar to the Taiwanese specimen. Afrotropical specimens of *A. sapphirina* (Wiedemann, 1830) in the NHM differ from the Taiwanese specimen of "*A. sapphirina*" by the clearly less infuscated wings and the maculae on the abdomen in *A. sapphirina* are larger than those of the Taiwanese specimens. Based on the description of the female type of *Baccha sapphirina* it seems more similar to the Afrotropical specimens in the NHM than to those from Taiwan. This species is mentioned by Shiraki (930) under the name *A. sapphirina*, but here we use *A. umbrosa* and not *A. sapphirina* for the Taiwanese specimens as these correspond best with the type of *A. umbrosa*.

6. *Allobaccha* spec 1
Figs 10B, 10C, 10D
New record for Taiwan.
Records. **2d**: 1♀; **3b**: 2♂, 18♀; **5**: 1♀; **8b**: 1♀; **14**: 1♀; **16**: 1♂; **20**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. Scutellum entirely black; tergum I and notopleuron almost entirely yellow; tergum III with posterior margin 3 times wider than anterior margin, maculae with medial end all the way down to the posterior margin, lateral end only down to posterior half; cell CuP with sub-basal 1/6-1/4 bare, basal 1/8 of cell DM bare. Several females were found with cell CuP almost entirely microtrichose and cell DM entirely microtrichose, possibly indicating two separate species.
Biology. Found throughout Taiwan at altitudes of 200-1930 m a.s.l. Most of the Mingchih specimens were collected flying through and feeding on the flowers of one single tree (*Melanolepis multiglandulosa*). This tree stood in a sunny place along the road at one side and the river at the other within a mid-elevation forest. Also collected in a lowland tropical rainforest close to a boggy grassland area.
Remarks. Most likely an undescribed species. Females of the two different forms were collected in Mingchih flying together around the same tree.

7. *Allograpta javana* (Wiedemann, 1824)
Figs 10G, 10H
Records. **2c**: 1♀; **2d**: 2♂, 1♀; **3b**: 3♀; **8a**: 1♂; **8b**: 2♀; **10**: 2♂, 3♀; **14**: 1♀.
Distribution. India to Japan, southern Australia, Fiji and Solomons (Evenhuis and Pape, 2021).
Identification. Easily identified by the yellow lateral margins of the scutum and the yellow fascia on the abdominal terga.
Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. Flower visiting on

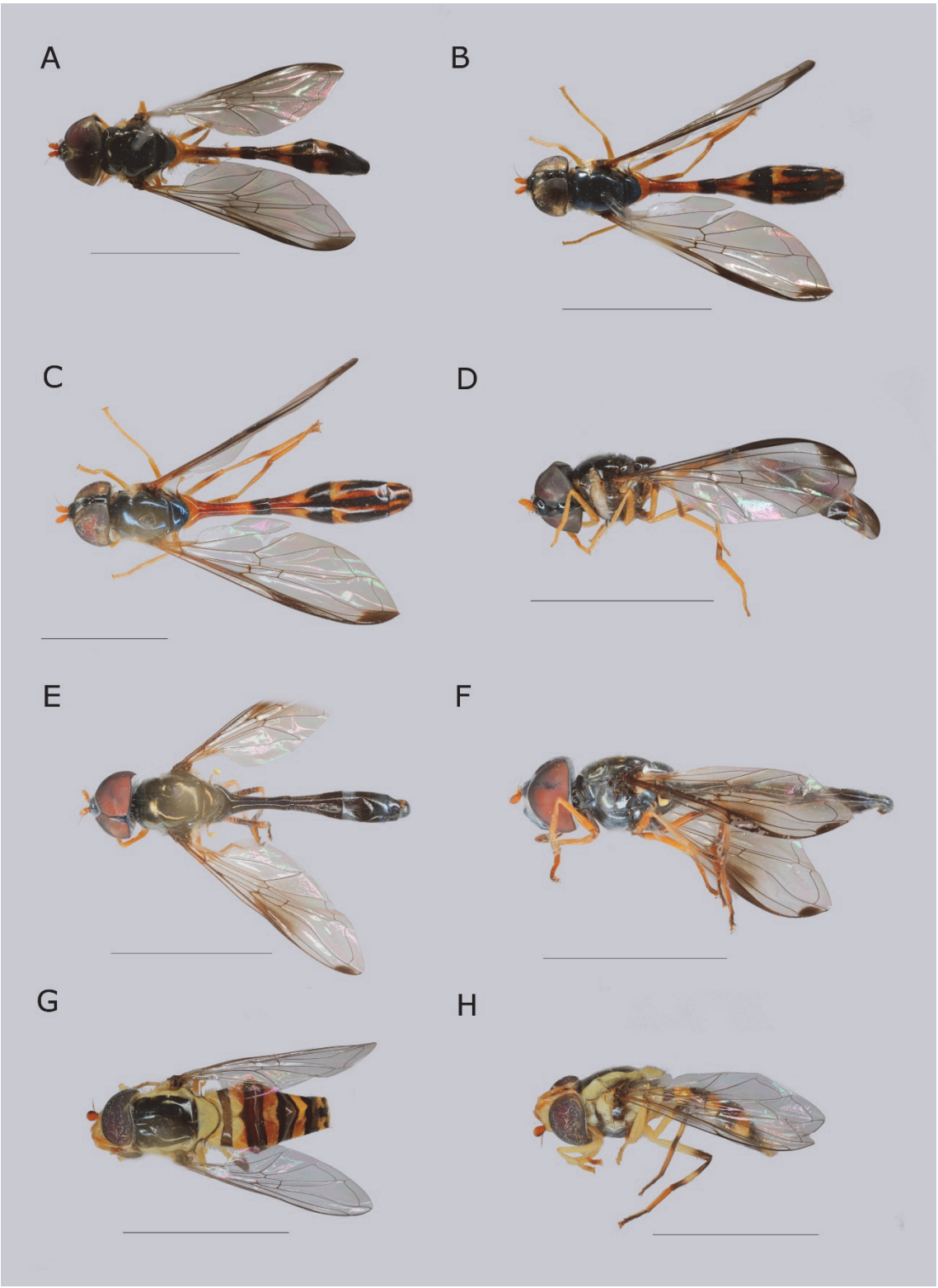

Fig. 10. Adult habitus, A, B, C, E, G, dorsal view; D, F, H, lateral view. A. *Allobaccha pulchifrons*, male, Mingshih. B. *A.* spec 2, male, Mingshih. C, D. *A.* spec 2, female, Mingshih. E, F. *A. umbrosa*, male, Datun Mt. G, H. *Allograpta javana*, male, Mingshih. Scale 5.0 mm.

Melanolepis multiglandulosa, also found in lowland mixed forests.

Remarks. This is a widespread Oriental species.

8. *Archimicrodon caeruleus* (Brunetti, 1908)

Records. **2a**: 1♀; **10**: 1♂; **15**: 1♂, 1♀; **16**: 4♂, 1♀; **17**: 2♂, 1♀.

Distribution. India and Taiwan (Evenhuis and Pape, 2021).

Identification. A small and dark microdontine

with infuscated wings and distinct spines on scutellum; wing cell BM with only anterior half microtrichose; male and female with lateral margin and anterior part of scutum broadly golden pilose, other part predominantly short black pilose. Several specimens have been collected with wing cell BM almost entirely microtrichose, possibly representing an undescribed species.

Biology. Found throughout Taiwan at altitudes of 200-1068 m a.s.l. Flying low through the vegetation with several specimens together in a partly sunny part of a wet ravine.

Remarks. Based on morphological and molecular data, there are several morphospecies within *A. caerulescens*. A thorough review of the different types and the study of additional material is necessary to establish species boundaries and to name the different morphospecies.

9. *Asarkina formosae* Bezzi, 1908

Figs 11A, 11B

Records. **2b**: 7♀; **2c**: 3♂; **2d**: 1♀; **3b**: 1♀; **5**: 1♂; **8b**: 6♂, 6♀; **8c**: 1♂; **10**: 1♂; **11**: 1♀; **12**: 1♂; **13**: 1♀; **15**: 1♂, 3♀.

Distribution. Taiwan, as *Asarcina ericetorum* var *formosae* (Evenhuis and Pape, 2021).

Identification. Frons yellow, frontal pile yellow; very similar to *A. salviae*, only minor differences in color of setae on probasitarsus were found.

Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. and collected in different forest habitats and found visiting flowers of *Bidens pilosa*.

Remark. Ghorpade (2009) mentioned this species as a synonym of *A. incisuralis* (Macquart, 1855). As it is unclear if Ghorpade studied the relevant types and *A. formosae* was described from Taiwan this last name is used for the specimens mentioned here. The DNA seems to match with other Oriental and Australian specimens named *A. ericetorum* (Fabricius, 1781) and possibly *A. formosae* is a junior synonym of *A. ericetorum*. The name "formosae" is used for the here-studied specimens as they appear similar to the specimens mentioned by Shiraki (1930), furthermore, the type locality of *A. ericetorum* is South Africa and it is most likely the here studied specimens belong to a different species than those from the Afrotropical region.

10. *Asarkina fumipennis* Sack, 1913

Figs 11C, 11D

Records. **2b**: 2♂; **2c**: 4♂; **2d**: 2♂; **3b**: 13♂, 15♀; **8c**: 1♀; **16**: 13♂, 15♀; **17**: 2♂, 1♀.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Frons with anterior part black, black pilose; face with black pile medially; tergum III extensively black pilose; yellow fascia on tergum IV entirely reaching lateral margin.

Biology. Found throughout Taiwan at altitudes of 250-1020 m a.s.l. A forest species collected in lowland to mid-elevational forests. Found in numbers on a single flowering *Melanolepis multiglandulosa*, also found visiting flowers of *Bidens pilosa*.

11. *Asarkina orientalis* Bezzi, 1908

Fig. 11E

Records. **10**: 1♂.

Distribution. China, Taiwan, Peninsular Malaysia and the Philippines (Evenhuis and Pape, 2021).

Identification. Frons anteriorly black and black pilose; face entirely yellow pilose; yellow fascia on tergum IV not entirely reaching lateral margin, posterior half of fascia separated from margin by a narrow dark-brown to black vitta; tergum II with median black vitta.

Biology. Found in subtropical lowland rainforest in Central Taiwan at an altitude of 200-650 m a.s.l.

Remarks. Based on preliminary molecular data this species is also found in Japan, and might be *A. porcina* sensu Shiraki (1930).

12. *Asarkina salviae* (Fabricius, 1794)

Fig. 11F

Records. **2c**: 1♂; **10**: 1♂; **11**: 1♂, 1♀; **15**: 1♂; **16**: 1♀; **17**: 1♂.

Distribution. Sierra Leone, as synonym of *Syrphus ericetorum* Fabricius, 1781 and Taiwan (Evenhuis and Pape, 2021).

Identification. Morphologically very similar to *A. formosae*, see the key for identification.

Biology. Found in several lowland tropical rainforests throughout Taiwan at an altitude of 200-650 m a.s.l.

Remarks. The genus *Asarkina* is in need of a revision and it could be the specimen studied here is just an aberrant *A. formosae* and our interpretation of *A. salviae* might be wrong.

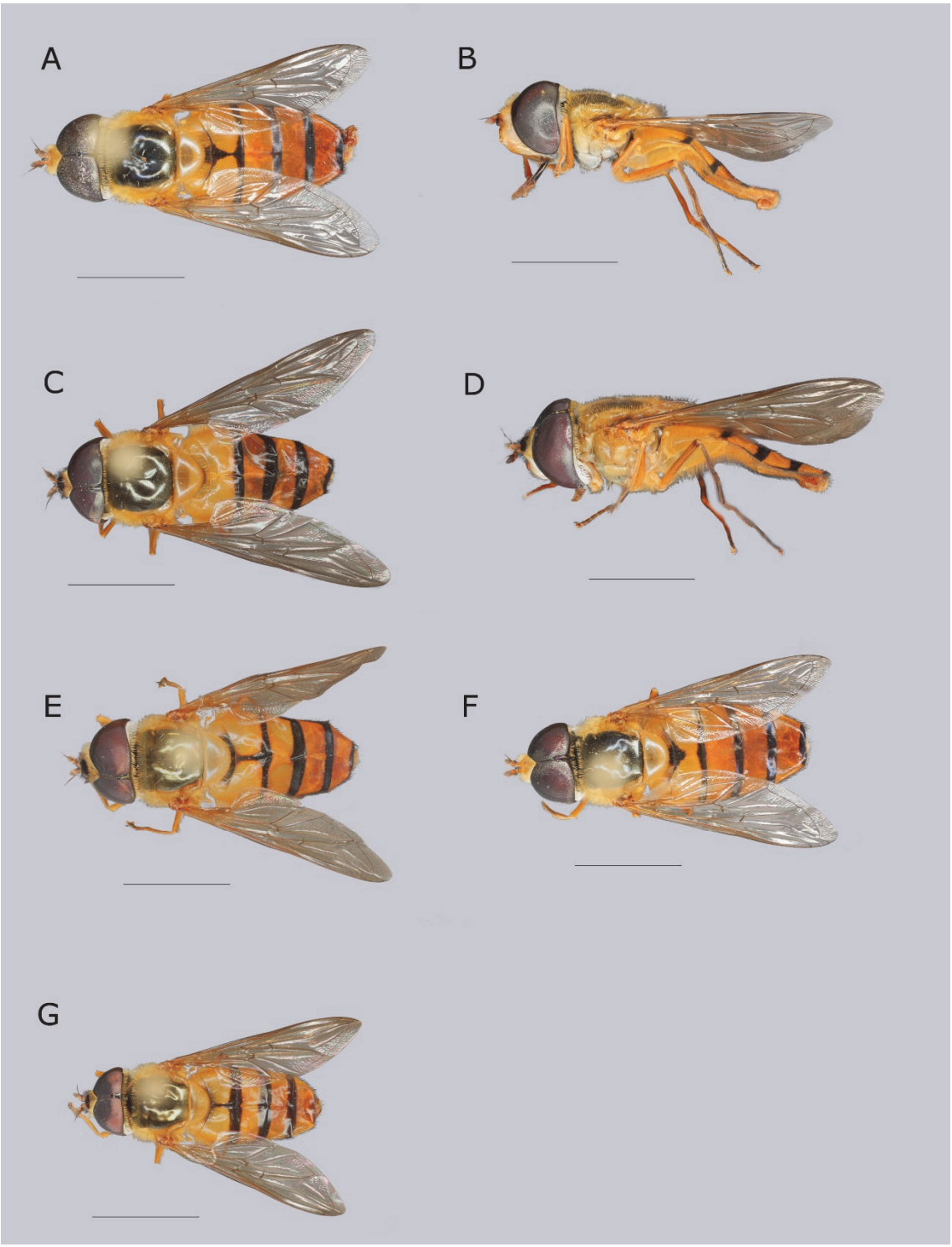

Fig. 11. Adult habitus of *Asarkina* species, A, C, E, F, G, dorsal view; B, D, lateral view. A. *A. formosae*, male, Hueisun. B. *A. formosae*, male, Mt Shamao. C. *A. fumipennis*, male, Mingchih. D. *A. fumipennis*, male, Cikong. E. *A. orientalis*, male, Fuyuan. F. *A. salviae*, male, Cikong. G. *A.* spec 2, male, Kenting. Scale 5.0 mm.

13. *Asarkina* spec 1

New record for Taiwan.

Records. **2c**: 3♂, 1♀; **8b**: 1♂; **10**: 1♀.

Distribution. Taiwan, not mentioned anywhere bofore.

Identification. Similar to *A. orientalis*, except for tergum II with entire yellow fascia.

Biology. Found in subtropical lowland rainforest, at an altitude of 200-650 m a.s.l.

Remarks. The genus *Asarkina* is in need of a revision and it could be that the specimens studied here are just aberrant *A. orientalis*.

14. *Asarkina* spec 2
Fig. 11G
New record for Taiwan.
Records. **3b**: 1♂, 2♀; **10**: 1♂; **16**: 1♂; **17**: 1♂.
Distribution. Taiwan, not mentioned anywhere before.
Identification. Similar to *A. fumipennis*, except for the extensively yellow pilose tergum III and minor details as highlighted in the key.
Biology. Found throughout Taiwan at altitudes of 290-1020 m a.s.l. Collected in subtropical lowland rainforest and mid-elevation cloud forest.
Remarks. The genus *Asarkina* is in need of a revision and it could be that the specimens studied here are just aberrant *A. fumipennis*.

15. *Asiobaccha maculosa* Mengual & Thompson, 2016
New record for Taiwan.
Records. **2c**: 1♂, 1♀; **12**: 1♀.
Distribution. Peninsular Malaysia and Sumatra (Evenhuis and Pape, 2021), Taiwan.
Identification. Similar to *A. sauteri* but with very narrow alula.
Biology. Found in North and South Taiwan at altitudes of 150-630m a.s.l. Hovering at 1 to 2 meters along the footpath close to broadleaved trees like *Quercus* spp., or flying through high and low vegetation.
Remarks. The Taiwanese record of this recently described species lies far away from its type locality and could indicate it concerns a sibling species.

16. *Asiobaccha nubilipennis* (Austen, 1893)
Fig. 12A
Records. **2a**: 1♂, 2♀; **2c**: 42♂, 1♀; **3b**: 1♂, 1♀; **5**: 2♂, 2♀; **8a**: 1♂; **8b**: 2♂; **8c**: 2♂, 1♀; **12**: 2♂; **14**: 1♂.
Distribution. India, Japan, Nepal, Sri Lanka and Taiwan (Evenhuis and Pape, 2021).
Identification. Large dark winged species, alula present and extensively microtrichose, mesonotum black, scutellum at least apically yellow, metafemur yellow,
Biology. Found throughout Taiwan at altitudes of 150-1068 m a.s.l. Hovering at 1 to 2 meters above a footpath, besides a *Quercus* spp. tree, or found feeding on *Melanolepis multiglandulosa*.

17. *Asiobaccha sauteri* (Kertész, 1913)
Fig. 12B
Records. **2c**: 27♂, 4♀; **2d**: 3♂; **10**: 2♂; **11**: 1♀; **12**: 1♂; **14**: 1♂; **16**: 3♂; **17**: 7♂, 3♀.
Distribution. Taiwan, Vietnam to the Philippines and Sulawesi (Evenhuis and Pape, 2021).
Identification. Species without alula, face yellow, scutellum brown-yellow.
Biology. Found throughout Taiwan at altitudes of 200-650 m a.s.l. Hovering above a footpath, in a lowland subtropical forest and also in tropical rainforests.

18. *Azpetia flavoscutellata* Kertész, 1913
Records. **10**: 2♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Wing with black macula; two pairs of dens on the abdomen; metafemur slightly thickened and with two rows of setae.
Biology. Found in a lowland forest in the forest margin bordering a large meadow, at 200-650m a.s.l.
Remarks. The specimens collected here combine characters of both *A. maculata* Shiraki, 1930 and *A. flavoscutellata* Kertész, 1913. As both species are known from Taiwan and *A. flavoscutellata* was described prior to *A. maculata* the name *flavoscutellata* is used here. The study of the type material is needed to see if these names represent two different species.

19. *Baccha maculata* (Walker, 1852)
Fig. 12D
Records. **3b**: 2♂, 1♀; **11**: 3♂, 5♀.
Distribution. Borneo, India, Java, Peninsular Malaysia and Taiwan (Evenhuis and Pape, 2021).
Identification. Typical *Baccha* species with club-shaped abdomen and predominantly black colored body; wing medially with two black infuscated maculae.
Biology. Found in North and Central Taiwan at altitudes of 270-1020 m a.s.l. Flower visiting small white Apiaceae along a road through a Catechu-palm plantation and in a wet forest gully in mid-elevational forests.

20. *Baccha* spec 1
Fig. 12C
New record for Taiwan.

Records. **18a**: 1♂.
Distribution. Taiwan, not mentioned anywhere before.
Identification. Overall blackish species with almost entirely dark-grey wings, black antennae, black legs and tergum I entirely black.
Biology. Found in a high-elevational mixed broadleaved and pine afforestation at an altitude of 2310-2820 m a.s.l.
Remarks. This species is not mentioned by Shiraki (1930) and most likely an undescribed species.

21. *Betasyrphus serarius* (Wiedemann, 1830) species A
Fig. 12E
Records. **2a**: 1♀; **3b**: 1♀; **18a**: 2♂, 7♀; **19**: 2♀; **20**: 1♀.
Distribution. The distribution of *Betasyrphus serrarius* A and B is not further differentiated here and the superspecies is known from Australia, China and New Guinea (Evenhuis and Pape, 2021). and Taiwan (Shiraki, 1930).
Identification. Eyes densely and white pilose; wing with basal cells extensively bare; stigma and subcostal cell light-brown; scutellum with many yellow pile mixed with black pile to predominantly black pilose; metaleg black and dark-yellow; abdomen with terga II-IV maculae and fascia yellow to dusky-yellow and pollinose.
Biology. Found in high-elevational mixed broadleaved and pine forest, and in mid-elevational subtropical forest, at an altitude of 970-2820m a.s.l.
Remarks. The genus *Betasyrphus* contains several morpho-species in the Oriental region and a revision is needed to establish species boundaries and their names. As no type material was studied this species and the next are mentioned as species A respectively species B, clearly representing two different species but not further named here.

22. *Betasyrphus serarius* (Wiedemann, 1830) species B
New record for Taiwan.
Records. **18a**: 3♀; **19**: 1♀.
Distribution. Taiwan, see for further distribution above.
Identification. Eyes sparsely and mixed black and white pilose; wing with basal cells only slightly bare; stigma and subcostal cell dark-brown; scutellum predominantly to entirely black pilose; metaleg almost entirely dark-brown to black; abdomen with vague dusky-yellow densely pollinose maculae on tergum III only.
Biology. Found in Central Taiwan at an altitude of 1980-2820 m a.s.l. in high-elevational mixed broadleaved and pine forest.
Remarks. Only one *Betasyrphus* species was mentioned from Taiwan (Shiraki, 1930) so at least one of the two species of *Betasyrphus* mentioned here has not been recorded from Taiwan before. For ease of understanding species B is considered as new for Taiwan.

23. *Brachypalpoides* spec 1
New record for Taiwan.
Records. **7d**: 1♂.
Distribution. Taiwan, not mentioned anywhere before.
Identification. Entirely black species with pilose (and not setose) ridge on metatibia and non pilose metasternum.
Biology. Found in Central Taiwan at an altitude of 2200 m a.s.l. Flying around a flowering tree in a mountain cloud forest.
Remarks. This species is close to *B. perniger* Hippa, 1985 and represents an undescribed species. The genus *Brachypalpoides* contains several undescribed Oriental species and a revision is needed.

24. *Chalcosyrphus annulatus* (Brunetti, 1913)
Fig. 12G
Records. **3b**: 1♀.
Distribution. India, Laos and Peninsular Malaysia (Evenhuis and Pape, 2021) and Taiwan (Shiraki, 1930).
Identification. A *Chalcosyrphus* with large yellow maculae on the abdomen and predominantly orange-red legs.
Biology. Found in North Taiwan at altitudes of 970-1020 m a.s.l. Flying through *Melanolepis multiglandulosa* tree and resting on leaves.

25. *Chalcosyrphus flavipes* (Sack, 1922)
Fig. 12H
Records. **18a**: 1♂, 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A species with dark-brown to

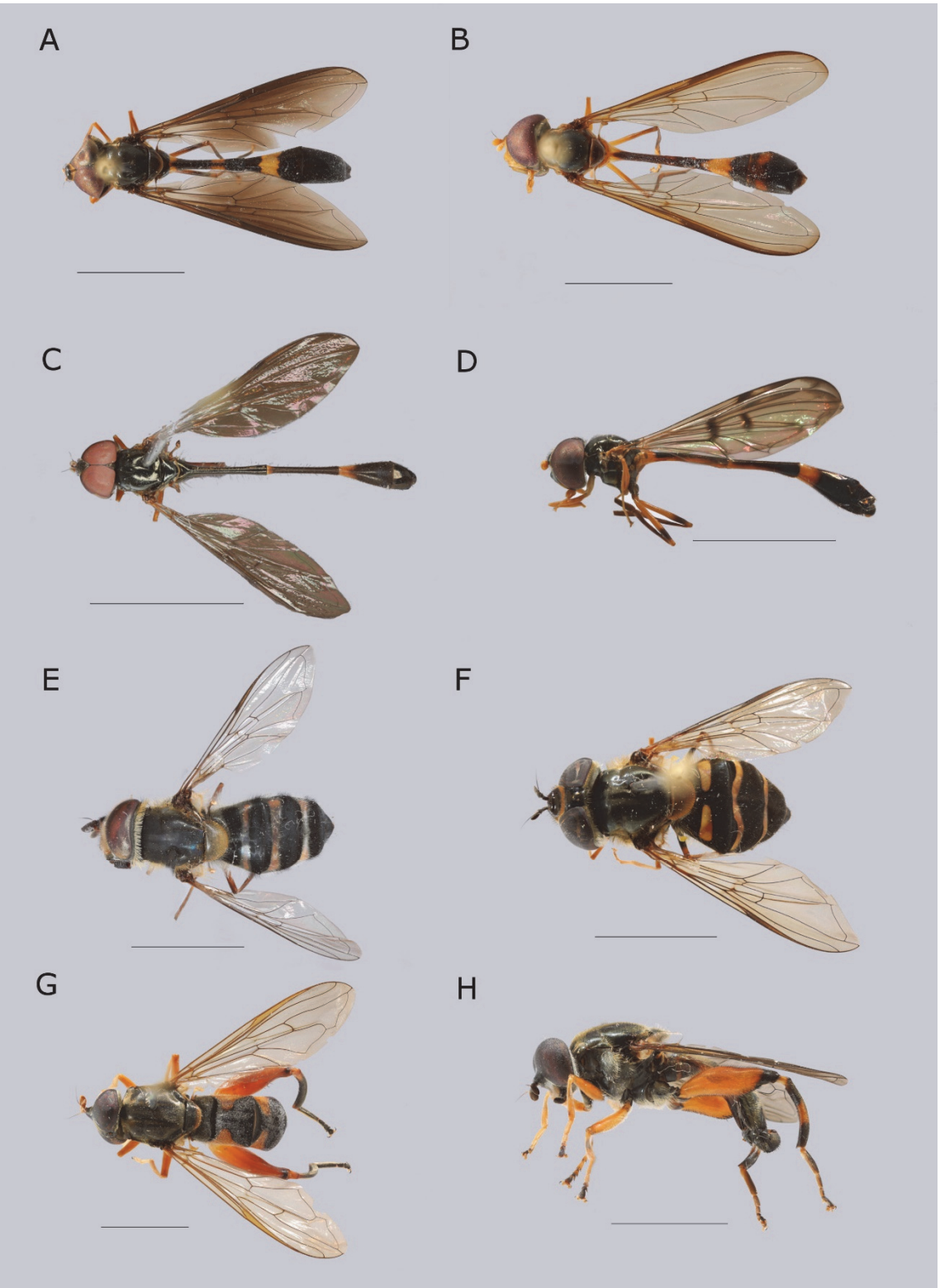

Fig. 12. Adult habitus, A, B, C, E, F, G, dorsal view; D, H, lateral view. A. *Asiobaccha nubilipennis*, male, Dapu trail. B. *A. sauteri*, male, Fuyuan. C. *Baccha* spec, male, Siangyang. D. *B. maculipennis*, male, Antong. E. *Betasyrphus serarius* A, female, Siangyang. F. *Dasysyrphus orsua*, female, Hehuanshan. G. *Chalcosyrphus annulatus*, female, Mingshih. H. *C. flavipes*, male, Siangyang. Scale 5.0 mm.

black abdomen and unicolored orange-red metafemur.

Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation with a small brook in semi-shade with *Rubus* (懸鉤子屬) shrub.

26. *Chalcosyrphus* spec 1
New record for Taiwan.
Records. **18a**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. A stout *Chalcosyrphus* with dark metafemur and infuscated pattern on wings.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation with a small brook in semi-shade with *Rubus* shrub.
Remarks. This species was initially identified as *Myolepta* spp. and is now considered as an undescribed *Chalcosyrphus* species and thus new for Taiwan.

27. *Cheilosia aterrima* Sack, 1927
Records. **18a**: 2♀.
Distribution. China, Japan and Taiwan (Barkalov and Cheng, 2004).
Identification. A small and extensively black species, femora and tibia extensively black; pilose eyes and face.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation visiting flowers of *Astilbe longicarpa*.

28. *Cheilosia* aff *carbonaria* Egger, 1860
Records. **2a**: 1♂; **3b**: 1♀.
Distribution. Taiwan, possibly recorded from Taiwan earlier (Shiraki, 1930), see under Remarks below.
Identification. A rather small and predominantly black colored species. Legs with yellow apex and base of tibiae.
Biology. Found in North Taiwan at altitudes of 970-1068 m a.s.l. Collected on a steep mountain trail with Bamboo-Sedge and in a mid-elevational cloud forest.
Remarks. It was not possible to identify this species by use of the key in Shiraki (1930). Based on molecular data, this species is similar to *Cheilosia carbonaria*. As its true identity is unknown and several species of *Cheilosia* are known from Taiwan, it is possibly not a new species for Taiwan.

29. *Cheilosia niitakana* Shiraki, 1930
Records. **7a**: 3♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A large long yellow and black pilose *Cheilosia*.
Biology. Found in Central Taiwan at altitudes of 3355-3417 m a.s.l. Collected on the highest part of the Hehuanshan.
Remarks. DNA results suggest that *Cheilosia illustrata*, *C. motodomariensis* and *C. niitakana* could be synonyms. However, there are several morphological differences between these species indicating they form a species complex. More study is needed to establish species boundaries.

30. *Cheilosia ochreipila* Shiraki, 1930
Records. **18a**: 1♂; **18b**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Rather large, densely orange-yellow pilose species with pilose eyes, pilose face, and without black setae on scutellum.
Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation.

31. *Cheilosia rakurakuensis* Shiraki, 1930
Records. **18a**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Eyes and face pilose; antennae, tibia and pile yellow; femora and tarsi mixed black and yellow colored.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation.

32. *Cheilosia* spec 1
New record for Taiwan.
Records. **7a**: 10♂; **7b**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. This species has long dark-brown pilose eyes, shiny sterna, bare face, orange-brown basoflagellomere, and predominantly black legs.
Biology. Found in Central Taiwan at altitudes of 3355-3417 m a.s.l. Collected at the highest part of the Hehuanshan.
Remarks. In Shiraki (1930), no *Cheilosia* was listed with this combination of characters and it is assumed that our specimens belong to an

undescribed species and thus new for Taiwan.

33. *Cheilosia* spec 2
New record for Taiwan.
Records. **18a**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. A species with pilose eyes, bare face and long black setae on scutellum. Shiraki (1930) only gives *C. splendida* Shiraki, 1930 with these characters from Taiwan; however, *C. splendida* has extensively yellow legs while our specimen has predominantly dark-brown to black legs.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation.
Remarks. The color of the legs is an important species character in the genus *Cheilosia* and based on this, our specimen could belong to an undescribed species. This species is considered to be new for Taiwan.

34. *Cheilosia yoshinoi* Shiraki, 1930
Records. **18a**: 1♀; **18b**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. This is a shiny black species with predominantly orange-yellow legs, predominantly yellow pilose thorax and abdomen; pilose eyes and face.
Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation.

35. *Chrysotoxum formosanum* Shiraki, 1930
Records. **18a**: 3♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Basoflagellomere as long or longer than other two segments together; frons black; face with medial black vitta; abdomen with on terga II-IV one medially interrupted fascia.
Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in a high elevational *Pinus taiwanensis*afforestation.

36. *Chrysotoxum baphyrum* Walker, 1849
= *Chrysotoxum testaceum* Sack, 1913 syn Ghorpadé (2012).
Records. **11**: 2♀.
Distribution. Sri Lanka, India, Indochina, Java, Nepal and Taiwan (Evenhuis and Pape, 2021).
Identification. Basoflagellomere as long or longer than other two segments together; frons yellow; face with short medial black vitta; abdomen with on terga II-IV one medially interrupted fascia.
Biology. Found in Central Taiwan at altitudes of 270-600 m a.s.l. Collected in a Catechu-palm plantation.

37. *Citrogramma clarum* (Hervé-Bazin, 1923)
= *Xanthogramma fasciatum* Shiraki, 1930 syn Mengual, 2012
Figs 13A, 13B
Records. **3b**: 3♂, 4♀.
Distribution. Borneo, Java, Laos, the Philippines and Taiwan (Evenhuis and Pape, 2021).
Identification. A species with yellow lateral margin of scutum and extensively yellow colored head, legs and abdomen; tarsi black; abdomen relatively broad.
Biology. Found in North Taiwan at altitudes of 970-1020 m a.s.l. Flower visiting *Melanolepis multiglandulosa* and flying through a wet forest gully.
Remarks. There is some variation in characters within the Taiwanese specimens indicating a larger variability in this species than known before (Mengual and Ghorpade, 2012). The difference between our Taiwanese specimens and *C. frederici* Mengual & Ghorpade, 2012 is not clear. It could be that *C. frederici* is only a color variant of *C. clarum*.

38. *Criorhina* aff *shirakii* (van der Goot, 1964)
New record for Taiwan.
Records. **18b**: 1♂.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. A honey-bee mimic with pollinose fascia on terga.
Biology. Found in Central Taiwan at altitudes of 2120-2230 m a.s.l. Collected on a steep rocky slope with a stream at the bottom and surrounded by mixed forest. Flying low over the ground and settling on bare rocks.
Remarks. This is an undescribed species

similar to *C. shirakii* (Kevin Moran pers. comm).

39. *Dasysyrphus orsua* (Walker, 1852)
Fig. 12F
New record for Taiwan.
Records. **7a**: 2♂, 27♀, **7b**: 4♀.
Distribution. India, Sri Lanka and Sumatra (Evenhuis and Pape, 2021), Taiwan.
Identification. A black and yellow Syrphini with pilose eyes, black medial fascial vitta and rather narrow slightly concave yellow markings on the abdomen.
Biology. Found in Central Taiwan at altitudes of 3340-3417 m a.s.l. Hilltopping at high elevation and also found while visiting flowers of *Rhododendron pseudochrysanthum* and *Salix fulvopubescens*.
Remarks. The holotype of *D. orsua* (NHM) is in bad condition and no characters could be found differing with that of the Taiwanese specimens. Further study of specimens from the type locality (Sri Lanka) is needed to confirm the similarity with the Taiwanese specimens.

40. *Dasysyrphus taibaiensis* Huo, Zhang & Zheng, 2005
New record for Taiwan.
Records. **7b**: 1♀.
Distribution. China (Evenhuis and Pape, 2021), Taiwan.
Identification. A species with pilose eyes, an entirely yellow face and almost straight yellow fascia on terga II and IV.
Biology. Found in Central Taiwan at 3340-3350 m a.s.l. Collected visiting flowers of *Salix fulvopubescens* at a high mountain pass together with the much more numerous *Dasysyrphus orsua*.
Remarks. The specimens seem to differ slightly from *Dasysyrphus taibaiensis* based on the description given in Huo and Zheng (2005). The study of the type material is needed to be sure about the identity of the Taiwanese specimen.

41. *Didea intermedia* (Loew, 1854)
New record for Taiwan.
Records. **18a**: 1♀.
Distribution. Palaearctic (Evenhuis and Pape, 2021), Taiwan.
Identification. A rather broad Syrphini specimen with yellowish fascia on terga III and IV.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevation *Pinus taiwanensis* afforestation.
Remarks. This species looks similar to European specimens of *Didea intermedia* but it might also be an undescribed species.

42. *Dideopsis aegrota* (Fabricius, 1805)
Fig. 13C
Records. **2b**: 1♂, 1♀; **2d**: 2♂; **3b**: 3♂, 3♀; **5**: 1♂, 2♀; **8a**: 6♂, 1♀; **8b**: 1♂, 22♀; **8c**: 2♂; **10**: 9♂, 7♀; **12**: 4♀; **14**: 6♀; **15**: 2♀; **16**: 2♂, 2♀.
Distribution. Australia, Nepal, New Guinea and widespread in SE Asia, including Taiwan (Evenhuis and Pape, 2021).
Identification. Unmistakable as the only Syrphini with almost entirely black wings.
Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. Collected in a wide variety of forested areas, always in shaded and moist conditions, from lowlands to mid-elevation forests. Females were regularly seen flying through aphid infested lowherbs. Also found while visiting flowers of *Melanolepis multiglandulosa*.
Remarks. Based on DNA, there are 3 morpho-species of *Dideopsis* in our material. A review of the genus with extensive Oriental material to be studied is needed to sort out the species boundaries and their names.

43. *Epistrophe griseocinctus* (Brunetti, 1923)
Fig. 13E
New record for Taiwan.
Records. **7a**: 3♀; **19**: 6♀.
Distribution. India, Myanmar and Nepal (Evenhuis and Pape, 2021), Taiwan.
Identification. Looks somewhat like a large and broad *Betasyrphus*, with narrow grey pollinose fascia on terga.
Biology. Found in Central Taiwan at altitudes of 2310-3417 m a.s.l. Visiting *Rhododendron* (杜鵑屬) at a high-elevation hilltop and in a high-elevational pine afforestation, also collected in a mid-elevational forest.
Remarks. It seems that the Taiwanese species is most similar to *E. griseocinctus* (from India) (Brunetti, 1923). Several similar species are described from India, but as no type of *E. griseocinctu*s was studied, no conclusions can be

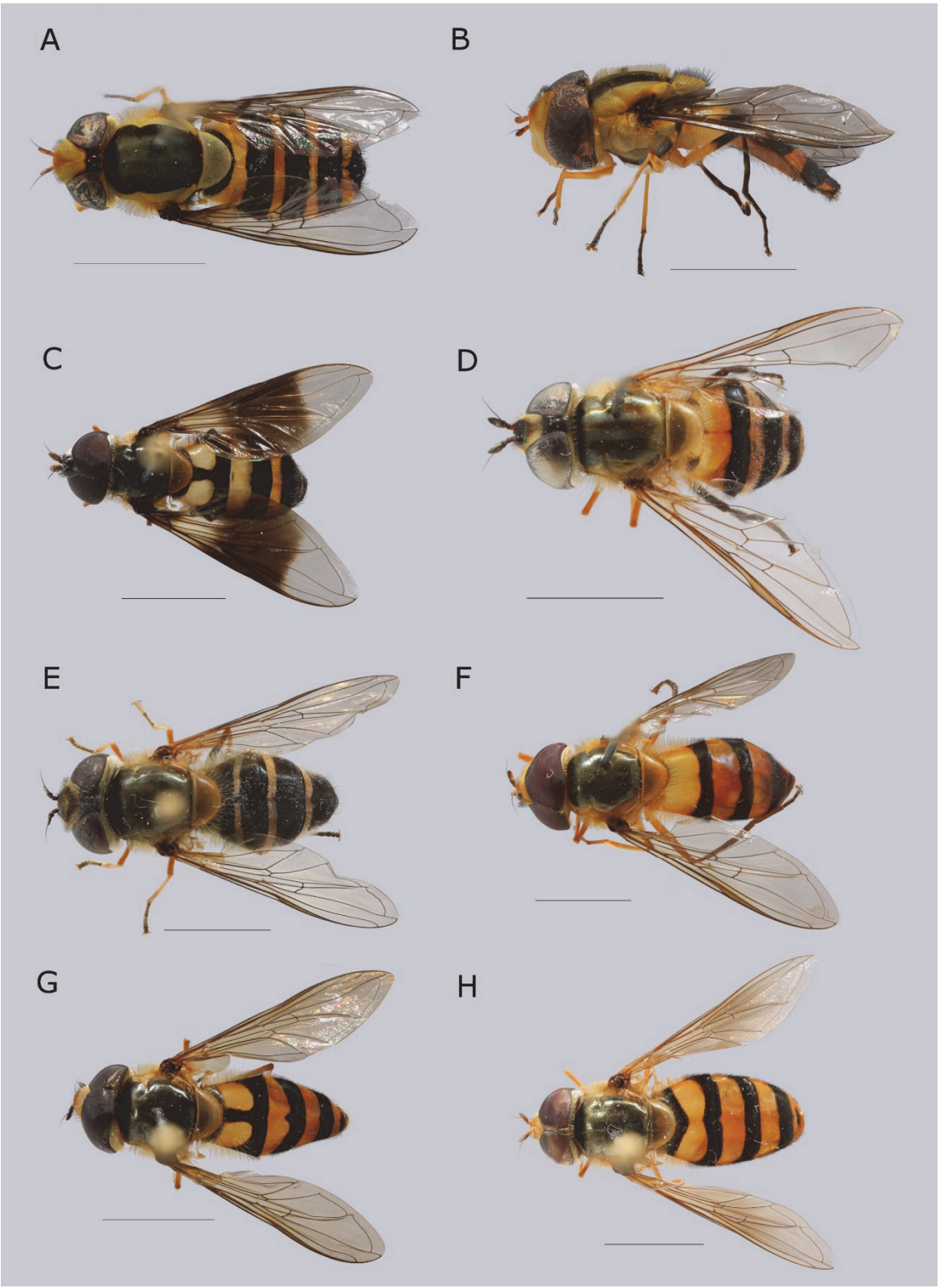

Fig. 13. Adult habitus, A, C-H, dorsal view; B, lateral view. A. *Citrogramma clarum*, female, Mingshih. B. *C. clarum*, male, Mingshih. C. *Dideopsis aegrota*, male, Fuyuan. D. *Epistrophe horishana*, female, Rongsing. E. *E. griseocinctus*, female, Hehuanshan. F. *E.* spec 2, male, Hueisun. G. *E.* spec. 1, male, Rongsing. H. *Eupeodes confrater*, male, Siangyang. Scale 5.0 mm.

drawn here. The species clearly differs from all known Taiwanese species of *Epistrophe* and it is therefore given the name *E. griseocinctus*.

44. *Epistrophe horishanus* (Matsumura, 1917)
Fig. 13D
Records. **19**: 1♀.
Distribution. Taiwan (Evenhuis and Pape,

2021).

Identification. Scutum with pollinose vittae; tergum II with yellow fascia; face with black medial vitta; metafemur with long black pile; frons black colored.

Biology. Found in Central Taiwan at an altitude of 1980m a.s.l. Visiting leaves sprayed with a mixture of alcohol, water and honey on sunlit leaves within a mid-elevational forest.

Remarks. The allotype of *E. quinquevittatus* Brunetti, 1923 carrying an identification label "*Syrphus* / *horishanus* Matsumura / by T. Shiraki (NHM) was studied and found similar to the Taiwanese specimen. A male, identified as *E. shibkawae* Matsumura, 1917 (NHM), similar to the Taiwanese specimens was found indicating a synonym with *E. horishanus*. As the specimen collected by us in Taiwan is a female and the allotype of *E. horishanus* is also a female, the name *E. horishanus* is used here. Further study is needed to confirm the possible synonymy of *E. horishanus* with *E. shibkawae*.

45. *Epistrophe* spec 1

Fig. 13G

New record for Taiwan.

Records. **18a**: 3♂; **18b**: 1♂.

Distribution. Taiwan, not mentioned anywhere else before.

Identification. Very different from all other Taiwanese species and somewhat resembling the European *E. grossulariae*; however, based on the entirely shiny scutum, yellow frons and oval maculae on tergum II it is clearly different from *E. grossulariae*.

Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in a high-elevational pine afforestation.

46. *Epistrophe* spec 2

Fig. 13F

New record for Taiwan.

Records. **3b**: 3♂; **8a**: 1♂.

Distribution. Taiwan, not mentioned anywhere else before.

Identification. Scutum entirely shiny; face yellow; antennae orange; fascia on tergum II very wide, medially almost connected; metafemur with short black pile; frons black.

Biology. Found in Central Taiwan at altitudes of 970-1020 m a.s.l. in mid-elevational wet forests.

Remarks. This species is most likely an undescribed species.

47. *Episyrphus alternans* (Macquart, 1842)

Figs 14A, 14B

Records. **3b**: 1♂, 1♀; **5**: 1♀; **6**: 1♀; **8a**: 2♀; **8c**: 1♂; **14**: 1♀; **15**: 1♀; **16**: 1♂, 2♀.

Distribution. India, as synonym of *E. viridaureus* (Evenhuis and Pape, 2021), also recorded in Taiwan (Shiraki, 1930).

Identification. Tergum II with straight black fascia; female with shiny ocellar triangle.

Biology. Found in Central and South Taiwan at altitudes of 200-1950 m a.s.l. A lowland to mid-elevational species collected in dense moist forests.

Remarks. Shiraki (1930) mentioned this species and *E. divertens* as separate species. It is possible that *E. alternans* is a junior synonym of *E. divertens* and then *E. alternans* sensu Shiraki (1930) should get another name. Further study is needed to sort out this issue.

48. *Episyrphus arcifer* (Sack, 1927)

Fig. 14C

Records: **2b**: 1♀; **2c**: 3♂, 2♀; **2d**: 2♂; **3b**: 3♀; **5**: 19♂, 2♀; **8a**: 1♂; **8b**: 1♀; **8c**: 2♂, 1♀; **10**: 6♂, 4♀; **12**: 1♂, 1♀; **14**: 1♀; **16**: 2♂, 3♀.

Distribution. Nepal, Peninsular Malaysia and Taiwan (Evenhuis and Pape, 2021).

Identification. A species with long wings and with very different abdominal markings compared with other *Episyrphus* species, more *Meliscaeva* like; broadly triangular maculae on terga II and IV; vertex narrow; ocellar triangle non-pollinose, shiny.

Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. Hovering at 2 to 3 meters in a sunlit place in dense low to mid-elevational forest. *Hydrangea paniculata* and *Melanolepis multiglandulosa* flower feeding.

49. *Episyrphus divertens* (Walker, 1856)

Figs 14D, 14E

Records. **2c**: 1♀; **2d**: 3♂, 3♀; **3b**: 2♂, 1♀; **8b**: 1♀; **11**: 1♀; **14**: 2♀; **15**: 1♀; **16**: 2♂, 2♀; **17**: 1♂, 1♀.

Distribution. Borneo, Taiwan and Thailand (Evenhuis and Pape, 2021).

Identification. Species with black narrow oblique maculae on terga III and IV; tergum IV

with characteristic black postero-medial vitta at posterior half of yellow fascia; ocellar triangle entirely yellow pollinose; wing extensively bare of microtrichia on basal and medial cells; scutellum medially extensively yellow pilose, other pile black.

Biology. Found throughout at altitudes of 200-1020 m a.s.l. Collected in lowland and mid-elevational wet forests.

Remarks. The male holotype of *E. divertens* (NHM) was studied and found similar to the Taiwanese specimens. Another specimen (Celebes, coll NHM) identified as *E. alternans* (Macquart, 1842) was studied and also found similar to the Taiwanese specimens. The possible synonym of *E. divertens* with *E. alternans* as well as with *E. claviger* Sack 1927 needs confirmation.

50. *Episyrphus nectarinus* (Wiedemann, 1830)

Fig. 14F

Records. **2a**: 3♂, 11♀; **2b**: 7♀; **2c**: 5♂, 2♀; **2d**: 3♂, 3♀; **3b**: 15♂, 16♀; **5**: 2♂, 10♀; **6**: 1♂, 2♀; **8a**: 5♀; **8b**: 10♂, 22♀; **8c**: 3♂; **10**: 2♂, 7♀; **11**: 4♂, 14♀; **12**: 1♂, 1♀; **14**: 2♀; **16**: 1♂; **18a**: 5♀.

Distribution. China (= *E. viridaureus* in Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).

Identification. Yellow pile on frons, in several specimens mixed with black; tergum II with medio-lateral oval triangular black macula and medial black fascia clearly developed; terga III and IV with clearly developed medial black vitta often forming a narrow fascia.

Biology. Found throughout Taiwan at altitudes of 150-2820 m a.s.l. Collected in a wide variety of low land and mid-elevational habitats. *Rosa sambucina*, *Hydrangea paniculata*, *Bidens pilosa*, *Melanolepis multiglandulosa*.

Remarks. A photo of the type of *E. nectarinu*s (http://www.daim.snm.ku.dk/digitized-type-collection-details-simple?catno=zmuc00025185) was studied and some differences were found between this type and the Taiwanese specimens studied here. It is possible that *Episyrphus formosae* (Sack, 1913) is not a synonym of *E. nectarinus* and that the correct name of the Taiwanese specimens is in fact *E. formosae*.

51. *Episyrphus obligatus* (Curran, 1931)

Fig. 14H

New record for Taiwan.

Records. **10**: 1♀; **16**: 1♂; **17**: 1♂.

Distribution. Peninsular Malaysia (Evenhuis and Pape, 2021), Taiwan.

Identification. Tergum II with 2 pairs of maculae; yellow metafemur and black metatibia; medial black fascia on terga III and IV short; wing with basal half of cell BM bare of microtrichia.

Biology. Found in South and Central Taiwan at altitudes of 200-650 m a.s.l. Flying low through vegetation in a shady wet forest gully and in other lowland wet forests.

Remarks. The male holotype of *E. obligatus* (NHM) was studied and found similar to the Taiwanese specimens.

52. *Episyrphus* spec 1

Figs 15A, 15B

New record for Taiwan.

Records. **3b**: 7♂, 5♀.

Distribution. Taiwan, not mentioned anywhere else before.

Identification. A large species, looking like an *Epistrophe* at first glance; ocellar triangle in female non-pollinose, shiny; tergum II predominantly yellow; scutellum entirely black pilose; black metatibia and metatarsus; wing with basal cells extensively bare of microtrichia.

Biology. Found in North Taiwan at altitudes of 970-1020m a.s.l. Hovering in a shaded forest close to the river and found visiting flowers of *Melanolepis multiglandulosa*.

Remarks. This easily identifiable species seems to be undescribed and it emphasizes the lack of knowledge of the Taiwanese fauna.

53. *Episyrphus viridaureus* (Wiedemann, 1824)

Fig. 14G

Records. **2d**: 1♀; **3a**: 1♂; **9**: 2♂.

Distribution. Java, Malaysia (Peninsular), New Caledonia (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).

Identification. Medial black fascia on terga III and IV is very reduced to absent.

Biology. Found in North and Central Taiwan at altitudes of 120-1180 m a.s.l. Collected flying in a wet gully in a mid-elevational wet forest.

Remarks. Photos of the male holotype of *Syrphus viridaureus* where studied (http://www.daim.snm.ku.dk/digitized-type-collection-details-simple?catno=zmuc00025007) which correspond

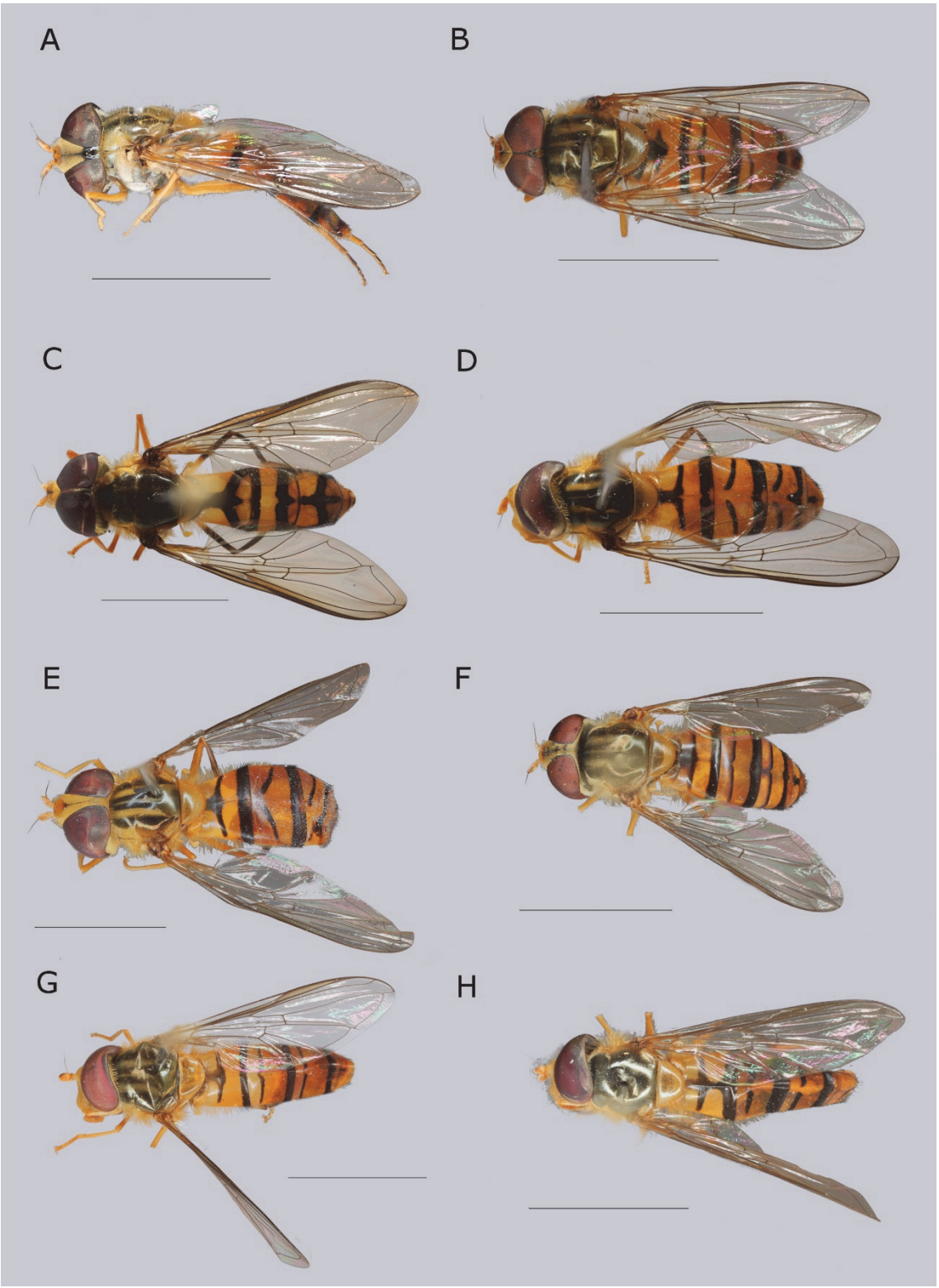

Fig. 14. Adult habitus of *Episyrphus* species, B-H, dorsal view; A, lateral view. A. *E. alternans*, female. B. *E. alternans*, male, Hueisun. C. *E. arcifer*, male, Chilan. D. *E. divertens*, male, Cikong. E. *E. divertens*, female, Nanrenshan. F. *E. nectarinus*, female, Yangmingshan. G. *E. nectarinus*, male, Yangmingshan. H. *E. obligatus*, male, Cikong. Scale 5.0 mm.

with the Taiwanese specimens.

54. *Eriozona nigroscutellata* Shiraki, 1930

Additional records. 1♀ "Taiwan: Hualien Co. / Hehueshan Pass 3200 m / 11-VIII-1988 / [leg.] John Heppner" (FSCA).

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. A rather large and pilose Syrphini with black scutellum and white with

orange pilose abdomen.
Biology. Found at high altitude on the Hehuanshan.

55. *Eristalinus arvorum* (Fabricius, 1787)
Records. **2c**: 2♂; **4**: 1♀; **5**: 1♀; **8b**: 1♂, 1♀; **11**: 1♀.
Distribution. Entire SE Asia including Taiwan, Australia, Hawaii, Marianas, Micronesia, China, Japan and the Seychelles (Evenhuis and Pape, 2021).
Identification. Scutum with 3 wide pollinose vittae medially, as broad or nearly as broad as shiny black vitta; pterostigma with two separated black macula; tarsi with tarsomere 1 and 2 yellow; terga predominantly yellow; pleurae predominantly yellow pollinose.
Biology. Found in North and Central Taiwan at altitudes of 270-630 m a.s.l. A low-elevational species found visiting flowers of *Angelica hirsutiflora*, *Bidens pilosa* and *Valeriana fauriei*.

56. *Eristalinus laetus* (Wiedemann, 1830)
Fig. 15C
Records. **13**: 1♀.
Distribution. China (= *E. megacephalus* (Rossi, 1794) in Evenhuis and Pape (2021).
Identification. Scutum with 3 narrow pollinose vittae medially, clearly narrower than shiny black vitta; stigma with one black macula; tarsi with at most tarsomere 1 yellow; tergum II with anterior margin black medially; pleurae grey pollinose with one shiny black macula
Biology. Found in South Taiwan at an altitude of 10 m a.s.l. Collected along the coast flying over flowering vegetation of *Carpobrotus* spp.
Remarks. *E. obscuritarsis* de Meijere, 1908 as mentioned in Shiraki (1930) is supposed to be a synonym of *E. laetus* (Evenhuis and Pape, 2021).

57. *Eristalinus quinquestriatus* (Fabricius, 1794)
Figs 15D, 15E
Records. **1b**: 1♀; **8a**: 1♂.
Distribution. China, Japan and widespread in the Oriental Region (Evenhuis and Pape, 2021).
Identification. Scutum with 3 narrow pollinose vittae medially, clearly narrower than shiny black vitta; stigma with two separated black macula; tarsi with tarsomere 1 and 2 yellow; tergum II with anterior margin yellow; pleurae grey pollinose with shiny black vitta medially from anterior to posterior end.
Biology. Found in North Taiwan at altitudes of 7-650 m a.s.l. Collected in a city park along a river with baseball and soccer fields and also in a lowland subtropical forest.

58. *Eristalinus flavus* (Sack, 1926)
New record for Taiwan.
Records. **15**: 1♀.
Distribution. Indonesia to the Philippines and Micronesia (Evenhuis and Pape, 2021), Taiwan.
Identification. Face orange; scutum uniformly colored without vittae; predominantly orange femora; stigma with two separated black macula.
Biology. Found in South Taiwan at altitudes of 290-310 m a.s.l. Collected along the shore of a lowland lake.
Remarks. This specimen is preserved in alcohol and the pollinosity on the scutum is not well visible. If the specimen has pale vittae on the scutum it is possibly *E. quadrioculata* Bigot or *E. punctulatus* Macquart. The name *rufus* (van der Goot, 1964) is a junior synonym of *E. flavus*.

59. *Eristalis cerealis* Fabricius, 1805
Fig. 15F
Records. **2a**: 3♂, 7♀; **2b**: 1♀; **7d**: 1♀; **18a**: 2♀.
Distribution. Entire Oriental Region and the eastern part of the Palaearctic region, including Taiwan (Evenhuis and Pape, 2021).
Identification. A rather pollinose and greyish *Eristalis*.
Biology. Found in North and Central Taiwan at altitudes of 330-2820 m a.s.l. Flying on open areas in low mountains, visiting flowers of *Angelica hirsutiflora*, *Astilbe longicarpa*, *Bidens pilosa* and *Valeriana fauriei*.
Remarks. DNA data show that the Taiwanese specimens could be another species rather than *E. cerealis*. No types have been studied so no conclusion can be drawn here.

60. *Eristalis tenax* (Linnaeus, 1758)
Records. **7a**: 4♂; **7b**: 1♀; **18a**: 2♀; **20**: 1♂.
Distribution. Cosmopolitan species, including Taiwan (Evenhuis and Pape, 2021).
Identification. A large bee-like species with eye pilosity uneven forming two dark vitta on each eye.
Biology. Found in Central Taiwan at altitudes

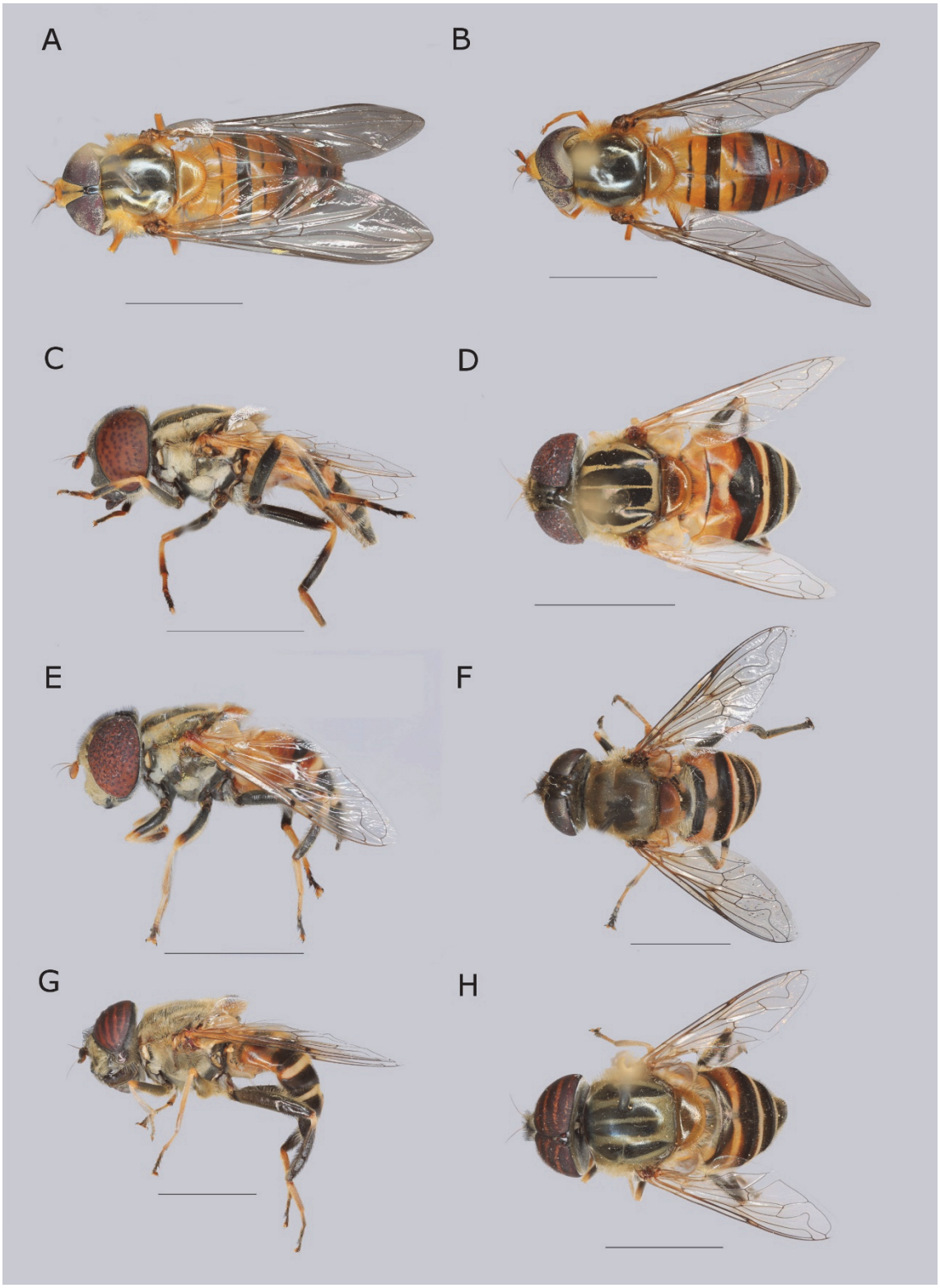

Fig. 15. Adult habitus, A, B, D, F, H, dorsal view; C, E, G, lateral view. A. *Episyrphus* spec 1, female, Mingshih. B. *E.* spec 1, male, Mingshih. C. *Eristalinus laetus*, female, Fengping. D, E. *E. quinquestriatus*, female, Taipei. F. *Eristalis cerealis*, female, Yangmingshan. G. *Eristalodes paria*, female, Yangmingshan. H. *E. paria*, female, Yangmingshan. Scale 5.0 mm.

of 1930-3417m a.s.l. Collected on flowers of *Anemone vitifolia* hybrid "*japonica*" and *Rhododendron pseudochrysanthum*.

Remarks. A cosmopolitan and strongly migratory species found throughout Taiwan.

61. *Eristalodes paria* (Bigot, 1880)

Figs 15G, 15H

Records. **1b**: 1♂; **2a**: 13♂, 25♀; **2b**: 8♂, 3♀; **2c**: 2♂, 2♀; **2d**: 1♀; **5**: 1♀; **8a**: 2♀; **8c**: 1♀; **14**: 1♀; **18a**: 1♂, 4♀; **20**: 2♂.
Distribution. India, Java, Maluku, Sri Lanka and Taiwan (Evenhuis and Pape, 2021).
Identification. Eyes with brown vittae; abdomen with brownish fascia; rather dull colored species.
Biology. Found throughout Taiwan at altitudes of 7-2820 m a.s.l. Flower visiting *Angelica hirsutiflora*, *Astilbe longicarpa*, *Bidens pilosa*, *Cirsium japonicum*, *Sambucus javanica* and *Valeriana fauriei* in open areas.
Remarks. This species is most likely synonymous with *E. kobusi* de Meijere, 1908 and *E. arisanus* Matsumura, 1915 sensu Shiraki (1930).

62. *Eumerus aurifrons* (Wiedemann, 1844)
Records. **8b**: 1♂.
Distribution. India to the Philippines, including Taiwan, Indonesia, Australia and Hawaii (Evenhuis and Pape, 2021).
Identification. A densely golden yellow pilose species, especially the frons of the male.
Biology. Found in Central Taiwan at an altitude of 500 m a.s.l. Collected flying through the vegetation in a coffee plantation and forest with open ruderal vegetation.

63. *Eumerus nicobarensis* Schiner, 1868
Figs 16A, 16B
Records. **8c**: 1♂; **10**: 1♂; **12**: 7♂, 1♀; **14**: 4♂, 2♀; **15**: 1♂, CP; **16**: 1♂; **17**: 1♂.
Distribution. Borneo, India, Peninsular Malaysia, Sri Lanka and Taiwan (Evenhuis and Pape, 2021).
Identification. The eyes are clearly holoptic, a difference with *E. rufitibiis*, and with only short pile on the frons and eyes. The Taiwanese specimens fit very well the redescription in Brunetti (1923).
Biology. Found in Central and South Taiwan at altitudes of 150-790 m a.s.l. Collected in a wet forest gully on a sunlit place, but mostly on open partly shady places with low vegetation along road verges. Low to mid-elevational species.

64. *Eumerus rufitibiis* Sack, 1922
Records. **14**: 1♀; **16**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Large yellow maculae on tergum II and male with silvery white pilose metatarsus as in *E. nicobarensis*, however densely long yellow pilose on frons and eyes and eyes dichoptic.
Biology. Found in South Taiwan at altitudes of 200-370 m a.s.l. Collected in a low-elevational marshy area.

65. *Eupeodes confrater* (Wiedemann, 1830)
Fig. 13H
Records. **2c**: 1♂; **5**: 1♂; **18a**: 1♂, 1♀; **19**: 1♀.
Distribution. Australia, China, Japan and Java (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. Large Syrphini species with broad yellow fascia on terga II-IV.
Biology. Found in North and Central Taiwan at altitudes of 1980-2820 m a.s.l. Collected in different forested habitats from mid-elevational wet broadleaved forest to high-elevational *Pinus taiwanensis* afforestation.

66. *Eupeodes corollae* (Fabricius, 1794)
Records. **19**: 4♂; **20**: 1♂.
Distribution. Cosmopolitan species, including Taiwan (Evenhuis and Pape, 2021).
Identification. A rather small black and yellow Syrphini with yellow abdominal maculae.
Biology. Found in Central Taiwan at altitudes of 1930-1980 m a.s.l. Collected in high-elevational wet forest.
Remarks. A cosmopolitan species found in a wide variety of habitats.

67. *Ferdinandea formosana* Shiraki, 1930
Records. **18a**: 1♂, 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A coppery shiny species with orange face and strong long setae of the scutum and scutellum.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high elevational *Pinus taiwanensis* afforestation.

68. *Graptomyza arisana* Shiraki, 1930
Records. **17**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Basoflagellomere elongate, strap-like with feathered arista; lateral margin of abdomen black; abdomen with black and yellow pattern with on tergum II a semi-circular black posterior macula and tergum IV with three black posterior maculae.
Biology. Found in South Taiwan at altitudes of 350-610 m a.s.l. Flying through low vegetation in a wet forest gully.

69. *Graptomyza dentata* Kertész, 1914
Fig. 16C
Records. **17**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A typical *Graptomyza* with elongate face and elongate basoflagellomere with feathered arista, tergum IV with dens; wing hyaline; terga II and III yellow with medially on each tergum a large squarish black macula.
Biology. Found in South Taiwan at altitudes of 350-610m a.s.l. Collected in a wet forest gully on flowering *Sambucus javanica*.

70. *Graptomyza dolichocera* Kertész, 1914
Figs 16D, 16E
Records. **2b**: 1♀; **3b**: 2♀; **10**: 4♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Abdomen with 3 maculae on tergum 3; infuscated wings.
Biology. Found in North and Central Taiwan at altitudes of 200-1020 m a.s.l. Flying low through wet vegetation in a mid-elevation tropical forest and a wet gully. Females often seen flying close by rotting stems of *Colocasia* spp.
Remarks. Many rotten stems of *Colocasia* spp. were examined and only one larva was found, possibly belonging to this species. Unfortunately, the larvae died and decayed while trying to rear it.

71. *Heringia* spec 1
New record for Taiwan.
Records. **18a**: 1♀.
Distribution. Taiwan, other distribution unknown.
Identification. Small, slender entirely black species with pollinosity on frons and short oval basoflagellomere.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high elevational Pinus taiwanensis afforestation.
Remarks. This specimen belongs to an unknown species of *Hernigia*. As only one Oriental species of *Heringia* (*H. cyanea* (Brunetti, 1915)) is known it might be the specimen from Taiwan belongs to this species.

72. *Ischiodon scutellaris* (Fabricius, 1805)
Figs 16G, 16H
Records. **13**: 2♂ 1♀.
Distribution. Widespread Australasian, Oriental and Palaearctic species (Evenhuis and Pape, 2021).
Identification. A yellow colored Syrphini species with characteristic abdominal pattern with a medially interrupted yellow fascia on terum II.
Biology. Found in South Taiwan at an altitude of 10m a.s.l. Collected in a coastal habitat flying through low vegetation in direct sunlight.
Remarks. The two species of this genus are widespread within the Oriental, Australasian and South-East Palaearctic region and recently spreading into Europe (de Courcy Williams *et al*., 2011; van Steenis *et al*., 2019b; van Steenis *et al*., in prep).

73. *Kertesziomyia* (*Paramesembrius*) aff *abdominalis* (Sack, 1927)
Figs 17A, 17B
New record for Taiwan.
Records. **3b**: 4♂.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. A small black *Kertesziomyia* with unicolorous eyes, golden pile on tergum I and thorax; yellow wing base; vague dark wing macula and open cell I.
Biology. Found in Central Taiwan at altitudes of 970-1020 m a.s.l. Flying through *Melanolepis multiglandulosa* and also found in a wet gully in a mid-elevational tropical forest. Visiting flowers of *Prunus buergeriana* or sitting on low tree vegetation.
Remarks. In the open wing cell I and enlarged metafemur it resembles *Mallota*, however the postalar pile tuft, the pilose tubercle, pilose arista and sulcate scutellum groups it with *Kertesziomyia*. It differs from *K. abdominalis* by the dark color (with yellow macula in *K. abdominalis*) and the sulcate scutellum (evenly

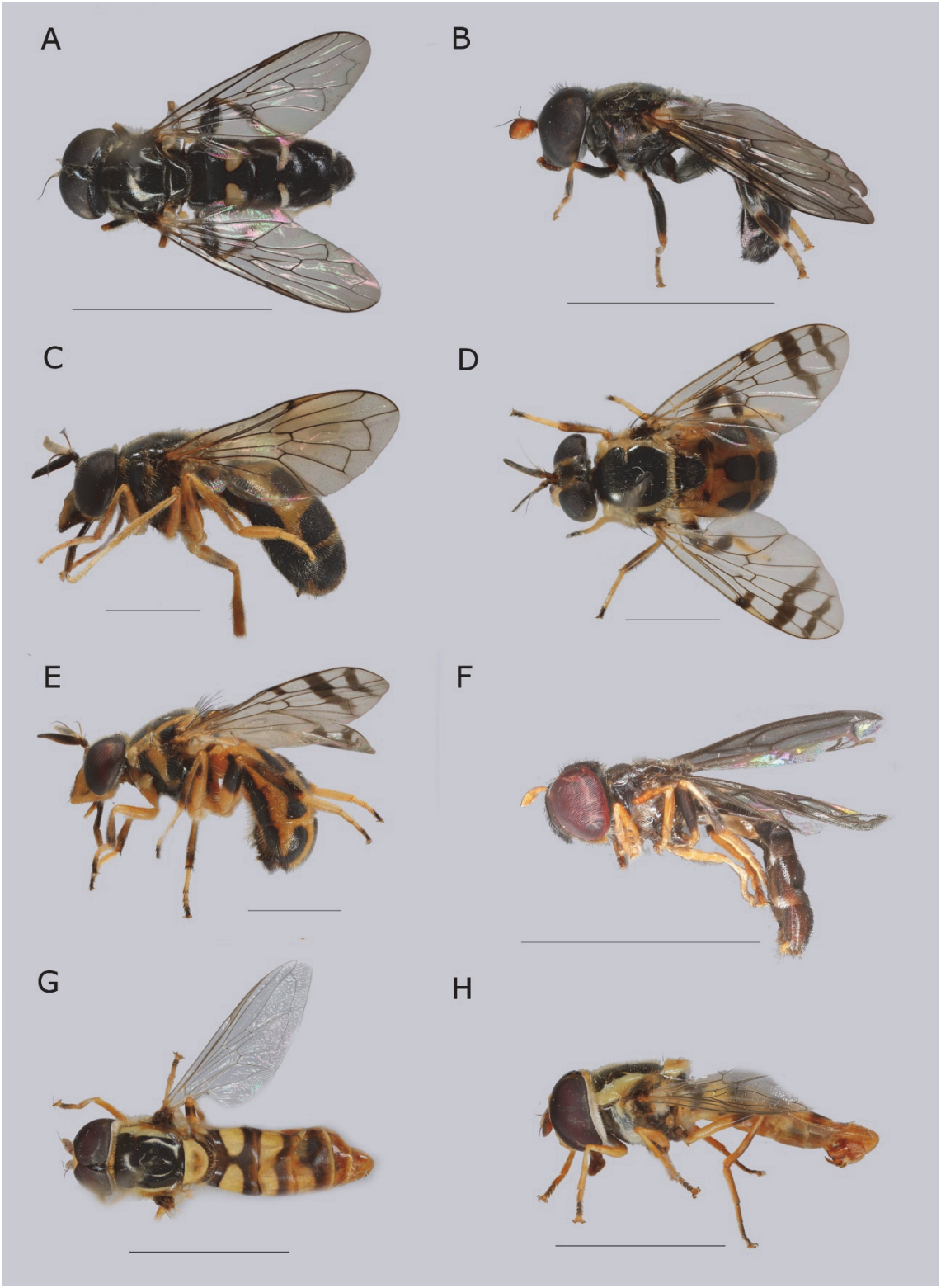

Fig. 16. Adult habitus, A, D, G, dorsal view; B, C, E, F, H, lateral view. A. *Eumerus nicobarensis*, male, Mutan. B. *E. nicobarensis*, female, Mutan. C. *Graptomyza dentata*, female, Cikong. D, E. *G. dolichocera*, female, Fuyuan. F. *Paramixogaster nigripes*, female, Cikong. G, H. *Ischiodon scutellaris*, male, Fengping. Scale A, B, F, G, H; 5.0 mm, C, D, E; 2.5 mm.

rounded in *K. abdominalis*). This species is not listed from Taiwan by Shiraki (1930) and most likely an undescribed species.

74. *Kertesziomyia* (*Pseuderistalis*) *bicolor* (Shiraki, 1930)

Figs 17E, 17F

Records. **3b**: 4♂ 2♀.

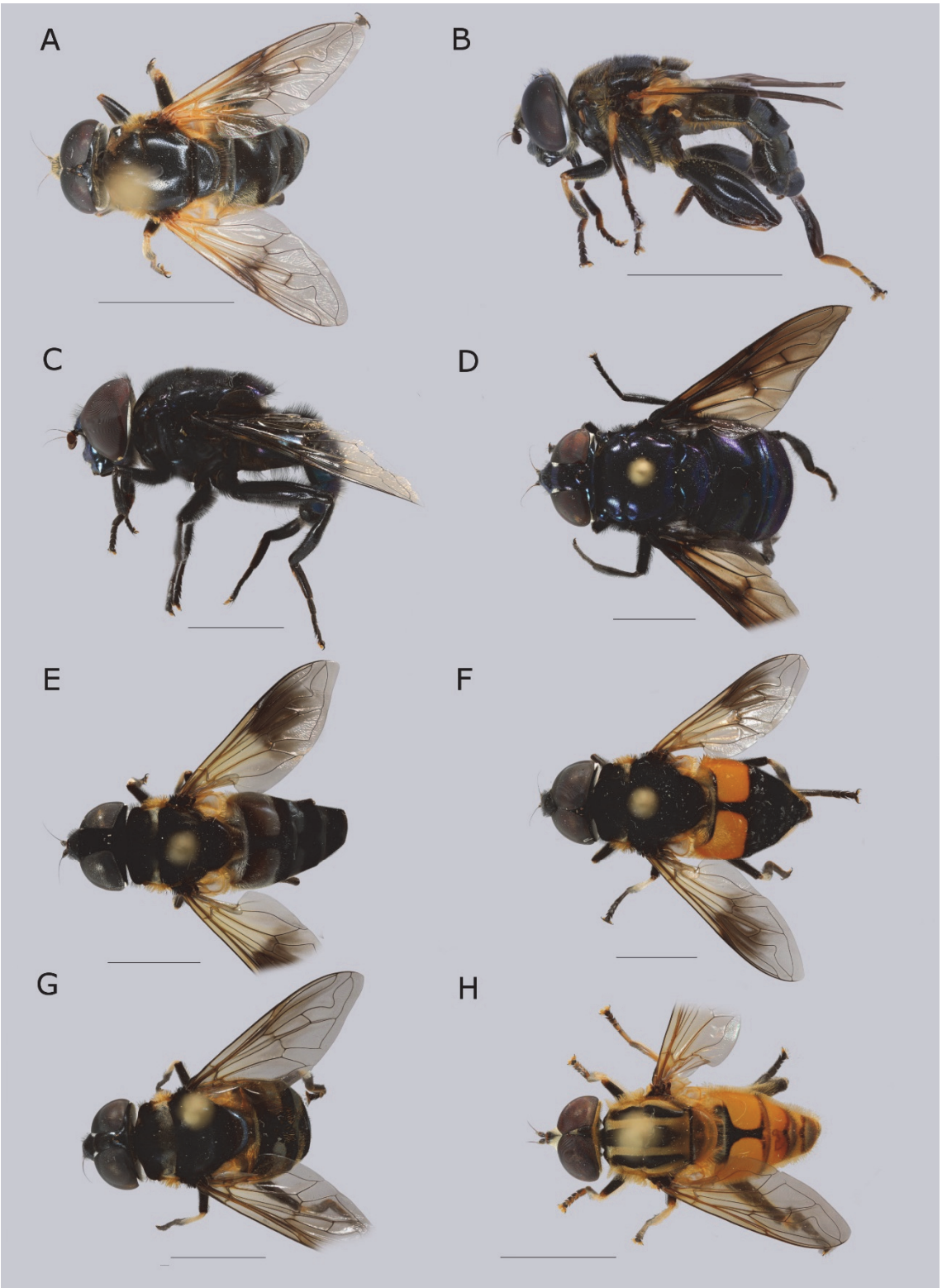

Fig. 17. Adult habitus, A, C, E-H, dorsal view; B, D, lateral view. A, B. *Kertesziomyia* aff *abdominalis*, male, Mingshih. C. *K. violascens*, male, Jhiben. D. *K. violascens*, female, Yangmingshan. E. *K. bicolor*, female, Mingshih. F. *K. bicolor*, male, Mingshih. G. *K. formosana*, female, Fuyuan. H. *Mesembrius niveiceps*, male, Nanrenshan. Scale 5.0 mm.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Male with large yellow maculae on tergum II and both male and female with dark wing macula, cell I closed.

Biology. Found in Central Taiwan at altitudes of 970-1020 m a.s.l. Flying through and visiting flowers of *Melanolepis multiglandulosa* and also

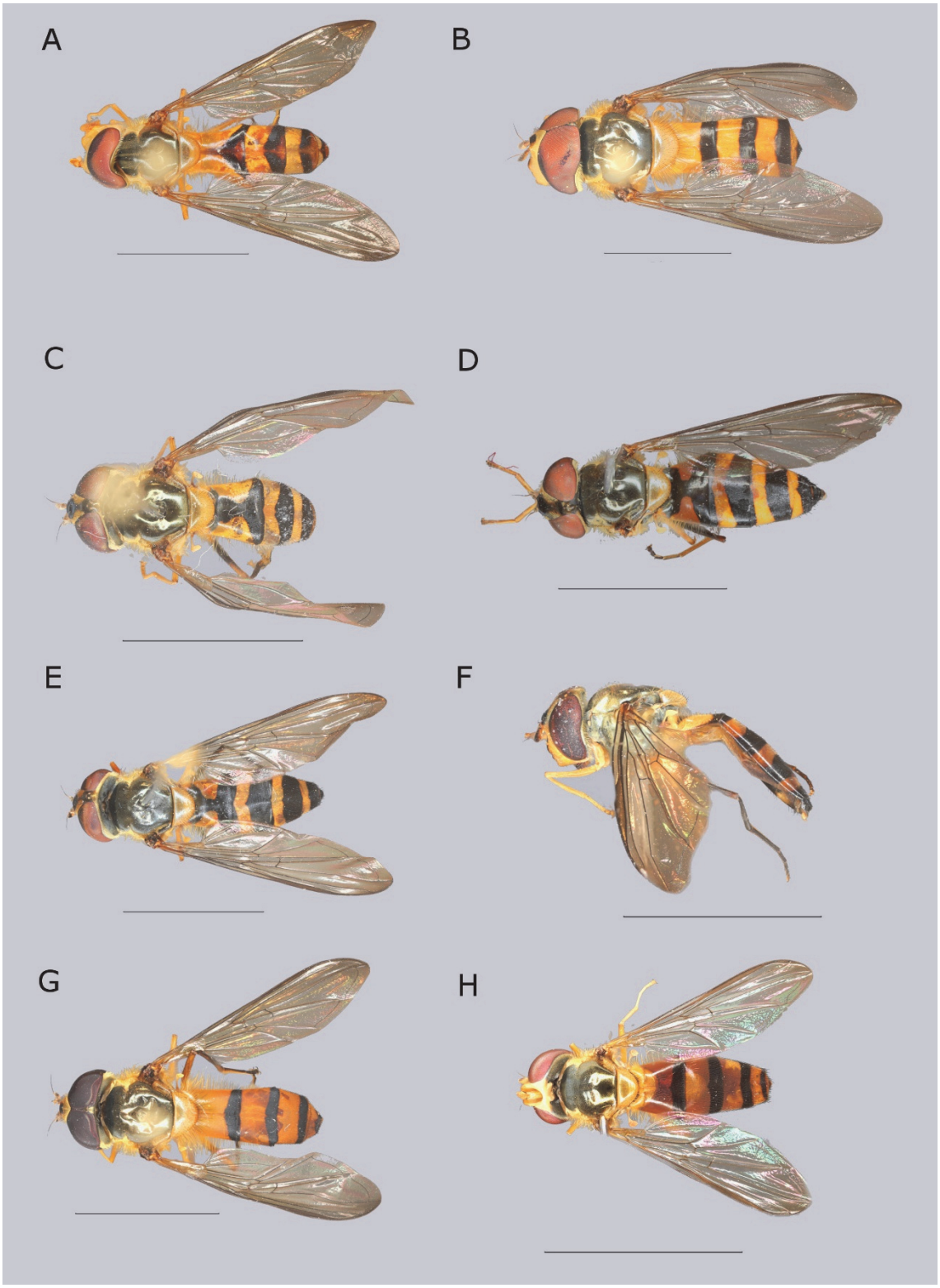

Fig. 18. Adult habitus of *Meliscaeva* species, A-E, G, H, dorsal view; F, lateral view. A. *M. abdominalis*, male, Fuyuan. B. *M. arisanica*, male, Hehuanshan. C. *M. formosana*, female, Siangyang. D. *M.* cf *monticola*, female, Hehuanshan. E. *M. monticola*, female, Hehuanshan. F. *M. monticola*, female, Siangyang. G. *M. sonami*, male, Siangyang. H. *M.* spec, female, Mingchih. Scale 5.0 mm.

found in a wet gully in a mid level tropical forest.

75. *Kertesziomyia* (*Eristalomyia*) *formosana* Shiraki, 1930

Fig. 17G

Records. **2c**: 1♀; **10**: 2♀.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Dark black, grey-bronze shiny macula on abdomen with hyaline wing, cell I closed. The frons is clearly broader and with narrow pollinosity along eyes compared to *K. bicolor*.

Biology. Found in North and Central Taiwan at altitudes of 200-650 m a.s.l. Feeding on white flowers of a high growing shrub.

76. *Kertesziomyia* (*Kertesziomyia*) *violascens* (Kertész, 1913)

Figs 17C, 17D

Records. **2a**: 8♀; **2c**: 1♂, 4♀; **2d**: 1♀; **3a**: 1♂, 1♀; **3b**: 1♂, 3♀; **5**: 1♂, 3♀; **10**: 3♀; **11**: 1♀; **12**: 2♂, 1♀; **16**.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Easily recognized by the blue shiny color and, especially in the female, darkened wings.

Biology. Found throughout Taiwan at altitudes of 150-1180 m a.s.l. Settling on partly sunlit leaves of low and high shrubs and trees in. Feeding on high and low trees and shrubs like *Angelica hirsutiflora*, *Callicarpa formosana*, *Cirsium japonicum*, *Prunella vulgaris*, *Prunus buergeriana* and *Valeriana fauriei*.

77. *Mallota haemorrhoidalis* Sack, 1927

Records. **10**: 1♀.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Eyes pilose, thorax and abdomen predominantly black pilose, apex of abdomen orange-red pilose, some yellowish pile in antero-lateral corner of tergum II; legs metaleg entirely and pro- and mesoleg extensively orange colored and orange pilose,

Biology. Found in Central Taiwan at an altitude of 200-650 m a.s.l. Collected in a low-land subtropical rainforest.

Remarks. Slightly similar to *Mallota maculata* Curran, 1928 based on the predominantly black pile and the predominantly orange colored and orange pilose legs; *M. maculata* with yellow pilose scutellum and part of scutum; pro- and mesofemur black pilose. Differing from *M. haemorrhoidalis* by the black pilose scutellum and scutum, and almost entirely black pilose abdomen, while in *M. haemorrhoidalis* the scutellum is predominantly yellow pilose and the abdomen predominantly orange pilose. In the NMNS there is one male ("Taiwan, Taipei // Shihting Shihkuh // 1992/III/19 // W. T. Yang // Sweepingnet", "1453-1") corresponding with the description of *M. haemorrhoidalis* and a female ("Taiwan, Nantou // Meifeng // IV/6---V/11/2004 // C. S. Lin & W. T. Yang // Malaise trap (KCN)", "NMNS ENT // 5778-8") identical to our female specimen. It could be the females are sexually dimorphic and are more black pilose but more males and females are to be studied in order to see if these specimens belong to different species.

78. *Mallota* cf *vilis* (Wiedemann, 1830)

Figs 19E, 19F

New record for Taiwan.

Records. **2a**: 5♂, 1♀; **16**: 1♂.

Distribution. Taiwan, not mentioned anywhere else before.

Identification. Bee mimic with pilose eyes, narrow metafemur and orange fascia on the abdomen, wing cell r1 open.

Biology. Found throughout Taiwan at altitudes of 200-1068 m a.s.l. Collected in lowland forests visiting flowers of *Angelica hirsutiflora*, *Valeriana fauriei* and *Sambucus javanica*.

Remarks. The identification of this species is based on an unpublished key on Oriental **SYRPHIDAE** (Thompson, in lit.) and Wiedemann (1830). This species differs from similar *Mallota* species (*Paramallota formosana* Shiraki, 1930 and *P. horishana* Shiraki, 1930) mentioned in Shiraki (1930) and thus this is the first record of this species for Taiwan. Molecular data suggest this species is close to other species of the genus *Myathropa* and it could well be this is an undescribed *Myathropa* species. In Evenhuis and Pape (2021) it is mentioned that *Eristalomyia cingulata* Sack, 1927: 311 = *Helophilus horishanus* Shiraki, 1930: 178 and that this species is a *Mallota*. The description of these latter two species do not give the most important character to differentiate between Eristalini and Helophilini, i.e. the open cell r1. It could be the specimens studied here are in fact *Eristalomyia cingulata*, but the study of relevant type material is needed.

79. *Matsumyia rubripes* (Matsumura, 1915)

Records. **7d**: 1♂, 2♀; **18a**: 1♂, 1♀.

Distribution. China and Japan (Evenhuis and

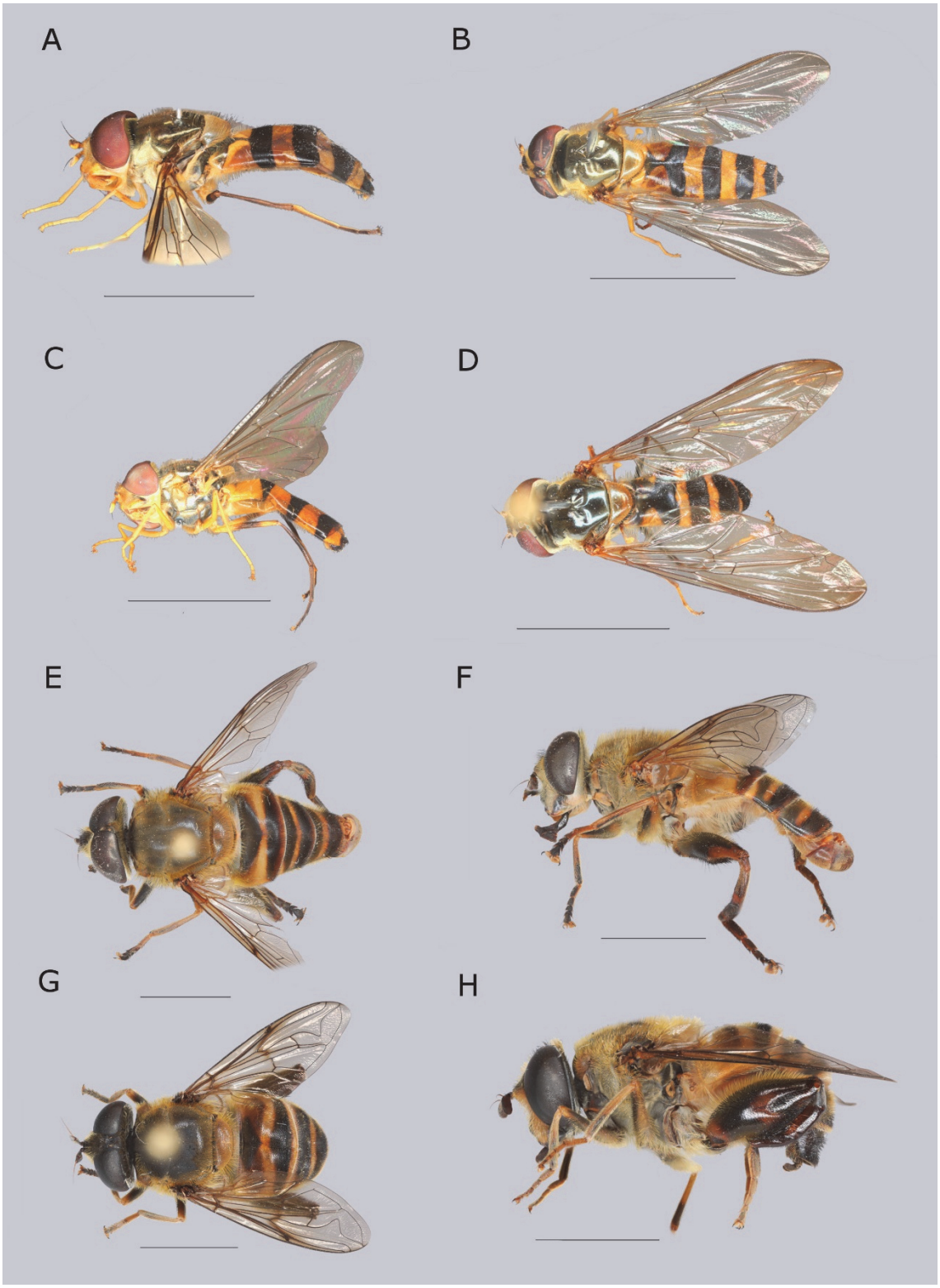

Fig. 19. Adult habitus, B, D, E, G, dorsal view; A, C, F, H, lateral view. A. *Meliscaeva* cf *taiwana*, female, Mingchih. B. *M. taiwana*, female, Rongsing. C. *M. taiwana*, female, Hehuangshan. D. *M. tenuiformis*, female, Hehuanshan. E, F. *Mallota* cf *villis*, male, Yangmingshan. G, H. *Tigridomyia curvigaster*, female, Fuyuan. Scale 5.0 mm.

Pape, 2021), and Taiwan (Shiraki, 1930).

Identification. A bumble-bee mimic with a black and red pilose abdomen.

Biology. Found in Central Taiwan at altitudes of 2200-3350 m a.s.l. A high-elevational species found in forested areas, and on a flowering *Trochodendron aralioides*.

Remarks. This is an undescribed species similar to *Matsumiya rubripes* (Kevin Moran pers. comm). It is possible that all Taiwanese

specimens of *M. rubripes* sensu Shiraki (1930) belong to this new species and if so it is not a new species for Taiwan.

80. *Melanostoma mellinum* (Linnaeus, 1758)
Records. **2a**: 38♂, 19♀; **2b**: 1♂; **2c**: 1♂, 1♀; **3a**: 55♂, 36♀; **3b**: 16♂, 30♀; **5**: 1♂; **6**: 2♂, 4♀; **7a**: 2♀; **7c**: 1♀; **7d**: 1♀; **8a**: 2♀; **8c**: 2♀; **11**: 3♂, 1♀; **14**: 4♂, 4♀; **15**: 2♂; **18a**: 6♂, 38♀; **18b**: 2♂, 8♀; **19**: 2♀.
Distribution. Holarctic and Oriental species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Rather stout species; arista short pilose; legs mixed black and yellow, metafemur broadly yellow basally and apically; abdominal marking relatively small; tergum II with small roundish maculae postero-laterally; maculae on tergum III small rectangular, posterior margin straight in male, in female broadly triangular with postero-medial margin almost straight.
Biology. Found throughout Taiwan at altitudes of 270-3350 m a.s.l. Collected in many different habitats from lowland tropical rain forest to high-elevational *Pinus taiwanensis* afforestation. Visiting flowers of *Astilbe longicarpa*, *Bidens pilosa*, *Melanolepis multiglandulosa*, *Oenanthe javanica*, *Plantago lanceolata, Rhododendron breviperulatum* and *R. pseudochrysanthum*.
Remarks. This species is similar to European specimens of *Melanostoma mellinum* and could be the species named *Melanostoma abdominale* (Sack 1922). The genus *Melanostoma* consists of many very similar species and a thorough taxonomic revision is needed to establish species boundaries and correct names.

81. *Melanostoma orientale* (Wiedemann, 1824)
Fig. 20B
Records. **2a**: 2♂, 6♀; **2b**: 2♀; **2c**: 3♂; **3a**: 3♂, 6♀; **3b**: 6♂, 10♀; **11**: 1♂ 2♀; **14**: 1♀; **18a**: 2♀.
Distribution. Oriental species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Rather elongate species; legs extensively yellow, especially femora almost entirely yellow; arista long pilose; abdomen with relatively large yellow maculae, maculae on tergum II about as long as half the length of the tergum; maculae on tergum III in female elongate triangular, with postero-medial margin concave.
Biology. Found throughout Taiwan at altitudes of 270-2820 m a.s.l. Collected in lowland to mid-elevational forests. Visiting flowers of *Bidens pilosa* and *Melanolepis multiglandulosa*.
Remarks. The female type of *M. orientale* (http://www.daim.snm.ku.dk/digitized-type-collection-details-simple?catno=zmuc00025155) was named as *M. univittata* (Wiedemann, 1824) by Claussen. It is not clear if Claussen studied all relevant type material and therefore this possible synonym is not used here. The specimens correspond with the description of *M. orientale* in Sack (1922) and Shiraki (1930) and so this name is used for the Taiwanese specimens.

82. *Melanostoma scalare* (Fabricius, 1794)
Fig. 20A
Records. **3a**: 1♂; **7a**: 1♀; **11**: 1♂; **18a**: 2♂, 2♀.
Distribution. Holarctic and Oriental species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Rather elongate species; arista long pilose; legs mixed black and yellow, metafemur at most narrowly yellow basally and apically; abdominal marking relatively small; tergum II with elongate roundish maculae postero-laterally; maculae on tergum III small rectangular, posterior margin skewed, with medial corner more posteriorly in male, in female elongate triangular, with postero-medial margin concave.
Biology. Found in North and Central Taiwan at altitudes of 270-3417 m a.s.l. Collected in mid-elevational broadleaved forest, high-elevational *Pinus taiwanensis*afforestation and at the highest parts of the Hehuanshan. Visiting flowers of *Salix* spp. (柳屬) and *Rhododendron* spp.

83. *Melanostoma univittatum* (Wiedemann, 1824)
Figs 20C, 20D
Records. **3a**: 1♂; **3b**: 2♀; **8b**: 1♂, 2♀; **10**: 1♂, 4♀; **11**: 1♂, 2♀; **14**: 4♂, 6♀; **15**: 1♂; **16**: 10♂, 3♀.
Distribution. Oriental and eastern Palaearctic species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Face without central knob, entirely golden pollinose; abdomen extensively yellow colored, in male almost entire abdomen yellow; genitalia with very long surstylus
Biology. Found throughout Taiwan at altitudes

of 200-1180 m a.s.l. Predominantly lowland tropical forest species with some records from mid-elevational forests.

Remarks. The COI data of the Taiwanese specimens do not differ from *M. apicale* from Australia. In *Melanostoma* it is known that COI is not always conclusive (Haarto and Ståhls, 2014) and it is possible the Taiwanese specimens belong to a different species. The name "*univittatum*" is used as it is in use for the Oriental species and also mentioned in Shiraki (1930).

84. *Meliscaeva abdominalis* (Sack, 1927)

Fig. 18A

Records. **2c**: 1♀; **3b**: 4♂, 4♀; **5**: 1♂, 1♀; **10**: 1♂, 1♀; **17**: 1♂, 1♀.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Face and antennae entirely yellow; abdominal yellow fascia strongly incised postero-medially.

Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. Collected in a wet forest gully in tropical lowland forest feeding on *Sambucus javanica* and in a mid-elevational wet forest gully.

Remarks. The female holotype of *M. morna* (Curran, 1931) (NHM) was studied and is similar to the here studied Taiwanese specimens. It is likely that *M. morna* is a junior synonym of *M. abdominalis* and as *M. abdominalis* is used in Shiraki (1930) this name is also used here.

85. *Meliscaeva arisanica* (Shiraki, 1930)

Fig. 18B

Records. **7d**: 2♂.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Face with black medial vitta; abdomen with broad yellow fascia on terga II-IV.

Biology. Found in Central Taiwan at an altitude of 2200 m a.s.l. Flying around a flowering tree in a high elevational cloud forest.

Remarks. The female holotype of *M. peteus* Curran, 1931 (NHM) was studied and found similar to the Taiwanese specimens. The description of *M. arisanica* also applies to these specimens and it is likely that *M. peteus* is a junior synonym of *M. arisanica*.

86. *Meliscaeva formosana* (Shiraki, 1930)

Fig. 18C

Records. **7a**: 2♀; **7d**: 2♂; **18a**: 1♂, 2♀.

Distribution. Taiwan (Evenhuis and Pape, 2021).

Identification. Face with black medial vitta; macula on tergum II large.

Biology. Found in Central Taiwan at altitudes of 2200-3417 m a.s.l. Collected in a high-elevational *Pinus taiwanensis* afforestation. Flower visiting *Astilbe longicarpa*, *Salix fulvopubescens* and *Trochodendron aralioides*.

Remarks. This species corresponds well with the description of *Meliscaeva formosana*, although some of our Taiwanese specimens were identified as *Meliscaeva ceylonica* (Keiser, 1958). No types were studied and as *M. ceylonica* was not mentioned to occur in Taiwan by Shiraki (1930), here the name *M. formosana* is used. Furthermore, *M. ceylonica* sensu Ghorpade (1994) has the scutellum dark on disk, in the here studied specimens the scutellum is entirely yellow.

87. *Meliscaeva monticola* (de Meijere, 1914)

Figs 18E, 18F

Records. **7a**: 1♂, 7♀; **7b**: 6♀; **7d**: 1♀; **18a**: 1♀.

Distribution. Java, Sri Lanka and Taiwan (Evenhuis and Pape, 2021).

Identification. Face with black medial vitta; pro- and mesofemur yellow; wing with basal cells extensively bare; posterolateral margin on scutum yellow pilose.

Biology. Found in Central Taiwan at altitudes of 2200-3417 m a.s.l. A high mountain species found on the highest part of the Hehuanshan and in a *Pinus taiwanensis* afforestation. Visiting flowers of *Rhododendron pseudochrysanthum* and *Salix fulvopubescens*.

Remarks. No type material has been studied but the Taiwanese specimens are similar to *M. monticola* sensu Shiraki (1930). The type locality of *M. monticola* is Java and it could be that the Taiwanese specimens belong to a different species and then most likely undescribed. Here the name *M. monticola* is used as it is mentioned in Shiraki (1930).

88. *Meliscaeva* aff *monticola* (de Meijere, 1914)

Fig. 18D

New record for Taiwan.
Records. **7b**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. Face with black medial vitta; pro- and mesofemur yellow; wing with basal cells extensively bare; posterolateral margin on scutum mixed yellow and black pilose.
Biology. Found in Central Taiwan at altitudes of 3340-3350m a.s.l. Collected on the slopes of the Hehuanshan visiting flowers of *Salix* spp.
Remarks. The specimen is clearly different from the previous species and as such it is supposed that this is the first record for Taiwan.

89. *Meliscaeva sonami* (Shiraki, 1930)
Fig. 18G
Records. **3b**: 6♂, 5♀; **7d**: 2♀; **18a**: 1♂, 1♀; **18b**: 1♀; **19**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Face yellow, abdomen with very wide yellow fascia on terga II-IV.
Biology. Found in Central Taiwan at altitudes of 970-2820 m a.s.l. Collected in high-elevation cloud forest visiting *Trochodendron aralioides* and *Pinus taiwanensis* afforestation, also found in mid-elevation forest in a wet gully.
Remarks. This species was described from Taiwan by Shiraki (1930) and has been identified as *Meliscaeva arisana*, *M. formosana* and even as *M. strigifrons*. It could be that *M. arisana* and *M. sonami* are synonyms as these names most likely represent the opposite sex, and if this is the case this species need to get a new name. Here the name *M. sonami* is used as the male specimens correspond with its description.

90. *Meliscaeva* spec 1
Fig. 18H
New record for Taiwan.
Records. **3b**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. Face yellow, entirely pollinose; scutellum predominantly yellow pilose.
Biology. Found in Central Taiwan at altitudes of 970-1020 m a.s.l. Collected in a wet forest gully in a mid-elevational broadleaved forest.
Remarks. This species is clearly different from all other *Meliscaeva* collected during this trip and seem to be *M. taiwana* ♀ sensu Shiraki, 1930. It could well be an undescribed species.

91. *Meliscaeva taiwana* (Shiraki, 1930)
Fig. 19B, 19C
Records. **7d**: 2♂, 3♀; **19**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Face yellow; tergum II with black medial vitta; vertex around ocellar triangle entirely pollinose, dull.
Biology. Found in Central Taiwan at altitudes of 1980-2200 m a.s.l. Collected in a high-elevation forest flying around a flowering tree or settling on leaves sprayed with a mixture of honey, water and alcohol.
Remarks. The specimens mentioned here correspond with its original description by Shiraki (1930); however it has also been identified as *M. strigifrons* sensu Thompson unpublished, in part.

92. *Meliscaeva* aff *taiwana* (Shiraki, 1930)
Fig. 19A
New record for Taiwan.
Records. **3b**: 1♀; **7d**: 1♂ 2♀; **18a**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. Face yellow; tergum II with black medial vitta; vertex around ocellar triangle non-pollinose, shiny.
Biology. Found in North and Central Taiwan at altitudes of 970-2820 m a.s.l. Collected in a mid- and high-elevational cloud forest and in high-elevational *Pinus taiwanensis* afforestation.
Remarks. This species clearly differs from *Meliscaeva taiwana* as highlighted in the key further on. It could be this specimen represents an undescribed species.

93. *Meliscaeva tenuiformis* (Curran, 1928)
Fig. 19D
New record for Taiwan.
Records. **7a**: 2♀; **7b**: 8♀.
Distribution. Borneo and Peninsular Malaysia (Evenhuis and Pape, 2021), Taiwan.
Identification. Face with black medial vitta; pro- and mesofemur extensively black; metafemur only narrowly yellow basally; wing entirely microtrichose; posterolateral margin of scutum mixed yellow and black pilose.

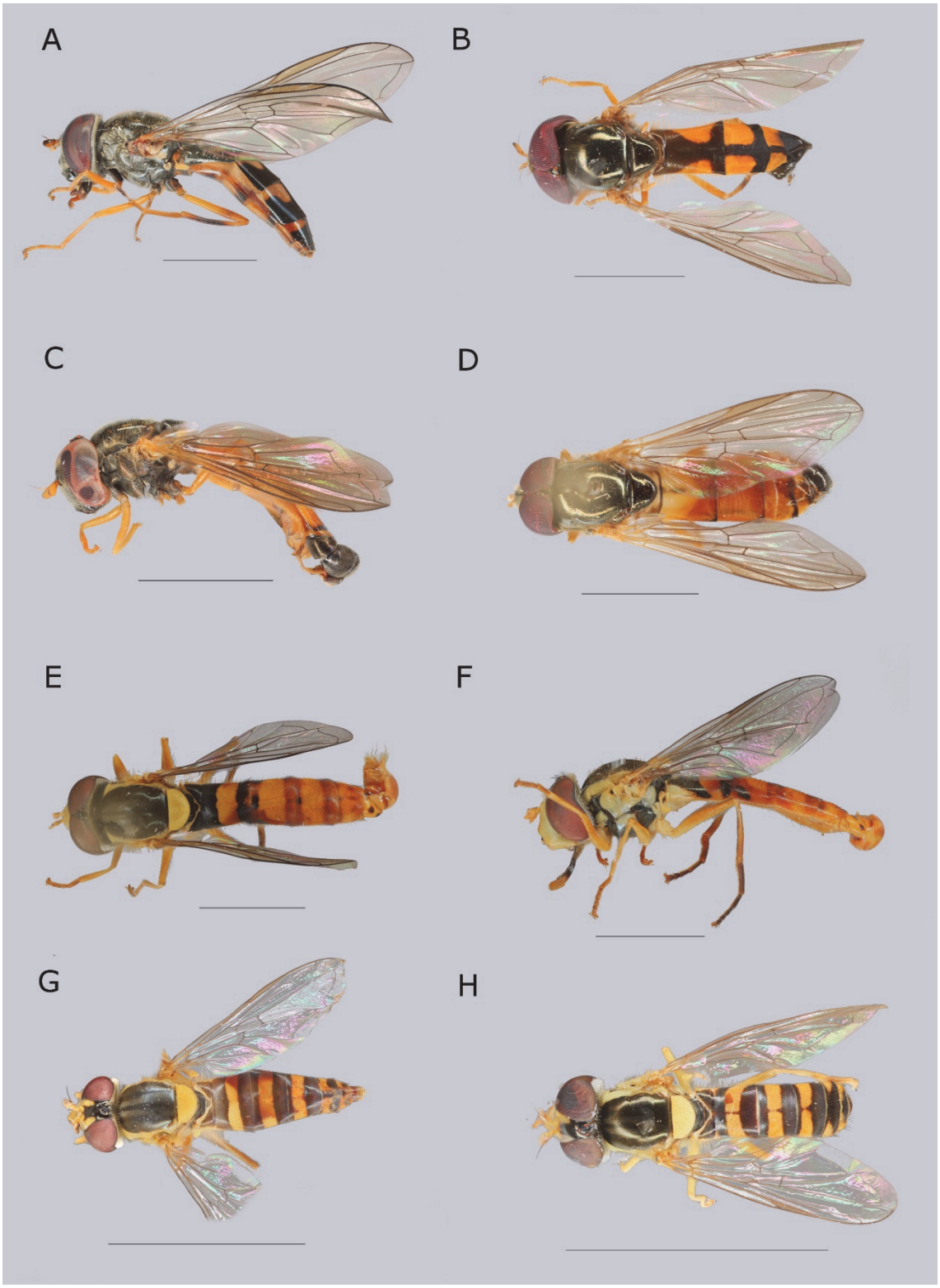

Fig. 20. Adult habitus, B, D, E, G, H, dorsal view; A, C, F, lateral view. A. *Melanostoma scalare*, female, Siangyang. B. *M. orientale*, male, Mingshih. C. *M. univittata*, male, Mutan. D. *M. univittata*, male, Nanrenshan. E, F. *Sphaerophoria indiana*, male, Mt Datun. G. *S. indiana*, female, Yousheng. H. *S. vockerothi*, female, Mingchih. Scale A-F; 2.5 mm, G, H; 5.0 mm.

Biology. Found in Central Taiwan at altitudes of 3340-3417 m a.s.l. A high montane species found feeding on *Rhododendron pseudochrysanthum* and *Salix fulvopubescens*.

Remarks. The syntypes of *M. tenuiformis* (NHM) were studied and a slight similarity was found with the Taiwanese specimens. In an unpublished draft key of Oriental *Meliscaeva* by F.C. Thompson this species runs to *M. tenuiformis*. It is also similar to *M. monticola*

sensu Shiraki, 1930 in part. As *M. monticola* already was mentioned here the name *M. tenuiformis* was applied to the studied species here.

94. *Mesembrius niveiceps* (de Meijere, 1908)
Fig. 17H
Records. **8b**: 2♀; **15**: 2♀; **16**: 28♂, 4♀.
Distribution. Java, (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. A *Mesembrius* with the scutellum black pilose medially; mesofemur smooth, without basal tooth.
Biology. Found in Central and South Taiwan at altitudes of 200-500 m a.s.l. Flower visiting purple *Rhododendron* spp. along a marshy area, and also visiting *Bidens pilosa*, *Melastoma malabathricum* in other low land marshy areas.
Remarks. *Mesembrius hilaris* (Walker, 1849) seems to be similar to *M. niveiceps*, but as no types of these species have been studied here no conclusion can be made and the Taiwanese specimens are named according to Shiraki (1930).

95. *Metadon bicolor* (Sack, 1922)
Records. **16**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Small species with entirely red abdomen.
Biology. Found in South Taiwan at altitudes of 200-340 m a.s.l. Flying along a sunlit path bordered with 1-2 m high vegetation and resting on broad leaves of *Melastoma malabathricum* in a lowland bog area.
Remarks. *Microdon bicolor* was described based on one male, incorrectly stated as female by Sack (1922) (see Reemer and Ståhls, 2013), from south-west Taiwan and our specimen seems similar based on this description (Sack 1922).

96. *Metadon formosanus* (Shiraki, 1930)
Records. **18a**: 4♂, 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A large species with dark-red marginated abdomen; the first antennal segment clearly shorter than the second and third combined.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Flying low over the ground and settling on bare parts like stones etc. in a high mountainous *Pinus taiwanensis* afforestation.
Remarks. Based on DNA the Taiwanese specimens are similar to Japanese specimens of *M. bifasciatus* Matsumura, 1916. With the key of Shiraki (1930) our specimens run to *M. formosanus* Shiraki, 1930 and it could be that *M. formosanus* is a junior synonym of *M. bifasciatus*.

97. *Microdon* (*Chymophila*) *stilboides* Walker, 1849
Figs 21A, 21B
Records. **2d**: 1♀; **5**: 4♂.
Distribution. India, Java, the Philippines and Taiwan (Evenhuis and Pape, 2021).
Identification. Large shiny bluish-green species with orange pilose face and orange genitalia; wings slightly infuscated.
Biology. Found in North Taiwan at altitudes of 250-600 m a.s.l. Males defend territories along a footpath and fly around low vegetation or sometimes settling on the foot of lowland deciduous trees and flying rapidly away when disturbed.
Remarks. The Oriental species of the subgenus *Chymnophila* are in need of a revision and several undescribed species are to be expected (M. Reemer pers. comm.).

98. *Milesia fissipennis* Speiser, 1911
Figs 21C, 21D
Records. **2c**: 5♂, 2♀; **5**: 6♂, 1♀; **8b**: 2♂; **8c**: 5♂; **10**: 14♂, 4♀; **12**: 6♂, 2♀; **16**: 2♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Very large species with extensive yellow, brown and black coloration.
Biology. Found throughout Taiwan at altitudes of 150-790m a.s.l. Males were often seen defending a territory around trees, over footpaths and also found hilltopping, in mid-elevational forests. Flower visiting a palm tree and *Hydrangea paniculata*.
Remarks. This is an unmistakable species.

99. *Monoceromyia annulata* (Kertész, 1913)
Fig. 21E
Records. **5**: 1♀; **10**: 2♀; **14**: 1♂ and "Taiwan: Hualien Co. / Tienhsing / 15-IX-2001 / J & L

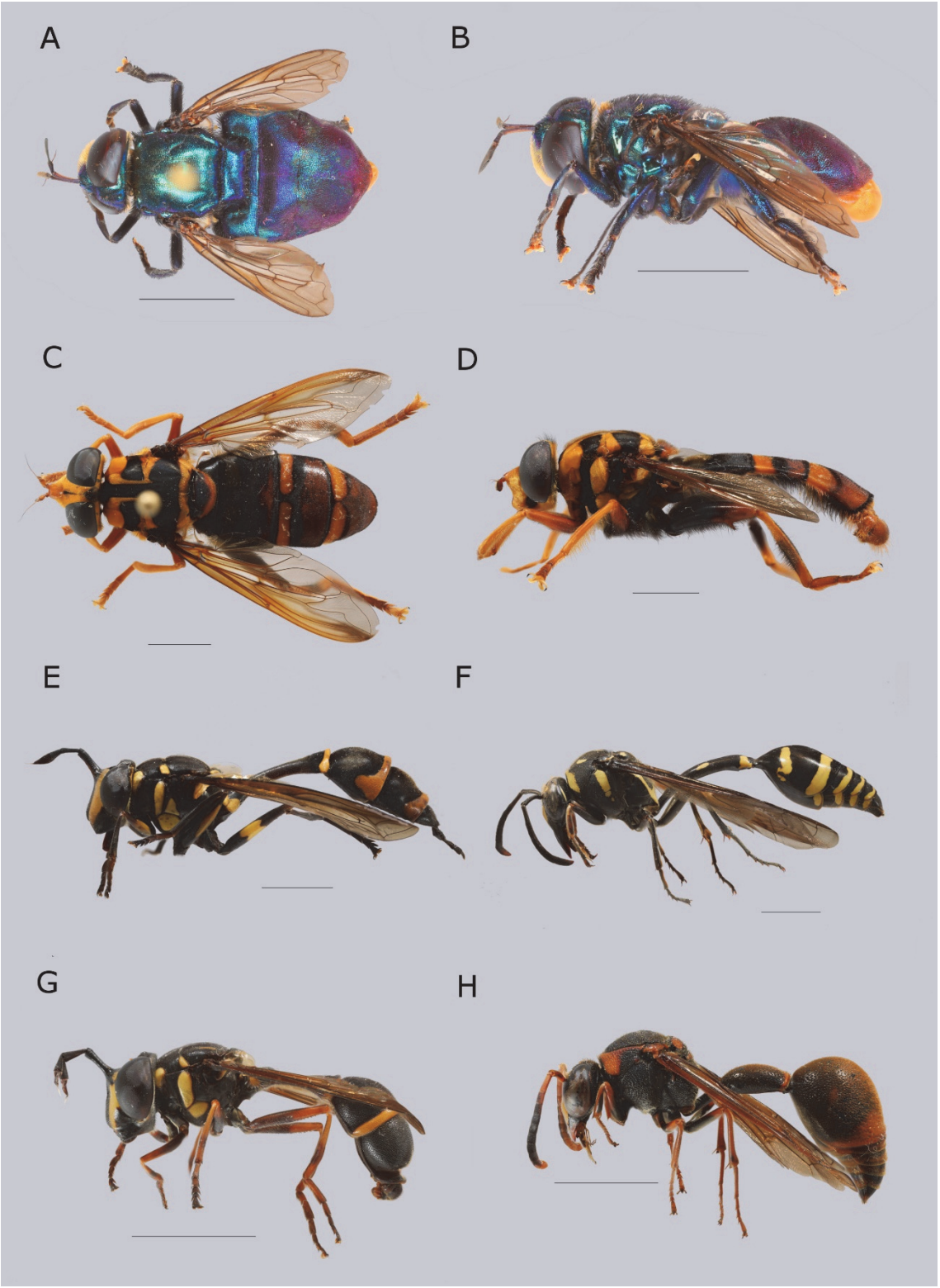

Fig. 21. Adult habitus, A, C, dorsal view; B, D-H, lateral view. A, B. *Microdon* (*Chymophila*) *stilboides*, male, Fuyuan. C. *Milesia fissipennis*, female, Fuyuan. D. *M. fissipennis*, male, Fuyuan. E. *Monoceromyia annulata*, female, Chilan. F. *Phimenes flavopictus formosanus*, Hueisun, model of *M. annulata*. G. *M. similis*, male, Hueisun. H. *Oreumenes decoratus*, Jhiben, model of *M. similis*. Scale 5.0 mm.

Stange", 1♂ (FSCA).

Distribution. Japan and Taiwan (Evenhuis and Pape, 2021).

Identification. Large species with three yellow maculae on pleurae (anepisternum, anepimeron and katepisternum) and fascia on tergites III and IV strongly curved laterally, scutellum with posterior margin medially black.

Biology. Found in Central and South Taiwan at altitudes of 200-650 m a.s.l. Flying in midair

beside flowering shrubs of *Koelreuteria elegans* subsp. *formosana*, sitting on leaves of roadside shrub and also hovering beside a person standing in a grassland adjacent to the forest. In flight mimicking *Phimenes flavopictus formosanus* (Zimmermann, 1931) **HYMENOPTERA** (Fig. 21F). This model was also noted for *Monoceromyia javana* (Wiedemann, 1824) in India (Sankararaman *et al*., 2020).

100. *Monoceromyia similis* (Kertész, 1913)
Fig. 21G
Records. **2a**: 1♂; **2c**: 2♂, 2♀; **5**: 2♀; **8a**: 1♀; **8b**: 1♂, 2♀; **8c**: 3♂, 2♀; **10**: 2♂, 1♀; **15**: 1♀; **16**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A relatively small species with 2 and sometimes a small third maculae on pleura, straight fascia on abdominal terga and scutellum with entire posterior margin yellow.
Biology. Found throughout Taiwan at altitudes of 200-1068 m a.s.l. Mostly seen flying around trees with visible sap streams of different size but also around trees without noticeable sap streams. Males defending a territory are not easily scarred away; also females tend to stay at the same spot for longer periods. In overall appearance very similar to and to be excepted as a mimic of *Oreumenes decoratus* (Smith, 1852) HYMENOPTERA (Fig. 21H).

101. *Monoceromyia* aff *annulata* (Kertész, 1913)
New record for Taiwan.
Records. **2c**: 1♂; **10**: 1♀.
Distribution. Taiwan, not mentioned anywhere else before.
Identification. A large black and yellow colored species with elongate and basally constricted abdomen, resembling *M. annulata*, but differing by the presence of yellow vittae on postero-lateral surface of scutum, in *M. annulata* black; the entire but narrowly yellow posterior margin of scutellum, in *M. annulata* wider and medially broadly interrupted; the yellow posterior anepisternum, in *M. annulata* also yellow on katepisternum and anepimeron and the straight yellow fascia on terga III and IV, in *M. annulata* laterally curved towards anterior margin. Furthermore, there are also differences in male genitalia.
Biology. Found in North and Central Taiwan at altitudes of 200-650 m a.s.l. Collected in subtropical lowland forests. The male was chasing a male of *Monoceromyia similis* around the base of a large tree trunk, presumably defending a territory, after which both males were captured in the same net.
Remarks. Clearly different from *M. annulata* and most likely an undescribed species.

102. *Paragus* (*Serratoparagus*) *crenulatus* (Thomson, 1868)
Figs 22A, 22B
Records. **13**: 1♀; **14**: 1♂, 1♀; **15**: 7♂, 5♀; **16**: 2♂; **17**: 2♂.
Distribution. Australian and Oriental (Evenhuis and Pape, 2021).
Identification. A yellowish colored species with characteristic white serrated apical margin of scutellum.
Biology. Found in the southern part of Taiwan at altitudes of 10-610 m a.s.l. in open grassy areas, sometimes within tropical rainforest.
Remarks. This species was mentioned as *P. serratus* (Fabricius, 1805) in Shiraki (1930), which seems to be a misidentification as only *Paragus crenulatus* is mentioned from Taiwan by Thompson and Ghorpade (1988).

103. *Paragus* (*Pandasyopthalmus*) *politus* Wiedemann, 1830
Records. **2b**, 2♂; **13**: 1♂.
Distribution. Australia, China, India and the Philippines (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. A small black species, identified by the features of the male genitalia.
Biology. Found in North and South Taiwan at altitudes of 10-330 m a.s.l. Collected on open grassy areas.
Remarks. This species was mentioned from Taiwan by Sack (1922). In Shiraki (1930) instead of this species *Paragus tibialis* was mentioned with *P. rufiventris* as synonym; however Thompson and Ghorpade give *P. rufiventris* as synonym of *P. politus*, which is followed here.

104. *Paragus* (*Pandasyopthalmus*) *rufocinctus* (Brunetti, 1908)
Fig. 22C
Records. **2a**: 1♂; **2b**: 3♂; **2d**: 1♂; **8a**: 1♂; **8b**: 6♂;

10: 1♂; **11**: 10♂; **12**: 1♂, 1♀.
Distribution. southern China, India, Myanmar and Sri Lanka (Evenhuis and Pape, 2021).
Identification. A small black species, identified by the features of the male genitalia.
Biology. Found throughout Taiwan at altitudes of 150-1068 m a.s.l. Visiting flowers of *Bidens pilosa*.
Remarks. This species is most likely *Paragus tibialis* sensu Sack (1922). In Shiraki (1930) it is most likely mentioned as *P. haemorrhous* as *P. rufocinctus* was not recognized or synonymized at that time. Thompson and Ghorpade (1988) mentioned this species from Taiwan.

105. *Paragus* (*Pandasyopthalmus*) *stuckenbergi* Thompson, 1988
New record for Taiwan.
Records. **5**: 2♂; **8c**: 1♂; **10**: 12♂.
Distribution. The Philippines (Evenhuis and Pape, 2021), Taiwan.
Identification. A small black species, identified by the features of the male genitalia.
Biology. Found in Central Taiwan at altitudes of 200-790 m a.s.l. Visiting the flowers of *Hydrangea paniculata*.
Remarks. Interesting record as it is previously only recorded from the Philippines (Thompson and Ghorpade, 1988).

106. *Paramicrodon* (*Myxogasteroides*) *nigripennis* (Sack, 1922)
Fig. 16F
Records. **15**: 1♂; **17**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Small elongate dark species with short oval to round basoflagellomere.
Biology. Found in South Taiwan at altitudes of 290-610 m a.s.l. Flying low through the vegetation in a wet forest gully amd among low wetland vegetation beside a footpath.

107. *Paramixogaster* (*Paramixogasteroides*) *sacki* Reemer & Ståhls 2013
Records. **16**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A relatively large, elongate and yellow colored Microdontine.
Biology. Found in South Taiwan at altitudes of 200-340 m a.s.l. Flying along a footpath bordered by lowland wetland vegetation of grasses and high shrubs.

108. *Parasyrphus* aff *annulatus* (Zetterstedt, 1838)
New record for Taiwan.
Records. **7a**: 1♀.
Distribution. Palaearctic species (Evenhuis and Pape, 2021), Taiwan.
Identification. A Syrphini with dull greenish scutum and yellow abdominal fascia; anterior anepisternum pilose; legs extensively yellow.
Biology. Found in Central Taiwan at altitudes of 3355-3417 m a.s.l. Collected while hilltopping.
Remarks. This species resembles European specimens of *Parasyrphus annulatus* but it could well be an undescribed species.

109. *Parasyrphus minimus* (Shiraki, 1930)
Figs 22E, 22F
Records. **7a**: 3♂, 14♀; **18a**: 7♂, 26♀.
Distribution. Japan (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. A Syrphini with dull greenish scutum and yellow abdominal fascia; anterior anepisternum pilose; legs predominantly black.
Biology. Found in Central Taiwan at altitudes of 2310-3417 m a.s.l. Collected while hilltopping and in a high-elevational forest and also flying low over and settling on wet parts of footpath in a high-elevational *Pinus taiwanensis* afforestation. Visiting flowers of *Astilbe longicarpa* and *Salix fulvopubescens*.
Remarks. This species resembles European specimens of *Parasyrphus lineolus* and it could be a synonym of this species.

110. *Phytomia errans* (Fabricius, 1787)
Figs 23A, 23B
Records. **15**: 1♂, 1♀; **16**: 3♂.
Distribution. Oriental and eastern Palaearctic species (Evenhuis and Pape, 2021).
Identification. A typical *Phytomya* species with relatively large eyes and very dense but short predominantly black pilose thorax. Thorax with yellow transverse pollinose vittae and abdomen medially black and laterally with orange-yellow maculae.
Biology. Found in South Taiwan at altitudes of 20-340 m a.s.l. Only found in a low land marsh

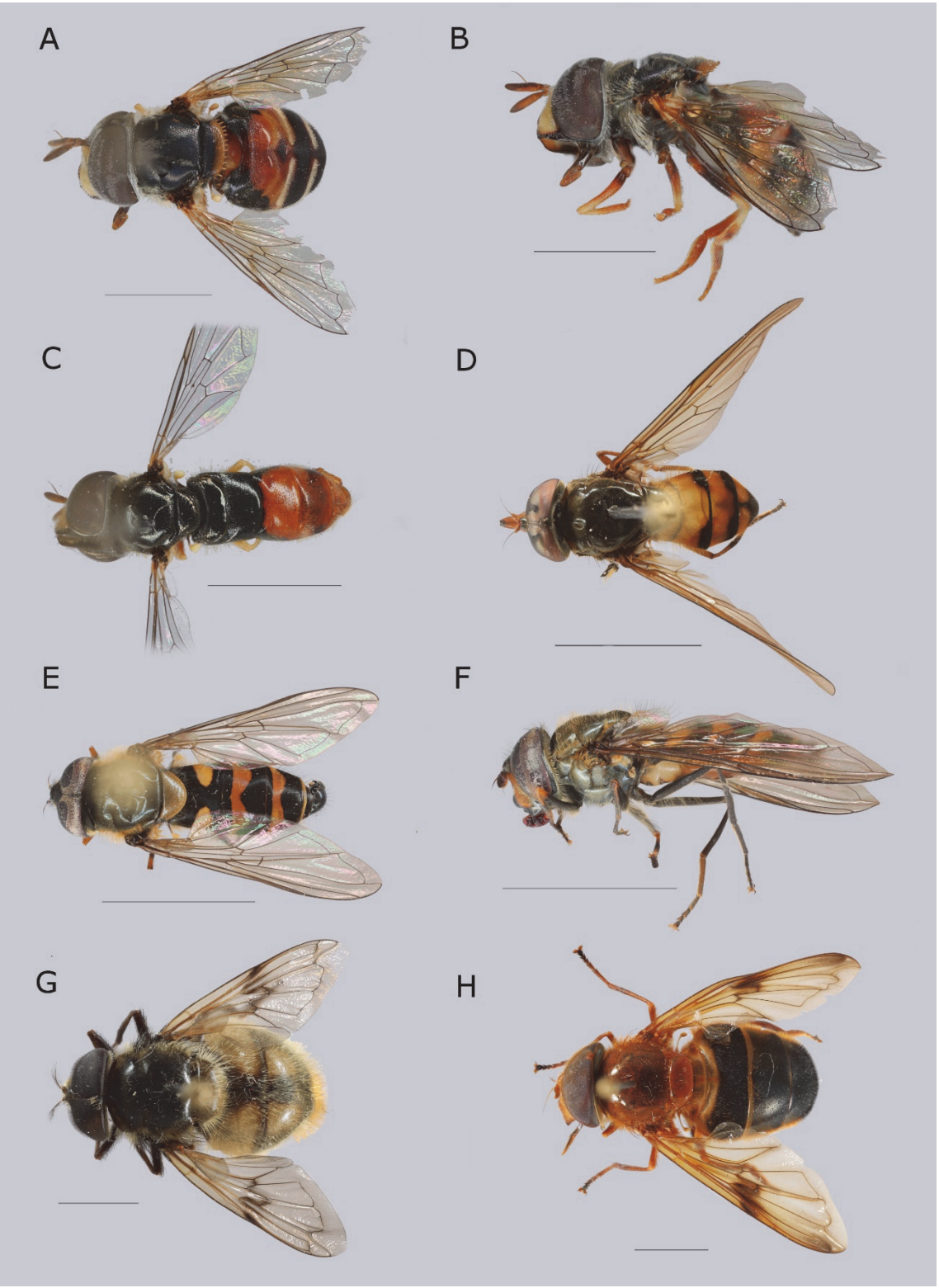

Fig. 22. Adult habitus, A, C, D, E, G, H, dorsal view; B, F, lateral view. A, B. *Paragus crenulatus*, male, Dongyuan. C. *P. rufocinctus*, male, Yangmingshan. D. *Rhingia formosana*, male, Siangyang. E, F. *Parasyrphus minimus*, male, Siangyang. G. *Volucella taiwanensis*, male, Siangyang H. *V. vespimima*, female, Cikong. Scale 5.0 mm.

area in the southern part of Taiwan. Visiting flowers of *Bidens pilosa*

111. *Phytomia zonata* (Fabricius, 1787)
Figs 23C, 23D

Records. **2a**: 28♂, 3♀; **2b**: 4♂; **2c**: 1♂; **4**: 2♂; **5**: 1♂; **8b**: 5♂, 11♀; **8c**: 1♀; **9**: 1♂; **10**: 1♀; **11**: 1♀; **15**: 3♀; **20**: 1♀.

Distribution. Australian, Oriental and eastern Palaearctic species (Evenhuis and Pape, 2021).

Identification. A species with densely black pilose thorax, black abdomen with sharply contrasting white-yellowish colored basal tergum.
Biology. Found in Central Taiwan at altitudes of 120-1930 m a.s.l. Collected in several mid-elevational sites in the northern part of Taiwan. Also found in lowland marsh areas. Visiting flowers of a variety of species: *Angelica hirsutiflora*, *Astilbe longicarpa*, *Bidens pilosa*, *Cirsium japonicum* and *Valeriana fauriei*.

112. *Platycheirus ferrumitarsis* Van Steenis, Wu, Young, Ssymank, Shiao & Skevington, 2019
Records. **7a**: 73♂, 13♀; **7b**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Abdomen with large yellowish macula, legs with characteristic widened parts and pilosity. Similar to thePalaearctic species *Platycheirus parmatus* Rondani, 1857.
Biology. Found in Central Taiwan at altitudes of 3340-3417 m a.s.l. Visiting flowers of *Rhododendron pseudochrysanthum* at a high elevational hilltop and *Salix fulvopubescens* at slightly lower altitude.
Remarks. This species was described by van Steenis *et al*. (2019a) based on the specimens collected during this trip.

113. *Platycheirus formosanus* Shiraki, 1930
Records. **7a**: 23♂, 67♀; **7b**: 7♂, 22♀; **7c**: 6♂, 18♀; **18a**: 8♂, 23♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Abdomen with silvery spots and pro- and metaleg with characteristic pilosity and widened parts. Extensively described by Van Steenis *et al*. (2019a).
Biology. Found in Central Taiwan at altitudes of 2310-3417 m a.s.l. Visiting flowers of *Rhododendron pseudochrysanthum* at Hehuanshan, further collected on flowers of *Salix fulvopubescens*, some small white Apiaceae, *Astilbe longicarpa*, *Primula miyabeana and Ranunculus* spp.

114. *Platycheirus perpes* Van Steenis, Wu, Young, Ssymank, Shiao & Skevington, 2019
Records. **7a**: 5♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A very narrow and entirely black *Platycheirus* without widened legs.
Biology. Found in Central Taiwan at altitudes of 3355-3417 m a.s.l. Collected hilltopping at Hehuanshan.
Remarks. This species was described by Van Steenis *et al*. (2019a) based on the specimens collected during this trip.

115. *Pseudovolucella mimica* Shiraki, 1930
Fig. 23F
Records. **7c**: 1♂, 1♀; **18a**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A brownish species with whitish abdominal fascia and remarkably narrow head in sagittal plane as typical for *Pseudovolucella*.
Biology. Found in Central Taiwan at altitudes of 2310-3070 m a.s.l. Collected along a small brook within a montane cloud forest, resting on leaves of *Petasites* spp. and in a high mountain wet meadow with small streams, low flowering herbs and a bamboo thicket close by.

116. *Rhingia formosana* Shiraki, 1930
Fig. 22D
Records. **7d**: 1♂; **18a**: 1♂; **18b**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Red and black colored *Rhingia*.
Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in high mountain mixed forest feeding on purple *Rhododendron* and in a high-elevational cloud forest.

117. *Sphaerophoria indiana* Bigot, 1884
Figs 20E, 20F, 20G
Records. **2a**: 19♂, 7♀; **3a**: 2♂; **3b**: 1♂; **6**: 2♀; **8a**: 1♀; **19**: 1♂, 1♀.
Distribution. Oriental and eastern Palaearctic species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Abdomen extensively yellow, female tergum V with rectangular maculae, widest medially.
Biology. Found in North Taiwan at altitudes of 500-1980 m a.s.l. Flying on open areas and along forest edges in low to mid-elevational forests. Visiting flowers of *Angelica hirsutiflora*, *Astilbe*

longicarpa, *Prunella vulgaris* and also some small white Apiaceae.

118. *Sphaerophoria vockerothi* Joseph, 1970
Fig. 20H
Records. **3b**: 1♂ 2♀; **8a**: 1♀; **8b**: 1♀; **8c**: 1♀; **10**: 1♀; **11**: 2♂, 5♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A small *Sphaerophoria* within the female tergum V with small triangular maculae, widest along lateral margin.
Biology. Found in North and Central Taiwan at altitudes of 200-1020 m a.s.l. Collected in mid-elevational broadleaved forests.
Remarks. This species was described in 1970 and thus not mentioned in Shiraki (1930). The true status of the name *Sphaerophoria vockerothi* is not clear and it could be a synonym of *S. formosana* Matsumura, 1917. The original description of *S. vockerothi* does not rule out this hypothesis and since Shiraki (1930) mentions *S. formosana* for Taiwan, the species is not listed as new for Taiwan.

119. *Sphegina* (*Asiosphegina*) *apicalis* Shiraki, 1930
Records. **18a**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Wing hyaline, tergum I posterolateral with an oblique row of light-yellow setae, pro- and meso tibia yellow.
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational pine afforestation Visiting flowers of *Astilbe longicarpa*.

120. *Sphegina* (*Asiosphegina*) *dentata* Van Steenis, Hippa & Mutin, 2018
Records. **18a**: 1♂; **18b**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Tergum I posterolateral with oblique row of light-yellow setae, very dark specimen: pro- and meso femur extensively black, hyaline wing, scutum with pollinose vittae
Biology. Found in Central Taiwan at altitudes of 2120-2820 m a.s.l. Collected in a high-elevational pine afforestation and visiting flowers of *Astilbe longicarpa*.
Remarks. Only two other male specimen are known of this recently described species (van Steenis *et al*., 2018).

121. *Sphegina* (*Asiosphegina*) *orientalis* Kertész, 1914
Records. **3a**: 10♂, 32♀; **3b**: 3♂, 1♀; **8c**: 1♀; **11**: 1♀.
Distribution. China, Ryukyu Islands and Taiwan (van Steenis *et al*., 2018). The record from the Philippines from Evenhuis and Pape (2021) needs confirmation.
Identification. Tergum I lateral with 2-3 strong yellow setae in a more or less horizontal plane, wing infuscated along crossveins and apically, frontal prominence long
Biology. Found in North and Central Taiwan at altitudes of 270-1180 m a.s.l. Flying in great numbers during cold misty periods and feeding on small herbs in Pine forest. Also found to feed during warmer conditions in mixed mid-level mountain forest on *Oenanthe javanica*.

122. *Sphegina* (*Asiosphegina*) *perlobata* Van Steenis, Hippa & Mutin, 2018
Records. **18a**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Tergum I posterolateral with oblique row of light-yellow setae,
Biology. Found in Central Taiwan at altitudes of 2310-2820 m a.s.l. Collected in a high-elevational *Pinus* (松屬) afforestation.
Remarks. Only the holotype male is known of this recently described species (van Steenis *et al*., 2018).

123. *Sphegina* (*Asiosphegina*) *taiwanensis* Van Steenis, Hippa & Mutin, 2018
Records. **3a**: 2♀; **18a**: 4♀; **18b**: 2♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Very similar to *S.* (*A.*) *orientalis*, however, wing apically hyaline, frontal prominence of medium length.
Biology. Found in North and Central Taiwan at altitudes of 980-2820 m a.s.l. Collected in a mid-elevational cloud forest and a high-elevational Pine afforestation.

124. *Syritta indica* (Wiedemann, 1824)
Records. **2d**: 1♂; **10**: 1♀; **15**: 1♂, 1♀.

Distribution. India, Nepal and Taiwan (Evenhuis and Pape, 2021).
Identification. A species with large rectangular maculae on trega II and III; a well sclerotized spurious vein; metafemur with setose tubercles subbasally, but without spina.
Biology. Found throughout Taiwan at altitudes of 200-650 m a.s.l. Collected in a sub-tropical lowland forest and in a grassy area close to subtropical forest.
Remarks. Not mentioned in Shiraki (1930) but recently mentioned from Taiwan by Lyneborg and Barkemeyer (2005).

125. *Syritta orientalis* Macquart, 1842
Records. **2d**: 2♂; **10**: 1♂; **15**: 2♂, 1♀.
Distribution. Australian and Oriental species, including Taiwan (Evenhuis and Pape, 2021).
Identification. A variable colored species with a well sclerotized spurious vein; metafemur with a subbasal cone-shaped spina posteroventrally.
Biology. Found throughout Taiwan at altitudes of 200-650 m a.s.l. Collected on grassy areas within sub-tropical lowland forests.

126. *Syrphus ribesii* (Linnaeus, 1758)
New record for Taiwan.
Records. **18a**: 2♂, 3♀; **19**: 1♀.
Distribution. Holarctic species, including Taiwan (Evenhuis and Pape, 2021).
Identification. Male with bare eyes; wing with complete microtrichia in basal cells; metafemora black for basal 5/6th, metatibia black for distal 1/2
Biology. Found in Central Taiwan at altitudes of 1980-2820 m a.s.l. Collected in a high-elevational Pine afforestation and in a mixed forest on partly sunlit leaves sprayed with a mixture of water, alcohol and honey.
Remarks. The specimens studied here differ slightly from European specimens of *Syrphus ribesii*. These and all other Taiwanese specimens formerly identified as *S. ribesii* could belong to an undescribed species.

127. *Syrphus torvus* Osten-Sacken, 1875
Records. **7a**: 5♂, 4♀; **7b**: 1♂; **18a**: 4♀; **19**: 1♂, 3♀.
Distribution. Holarctic (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. A typical *Syrphus* species with dull scutum and yellow fascia on the abdominal terga; eyes pilose and metalegs extensively black colored.
Biology. Found in Central Taiwan at altitudes of 1980-3417 m a.s.l. Collected at the highest point of the Hehuanshan, visiting flowers of *Rhododendron pseudochrysanthum* and also lower down on *Salix fulvopubescens*, also in a high-elevational Pine afforestation.

128. *Syrphus vitripennis* Megerle *in* Meigen, 1822
Records. **7d**: 1♀.
Distribution. Holarctic (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. Female with bare eyes, partially bare 2nd basal cell and metatibia more than apical 1/2 dark-brown to black.
Biology. Found in Central Taiwan at an altitude of 2200 m a.s.l. Collected in a high-elevational cloud forest.
Remarks. The specimens studied here differ slightly from European specimens of *Syrphus vitripennis*. These and all other Taiwanese specimens formerly identified as *S. vitripennis* could belong to an undescribed species.

129. *Tigridomyia curvigaster* (Macquart, 1842)
Figs 19G, 19H
Records. **2c**: 1♂, 2♀; **7a**: 1♂; **8b**: 1♀; **10**: 1♂, 1♀.
Distribution. Borneo, China, India, Japan, Java, Sri Lanka and Taiwan (Evenhuis and Pape, 2021).
Identification. Bee mimic with bare eyes; enlarged metafemur; wing cell r1 open.
Biology. Found in North and Central Taiwan at altitudes of 200-3417 m a.s.l. Collected in different habitats, from open bamboo thicket to tropical rain forest and flower visiting on *Angelica hirsutiflora*, hovering in front of a water filled rothole and found at a wet sapstream on broadleaved trees. Also at high altitude visiting flowers of *Salix fulvopubescens*.
Remarks. Several specimens of *T. curvigaster* including the supposed neotype in the NHM were studied and found similar to the Taiwanese specimens. This species is closely related to species of the genus *Mallota*.

130. *Volucella dimidiata* Sack, 1922
Records. **17**: 1♀.
Distribution. Taiwan (Evenhuis and Pape,

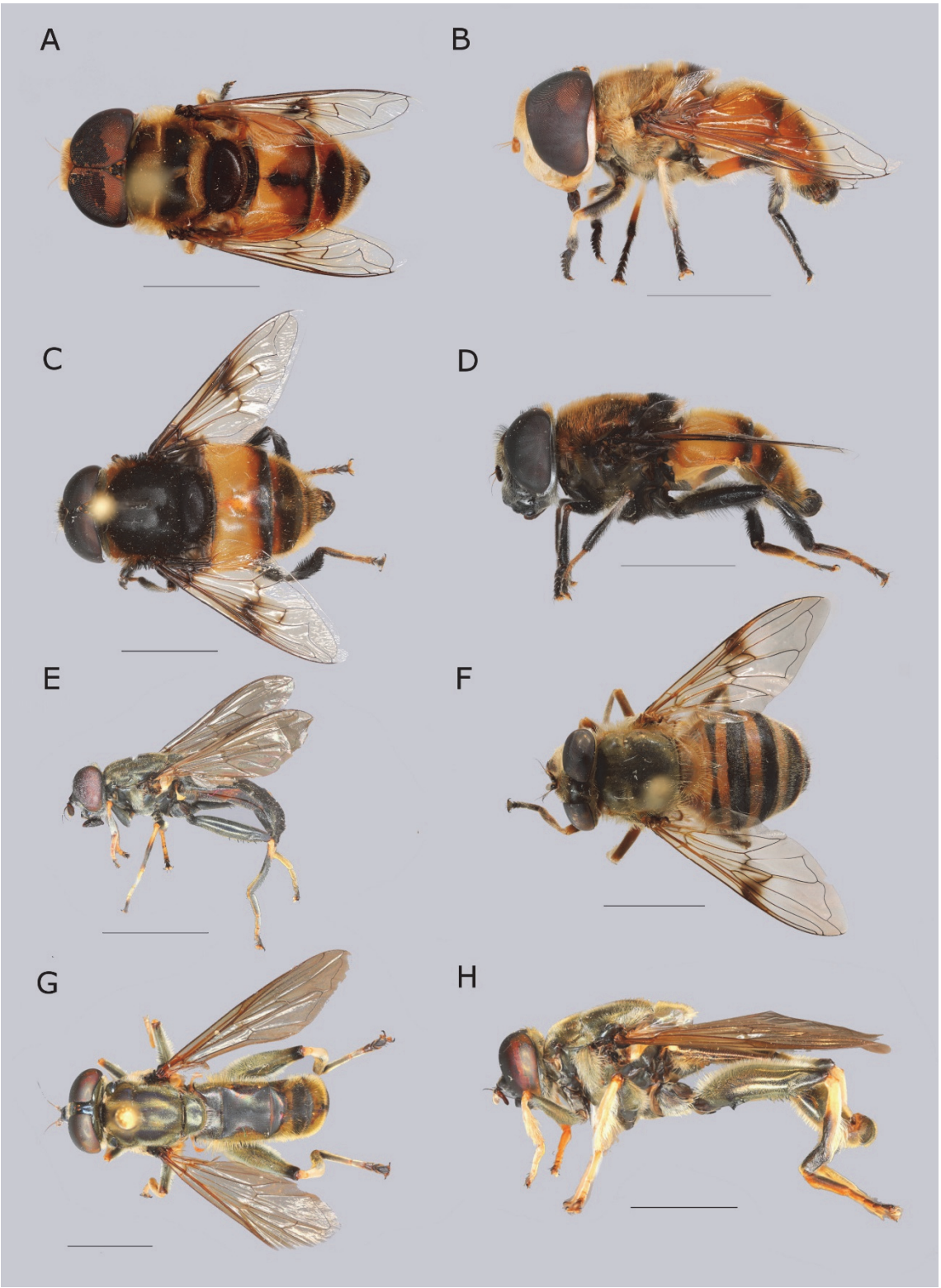

Fig. 23. Adult habitus, A, C, D, E, G, H, dorsal view; B, F, lateral view. A, B. *Phytomyia errans*, male, Nanrenshan. C, D. *P. zonata*, male, Datun. E. *Xylota aeneimaculata*, female, Hehuanshan. F. *Pseudovolucella mimica*, female, Siangyang. G. *Xylota steyskali*, female, Mingshih H. *X. steyskali*, male, Mingshih. Scale 5.0 mm.

2021).

Identification. A black species with a rather narrow abdomen; with darkened anterior part of the wing.

Biology. Found in South Taiwan at altitudes of 350-610 m a.s.l. Collected in a wet forest gully in a lowland tropical forest. Flying low over a rocky surface in a peculiar way, more resembling workers wasps approaching their nest. Possibly this female was looking for wasp nests to

oviposit.

131. *Volucella taiwana* Shiraki, 1930
Fig. 22G
Records. **18a**: 6♂, 3♀; **19**: 1♂.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. Pilose species, somewhat resembling the European species *Volucella bombylans*.
Biology. Found in Central Taiwan at altitudes of 1980-2820 m a.s.l. Collected in high montane mixed forest hovering at 2-5 m above forest tracks and also found feeding on purple *Rhododendron*.

132. *Volucella vespimima* Shiraki, 1930
Fig. 22H
Records. **17**: 1♀.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A brown-orange colored *Volucella* species with whitish, brown-orange tinged wings.
Biology. Found in South Taiwan at altitudes of 350-610 m a.s.l. Collected in a wet forest gully in a lowland tropical forest, flying through the gully.

133. *Xanthandrus comtus* (Harris, 1782)
Records. **7d**: 1♀; **19**: 1♀.
Distribution. Palaearctic (Evenhuis and Pape, 2021), and Taiwan (Shiraki, 1930).
Identification. A rather dark species with black face, thorax and abdomen, terga III and IV with large oval dark-orange maculae.
Biology. Found in Central Taiwan at altitudes of 1980-2200 m a.s.l. Collected in high-elevational cloud forests.
Remarks. The specimens studied here differ slightly from European specimens of *Xanthandrus comtus*.

134. *Xylota aeneimaculata* (de Meijere, 1908) sensu Shiraki, 1930
Fig. 23E
Records. **3b**: 1♀; **7d**: 1♀.
Distribution. Taiwan (Shiraki, 1930).
Identification. Normal sized dark *Xylota*, with a setose ridge on metatibia, in contrast to most European species of *Xylota* which are without spines on this ridge.
Biology. Found in North and Central Taiwan at altitudes of 970-2200 m a.s.l. Flying through a *Melanolepis multiglandulosa* tree in a mid-elevational forest and also in a high-elevational cloud forest.
Remarks. This species is not *X. aeneimaculata* de Meijere, 1908 and does not even belong to the same subgroup. It is an undescribed species belonging to the *X. coquilletti* group. From Taiwan several undescribed species of *Xylota* are known and a review of its species is in preparation (J. van Steenis pers. comm.).

135. *Xylota armipes* (Sack, 1922)
Figs 24A-D
Records. This species was not collected during this trip.
Additional records. The lectotype ♂: "Sokutsu // Formosa // H. Sauter V.1921", "*Zelima* // *armipes* Sack" [handwritten, white label], "Sack det.", "Syntypus" [Pink label], "DEI // EBERSWALDE", "Lectotype ♂ // *Zelima armipes* // Sack, 1922 // design. J. van Steenis, 2021" [red label], (SDEIM) and paralectotype ♂: "II Fuhosho // Formosa // H. Sauter 09", "illegible handwriting", "Paralectotype ♂ // *Zelima armipes* // Sack, 1922 // design. J. van Steenis, 2021" [red label], (SDEIF) and 1♀: "Taiwan Pingtung // Shihtzu Shouka // V/2--V/29/2011 // W.T. Yang // Malaise trap (KCN)" (NMNS) were studied.
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A large *Xylota* with vague dark-orange abdominal markings, similar to *X. steyskali*. See under the remarks for differentiating characters.
Remarks. Two syntypes of *Xylota armipes* Sack, 1922 were studied. The specimens and their labels correspond with the description and figures given by Sack (1922) and the most well kept specimen is hereby designated as Lectotype, the other as paralectotype. *Xylota armipes* and *X. steyskali* can be identified based on the key in Hippa (1982) and the following additional characters: *Xylota steyskali* with mesotibia baso-ventrally with rather long, appressed and anteriorly bent black pile, in *X. armipes* the pile is shorter, yellow, straight and ventrally directed, this is also a good character

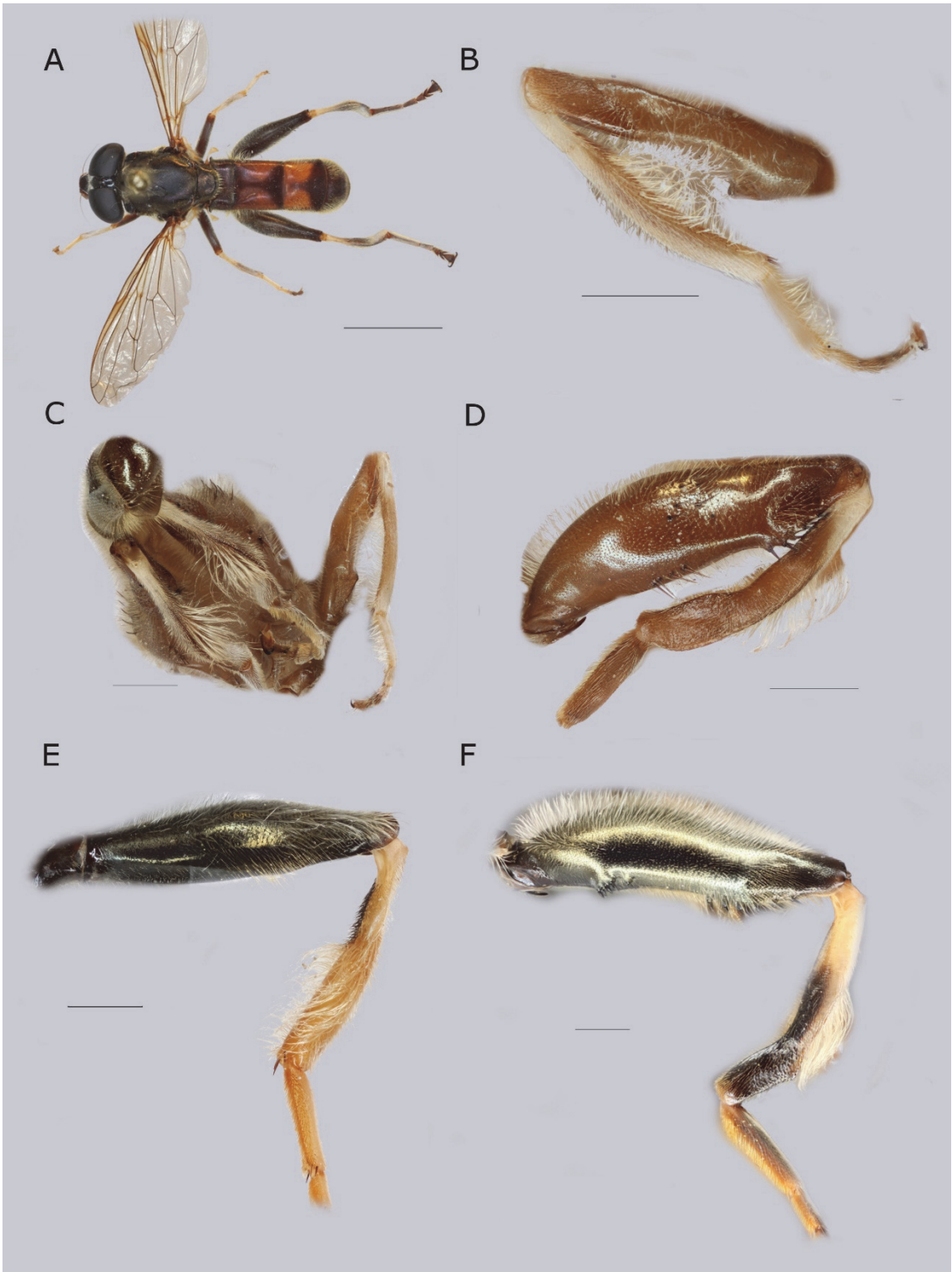

Fig. 24. A. Adult habitus, dorsal view; B, D-F, lateral view; C, ventral view. B, E. mesoleg. C. meso- and metalegs and abdomen. D, F. metaleg. A. *Xylota armipes*, female, Pingtung. B-D. *X. armipes*, male lectotype, Fuhosho. E, F. *X. steyskali*, male, Mingshih. A: scale 5.0 mm; B-F: scale 1.0 mm.

to separate the females of these species; *X. steyskali* with ventral side of mesotibia long yellow pilose along apical 5/9 of its length, in *X. armipes* mesotibia more extensively pilose, along 2/7 of its length; *X. steyskali* with a small protuberance on baso-ventral part of mesofemur, in *X. armipes* a more elongate protuberance placed more apically; *X. steyskali* with only short pile on the basitarsus of mesotarsus, in *X. armipes* ventro-laterally with very long yellow pile.

136. *Xylota steyskali* Thompson, 1975
Figs 23G, 23H, 24E, 24F
Records. **2c**: 1♂; **3b**: 3♂, 2♀; **16**: 1♀.
Additional records. 1♀: "Taiwan Miaoli // Sani // VI/16-17/1999 // C.S. Lin & W.T. Yang // UV light", "NMNS ENT // 3235-172", (NMNS); 1♀: "NE-Taiwan, Shiueshan Mts // Fushan Botanical Garden // ca. 24°46' N / 121°35' E // 650m, 17.-22.VI.2000 // leg. W. Schacht", "Holotype and one third // of paratypes resulting // from this material are // property of Taiwan!" (SMNS).
Distribution. Taiwan (Evenhuis and Pape, 2021).
Identification. A very large golden pilose species with long pilose metatibia and large setose and pilose metafemur.
Biology. Found throughout Taiwan at altitudes of 200-1020 m a.s.l. Male flying through and female settling on leaves of a *Melanolepis multiglandulosa* tree and also visiting its flowers.
Remarks. See under *Xylota armipes*.

Keys to species of *Allobaccha*, *Asarkina*, *Episyrphus* and *Meliscaeva* in Taiwan.

Key to species of *Allobaccha* in Taiwan

1 Scutellum entirely yellow; face non-pollinose shiny, yellow with wide medial black vitta; pleura extensively yellow ----------
- ---------- ***A. amphithoe*** Walker
- scutellum entirely black; face only on medial black vitta non-pollinose; pleura with at most anepisternum grey-yellow ----------2
2 Tergum I and notopleuron almost entirely black ----------3
- tergum I and notopleuron almost entirely yellow----------5
3 Squamae yellow; medial surface of scape and pedicel same color or slightly less dark, yellow to orange, than orange basoflagellomere -----4
- squamae grey, medial surface of scape and pedicel dark-brown, more dark than orange basoflagellomere --------- ***A. porphyra*** Curran
4 Tergum I with lateral corners yellow, T II-IV with yellow lateral maculae; wing with extended apical maculae, sometimes hyaline in the center part --------***A. nigricoxa*** Curran
- all terga black; wing membrane greyish, with black macula posterior to stigma and a small oval macula at apex-----***A. umbrosa*** Brunetti
5 Tergum III with posterior margin 2 x wider than anterior margin, maculae with medial end as far posterior as lateral end----------
- ----------***A. pulchrifrons*** Austen
- tergum III with posterior margin 3 x wider than anterior margin, maculae with medial end all the way down to the posterior margin, lateral end only down to posterior half---------
- ---------- **A. spec 1**

Key to species of *Asarkina* in Taiwan

1 Frons yellow and predominantly to entirely yellow pilose; pleura dorsomedially with yellow pollinosity and laterally with light-grey pollinosity; metafemur only basal 1/10 with black pile; basal 1/3 of cell BM bare of microtrichia ----------2
- frons black and entirely black pilose; pleurae almost entirely yellow pollinose; metafemur with basal 1/4-3/4 black pilose; cell BM entirely microtrichose ----------3
2 First tarsus of protarsus with several (>5) dark-brown to black setulae----------
- ----------***A. salviae*** (Fabricius, 1794)
- first tarsus of protarsus with at most 2-3 dark-yellow setulae; cell BM bare on basal 1/3; female with frontal pollinosity medially divided by a black shiny vitta----------
- ---------- ***A. formosae*** Bezzi, 1908
3 Face entirely yellow pilose; yellow fascia on tergum IV not entirely reaching lateral margin, posterior half of fascia separated from margin by a narrow dark-brown to black vitta; first tarsus of protarsus at most with some black setulae ----------4
- face medially around the central knob with black pile; yellow fascia on tergum IV reaching lateral margin over entire length; first tarsus of protarsus with many black setulae, sometimes number of black setulae strongly reduced ----------5
4 Tergum II with an entire yellow fascia---------
- ---------- **A. spec 1**
- yellow fascia on tergum II medially divided by a black vitta --------- ***A. orientalis*** Bezzi, 1908
5 Tergum II with entire yellow fascia; lateral margin of terga III and IV only narrowly yellow, posterior 1/2-3/4 black; tergum III extensively black pilose----------
- ----------***A. fumipennis*** Sack, 1913

- yellow fascia on tergum II medially divided by a black vitta; lateral margin of terga III and IV broadly yellow; tergum III medially extensively yellow pilose ---------- ***A.* spec 2**

Key to species of *Episyrphus* in Taiwan

1 Tergum IV with entire fascia; tergum II with anterior maculae laterally broadly connected with posterior markings, being either a fascia or lateral maculae; yellow fascia on tergum III with narrow black fascia, often reduced laterally and medially and sometimes even missing; ocellar triangle broad and pollinose, in some species partly non-pollinose and shiny
- ----------2
- abdomen with characteristic yellow and black pattern, terga II and IV with two large triangular antero-medial yellow maculae; tergum II with yellow maculae clearly separated from the posterior yellow fascia; yellow fascia on tergum III without medial black fascia; ocellar triangle elongate, narrow, at least partly non-pollinose and shiny; scutum without pollinose pattern, predominantly non-pollinose and shiny--------
- ---------- ***E. arcifer*** (Sack, 1927)

2 Narrow black fascia on terga III and IV straight, sometimes narrowly interrupted medially; tergum IV with black posterior fascia almost to entirely straight; ocellar triangle broad and brownish-yellow pollinose, or partly non-pollinose and shiny----------3
- narrow black, medially interrupted fascia on terga III and IV obliquely placed; tergum IV with black posterior fascia medially extended into anterior yellow fascia; ocellar triangle rather narrow and brightly golden-yellow pollinose ----------***E. divertens*** (Walker, 1856)

3 Sterna II and III with postero-lateral black triangular macula, in some specimens these macula medially connected, forming a fascia, lateral sides always triangularly extended and wider than medial part; ocellar triangle entirely pollinose or partly non-pollinose and shiny----------4
- sterna II and III with narrow posterior black fascia; ocellar triangle, especially in female non-pollinose and shiny----------
- ---------- ***E. alternans*** (Macquart, 1842)

4 pile on ocellar triangle forming a clear and narrow cocks coomb; ocellar triangle partly non-pollinose and shiny in female; either stout species with ocellar triangle placed relatively far anteriorly or tergum II with posterior fascia medially widely interrupted----------5
- pile on ocellar triangle forming a weak and broad cocks comb; ocellar triangle almost entirely pollinose, placed more posteriorly, as usual in this genus; tergum II with posterior fascia broad and non-interrupted; the differences between the two following species are arbitrary and by no means certain for species identification ----------6

5 Stout species; scutum with grey-pollinose vitta anteromedially and a dark-metallic pollinose macula at posterior margin; tergum II with uninterrupted yellow posterior fascia; metatibia mostly to entirely black, in some females predominantly yellow; tergum V in female with semi-circular narrow black fascia
- ---------- ***E.* spec 1**
- slender species; scutum evenly but slightly metallic pollinose; tergum II with broadly medially interrupted posterior fascia; metatibia entirely yellow----------
- ---------- ***E. obligatus*** (Curran, 1931)

6 Terga III and IV with clearly developed medial black fascia, sometimes narrowly medially interrupted; scutum with clear pollinose marking; sternum II with posterior triangular macula, sometimes broadly connected medially ***E. nectarinus*** (Wiedemann, 1830)
- terga III and IV with strongly reduced medial black fascia; scutum with weak pollinose markings; sternum II with posterior black fascia ----***E. viridaureus*** (Wiedemann, 1824)

Key to species of *Meliscaeva* in Taiwan

1 Face entirely yellow----------2
- face with at least central knob brown to black
- ----------6

2 Antennae completely yellow; maculae tergum II reaching anterior margin of tergum III; posterior margin of fascia on terga III and IV incised---------- ***M. abdominalis*** Sack
- antennae yellow with at least basoflagellomere dorsally brown to black ----------3

3 Tergum II with black medial vitta; in female vertex wide, ocellar triangle relatively narrow
- ----------4
- tergum II with at most weak dark-yellow medial vitta, yellow forming an uninterrupted

fascia, in female vertex narrow, ocellar triangle relatively wide ----------5

4 Vertex around ocelli entirely pollinose, ocellar triangle relatively short and wide; fascia on tergum III clearly separated from anterior margin by a black fascia ---------- ***M. taiwana***

- vertex anteriorly and laterally of ocelli non pollinose, shiny (likely also in the male), ocellar triangle elongate and relatively narrow; fascia on tergum III only laterally separated from anterior margin by a narrow black fascia ---------- ***M.* aff *taiwana***

5 Facial knob non-pollinose, shiny; frons with large black shiny macula anteriorly and weak pollinose dark-yellow to brown vitta medially; vertex around ocelli pollinose ... ***M. sonami***

- facial knob pollinose, dull; frons with very small black shiny macula anteriorly and dense pollinose medially; vertex anterior of ocelli non-pollinose, shiny---------- ***M.* spec**

6 Pro- and mesoleg predominantly black; post-alar callus and scutum at wing base mixed yellow and black pilose; wing cell BM entirely microtrichose; posterior margin of tergum I black ---------- ***M. tenuiformis***

- pro- and mesoleg entirely yellow, or at most with dark-brown to black base of femora; pile on post-alar callus and scutum yellow; wing with at least cell BM antero-basally broadly bare; posterolateral corner of tergum I extensively yellow ----------7

7 Tergum II with very wide yellow fascia; basoflagellomere elongate----------

- ---------- ***M. arisanica*** Shiraki, 1930

- tergum II with oval yellow maculae; basoflagellomere oval----------8

8 Facial black vitta short, covering slightly more than facial tubercle; tergum II elongate about as long as wide; fascia on tergum III widest laterally, posterior margin incised; metafemur yellow on basal 1/3 and apical 1/10----------

- ---------- ***M. formosana*** Shiraki, 1930

- facial black vitta long, almost or entirely reaching antennal sockets; tergum II broader, clearly shorter than wide; fascia on tergum III of equal width throughout, posterior margin slightly incised; metafemur at most yellow on basal 1/4 ----------9

9 Post-alar callus and scutum yellow pilose-----

- ---------- ***M. monticola*** De Meijere, 1918

- post-alar callus and scutum at wing base yellow with black pile --------***M.* cf *monticola***

Discussion

A total number of 136 **SYRPHIDAE** species were recorded during this research, which was above expectations. This is about 1/3 of the previously known Taiwanese fauna (Shiraki, 1930). Of these 33 are new faunal records, several of which are undescribed species. In addition, details of two further species not recorded during the expedition are provided from specimens deposited at two museums (NMNS, SDEIM).

The nomenclature of many genera like *Allabaccha*, *Asarkina*, *Episyrphus* and *Meliscaeva* and within Eristalini is unreliable as very few type species have been studied by subsequent authors. The names given in Shiraki (1930) are used here for those cases where no other suitable reference was available, especially in the genera *Cheilosia* and *Meliscaeva* and the tribe Eristalini. Species revisions on the generic level of the entire Oriental fauna are needed to better understand the Taiwanese fauna.

In a revision of the Oriental species of the genus *Sphegina* (van Steenis *et al*., 2018) the Taiwanese fauna was doubled from 4 to 8 species of which all 4 new species for Taiwan. During the current expedition a total of 5 species of *Sphegina* were collected of which three (*Sphegina* (*Asiosphegina*) *apicalis*, *S.* (*A.*) *dentata* and *S.* (*A.*) *perlobata*) very rare with, in total, only 5, 6 and 2 known specimens respectively worldwide. However, the other two species (*S.* (*A.*) *orientalis* and *S.* (*A.*) *taiwanensis*) are rather more common with 48 and 8 specimens respectively. Surprisingly, even within the genus *Platycheirus* two undescribed species (van Steenis *et al*, 2019a) were found on Hehuanshan, one of which was abundant and also very characteristic and very different from the known *P. formosanus*.

The number of species collected in each locality varied between one and 39 (18a), with a mean of 14.1 and a deviation of 9.5. The five localities (2c, 3b, 10, 16 and 18a) with more than 20 species each had no clear characters in common, they were in an altitudinal range of 200-2820m a.s.l and from 25°08' N to 22°05' N. Thus the number of species collected does not

correlate with the altitude or latitude nor any other observed characteristic like habitat. The individual species, however, show clear differences in altitudinal and latitudinal occurrence. Each of the species has been collected in one (46 species) to maximal 18 (*Melanostoma mellinum*) localities with a mean of 3.3 localities for each species. The species, 106 in total, only collected in 4 or less localities have not been incorporated in the following discussion. The latitude is categorized in the following three categories: South: 22°12' N-23°00' N; Central: 23°00' N-24°11' N and North: 24°12' N-25°10' N.

In total 30 species were collected in more than four localities, of which six species were found to have a latitudinal preference namely *Paragus crenulatus* Southern distribution; *Episyrphus alternans* and *Eumerus nicobarensis* with a South-Central distribution; *Betasyrphus serarius* A and *S. vockerothi* with a North-Central distribution and *Sphaerophoria indiana* with a North distribution. In altitude only the lowland species stand out, while all of the others are distributed in a wide range of altitudes from 7 to 3350 m a.s.l. The species with a strict lowland preference i.e. up to 800 m a.s.l. are: *Asarkina salviae*, *Asiobaccha sauteri*, *Eristalinus arvorum*, *Eumerus nicobarensis*, *Milesia fissipennis* and *Paragus crenulatus*. It was expected that the geographically widespread species would show a great altitudinal dispersal too. The preference for low altitudes of several species indicate the Oriental preference for these species. Several species are only found at altitudes of over 3000m a.s.l. are mostly rare species and consequently not found in many localities during our expedition. These species belong to the genera *Cheilosia*, *Dasysyrphus*, *Meliscaeva*, *Parasyrphus* and *Platycheirus* of which many originate from the Palaearctic region.

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2016 年國際遠征隊於台灣調查雙翅目食蚜蠅科之結果

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摘　要

2016 年的 5~6 月，一組國際遠征隊來到台灣，為了獲取更多關於台灣產食蚜蠅（雙翅目：食蚜蠅科）的資訊，到訪許多已知的主要採集地，進行食蚜蠅的採集。參與的成員來自七個不同的國家，大部分專精於食蚜蠅科。於 2015 年初，開始與臺灣大學昆蟲學系合作、聯繫，並由該單位負責申請採集證和確認採集協定（名古屋議定書）。總共前往 20 個地點進行採集，提供各地點的食蚜蠅棲地資訊，以及採集和初步鑑定的結果。提供四個屬，*Allobaccha* Curran, 1928、*Asarkina* Macquart, 1834、*Episyrphus* Matsumura & Adachi, 1917 和 *Meliscaeva* Frey, 1946 的物種檢索表。在採集到的 136 個物種中，有 33 種新的紀錄，並包含一些尚未發表的新種。最後討論台灣產食蚜蠅科物種的潛在性，以及正進行中的分類修訂。在比對採樣標本及數個博物館的蒐藏標本以及模式標本後，指定 *Zelima armipes* Sack, 1922 的選定模式標本。

關鍵詞：食蚜蠅科、分布、台灣、棲地、檢索表、*Allobaccha*、*Asarkina*、*Episyrphus*、*Meliscaeva*