Flower flies (Diptera: Syrphidae) of Philippines, Solomon Islands, Wallacea and New Guinea

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Abstract: The flower flies of the Philippines, Solomon Islands, Wallacea and New Guinea are reviewed. An overview of the family is given followed by a key to the genera with a synopsis of each genus. Two new combinations are made: *Matsumyia cyaniventris* (Sack, 1926) comb. nov. (formerly *Criorhina cyaniventris*) and *Citrogramma calceata* (Sack, 1926) comb. nov. (formerly *Xanthogramma calceata*).

Key words: Diptera, Brachycera, Syrphidae, Philippines, Wallacea, New Guinea, Solomon Islands, identification key, Indomalayan (Oriental) Region.

Introduction

Flower flies are an abundant and critical component of terrestrial ecosystems. They are found from northernmost Greenland to the subantarctic islands (South Georgia), with the greatest species richness in the Neotropics. As their common name indicates, adults are flowers visitors. The immature feeding modes range from predaceous (feeding on sternorrhynchous bugs), to wood borers, to aquatic filter-feeders and to specialized inquilines in social hymenopteran colonies. These flies are favourites among amateurs, especially in Europe.

Acronyms used in the text:

Is. – Island or islands;
PSWNG – Phillippines, Solomon Islands, Wallacea, and New Guinea.

Diagnosis

Small to large flies (body length 4-25 mm). Fully winged; usually with holoptic males (Fig. 5, plate 169 fig. 3, plate 169 fig. 7); females (Fig. 5, plate 170 fig. 7, plate 171 fig. 1) and some males (Plate 169 fig. 5) dichoptic; three ocelli present; antenna short to elongate, with distinct scape, pedicel, basoflagellomere, and apical style (Plate 167 fig. 1) or dorsal to subbasal arista (Fig. 3, plate 167 figs 3-7); without head bristles, rarely with bristles on thorax (*Cheilosia*, *Graptomyza*, *Ornidia* and *Volucella*); plumula (fringed posteroventral extension of subalar sclerite) short to long, rarely absent. Wing with large basal cells r, bm, and cu*p*; with closed apical cell (cell r_{4+5}) (Figs 7-8, plate 172 figs 1-10); spurious vein usually present between radial and medial fields (absent in *Graptomyza*, *Psilota*, and *Syritta flaviventris* in the PSWNG area) (Plate 172 figs 7, 9); calypter usually well developed. Abdomen slender or petiolate (Plate 169 fig. 1) to elongate (Plate 169 fig. 5) or oval (Plate 170 figs 1, 3).

Third instar larvae (Figs 20-23) and puparia are easily recognized by the following combination of characters: anal segment bearing single, sclerotized breathing tube; anus on anteroventral margin of anal segment, not separated from it by transverse integumental fold; dorsum of prothorax with




longitudinal folds (inconspicuous in microdontines and some syrphines).

Four basic forms of larvae exist: (1) Microdontinae: mandibles at apex of head skeleton, bladelike with serrated ventral margins. Larva hemispheric, with distinct lateral fringe (Fig. 20). Mesothorax, prothorax, and mouthparts concealed in ventral pocket of metathorax, which consequently forms anterior margin of larva. Anal segment and posterior respiratory process short. (2) Syrphinae and Pipizinae: apex of head skeleton consists of elongated, thin, and tapered labrum and labium forming black sclerotized upper and lower rods; mandibles thin and stylet-like and appear on each side of these rods. Anal segment and posterior respiratory process short. (3) Rhingiini and Merodontini: mandibles also at apex of head skeleton but hook-like in form and projecting from mouth. Anal segment and posterior respiratory process usually short. (4) Eristalinae, exclusive of Rhingiini and Merodontini: mandibles reduced and inconspicuous. With specialized pouch-like structure, formed from mandibles and their lobes. Anal segment usually elongate, extended, and partially retractile (Figs 22-23). Prolegs with crochets (Fig. 22), except in most eumerines and cheilosines and lacking in syrphines, pipizines and microdontines.

Syrphid flies are easily recognized by a combination of large basal cells (cells r, bm, and cu*p*) with a closed apical cell (cell r_{4+5}) (Figs 7-8, plate 172 figs 1-10). A long spurious vein between the radial and medial sectors is a useful diagnostic character, but is not found in all species, and shorter spurious veins are found in some Conopidae.

Biology

Most syrphid flies visit flowers, and many are pollinators, although the microdontines (Cheng & Thompson 2008) are only found in association with ant colonies. Males hover or rest near flowers and/or breeding sites awaiting females. Syrphid larvae have a wide range of niches. Saprophages occur in all types of wet environments, from tree sap to bromeliads, decaying plant parts, and specialized niches such as the refuse dumps of *Atta* leaf-cutter ants. Predatory species also vary in the niches occupied. Some live concealed in ant nests, attacking the early stages of ants or other myrmecophiles. Many syrphines live on plants, attacking colonial insects such as sternorrhynchous Hemiptera. Given this diversity, we have included in the synopsis below more specific information on the biology of each group.

Because of the diverse life histories of flower flies, they are of great importance. Adult flies are beneficial pollinators (Ssymank & Kearns 2009; Ssymank et al. 2009; Inouye et al. 2015), some being used for greenhouse pollination of flowers and seed-producing plants (Jarlan et al. 1997; Rader et al. 2016). A number of the predaceous species are valuable biological control agents of plant pests on agricultural crops (Tenhumberg & Poehling, 1995; Bergh & Short 2008; Nelson et al. 2012), and phytophagous species (*Cheilosia*) have been used for weed control (Grosskopf 2005). Some of the saprophagous species (*Palpada*, *Ornidia*) have been used to recycle wastes from coffee and orange juice production. In Europe, syrphids are used as ecological indicators to assess environmental quality (Sommaggio, 1999; Sommaggio & Burgio 2014). A few species (*Eumerus* and *Merodon*) are pests of ornamental flowers (Ben-Yakir et al. 1997; Tompsett 2002; Alford 2012), and occasionally some eristaline species cause accidental myiasis (Aguilera et al. 1999; Ferrer Bradley et al. 2010).

Phylogenetic relationships

The monophyletic order Diptera is divided in a series of groups but monophyly has only been supported for a few of these groups, e.g. Cyclorrhapha (Griffiths 1972; Stoffolano et al. 1988; McAlpine 1989; Cumming et al. 1995; Melzer et al. 1995; Wiegmann et al. 2003, 2011; Lambkin et al. 2013). Cyclorrhapha was previously divided into Schizophora and Aschiza, the latter now believed to be a paraphyletic grouping of families including Pipunculidae and Syrphidae (Collins & Wiegmann 2002; Moulton & Wiegmann 2004, 2007; Wiegmann et al. 2011; Young et al. 2016). Syrphidae has long been considered to be the sister group to Pipunculidae, forming the superfamily Syrphoidea (e.g. Brauer 1883; Hennig 1948; Griffiths 1972; McAlpine 1989; Cumming et al. 1995; Skevington & Yeates 2000; Rotheray & Gilbert 2008), and both were suggested to be the sister group of Schizophora. But recent morphological (Tachi 2014) and molecular analyses (Collins & Wiegmann 2002; Moulton & Wiegmann 2004; Wiegmann et al. 2011; Young et al. 2016) resolve Pipunculidae as the sister group of Schizophora, depicting Syrphoidea as paraphyletic.

The family Syrphidae has traditionally been divided into three subfamilies: Microdontinae, Eristalinae and Syrphinae (Vockeroth & Thompson




1987). Nevertheless, the pipizines, a tribe of historically uncertain placement (Vujić et al. 2013), has recently been elevated to subfamilial level (Mengual et al. 2015). Current tribal classification, with 15 recognized tribes, has not been generally accepted or fully supported by molecular characters (Mengual et al. 2008, 2015; Young et al. 2016).

Microdontinae is resolved as sister to the rest of the family in most phylogenetic analyses (Thompson 1969; Skevington & Yeates 2000; Ståhls et al. 2003; Rotheray & Gilbert 2008; Mengual et al. 2015; Young et al. 2016), and the tribe Spheginobacchini is placed as the sister group of the remaining microdontines (Ståhls et al. 2003; Hippa & Ståhls 2005; Reemer & Ståhls 2013b; Mengual et al. 2015).

In recent molecular and morphological analyses, the pipizines are resolved as sister to the other syrphines (Ståhls et al. 2003; Rotheray & Gilbert 2008; Mengual et al. 2015; Young et al. 2016). This phylogenetic placement suggests a common predatory ancestor for Pipizinae and Syrphinae, with the particular larval feeding mode on soft-bodied hemipteran and other arthropods evolving only once in the evolution of the Syrphidae. Current tribes within Syrphinae receive no support from combined molecular and morphological data (Mengual et al. 2008, 2015).

The subfamily Eristalinae has been recovered as para- or polyphyletic in most recent analyses (Rotheray & Gilbert 1999; Skevington & Yeates 2000; Ståhls et al. 2003; Hippa & Ståhls 2005; Mengual et al. 2015; Young et al. 2016). However, the relationships among the eristaline tribes have never been studied in detail for the entire group (Thompson 1972a, 1975; Rotheray & Gilbert 1999; Mengual et al. 2015), and more effort with a broader taxon sampling is needed to infer the relationships among them.

Classification

While some authors (Thompson 1969, 1972a; Speight 1987) have split off the basal clade of Syrphidae, recognizing two separate families (Microdontidae and Syrphidae), the monophyletic status and contents of the Syrphidae *sensu lato* have remained unchanged since the group was first recognized by Latreille (1802).

There are 202 genera and 96 non-typic subgenera of Syrphidae currently recognized in the world, 77 of which occur in the PSWNG subregion. The current tribal division of the family is based mostly on adult morphological characters and larval biology (Vockeroth 1969, 1992; Thompson 1972a; Thompson & Rotheray 1998). However, character evidence from the immature stages supports a slightly different view (Rotheray & Gilbert 1999; Katzourakis et al. 2001), and new data from molecular sequences when used in a total evidence analysis strongly suggest that neither immature nor adult characters provide a complete picture of the relationships among the genera of flower flies (Ståhls et al. 2003; Mengual et al. 2015; Young et al. 2016). Fifteen tribes are recognized: Microdontini and Spheginobacchini, in Microdontinae; Brachyopini, Callicerini, Cerioidini, Eristalini, Merodontini, Milesiini, Rhingiini, Sericomyiini, and Volucellini, in Eristalinae; and Bacchini, Paragini, Syrphini and Toxomerini, in Syrphinae. The subfamily Pipizinae has no tribal subdivision. Three clades (subfamilies Microdontinae, Pipizinae and Syrphinae) are supported as monophyletic based on current evidence, but the Eristalinae is not. Until further evidence is available to test this hypothesis, we will continue to follow a four subfamilies classification while recognizing that the Eristalinae is likely either poly- or paraphyletic.

Fossils

No fossils of flower flies are known from the Wallacea-New Guinea area. Fossils are known from Florissant shales (Eocene / Oligocene) in North America, Baltic amber, French and German deposits (Eocene / Oligocene / Miocene) and Sarmatian limestones in Croatia (Miocene) in Europe; and Dominican amber (Oligocene/Miocene) in the West Indies (Hull 1945, 1960; Evenhuis 1994).

Identification

No key to the genera for the Indomalayan [Oriental] or Australian Regions as a whole exist, but a couple of older works exist for subregions. Walker (1861, 1865) catalogued and described Diptera from New Guinea. Osten Sacken (1882) described Diptera from the Philippines. Edwards & Austen (1915) further described Diptera from Dutch [Papua] New Guinea. Brunetti (1923) revised the flower flies of British India. Sack (1926) described Syrphidae from the Philippines and Malaysia. In a series of studies, Curran (1928, 1931a, 1931b) revised the syrphid fauna of Malaysia, and Guadalcanal (Curran 1947). Ferguson (1926a, 1926b)




and Hardy (1933, Syrphinae) revised the Australian fauna. Keiser (1952) described some Syrphidae from Sumba, Sumbawa, Flores, and Timor. Shiraki (1963) revised the flower flies of Micronesia, and previously the fauna of Taiwan (Shiraki 1930). Doesburg (1966) described Syrphidae from New Guinea and Australia. More recently, Ohara & Kusigemati (1985) described several species of Syrphidae from Solomon Islands and New Guinea and Mengual & Thompson (2010) provide a species list of Syrphidae found in Papua, Indonesia.

General information on syrphid larvae can be found in Rotheray (1993) and references therein. No treatments of immatures for the Indomalayan or Australian regions exist. Only the treatments of the immatures of the Nearctic (Heiss 1938; Johanssen 1935) and European (Rotheray 1993; Rotheray & Gilbert 1999) regions exist.

Identification key to Philippine, Solomon Islands, Wallacea and New Guinea flower fly groups

The following key and generic annotations include all species known from the Philippines, Solomon Islands, Wallacea and New Guinea (see Map 1). For basic morphological terminology please refer to Figs 1-10.

1 Postmetacoxal bridge narrow but complete, face convex to straight in profile, never with long frontal prominence. Anterior anepisternum pilose. Antenna usually elongate, with scape and usually also basoflagellomere more than 2.5 times as long as wide (Plate 167 fig. 2). Eye bare [Microdontinae] 9
– Postmetacoxal bridge usually absent or incomplete, but if present then broad and face either concave, tuberculate, or with long frontal prominence. Anterior anepisternum pilose or bare. Antenna usually short; scape usually at most twice as long as wide; basoflagellomere usually rounded or oval. Eye bare or pilose 2
2 Postpronotum bare (see fig. 9). Head posteriorly strongly convex and closely appressed to thorax so that postpronota are partly or entirely hidden. Male abdomen with tergum 5 visible in dorsal view and varying in form of a subquadrate or subtriangular to short transverse sclerite (Plate 169 figs 1, 3, 5) [Syrphinae] 19
– Postpronotum pilose (see fig. 9). Head posteriorly less strongly convex so that postpronota are clearly exposed. Male abdomen with tergum 5 not visible in dorsal view (Plate 169 fig. 7, plate 170 figs 1, 3, 5, 7, plate 171 figs 1, 3, 5, 7) 3
3 Antenna with terminal stylus (Plate 167 fig. 1) [Cerioidini] 76
– Antenna with dorsal arista, with arista basal or subbasal, never at apex (Plate 167 figs 3-10) 4
4 Vein R_{4+5} moderately to strongly sinuate (Plate 172 figs 1, 4) 50
– Vein R_{4+5} straight or nearly so, not sinuate (Plate 172 figs 5, 7-10) 5
5. Arista plumose or pectinate, with pile at least 3 times as long as basal diameter of arista (Plate 167 fig. 7) [Volucellini] 48
– Arista bare or pubescent, with pile never more than twice as long as basal diameter of arista (Plate 167 fig. 9) 6
6. Vein M_1 recessive anteriorly and with external appendices; cell r_{2+3} open at wing margin (Plate 172 fig. 5). Arista bare. Anepisternum with anterior flattened portion pilose ..... *Eumerus*
– Vein M_1 usually processive anteriorly. If slightly recessive, then never with external appendices. Anepisternum usually bare anteriorly 7
7 Eye bare 78
– Eye pilose 8
8 Oral margin evenly rounded, not notched anteromedially; facial groove reduced to a pit (Plate 167 fig. 12). Abdominal terga 2 and 3 large; tergum 4 very short, less than 1/4 as long as tergum 3. Subscutellar fringe present (as in fig. 17) [Pipizinae] ..... *Triglyphus*
– Oral margin notched anteromedially; facial groove elongate, not forming a small round pit (Plate 167 fig. 11). Abdomen not as such. Subscutellar fringe present or absent 74
9 Vein R_{4+5} with an appendix extending posteriorly into cell r_{4+5} (Plate 172 fig. 3) 11
– Vein R_{4+5} without such an appendix 10
10 Transverse suture incomplete medially; anepisternum pilose only on anterodorsal corner and narrowly along posterior edge; metasternum usually pilose (as in fig. 16) ..... *Paramicrodon*
–Transverse suture distinct, continuous across scutum; anepisternum uniformly pilose, without bare medial area; metasternum bare ..... *Indascia*
11 Postpronotum bare 18
– Postpronotum pilose 12
12 Basoflagellomere greatly elongated, four or more times longer than scape, narrow, six or more times longer than broad. Scutellum unarmed. Abdomen elongate, widest apically; with only 3 segments visible dorsally; tergum 4 hidden dorsally by shield–like sides of tergum 3, vertical, and appearing as hypopygium; hypopygium concealed, only visible ventrally ..... *Kryptopyga*
– Basoflagellomere shorter, less than four times as long as scape 13
13 Vein M_1 (apical crossvein) strongly recurrent on anterior 1/3, usually with an appendix (Plate 172 fig. 3). Second abdominal segment with anterior margin rectangular; abdomen broadly triangular, broadest at base .... *Chymophila*
– Vein M_1 straight or rounded, not angulate, without an appendix. Second abdominal segment usually without rectangular anterior margin 14
14 Antenna quite short, shorter than distance between antennal fossa and anterior oral margin .....




..... *Archimicrodon*
– Antenna longer, scape and basoflagellomere several to many times longer than pedicel 15
15 Tergum 2 with a pair of depressed areas. Pro– and mesofemora with basoanterior patches of dense short spinose pile ..... *Parocyptamus*
– Tergum 2 without depressed areas. Femora without such patches of pile 16
16 Anepisternum extensively bare ventrally and medially, with bare part reaching dorsad to above half the height of the anepisternum ..... *Microdon*
– Anepisternum with bare part limited to ventral half of the anepisternum, or entirely pilose 17
17 Tergum 1 well–developed, especially on disc where it is frequently 1/2 as long as tergum 2 and always extends beyond scutellum; semicircular in shape with hind margin very rounded. Eye short pilose or bare .....
..... *Heliodon*
– Tergum 1 greatly reduced, frequently almost linear on disc and practically covered by scutellum. Eye bare .....
..... *Metadon*
18 Abdomen oval. Basoflagellomere 6 times as long as pedicel ..... *Bardistopus*
– Abdomen petiolate; tergum 2 flattened, sometimes constricted or with large basolateral pale macula; terga 3 and 4 (males) or 5 (females) forming a club. Basoflagellomere 3 to 5 times as long scape .....
..... *Paramixogaster*
19 Anterior anepisternum bare 23
– Anterior anepisternum pilose at least posterodorsally
..... 20
20 Posterior wing margin without sclerotized black maculae. Abdomen petiolate ..... *Petioleomyia*
– Wing with a series of minute closely spaced black maculae on posterior margin (fig. 19). Abdomen petiolate, parallel-sided or oval 21
21 Metasternum pilose ..... *Episyrphus*
– Metasternum bare 22
22 Abdomen oval to parallel–sided, never petiolate; tergum 2 always less than twice as long as its apical width. Metaepisternum bare; anterior anepisternum generally pilose ..... *Meliscaeva*
– Abdomen petiolate; tergum 2 more than 6 times as long as its apical width (Plate 169 figs 1-2); Metaepisternum pilose ventrad to spiracle; anterior anepisternum with a single row or patch of pile posterodorsally .....
..... *Asiobaccha*
23 Costa with strong black swelling at extreme base; alula narrow (Plate 172 fig. 6). Face produced strongly anteriorly. Metasternum bare. Male broadly dichoptic (Plate 169 figs 5-6) ..... *Giluwea*
– Costa simple basally, without such black swelling. Face variable. Metasternum pilose or bare. Male holoptic or dichoptic 24
24 Abdomen parallel–sided to oval, never distinctly petiolate 26
– Abdomen elongate, strongly petiolate; tergum 2 narrower than tergum 3 25
25 Postmetacoxal bridge usually incomplete. Postpronotum and/or anterior anepisternum pilose; laterotergite dorsally with a patch of long pile ..... *Allobaccha*, in part
– Postmetacoxal bridge complete. Postpronotum, anterior anepisternum, and laterotergite all bare .... *Baccha*
26 Face and scutellum entirely black in background colour. Abdomen without marginal sulcus. Metasternum bare (fig. 15). Eye bare 45
– Face or scutellum or both, at least partly yellow or yellowish brown in background colour, both never entirely black. Abdomen, metasternum, and eye variable 27
27 Tergum 1 greatly reduced, frequently almost linear on disc and practically covered by scutellum, sublaterally at most 1/2 as long as tergum 2; terga not punctate. Eye and metasternum variable. Length 6 mm or more .. 30
– Tergum 1 well-developed, especially on disc where it is frequently 1/2 as long as tergum 2 and always extends well beyond scutellum, sublaterally about 3/4 as long as tergum 2; terga minutely punctate. Eye pilose. Metasternum bare. Length 7.5 mm or less [Paragini] 28
28 Eye uniformly pilose. Scutellum entirely black .....
..... *Pandasyopthalmus*
– Eye with vertical alternate vittae (bands) of pile reflecting light differently (Plate 167 fig. 8). Scutellum black with apex narrowly yellow or reddish 29
29 Scutellum with conspicuous teeth on posterior margin. Eye in dorsolateral view with two dark and three more distinct white pile vittae ..... *Serratoparagus*
– Scutellum with apical margin simple, without teeth. Eye with two white pile vittae among dark pile ... *Paragus*
30 Metathoracic pleuron with a tuft of fine hairs ventrad to spiracle; metasternum pilose. Vein R_{4+5} distinctly sinuate. Large species with broad flattened abdomens with distinct marginal sulcus ..... *Asarkina*
– Metathoracic pleuron bare ventrad to spiracle; metasternum variable. Vein R_{4+5} straight or sinuate. Size and abdominal shape variable 31
31 Scutum with at most a poorly defined dull yellow pollinose lateral vitta; ground colour black 38
– Scutum with a sharply–defined, contrasting shiny yellow or whitish yellow lateral or sublateral vitta extending at least from postpronotum to transverse scutal suture; ground colour yellow 32
32 Abdomen without marginal sulcus 35
– Abdomen with at least a weak marginal sulcus on terga 4 and 5, often with a strong sulcus on terga 3-5 ... 33
33 Basoflagellomere elongate, from 1.6 to 2.0 times as long as broad. Male metatrochanter with ventral calcar. Wing extensively bare, bare on basal 2/3 and only sparsely microtrichose on apical 1/3. Eye bare .....
..... *Ischiodon*
– Basoflagellomere oval, at most 1.3 times as long as broad. Male metatrochanter simple. Wing extensively microtrichose, with moderate bare areas on basal 1/3, densely microtrichose on apical 1/3. Eye bare or pilose
..... 34
34 Subscutellar pile fringe absent. Lateral mesonotal yellow vitta does not reach yellow of scutellum; scutellum always black basally. Metasternum bare .....
..... *Xanthogramma*




– Subscutellar pile fringe present. Lateral mesonotal yellow vitta reaches yellow of scutellum; scutellum yellow, with or without medial black macula. Metasternum usually pilose ..... *Citrogramma*, in part
35 Metasternum pilose 37
– Metasternum bare 36
36 Vein M_1 (apical crossvein) perpendicular to R_{4+5}, nearly straight, widely divergent from wing margin. Scutellum subtriangular. Abdomen without marginal sulcus. Male narrowly dichoptic ..... *Eosphaerophoria*
– Vein M_1 progressive, oblique, slightly sinuous, parallel with wing margin or nearly so. Scutellum rounded. Abdomen with weak marginal sulcus on tergum 5. Male holoptic ..... *Citrogramma*, in part
37 Subscutellar pile fringe complete, well–developed, moderately dense. Male terminalia small, inconspicuous; tergum 9 at most 1/3 as wide as abdomen ..... *Allograpta*
– Subscutellar fringe absent or nearly so on at least median 1/3, present but sparse laterally. Male terminalia extremely large, globose; tergum 9 as wide as abdomen ..... *Sphaerophoria*
38 Wing with distinct transverse brown vitta at mid length extending from costa to posterior margin, about 1/3 of wing width (Plate 172 fig. 10); sparsely haired flies with *Syrphus*–like abdominal pattern of broad transverse yellow fasciae ..... *Dideopsis*
– Wing without transverse dark vitta, unmarked except for stigmal darkening or rarely with costal area longitudinally darkened and with dark anteroapical macula 39
39 Metasternum pilose 44
– Metasternum bare 40
40 Abdomen with weak but distinct marginal sulcus, oval 42
– Abdomen without sulcus, slender and parallel–sided or narrowly oval 41
41 Metacoxa with tuft of pile at posteromedial apical angle. Face not produced or prominent below. Male holoptic ..... *Melangyna*
– Metacoxa without posteromedial apical pile tuft. Face moderately produced anteriorly. Male dichoptic ..... *Melanosyrphus*, in part (pale areas on face are easily missed in some specimens)
42 Katepisternum pile patches distinctly separately posteriorly (as in fig. 13). Abdomen with pale yellow or grayish maculae, always very densely pollinose. Face densely grayish pollinose. Eye densely and uniformly pilose ... *Betasyrphus*
– Katepisternum pile patches narrowly to broadly joined posteriorly (fig. 11). Abdomen with bright yellow maculae, at most very slightly pollinose. If face densely pollinose, then eye distinctly pilose only on dorsal half ... 43
43 Eye densely pilose throughout or nearly so ..... *Dasysyrphus*
– Eye with dense pile only on dorsal half, nearly bare ventrally ..... *Epistrophe*
44 Metacoxa without a tuft of pile posterolaterally. Katepisternum with dorsal and ventral pile patches very nearly confluent anteriorly, distinctly separated posteriorly ..... *Macrosyrphus*
– Metacoxa with a tuft of pile posterolaterally. Katepisternum with pile patches broadly separated anteriorly, narrowly joined posteriorly (Plate 169 fig. 3-4) ..... *Dideoides*
45 Metaepisternum with several fine subappressed hairs; katepisternum with pile patches broadly separated posteriorly, joined anteriorly. Metacoxa with tuft of pile at posteromedial apical angle ..... *Xanthandrus*
– Metaepisternum bare; katepisternal pile patches broadly separated throughout. Metacoxa without posteromedial apical pile tuft 46
46 Metasternum greatly reduced, with deep posterior incision laterally so that sclerotized portion consists of a median diamond–shaped area with a narrow anterior and lateral strips (fig. 14). Face not produced below, with small tubercle. Male legs slender, without bristles, pile tufts or modified hairs ..... *Melanostoma*
– Metasternum entire (fig. 15). Face moderately produced anteriorly, with distinct tubercle 47
47 Male holoptic, with proleg modified, either broadened, or with special bristles, pile tufts or modified hairs. Face not greatly produced anteroventrally (Indomalayan) ..... *Platycheirus*
– Male dichoptic, with unmodified legs. Face strongly produced anteroventrally (New Guinea) ..... *Melanosyrphus*, in part (pale areas on face are easily missed in some specimens)
48 Cell r_1 open, not petiolate; vein M_1 [apical crossvein] perpendicular or slightly recessive (Plate 172 fig. 7). Katepimeron bare ..... *Graptomyza*, in part
– Cell r_1 petiolate; vein M_1 strongly recessive anteriorly (Plate 172 fig. 8). Katepimeron pilose 49
49 Face with medial and two lateral tubercles. Notopleuron enlarged, produced posteriorly. Anepimeron pilose posteriorly. Shiny metallic green to purple flies .... *Ornidia*
– Face with only a medial tubercle. Notopleuron normal, not produced. Anepimeron bare posteriorly. Non–metallic flies ..... *Volucella*
50 Vein M_1 usually processive anteriorly. If slightly recessive, then arista plumose or cell r_{2+3} petiolate. Anepisternum usually bare anteriorly 52
– Vein M_1 recessive anteriorly; cell r_{2+3} open at wing margin (Plate 172 fig. 5). Arista bare. Anepisternum with anterior flattened portion pilose 51
51 Scutellum broad, short, about four times as broad as long, as wide as head (Plate 170 figs 3-4). Vein M_1 without external appendixes ..... *Azpeytia*
– Scutellum more quadrate, about twice as long as broad, with its width less than that of head. Vein M_1 often with external appendixes ..... *Eumerus*
52 Metathoracic spiracle with a double row of protective pile (an outer and inner row of branched pile closing the spiracle), large, often larger than basoflagellomere. Large robust flies, 15 mm or larger, mimicking wasps and hornets ..... *Milesia*
– Metathoracic spiracle with only a single row of protec-




tive pile, small, smaller than basoflagellomere. Medium sized flies, about 15 mm or smaller 53
53 Cell r_1 petiolate, closed before reaching wing margin 60
– Cell r_1 open at wing margin 54
54 Postalar pile tuft present ..... *Pseuderistalis*, in part
– Postalar pile tuft absent 55
55 Katepimeron pilose. Metabasitarsus with globuliferous hairs basoventrally (Plate 168 fig. 1) .. *Mesembrius*
– Katepimeron bare. Metabasitarsus without such pile 56
56 Face straight, without tubercle. Anepimeron with dorsomedial triangular portion pilose. Pterostigma elongate ..... *Philippinophilus*
– Face tuberculate. Anepimeron with dorsomedial triangular portion bare. Pterostigma short simulating a crossvein 57
57 Metafemur with a large ventrobasal spur and subbasal excavation; metatibia with ventral carina continuing into apical spur (Plate 168 fig. 7) ..... *Tigridemyia*
– Metafemur without spur and excavation; metatibia without apical spur 58
58 Clypeus pilose ..... *Mallota*
– Clypeus bare 59
59 Mesonotum without distinctive pollinose ground pattern ..... *Imatisma*
– Mesonotum with distinctive pattern of pollinose vittae and maculae (Plate 169 figs 7-8) ..... *Austrophilus*
60 Anepimeron with dorsomedial triangular portion bare 64
– Anepimeron with dorsomedial triangular portion pilose 61
61 Postalar pile tuft absent. Eye bare, without maculation. Wing brown, completely microtrichose. Scutellum with marginal sulcus ..... *Solenaspis*
– Postalar pile tuft present. Eye with maculae or vittae. Wing hyaline. Scutellum without marginal sulcus 62
62 Metafemur thickened, distinctly arcuate (Plate 168 fig. 8); metatibia strongly compressed and carinate on basoventral 1/3. Eye bare or very finely pilose dorsally, with pili no longer than ommatidial diameter. Male metatrochanter with ventral patch of short stiff black setulae ..... *Merodonoides*
– Metafemur at most very slightly thickened, not arcuate; metatibia neither carinate nor compressed ventrally. Eye usually densely pilose, with pili much longer than ommatidial diameter. Male metatrochanter simple 63
63 Eye fasciate and punctate ..... *Eristalodes*
– Eye punctate (Fig. 4c) ..... *Lathyrophthalmus*
64 Katepimeron bare 68
– Katepimeron pilose 65
65 Meron bare posteroventrally, without pile anterior or ventrad to metathoracic spiracle. Eye pilose. Arista pilose ..... *Eristalis*
– Meron pilose posteroventrally, with pile anterior or ventrad to spiracle. Eye and arista variable 66
66 Scutellum without apical sulcus. Metatibia at most very slightly compressed apically, with apical half not broader than basal half, without dorsal or ventral pile fringes ..... *Austalis*
– Scutellum with apical sulcus along margin. Metatibia strongly compressed on apical half, distinctly broader than basal half, and often with dense dorsal and ventral fringes of dark hairs 67
67 Metafemur simple ..... *Phytomia*
– Metafemur with apicoventral spur or plate (Plate 168 fig. 3) ..... *Dolichomerus*
68 Postalar pile tuft present 72
– Postalar pile tuft absent 69
69 Face concave, straight or produced anteroventrally, without a tubercle (Plate 167 fig. 4, plate 170 fig. 8) ... 71
– Face with distinct tubercle 70
70 Wing hyaline; basoflagellomere large, much longer than metathoracic spiracle; katepisternum discontinuously pilose, with a few ventral pili, broadly bare medially, pilose on dorsal 1/4; plumula greatly reduced, not branched ..... *Digulia*
– Wing brown on anterior half; basoflagellomere small, only about as long as metathoracic spiracle; katepisternum continuously and densely pilose; plumula well developed, multibranched (Plate 170 fig. 1-2) ..... *Axona*
71 Mesonotum unicolourous; vein R_{4+5} only slightly sinuate; crossvein r-m basal, before middle of discal cell; wing partially bare; male dichoptic; body usually with short thick scale-like pile in addition to long normal pile (Plate 170 figs 7-8, plate 172 fig. 6) ..... *Dissoptera*
– Mesonotum vittate; R_{4+5} strongly sinuate; crossvein r-m apical, beyond middle of discal cell; wing entirely microtrichose; male holoptic; body without specialized pile (Plate 171 figs 1-2) ..... *Keda*
72 Scutellum with a moderately strong to very strong impressed apical margin. Scutellum with well developed ventral pile fringe; bright metallic bluish to purplish flies ..... *Kertesziomyia*
– Scutellum entirely without apical emarginate rim. Scutellar pile fringe variable; usually nor metallic bluish to purplish 73
73 Scutellum densely pilose ventrally on at least basolateral 1/3 or more. Bright coloured flies; face orange; scutellum bright yellow; legs and abdomen extensively orange ..... New Subgenus A
– Scutellum bare ventrally or with at most a very few ventral pili at extreme basolateral angles .... *Pseuderistalis*, in part
74 Vein M_1 recessive or perpendicular. Scutellum with medial concavity, without a distinct marginal sulcus. Male dichoptic ..... *Graptomyza*, in part
– Vein M_1 processive (Plate 172 fig. 9). Scutellum without medial concavity. Male holoptic 75
75 Face with a distinct medial keel, without a projecting epistoma. Metafemur greatly swollen; metatibia with a anteroventral apical toothed keel (Plate 167 fig. 10, plate 171 figs 5-6) ..... *Nepenthosyrphus*
– Face without a keel, straight, with a projecting epistoma. Metafemur thin, not swollen; metatibia without apical spur ..... *Psilota*
76 Eye pilose. Postmetacoxal bridge complete; abdomen petiolate ..... *Oculovillosa*




– Eye bare. Postmetacoxal bridge incomplete; abdomen variable 77
77 Vein R_{4+5} with an appendix into cell r_{4+5} (Plate 172 fig. 2). Abdomen not petiolate ..... *Ceriana*
– Vein R_{4+5} without appendix. Abdomen petiolate ..... *Monoceromyia*
78 Face produced into a long ventral snout (Plate 167 fig. 6). Costal vein continues around apical apex. Femora simple, without spines. Anterior anepisternum bare; metasternum pilose ..... *Rhingia*
– Face not produced into a long snout. Costal vein ends at wing apex. Femora variable 79
79 Pro- and mesofemora with distinct ventroapical spines (Plate 168 fig. 6). Vein R_{4+5} with last section much less than half as long as crossvein h or absent; cell r_{4+5} closed at wing margin, not petiolate. Small flies, 10 mm or less ..... *Myolepta*
– Pro- and mesofemora without distinct ventral spines (as in Plate 168 fig. 5); if metafemur with ventral spines, then vein R_{4+5} with last section longer than crossvein h and usually longer than crossvein r-m. Anterior anepisternum usually bare; if pilose, then larger flies, 16 mm or greater [see *Milesia*], or flies with metafemur greatly enlarged and with an anteroventral spinose ridge ... 80
80 Metasternum bare 85
– Metasternum pilose, with hairs as long as or longer than those of metacoxa 81
81 Metatrochanter with a large quadrate ventral calcar. Metafemur swollen, with large subapical ventral spur and apicoventral spinose ridge; metatibia with anteroapical spur ..... *Calcaretropidia*
– Metatrochanter simple. Metafemur variable, but not as above 82
82 Wing almost bare on basal 2/3, very sparsely microtrichose on apical 1/3. Metaepisternum with a patch of fine pile; metafemur greatly enlarged, with an anteroventral spinose ridge on apical 1/3 (Plate 168 fig. 4) ..... *Syritta*
– Wing entirely microtrichose or with just moderate bare areas on basal 1/3 or slightly more, densely and uniformly microtrichose on apical 1/3. Metaepisternum pilose or bare; metafemur variable, without apical spinose ridge 83
83 Face produced anteriorly and ventrally, distinctly concave ventrad to antenna, usually tuberculate; gena broad. Larger flies, 15 mm or more in length (Plate 167 fig. 5, plate 171 figs 3-4) ..... *Matsumyia*
– Face concave, sometimes subcarinate, not tuberculate nor produced anteriorly ventrad to antenna; gena narrow. Size variable 84
84 Metafemur slender, with preapical anteroventral tooth–like process. Face produced anteroventrally, projecting beyond antennifer. Scutellum with distinct emarginate rim. Large flies (14-15 mm) (Plate 168 fig. 2, plate 171 figs 7-8) ..... *Paratropidia*
– Metafemur swollen, without apicoventral process. Face concave, not projecting beyond antennifer. Scutellum without or with indistinct emarginate rim. Smaller flies (9 mm or less in length) (Plate 170 figs 5-6) ..... *Neploneura*
85 Abdomen elongate, tergum 2 not narrower than tergum 3 ..... *Xylota*
– Abdomen petiolate; tergum 2 narrower than tergum 3 86
86 Face concave, not tuberculate. Metafemur swollen, with apicoventral spines (Plate 168 fig. 4) ..... *Sphegina*
– Face tuberculate. Metafemur thin, not swollen nor with ventral spines ..... *Allobaccha*, in part

Synopsis of the fauna

The family Syrphidae is found in all biogeographic regions from the high arctic (northernmost Greenland) to the extreme south (South Georgia) except absent from the Antarctic continent. Over 6300 valid species are recognized and are distributed among some 338 groups (genera and subgenera), but many more species are known and remain to be described. In the PSWNG region currently 278 (286) species in 69 (73) genera and subgenera are recognized (numbers in brackets represent these tallies including known but undescribed species and genera, see below).

***Allobaccha* Curran, 1928** (Syrphinae) is a group of Old World tropical species occurring in the Afrotropics, Indomalaya and Australia, with extension to Japan (86 total species). The last published key to the species of PSWNG area was Curran (1947). Twenty-six species are found in PSWNG area [*amphithoe* (Walker, 1849), India to Japan south to Indonesia (Flores); *annulifemur* (Meijere, 1913), Indonesia (Central Moluccas: Buru); *atra* (Doesburg, 1959), Indonesia (West Papua); *basalis* (Walker, 1848), New Guinea; *bergi* (Curran, 1947), Solomon Islands; *cochleariformis* (Sack, 1926), Philippines; *denhoedi* (Doesburg, 1959), Indonesia (West Papua); *incisa* (Walker, 1912), Philippines (Batan Island); *keiseri* (Goot, 1964), Indonesia (Lesser Sundas: Sumbawa); *macgregori* (Curran, 1929), Philippines (Luzon, Calicoan); *meijerei* (Kertész, 1913), Taiwan to Philippines, south to Indonesia (Central Moluccas: Buru, Lesser Sundas: Sumbawa); *moluccana* (Doleschall, 1857), Indonesia (Central Moluccas: Ambon); *mundula* (Wulp, 1898), Papua New Guinea; *mundulosa* (Curran, 1947), Solomon Islands; *pallida* (Meijere, 1908), New Guinea; *perpallida* (Curran, 1947), Solomon Islands; *purpuricola* (Walker, 1859), Indonesia (Aru Islands, Kei Islands); *refulgens* (Austen, 1893), Indonesia (Central Moluccas: Buru); *rubella* (Wulp, 1897), Papua New Guinea, Indonesia (Central Moluccas: Ambon), Solomons; *sapphirina* (Wiedemann, 1830), Africa




to Taiwan & Papua New Guinea; *semilimpida* (Doleschall, 1858), Indonesia (Moluccas); *signata* (Sack, 1926), Philippines; *sumbana* (Keiser, 1952), Indonesia (Lesser Sundas: Sumbawa); *vespaeformis* (Doleschall, 1857), Indonesia (Sulawesi, Central Moluccas: Ambon); *vivida* (Hull, 1944), Indonesia (Timor); *wegneri* (Keiser, 1952), Indonesia (Lesser Sundas: Sumbawa)].

***Allograpta* Osten Sacken, 1875** (Syrphinae) is a cosmopolitan genus with 73 species, four of which occur in PSWNG area [*buruensis* (Meijere, 1929), Indonesia (Central Moluccas: Buru); *distincta* (Kertész, 1899) New Guinea to Fiji & Solomons; *javana* (Wiedemann, 1824), India to Japan, east to New Guinea, Solomon Islands and Fiji; *philippina* (Frey, 1946), Philippines]. The larvae are predaceous, except for a few Neotropical species which are phytophagous.

***Archimicrodon* Hull, 1945** (Microdontinae) is an Old World genus of 39 species, eleven of which are known from the PSWNG area (Reemer & Ståhls 2013a) [*boharti* (Curran, 1947), Solomon Islands; *clavicornis* (Sack, 1926), Philippines; *grageti* (Meijere, 1908), Indonesia (West Papua); *incisuralis* (Walker, 1865), New Guinea; *investigator* (Hull, 1937), Philippines; *limbinervis* (Meijere, 1908), New Guinea; *luctiferus* (Walker, 1865), New Guinea; *malukensis* Reemer, 2013, Indonesia (North Moluccas: Halmahera); *novaeguineae* (Meijere, 1908), New Guinea; *varicornis* (Sack, 1926), Philippines; *venosus* (Walker, 1865), New Guinea]. The immatures are ant-associated inquilines.

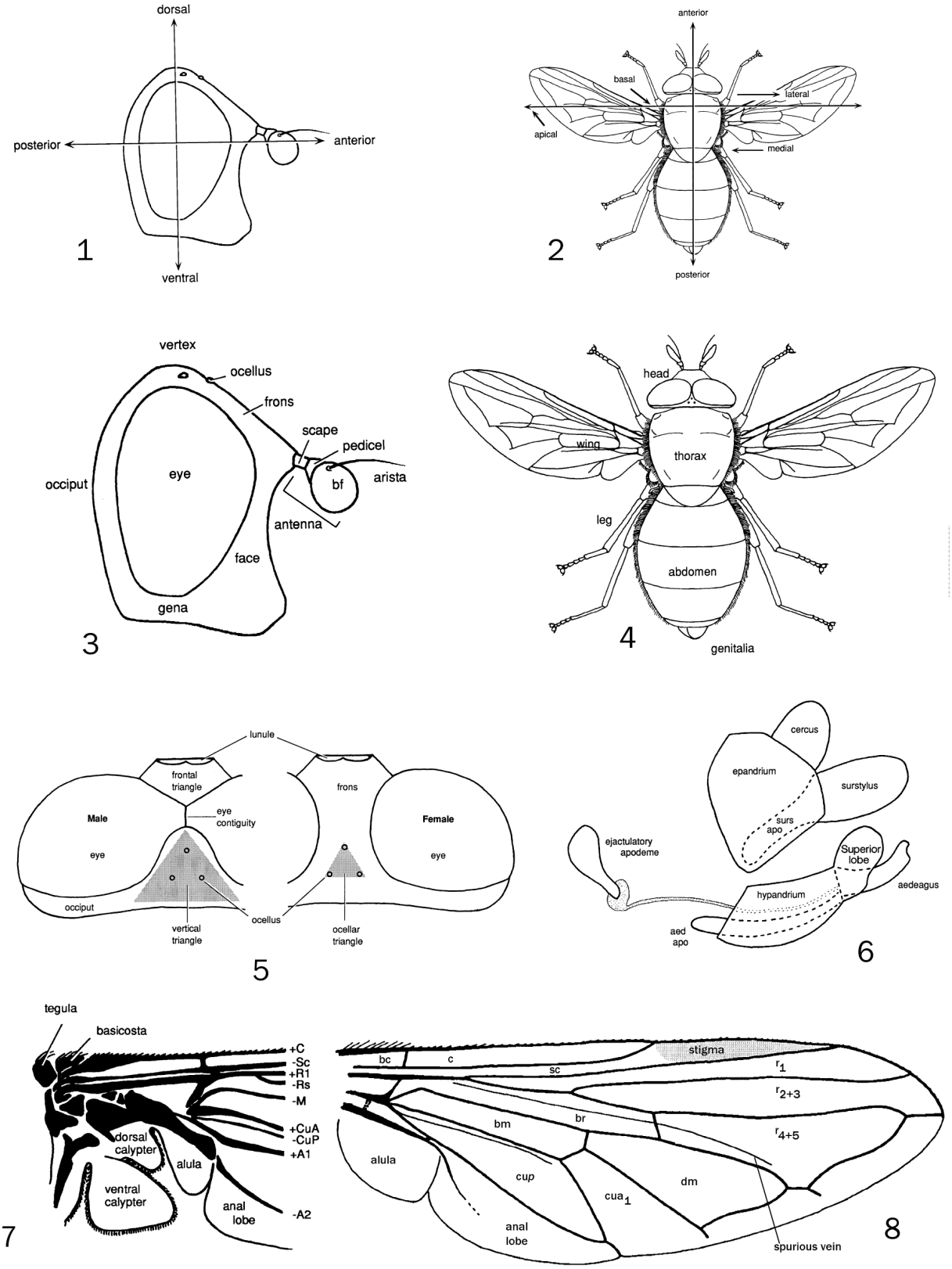
***Asarkina* Macquart, 1834** (Syrphinae) is a genus of Old World tropical distribution (47 total species). The last revision of the genus was by Bezzi (1908), although Ghorpadé (1994) did provide a key to the Indian subcontinental species (seven species). Nine species occur in PSWNG [*biroi* Bezzi, 1908, Indonesia (West Papua), Papua New Guinea; *ericetorum* (Fabricius, 1781), Afrotropical and Indomalayan Regions, Madagascar, to Solomons, Australia (NT, Qld.); *eurytaeniata* Bezzi, 1908, Taiwan to Philippines, SW to Sumatra and SE to Solomons (Guadalcanal); *longirostris* (Meijere, 1908), Papua New Guinea; *morokaensis* (Meijere, 1908), New Guinea; *orientalis* Bezzi, 1908, China, Malay Peninsula, Philippines (Luzon, Palawan); *papuana* Bezzi, 1908, Papua New Guinea, Indonesia (West Papua), Fiji; *ribbei* Bezzi, 1908, New Guinea; *salviae* (Fabricius, 1794), Africa, India to Central Moluccas (Ambon) and Solomons (Guadalcanal)].

***Asiobaccha* Violovitsh, 1976** (Syrphinae) is a group of syrphines with petiolate abdomens and is restricted to the Indomalayan and the Australian Regions (total of 19 species). There are ten species in PSWNG area and the group was revised by Mengual (2016) [*aquila* Thompson et Mengual, 2016, Philippines; *bicolor* (Austen, 1910), Indonesia (Central Moluccas: Buru and North Moluccas), New Guinea, New Ireland and Australia; *bimaculata* (Keiser, 1952), Indonesia (Sumba); *doesburgi* Mengual, 2016, Papua New Guinea; *loriae* (Meijere, 1908), New Guinea, Indonesia (Lesser Sundas: Sumbawa) and Philippines (Luzon); *marissae* Mengual, 2016, Indonesia (Sulawesi); *nubilipennis* (Austen, 1893), India through China to Japan, Myanmar, Taiwan, Vietnam, Laos, Thailand, Malaysia, south to Indonesia (Sumatra, Java, Sulawesi); *sauteri* (Kertész, 1913), Taiwan, Vietnam, Indonesia (Sulawesi) and Philippines (Luzon); *selsi* Mengual, 2016, New Guinea; *tripartita* (Walker, 1861), Indonesia (West Papua, Kei Islands, Misool Island), New Guinea (Papua, New Ireland, Woodlark Island)].

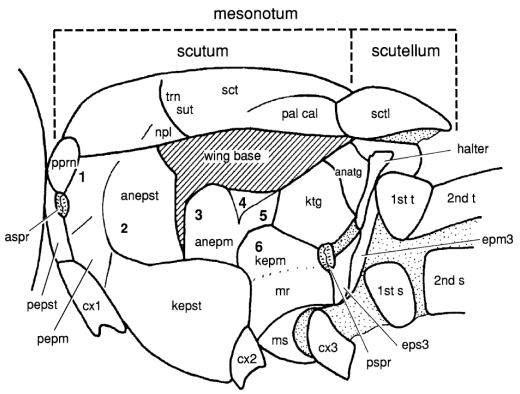
***Austalis* Thompson, 2003** (Eristalinae) is a group of rat-tailed maggots restricted to the Indomalayan and Australian Regions including 29 named species and some 11 known undescribed species (Thompson 2003), of which 13 are known from PSWNG area [*aequipars* (Walker, 1864), Indonesia (Moluccas); *bergi* (Curran, 1947), Solomons; *ciliata* (Meijere, 1913), New Guinea (West Papua); *cupreoides* (Goot, 1964), New Guinea; *erythropyga* (Walker, 1864), Indonesia (Moluccas); *inscripta* (Doleschall, 1857), Indonesia (Central Moluccas: Ambon), New Guinea (West Papua), Solomons; *latilimbata* (Meijere, 1913), New Guinea; *lucilioides* (Walker, 1861), Indonesia (North Moluccas: Bacan, West Papua: Misool); *muscoides* (Walker, 1858), Indonesia (Aru Islands, West Papua); Australia; *refulgens* (Doleschall, 1859), Indonesia (Moluccas); *resoluta* (Walker, 1858), Indonesia (Aru, Kei, Moluccas – Sula), New Guinea, Australia, Solomons; *rhina* Thompson, 2003, Solomon Is.; *triseriata* (Meijere, 1913), New Guinea].

***Austrophilus* Thompson, 2000** (Eristalinae) is a small genus of five species restricted to New Guinea and Australia (Thompson 2000). Four of the five species occur in PSWNG [*helophiloides* (Walker, 1861), Indonesia (Moluccas); *necopinus* Thompson, 2000, New Guinea (New Britain); *obscurus* Thompson, 2000, New Guinea; *terraereginae* (Ferguson, 1926), Australia, Indonesia (Aru Islands), Papua New Guinea].



Figures 1-8. Details of Syrphidae head, body, and wing. Orientation of (1) head and (2) body; 3 – Head parts, lateral view. bf – basoflagellomere; 4 – Body parts, dorsal view; 5 – Head parts, dorsal view; 6 – Male genitalia parts, lateral view; 7 – Wing base, dorsal view. Legends: A1 – First branch of anal vein; A2 – Second branch of anal vein; C – Costal vein; CuA – Anterior branch of cubital vein; CuP – Posterior branch of cubital vein; M – Medial vein; R1 – Anterior branch of radius; Rs – Radial sector; Sc – Subcostal; 8 – Cells of wing, dorsal view. bm – Basal medial cell; bc – Basal costal cell; br – Basal radial vein; c – Costal cell; cua_1 – Anterior cubital cell; cup – Posterior cubital cell; dm – Discal medial cell; r_1, r_{2+3}, r_{4+5} – Radial cells; sc – Subcostal cell. Figures 1-8 taken from Thompson (1999a). All figures used with permission from the author.



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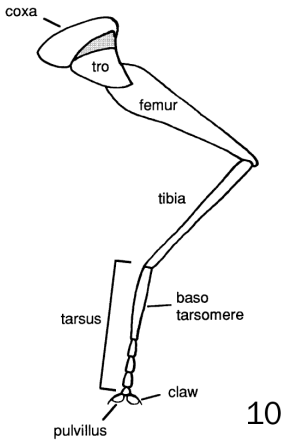

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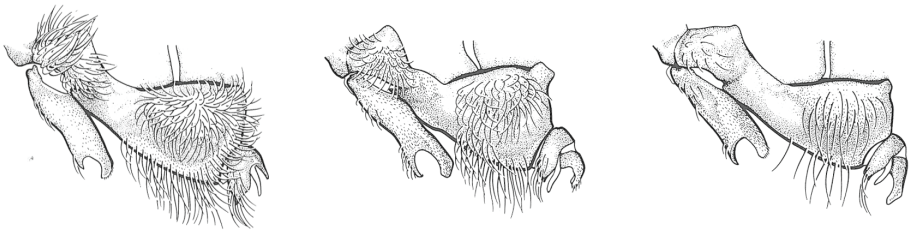

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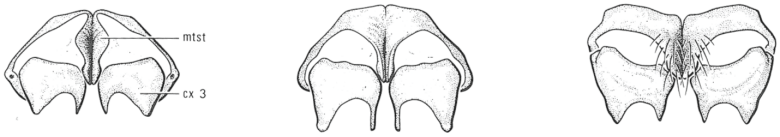

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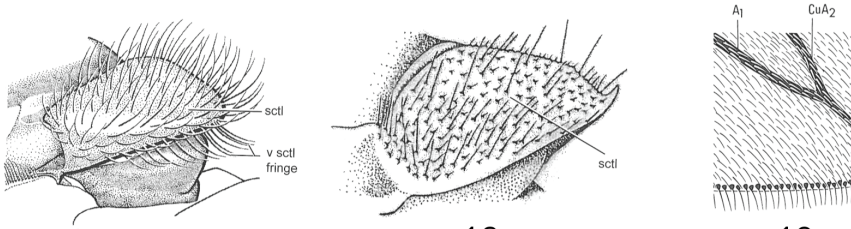

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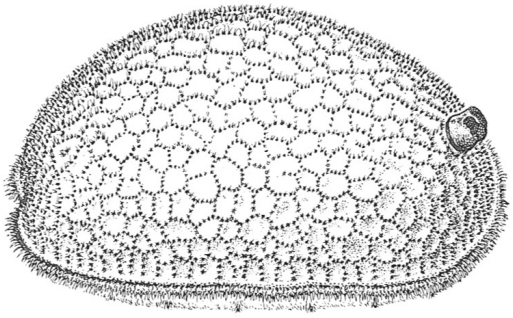
Figures 9-19. Details of Syrphidae thorax. 9 – Thorax and base of abdomen, parts, lateral view. Legends: 1 – Anterior anepisternum; 2 –Posterior anepisternum; 3 – Anterior anepimeron; 4 – Dorsomedial anepimeron; 5 – Posterior anepimeron; 6 – Katepimeron; 1st t, 2nd t – terga, first and second; 1st s, 2nd s – sterna, first and second; anatg – anatergum; anepm – anepimeron; anepst – anepisternum; aspr – anterior spiracle; cx1, cx2, cx3 – pro-, meso- and metacoxa; epm3 – metaepimeron; eps3 – metaepisternum; ktg – katatergum; kepm – katepimeron; kepst – katepisternum; mr – meron; ms – metasternum; npl – notopleuron; pal cal – postalar callus; pepst – proepisternum; pepm – proepimeron; pprn – postpronotum; pspr – posterior spiracle; sctl – scutellum; sct – scutum; trn sut – transverse suture; 10 – Leg parts, lateral view; 11-13 – Lateral view of katepisternum: 11 – *Epistrophe (E.) grossulariae* (Meigen); 12 – *Eupeodes (E.) americanus* (Wiedemann); 13 – *Epistrophe (E.) emarginata* (Say); 14-16 – Ventral views of metasternum: 14 – *Melanostoma mellinum* (Linnaeus); 15 – *Platycheirus quadratus* (Say); 16 – *Microdon piperi* Knab. Legends: mtst – metasternum; cx3 – metacoxa; 17-18 – Lateral view of scutellum: 17 – *Allograpta obliqua* (Say); 18 – *Syritta pipiens* Macquart. Legends: sctl – scutellum; v sctl fringe – ventral scutellar fringe; 19 – Posterior margin of wing of *Meliscaeva cinctella* (Zetterstedt). Figures 9-10 taken from Thompson (1999a) and figs 11-19 taken from Vockeroth & Thompson (1987). All figures used with permission from the author and from Agriculture and Agri-Food Canada respectively.



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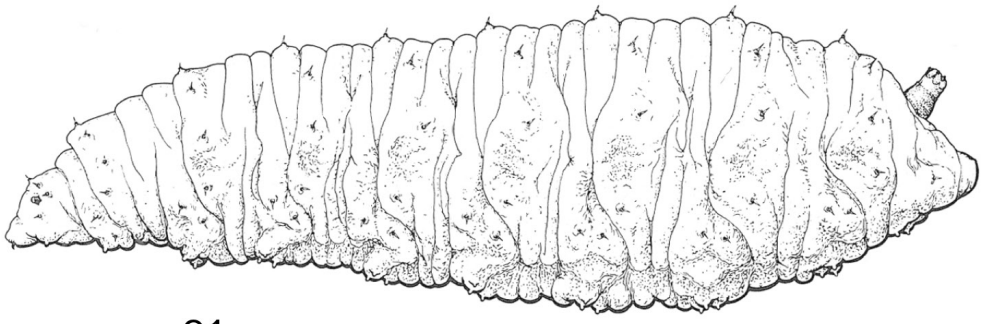

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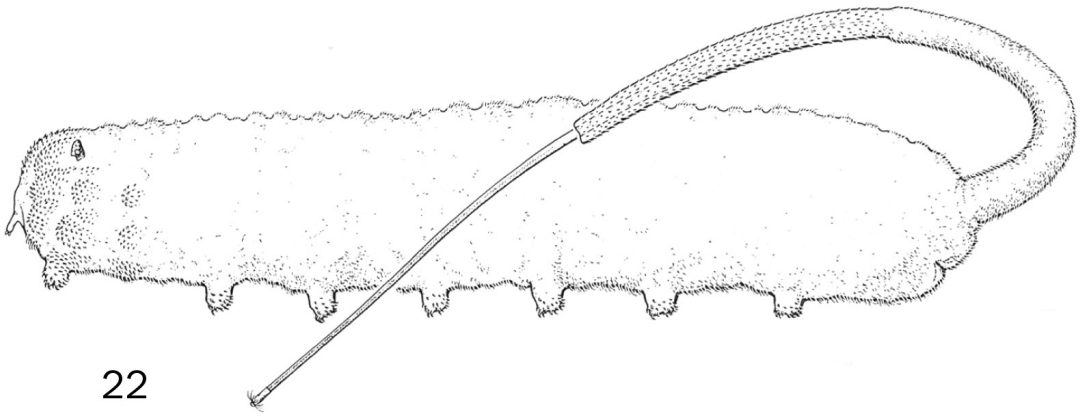

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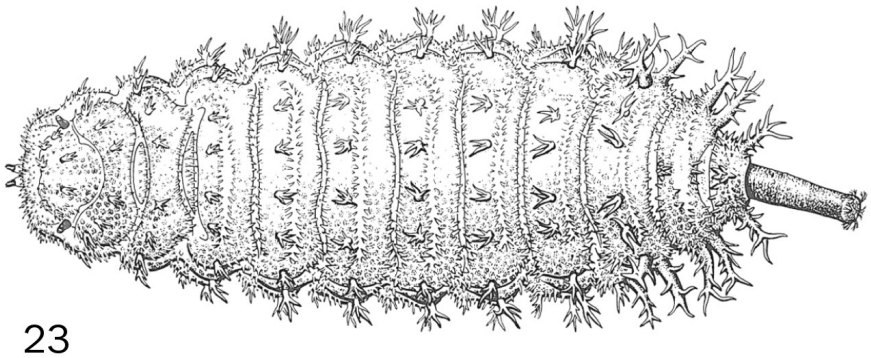

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Figures 20-23. Syrphidae larvae. 20 – *Ceriana ornata* (Saunders); 21 – *Syrphus knabi* Shannon; 22 – *Eristalis tenax* (L.), lateral view; 23 – *Brachyopa* sp., dorsal view. Figures taken from Vockeroth & Thompson (1987). All figures used with permission from Agriculture and Agri-Food Canada.

***Axona* Walker, 1864** (Eristalinae) is a monotypic genus (*chalcopyga* (Wiedemann, 1830)) that ranges from Myanmar to Micronesia and south to Australia.

***Azpeytia* Walker, 1865** (Eristalinae) is a small genus (5 species) that ranges from India to Japan, south to Australia and one species from New Guinea (Thompson 2017e) (*scutellaris* Walker, 1865).

***Baccha* Fabricius, 1805** (Syrphinae) is small north temperate genus (13 species) of predaceous flies. Only one species (*maculata* Walker, 1852) occurs in PSWNG area.

***Bardistopus* Mann, 1920** (Microdontinae) is a monotypic genus. The only known species (*papuanum* Mann, 1920) is restricted to the Solomon Islands (Mann 1920). The larvae are inquilines in the ant nest of *Technomyrmex albipes* Smith, 1861.

***Betasyrphus* Matsumura, 1917** (Syrphinae) is a small but widespread genus (19 species) in the Old World. One widespread species (*serarius* (Wiedemann, 1830)) occurs in PSWNG (from China to Indonesia (Central Moluccas: Buru and West Papua) and Australia). The larvae are predaceous.

***Calcaretropidia* Keiser, 1971** (Eristalinae) is a small genus of six species ranging from tropical Africa to New Guinea with one undescribed species in the PSWNG area (Thompson 2017d).

***Ceriana* Rafinesque, 1815** (Eristalinae) is a genus of hymenopteran mimics found in all regions except the Neotropics, and contains many likely paraphyletic subgenera that are in need of revision. Three of them, *Ceriana sensu stricto*, *Monoceromyia*, and *Oculovillosa*, are found in the PSWNG area. Three species of *Ceriana s. s.* occur in PWNG area and Thompson (2015a) provided a key to the two Papuan species [*annulifera* Walker, New Guinea; *metallica* Wulp, 1898, Papua New Guinea; *relictura* Walker, Indonesia (Aru Islands)].

***Chalcosyrphus* Curran, 1925** (Eristalinae) is a worldwide group of 107 species that is split into up to ten subgenera, one of which occurs in PSWNG (*Neploneura* Hippa, 1978 - see below) and two (*Syrittoxylota* Hippa, 1978 and *Xylotina* Hippa, 1978) occur nearby in the Indomalayan Region (Hippa 1985).

***Chymophila* Macquart, 1834** (Microndontinae) is here treated as a subgenus of *Microdon* and occurs in most regions (total of 34 species), except it is absent from the Afrotropical and Australian Regions. The immatures are ant-associated inquilines. One species (*stilboides* (Walker, 1849)) occurs in the PSWNG area (known from Taiwan, India, Java and the Philippines).

***Citrogramma* Vockeroth, 1969** (Syrphinae) is a group of syrphines restricted to the Indomalayan and Australian regions (42 species). The genus was last revised by Mengual (2012). There are 19 species in the PSWNG area [*amarilla* Mengual, 2012, India, Nepal, Java, Philippines, Thailand, Laos, Hainan; *bicornutum* Vockeroth, 1969, Papua New Guinea; *circumdatum* (Meijere, 1908), New Guinea; *clarum* (Hervé-Bazin, 1923), Vietnam, Thailand, Borneo, Philippines, Taiwan, Java, Malay Peninsula (Pahang); *distinctum* Thompson, 2012, New Guinea; *luteifrons* (Meijere, 1908), Indonesia (West Papua, Sulawesi); *luteopleurum* Mengual, 2012, New Guinea; *matsumurai* Mengual, 2012, Taiwan, New Guinea; *pintada* Mengual, 2012, New Guinea; *pinyton* Mengual, 2012, New Guinea; *quadratum* Mengual, 2012, New Guinea; *quadricornutum* Vockeroth, 1969, New Guinea; *robertsi* Wyatt, 1991, New Guinea; *schlingeri* Thompson, 2012, New Guinea; *sedlacekorum* Vockeroth, 1969, New Guinea; *solomonense* Wyatt, 1991, Solomon Islands, Papua New Guinea (Bougainville and New Britain islands); *triton* Mengual, 2012, New Guinea; *wyatti* Mengual, 2012, New Guinea; *Citrogramma* sp1 Mengual, Papua New Guinea (New Ireland island)].

***Dasysyrphus* Enderlein, 1938** (Syrphinae) is north temperate with limited extensions into South America and to the Philippines in the Indomalayan Region. Worldwide, the genus consists of 50 named species. The only PSWNG species is an unnamed species found in the Philippines.

***Dideoides* Brunetti, 1908** (Syrphinae) is a small Indomalayan and Palaearctic group of 11 described species. Only one species is known from PSWNG, an unnamed species from the Philippines.

***Dideopsis* Matsumura, 1917** (Syrphinae) is a small genus of two species. One wide-ranging species, *aegrota* (Fabricius, 1805), ranges from the Himalayas to northern Australia while the other species, (*pura* Curran, 1928) is more restricted: Solomons (Guadalcanal), Indonesia (West Papua),




and Philippines (Luzon).

***Digulia* Meijere, 1913** (Eristalinae) is a little known genus restricted to New Guinea from the region of the river Digula, as the name implies. Thompson (2017a) reviewed the genus. There is only one known species (*kochi* Meijere, 1913).

***Dissoptera* Edwards, 1915** (Eristalinae) is a small genus of eristaline flies (seven species) ranging from Borneo to Samoa, south to Australia. One species occurs in PSWNG (*heterothrix* (Meijere, 1908), Borneo to Australia, New Hebrides).

***Dolichomerus* Macquart, 1850** (Eristalinae) is here treated as a subgenus of *Phytomia* and contains one species (*crassus* (Fabricius, 1787)) found in the Indomalayan Region (India to Timor).

***Eosphaerophoria* Frey, 1946** (Syrphinae) is a group restricted to the Indomalayan Region and New Guinea (11 total species). The genus was revised by Mengual & Ghorpadé (2010) and six species occur in PSWNG [*adornata* Mengual, 2010, Papua New Guinea; *bifida* Mengual, 2010, Papua New Guinea; *hermosa* Mengual, 2010, Indonesia (North Moluccas: Halmahera); *luteofasciata* Mengual, 2010, Papua New Guinea (New Ireland); *marginata* Frey, 1946, Philippines, Thailand; *nigrovittata* Mengual, 2010, Papua New Guinea, Indonesia].

***Epistrophe* Walker, 1852** (Syrphinae) is a north temperate group (50 total species) with limited distribution in the Indomalayan Region. Only one species occurs within PSWNG (*shibakawae* (Matsumura, 1917), New Guinea).

***Episyrphus* Matsumura et Adachi, 1917** (Syrphinae) is a wide-ranging group in the Old World with 22 species. Four species are definitively known in the PSWNG area [*contax* (Curran, 1947), Solomons; *contractus* (Keiser, 1952), Indonesia (Lesser Sundas: Sumbawa); *demeijerei* (Curran, 1947), Solomons, New Guinea; *viridaureus* (Wiedemann, 1824), widespread throughout]. *Episyrphus balteatus* (De Geer, 1776) may occur in the region and has been definitively collected and identified as far south as Taiwan. This species ranges throughout the Palearctic and at least some populations are migratory. Much of the earlier collected material from the region is identified as *E. balteatus*, much or all of it likely incorrectly as this genus is badly in need of a revision and not well understood.

***Eristalinus* Rondani, 1845** (Eristalinae) is a large worldwide genus (87 total species) although the few species in the New World were introduced from the Old World. The genus is divided into five subgenera, of which only two subgenera (*Eristalodes* Mik, 1897 and *Lathyrophthalmus*, Mik, 1897) are found in the PSWNG area. The typic subgenus is restricted to one species (*sepulchralis* Linnaeus) in Europe to Japan, south to India.

***Eristalis* Latreille, 1804** (Eristalinae) was a broadly defined genus including many diverse species. Here the concept is restricted to just two species (*tenax* (Linnaeus, 1758) and *proserpina* Wiedemann, 1830). *Eristalis tenax* is a widespread parasynthanthropic species, but is rare in tropical areas. *Eristalis proserpina* is known only from southeastern China. *Eristalis cingulata* Sack, 1927 [from Negros, Philippines] is a *nomen dubium* and only known from its original description and the two female syntypes are apparently lost, neither being in the Baker collection (USNM) or Sack's collection.

***Eristalodes* Mik, 1897** (Eristalinae) is here treated as a subgenus of *Eristalinus* and is a small group (total 10 species) occurring mostly in southern Europe and Africa. There is only one PSWNG species [*paria* (Bigot, 1880), Sri Lanka, Taiwan, India, Java, Moluccas].

***Eumerus* Meigen, 1822** (Eriatalinae) is a large Old World genus (266 species) ranging to Fiji with several economic pests introduced into the New World. There are nine described PSWNG species [*argentipes* Walker, 1861, Taiwan to Philippines, south to Sri Lanka, Moluccas, New Guinea; *aurifrons* (Wiedemann, 1824), India to Philippines, south to Indonesia, Solomons, Australia, Hawaii; *bimaculatus* Doleschall, 1858, Moluccas; *ergator* Hull, 1941, Philippines (Mindanao); *flavicinctus* Meijere, 1908, Taiwan, Java, Philippines, Lesser Sundas: Bali; *niveipes* Meijere, 1908, Indonesia (Java, Lesser Sunda Islands), Philippines; *quadratimaculatus* Keiser, 1952, Indonesia (Lesser Sundas: Sumbawa); *speculifer* Sharp, 1899, New Guinea, Australia, Lord Howe Island, Solomons; *sutteri* Keiser, 1952, Indonesia (Lesser Sundas: Sumbawa)] with many more undescribed.

***Giluwea* Vockeroth, 1969** (Syrphinae) is a small genus of syrphines endemic to New Guinea where it is restricted to the alpine areas. Only two species (*flavomaculata* Vockeroth, 1969 and *nigra* Vockeroth, 1969) have been described (Vockeroth




1969).

***Graptomyza* Wiedemann, 1820** (Eristalinae) is a widespread genus (90 species) in the Old World tropics and in the Pacific. Eighteen species are recorded from the Philippines and New Guinea, but more are known but not yet described [*atripes* Bigot, 1883, Moluccas Islands; *bergi* Greene, 1949, Solomon Islands; *chaetomelas* Doesburg, 1966, New Guinea; *coniceps* Meijere, 1929, Central Moluccas: Buru; *flavipes* Meijere, 1911, Borneo, Java, Philippines; *flavorhyncha* Hull, 1949, Philippines, Mindanao; *globigaster* Hull, 1943, Philippines, Biliran; *lineata* Osten Sacken, 1881, Malaya, Moluccas; *literata* Osten Sacken, 1882, Philippines; *longicornis* Meijere, 1908, New Guinea; *melliponaeformis* Doleschall, 1858, Sulawesi, Central Moluccas: Ambon; *microdon* Osten Sacken, 1882, Philippines; *phyllocera* Hull, 1950, Philippines, Luzon; *punctata* Meijere, 1908, New Guinea; *setigloba* Hull, 1941, Philippines; *tibialis* Walker, 1858, Aru Islands; *trilineata* Meijere, 1908, New Guinea; *triseriata* Meijere, 1929, Central Moluccas: Buru].

***Heliodon* Reemer, 2013** (Microdontinae) is a genus of eight species that are restricted to the Indomalayan Region. Only one species occurs in Wallacea, *tricinctus* (Meijere, 1908) (known from the Philippines and Java).

***Imatisma* Macquart, 1842** (Eristalinae) is here treated as a subgenus of *Mallota* Meigen, 1822 and contains four species that are distributed in the Neotropical, Palaearctic and Indomalayan Regions. One undescribed species occurs in the Philippines.

***Indascia* Keiser, 1958** (Microdontinae) is a small genus of only four described species that were thought to be restricted to the Indomalayan Region (Reemer & Ståhls 2013a). There are another five undescribed species, with one each from the Philippines and New Guinea (Thompson 2017f). The latter two are the first known species from PSWNG and the New Guinea species is the first known species from outside of the Indomalayan Region.

***Ischiodon* Sack, 1913** (Syrphinae) is a common widespread group of two species found throughout the Afrotropics and the Indomalayan Region with extensions to southern Palaearctic. In the PSWNG area, *scutellaris* (Fabricius, 1805) ranges from Japan and India to Australia and the Pacific islands.

***Keda* Curran, 1931** (Eristalinae) is a monotypic genus (*conclusa* (Walker, 1859)) that is restricted to the Sulawesi, Borneo and New Guinea.

***Kertesziomyia* Shiraki, 1930** (Eristalinae) is here considered a broad genus with three subgenera, all of which may be expected in the PSWNG area (*Kertesziomyia*, *Pseuderistalis* Shiraki, 1930 and New Subgenus A (see below) Thompson & Vockeroth in prep.). *Kertesziomyia* sensu stricto contains four species and ranges from India to Japan, south to Australia. None of the species of *Kertesziomyia* s. s. are currently known from PSWNG.

***Kryptopyga* Hull, 1944** (Microdontinae) is a small genus of two species of and is only found in the Indomalayan Region (Reemer & Ståhls 2013a). There are no known species from PSWNG area, but the group is included in the key as they may be found there in the future.

***Lathyrophthalmus* Mik, 1897** (Eristalinae) is here treated as a subgenus of *Eristalinus* and includes 16 species in the PSWNG area [*aeneus* (Scopoli, 1763), widespread, parasynanthropic species; *arvorum* (Fabricius, 1787) widespread in the Indomalayan Region to Hawaii and Australia; *aurulans* (Wiedemann, 1824) widespread throughout Indonesia and New Guinea, Solomons; *buruensis* (Meijere, 1929) Indonesia (Central Moluccas: Buru); *cupreofasciatus* (Wulp, 1868) North (Bacan) and Central Moluccas (Ambon, Seram); *flavus* (Sack, 1926) Indonesia to Philippines, Micronesia; *lunatus* (Meijere, 1908) Moluccas to Solomons; *megacephalus* (Rossi, 1794) widespread synanthropic species, Philippines; *obliquus* (Wiedemann, 1824) Southern Indomalaya to East Indonesia (Kei Islands); *placens* (Walker, 1864) Indonesia (West Papua: Misool), Papua New Guinea, Solomons; *punctulatus* (Macquart, 1847) Solomons; *quinquestriatus* (Fabricius, 1794) widespread throughout Indomalaya south to Indonesia (Central Moluccas: Buru); *sextus* Curran, 1947 Solomons; *splendens* (Le Guillou, 1842) New Guinea, Solomons; *suavissimus* (Walker, 1858) Indonesia (Aru Islands, West Papua), Papua New Guinea, Solomons: New Georgia, Guadalcanal; *tristriatus* (Meijere, 1911) Java, Philippines, Negros].

***Macrosyrphus* Matsumura, 1917** (Syrphinae) is here treated as a subgenus of *Eupeodes* Osten Sacken, together with another two subgenera (*Eupeodes* and *Metasyrphus*). The genus *Eupeodes* is mainly north temperate with limited extensions




into the tropics, and only one *Macrosyrphus* species (*confrater* (Wiedemann, 1830)) ranges to New Guinea.

***Mallota* Meigen, 1822** (Eristalinae) is a paraphyletic group in need of taxonomic revision. *Imatisma* Macquart, 1842 *and Tigridemyia* Bigot, 1882 are two subgenera of *Mallota* that occur in the PSWNG region and are thus treated here.

***Matsumyia* Shiraki, 1949** (Eristalinae) is a Palearctic/Indomalayan group (11 described species), with one species known from the Philippines (*cyaniventris* **comb. nov.** (Sack, 1926)).

***Melangyna* Verrall, 1901** (Syrphinae) is divided into three subgenera, one (*Melangyna*) is north temperate and two are endemic to New Guinea (*Melanosyrphus* Vockeroth, 1969) and Australia (*Austrosyrphus* Vockeroth, 1969).

***Melanosyrphus* Vockeroth, 1969** (Syrphinae) is usually considered a subgenus of *Melangyna* and contains a single described species (*dichoptica* Vockeroth, 1969) known only from New Guinea (Vockeroth 1969) plus an undescribed species from West Papua.

***Melanostoma* Schiner, 1860** (Syrphinae) is found in all regions (56 total species) and four species occur in PSWNG area [*apicale* Bigot, 1884, Papua New Guinea, New Caledonia, Solomons, Fiji, Samoa, Tonga, Australia; *atrum* Sack, 1932, Indonesia (Lesser Sundas: Lombok); *fumivenosum* Doesburg, 1966, New Guinea; *univittatum* (Wiedemann, 1824) throughout SE Asia, including Indonesia (Central Moluccas: Buru)].

***Meliscaeva* Frey, 1946** (Syrphinae) is a north temperate group (28 species) with two species known from the Philippines [*angustatus* (Sack, 1926) Philippines (Luzon); *melanostomoides* (Hull, 1941) Java, Philippines (Mindanao)].

***Merodonoides* Curran, 1931** (Eristalinae) is here treated as a subgenus of *Eristalinus* and is restricted to the Afrotropical and Indomalayan Regions. Only one species (*fasciatus* (Macquart, 1834)) is known from Indomalaya (Thompson 2015b).

***Mesembrius* Rondani, 1857** (Eristalinus) is another Old World tropical group ranging from one species in southern Europe to South Africa and Australia (56 total species). Ten species occur in PSWNG [*bengalensis* (Wiedemann, 1819), India to Papua New Guinea, Australia; *bergi* Curran, 1947, Solomon Islands; *caudatus* (Meijere, 1904) Indonesia (Aru Islands); *fulvicauda* Curran, 1947 Solomon Islands; *fulvus* (Meijere, 1908), New Guinea; *hilaris* (Walker, 1849), New Guinea, Australia, New Caledonia; *mesoleuca* (Walker, 1858), Indonesia (Aru Islands); *pilipes* (Doleschall, 1857), Java, Indonesia (Central Moluccas: Ambon); *quadrivittatus* (Wiedemann, 1819), India, Java, Moluccas; *wulpi* Goot, 1964, Taiwan to Philippines, Java, New Guinea (West Papua), Indonesia (Aru)].

***Metadon* Reemer, 2013** (Microdontinae) was established by Reemer and Ståhls (2013a) for a group of 42 species that are widely distributed in the Old World. Four species occur in PSWNG (*auricinctus* (Brunetti, 1908), Sri Lanka Taiwan, India, Philippines; *bicoloratus* (Hull, 1944), Lesser Sundas: Sumbawa; *rutilus* (Keiser, 1952), Lesser Sundas: Sumbawa; and *sacki* (Goot, 1964), Philippines). The two species that were collected by Wallace on the Aru Islands off the southwest coast of New Guinea are the only known species from the Australian Region (*apicalis* (Walker, 1858) and *fulvicornis* (Walker, 1858)).

***Microdon* Meigen, 1803** (Microdontinae) is cosmopolitan except absent in New Zealand and the smaller oceanic islands. The immatures are inquilines in ant nests, where they prey on the brood. There are several subgenera recognized, of which only *Chymophila* Macquart, 1834 and *Microdon* s.s. occur in the PSWNG region. Overall, there are 126 species worldwide, including only three in the PSWNG area (one species in the subgenus *Chymophila* see above) and two in the nominate subgenus both known only from Sumbawa, Lesser Sundas (*aeneus* Keiser, 1952 and *sumbanus* Keiser, 1952). There are also two unplaced species of Microdontinae from the region: *obscurus* Wulp, 1898 (Papua New Guinea) and *sharpii* Mik, 1900 (New Britain).

***Milesia* Latreille, 1804** (Eristalinae) is a large Indomalayan group with a few species in the north temperate region and northern Neotropics (79 total species). The group was revised by Hippa (1990) and 11 species occur in PSWNG [*bigoti* Osten Sacken, 1882, Philippines (Luzon); *confluens* Hippa, 1990, Philippines; *conspicienda* Walker, 1859, Sulawesi, Philippines; *crinita* Hippa, 1990, Philippines; *dearmata* Hippa, 1990, Philippines;




labellata Hippa, 1990, Philippines; *macularis* Wiedemann, 1824, Indonesia (Java, Lesser Sundas: Sumbawa); *reinwardtii* Wiedemann, 1824, Borneo, Indonesia (Java), Malaya, Philippines (Luzon); *ritsemae* Osten Sacken, 1882, Philippines, (Luzon); *semperi* Osten Sacken, 1882, Philippines (Luzon, Negros, Mindanao); *simulator* Hippa, 1990, Indonesia (Lesser Sundas: Lombok)].

***Monoceromyia* Shannon, 1922** (Eristalinae) is here treated as a subgenus of *Ceriana*. It is a worldwide group of hymenopteran mimics. Thompson (2015a) provides a key to the New Guinea species and Thompson & van Steenis (2017) review the Philippine species. Three species occur in the PSWNG area (75 total species) [*metallica* (Wulp, 1898), New Guinea, Australia; *petersi* (Speiser, 1924), Philippines (Luzon); *smaragdina* (Walker, 1858), Indonesia (Aru Islands), Australia].

***Myolepta* Newman, 1838** (Eristalinae) occurs in all regions except the Australian Region (42 total species). There are no known species from PSWNG area, but the group is included in the key as they may be found there in the future.

***Nepenthosyrphus* de Meijere, 1932** (Eristalinae) is a small endemic Indomalayan group (five total species), with one species (*venustus* Thompson, 1971) in the Philippines (Thompson 1971; Hippa 1978; Rotheray et al. 2012).

***Neploneura* Hippa, 1978** (Eristalinae) is here treated as a subgenus of *Chalcosyrphus* and is a small endemic group restricted to the Australian Region (four total species), two of which occur in PSWNG area [*melanocephala* Hippa, 1978, New Guinea; *ventralis* (Walker, 1858), Indonesia (Aru Islands)].

New Subgenus A Thompson et Vockeroth, in prep. (Eristalinae) is a small subgenus of *Kertesziomyia* restricted to the Moluccas and northern Australia and consisting of two species the PSWNG area [*bidentata* (Sack, 1926) (Philippines) and *conducta* (Walker, 1858) (Moluccas to Australia)] (Thompson 2017c).

***Oculovillosa* Thompson, 2015** (Eristalinae) is a monotypic (*ismayi* Thompson, 2015) subgenus of *Ceriana* endemic to New Guinea (Thompson 2015a).

***Ornidia* Lepeletier et Serville, 1828** (Eristalinae) is a small group (five species) of New World subtropical species (Carvalho Filho & Esposito 2009), of which one species (*obesa* (Fabricius, 1775)) is parasynanthropic and has spread to most tropical areas of the World including PSWNG (Thompson 1991).

***Pandasyopthalmus* Stuckenberg, 1954** (Syrphinae) is considered a subgenus of *Paragus*. It is primarily an Old World group with only one of the 30 species known from the Nearctic. Three species are found in PSWNG area [*atratus* (Meijere, 1906), from Malay Peninsula to New Guinea; *goeldlini* (Thompson, 1992), Timor; *keiseri* (Goot, 1964), Java, Lesser Sundas: Sumbawa].

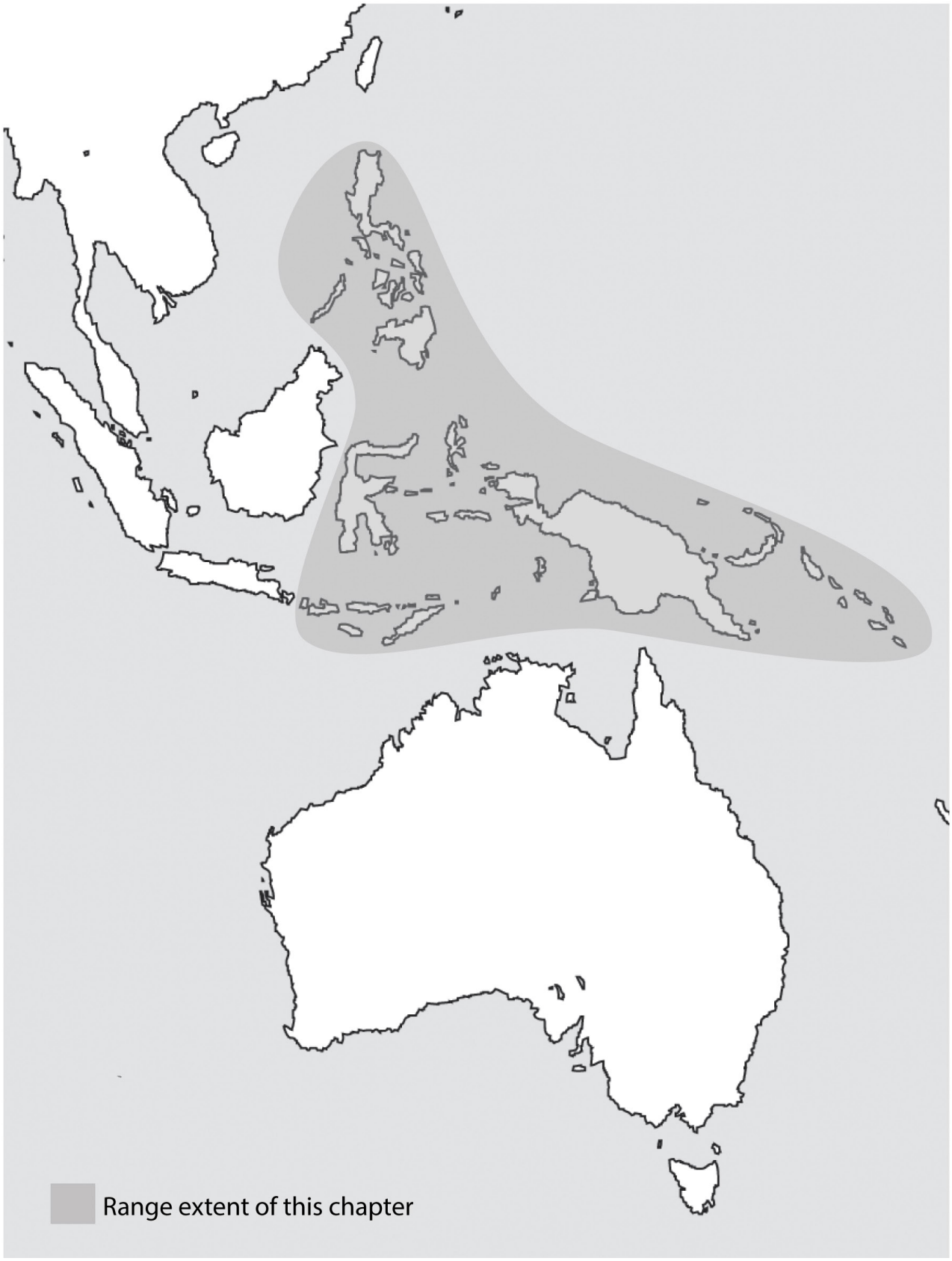
***Paragus* Latreille, 1804** (Syrphinae) is a worldwide group except with only limited distribution in the Neotropics (south only to Costa Rica). The genus is currently divided into four subgenera of which three are found in the PSWNG region: *Pandasyopthalmus, Paragus* and *Serratoparagus*. *Paragus* (*Paragus*) *stuckenbergi* Thompson is the only species in the nominate subgenus found in the region and it is endemic to the Philippines (Thompson & Ghorpade 1992).

***Paramicrodon* de Meijere, 1913** (Microndontinae) is a small group of eight species restricted to the tropics (Australian, Neotropical and Indomalayan Regions] with four species known from PSWNG area (Reemer & Ståhls 2013) [*cinctellus* (Sack, 1926), Philippines; *lorentzi* Meijere, 1913, New Guinea; *novus* Hull, 1913, Philippines; *toxopei* Meijere, 1929, Central Moluccas: Buru]. The immatures are presumed to be inquilines in ant nests as are other microdontine flies.

***Paramixogaster* Brunetti, 1923** (Microdontinae) is a medium sized group of hymenopteran mimics restricted to the Old World tropics, with four species found within the PSWNG area (Reemer & Ståhls 2013a) [*indicus* (Doleschall, 1857), Bali; Moluccas; *odyneroides* (Meijere, 1908), New Guinea; *vespiformis* (Meijere, 1908), Java, Malay Peninsula, Central Moluccas: Buru; *wegneri* Keiser, 1964, Moluccas].

***Paratropidia* Hull, 1949** (Eristalinae) is here treated as a subgenus of *Orthoprosopa Macquart*, 1850. Thompson (1972b) provides a revision of the genus and Hippa (1980) added an additional species from New Caledonia. It is an endemic Aus-



Map 1. Range map (shaded region shows the range extent covered in this chapter).

tralian regional group of five species known from New Guinea, New Caledonia and New Zealand. Two *Paratropidia* species occur in the PSWNG area [*alex* Thompson, 1972, New Guinea; *margarita* Thompson, 1972, New Guinea].

Parocyptamus **Shiraki, 1930** (Microdontinae) is a small Indomalayan group of two species of Microdontinae. Neither species is known from the PSWNG area but it is included in the event that they are found.

Petioleomyia **Thompson et Vockeroth, 2017** (Syrphinae) is here treated as a subgenus of *Allobaccha*, and is a small Indomalayan group of five species, with three species in the Philippines [*macgregori* (Curran, 1934), *semperi* Thompson, 2017, *signata* (Sack, 1926)] (Thompson 2017b).

Philippinophilus **Thompson, 2017** (Eristalinae) is a monotypic (*celeber* Osten Sacken, 1882) genus endemic to Mindanao. It is apparently rare, as only two specimens of it are known (Thompson 2017b).

Phytomia **Guerin-Meneville, 1833** (Eristalinae) is a group restricted to the Old World and is divided into two subgenera (the other is *Dolichomerus*, see above). The typic subgenus (19 total species) ranges from the Far Eastern Palaearctic to Africa and Australia (absent from the western and central Palaearctic). Two species occur in PSWNG area (*errans* (Fabricius, 1787) in the Philippines and *zonata* (Fabricius, 1787) through the Indomalayan Region and south to New Guinea).

Platycheirus **Lepeletier et Serville, 1828** (Syrphinae) is a large, mainly north temperate group with limited extension into the northern Indomalayan Region and into the Neotropics along the Andes (202 total species). One species (*albimanus* (Fabricius, 1781)) extends into the Philippines.

Pseuderistalis **Shiraki, 1930** (Eristalinae) is considered a subgenus of *Kertesziomyia* and is restricted to the Indomalayan and Australian Regions, with 18 described species but many more undescribed ones. Nine species occur in the PSWNG area [*aeneicinctus* (Meijere, 1929), Indonesia (Central Moluccas: Buru); *conducta* (Walker, 1858), Philippines (Mindanao, Calicoan), Indonesia (Sulawesi), New Guinea, New Britain, Australia, Solomons (Guadalcanal); *distinctus* (Meijere, 1913), New Guinea; *fascipennis* Thompson, 1975, Myanmar, India (Assam), Java, Philippines; *marfax* (Curran, 1947), Solomon Islands; *nigra* (Wiedemann, 1824), Southeast Asia, Indonesia to Moluccas; New Guinea; *obliterans* (Walker, 1860), Moluccas; *semisplendens (*Sack, 1926), Philippines (Luzon, Palawan, Leyte); *velutina* (Sack, 1926), Philippines (Negros)].

Psilota **Meigen, 1822** (Eristalinae) is a north temperate group of 32 species with limited extension into the Indomalayan Region and an expansion in the Australian Region. Two species, *basalis* (Walker, 1858) (Aru Islands) and *fasciata* Curran, 1929 (Philippines), are recorded from PSWNG.

Rhingia **Scopoli, 1763** (Eristalinae) is a large, almost worldwide, genus only absent from the Australian Region, consisting of 46 described species. Only one unnamed species occurs in the PSWNG region (from the Philippines).

Serratoparagus **Vujić et Radenković, 2008** (Syrphinae) is usually accepted as a subgenus of *Paragus* restricted to the Afrotropics and the Indomalayan Region. *Serratoparagus* contains only one species (*crenulatus* (Thomson, 1869)), which ranges throughout Indomalaya south into Australia. This species is an aphid predator in its larval stages.

Solenaspis **Osten Sacken, 1881** (Eristalinae) is a monotypic genus for an endemic New Guinea species (*nitens* (Bigot, 1880)).

Sphaerophoria **Lepeletier et Serville, 1828** (Syrphinae) is a largely north temperate genus of 77 species with limited extensions into southern regions. There is one widespread species (*macrogaster* (Thomson, 1869)) that occurs in New Guinea and ranges into Australia.

Sphegina **Meigen, 1822** (Eristalinae) is a north temperate genus (122 total species) with extensions into the Indomalayan Region. Only one species is known from the Philippines (*philippina* Thompson, 1999b). The larvae are known to feed in sap of tree wounds.

Syritta **Lepeletier et Serville, 1828** (Eristalinae) is a large and now worldwide genus of some 60 described species (with several more undescribed known); those now found in the New World were introduced from the Old World. Lyneborg and Barkemeyer (2005) provide a revision of the genus. Nine species occur in PSWNG [*aenigmatopatria*




Hardy, 1964, Hawaii, Micronesia, Philippines, Indonesia (Sumatra, Java); *indica* (Wiedemann, 1824), Philippines; *luteinervis* Meijere, 1908, Papua New Guinea, Solomons; *hackeri* Klöcker, 1924, Papua New Guinea; *noona* Lyneborg et Barkemeyer, 2005, Papua New Guinea (New Ireland); *oceanica* Macquart, 1855, throughout Indomalayan Region, New Guinea, Australia, Solomons, Hawaii, Society and Marquesas, Micronesia, Hawaii; *orientalis* Macquart, 1842, throughout Indomalayan Region, Solomons, Australia, Micronesia, New Caledonia, Hawaii; *papua* Lyneborg et Barkemeyer, 2005, Papua New Guinea; *polita* Lyneborg et Barkemeyer, 2005, Papua New Guinea (New Britain)].

***Tigridemyia* Bigot, 1882** (Eristalinae) is here treated as a subgenus of *Mallota*. The group contains four species, one of which occurs in the Philippines (*curvigaster* (Macquart, 1842)).

***Triglyphus* Loew, 1840** (Pipizinae) is a small genus distributed from the Palaearctic south through the Indomalayan Region to Australia. There are eight known species, but many undescribed species from Australia (at least 12), Indomalaya (three) and New Guinea (one).

***Volucella* Geoffroy, 1762** (Eristalinae) is mainly a north temperate group (47 total species) absent from the Afrotropical, Australian and Neotropical Regions. Two species are known from the Philippines [*flavolinea* Hull, 1943 and *nitidithorax* Hull, 1941].

***Xanthandrus* Verrall, 1901** (Syrphinae) is a nearly cosmopolitan genus of 29 described species, absent only from New Zealand. There are five species from PSWNG [*bergmani* Doesburg, 1966, New Guinea; *bicinctus* (Meijere, 1929), Indonesia (Central Moluccas: Buru); *orientalis* Sack, 1926, Philippines; and two undescribed species from Philippines and New Guinea].

***Xanthogramma* Schiner, 1860** (Syrphinae) While a species of this genus is listed from the Philippines in the Oriental Diptera catalog (Knutson et al. 1975: 320), it does not occur in the Indomalayan Region. The species, *calceata* Sack, 1926 belongs to *Citrogramma* (**comb. nov.**), but was unfortunately overlooked in the recent revision of that genus (Mengual 2012).

***Xylota* Meigen, 1822** (Eristalinae) is largely a north temperate group (132 species), but does extend into PSWNG, where six species are known [*aeneimaculata* Meijere, 1908, Indonesia (West Papua); *coeruleopicta* Hippa, 1978, Indonesia (North Moluccas: Halmahera); *conformis* Walker, 1857, Malaya, Philippines; *iriana* Hippa, 1978, New Guinea; *novaeguineae* Hippa, 1978, New Guinea; *philippinica* Mutin et Gilbert, 1999, Philippines]. Hippa (1978) placed these species into two species groups (*aeneimaculata* and *pendleburyi* groups).

Acknowledgements

This treatment is based on a similar one for the flower fly fauna of Central America (Thompson et al. 2010). Authorship is based on relative contribution, with the first doing the original draft and being responsible for the taxonomy and overall manuscript; Mengual and Skevington were responsible for the phylogenetics and checking the species lists; and Young coordinated the illustrations. All authors participated in the elaboration of the generic key.

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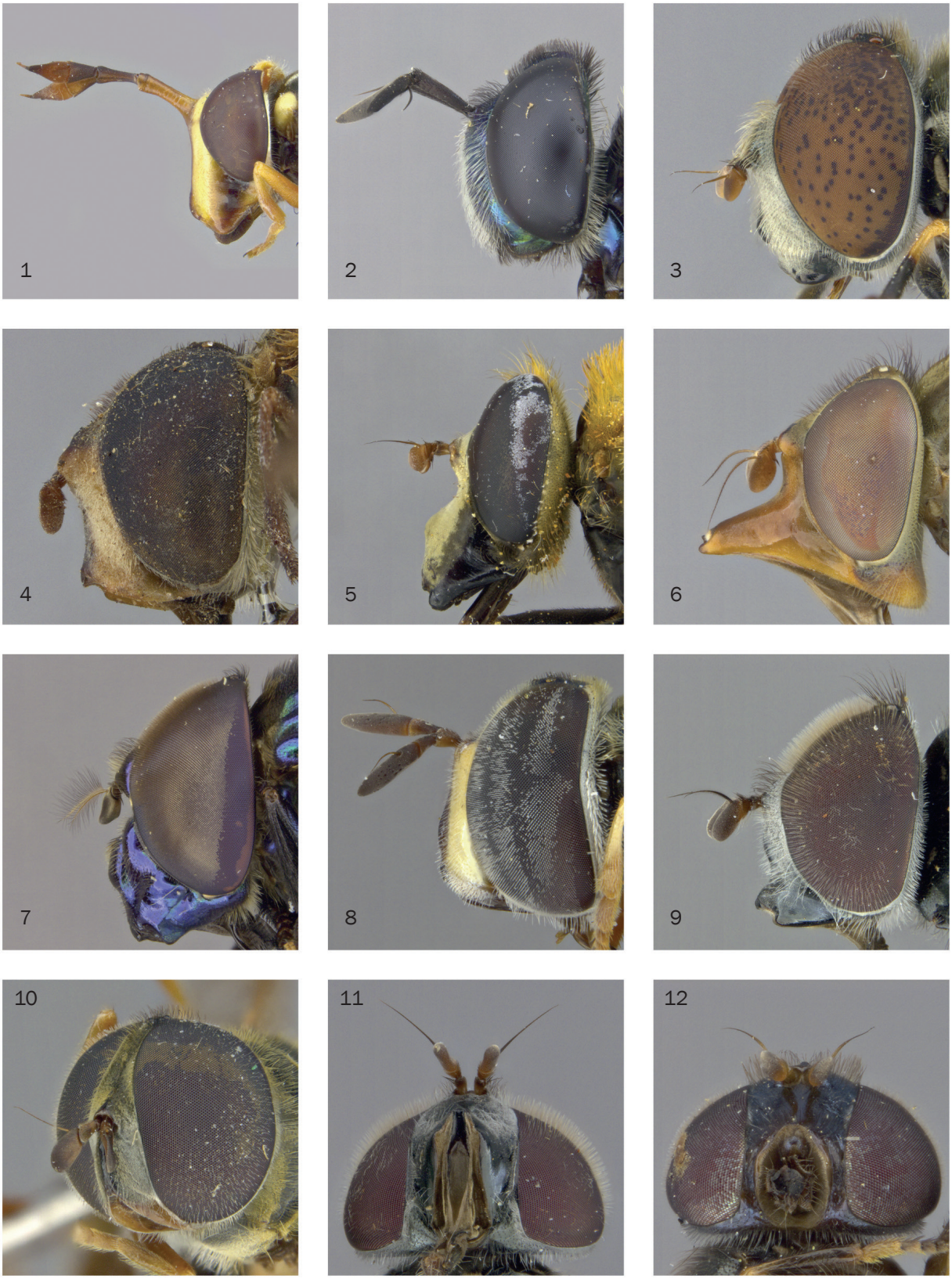
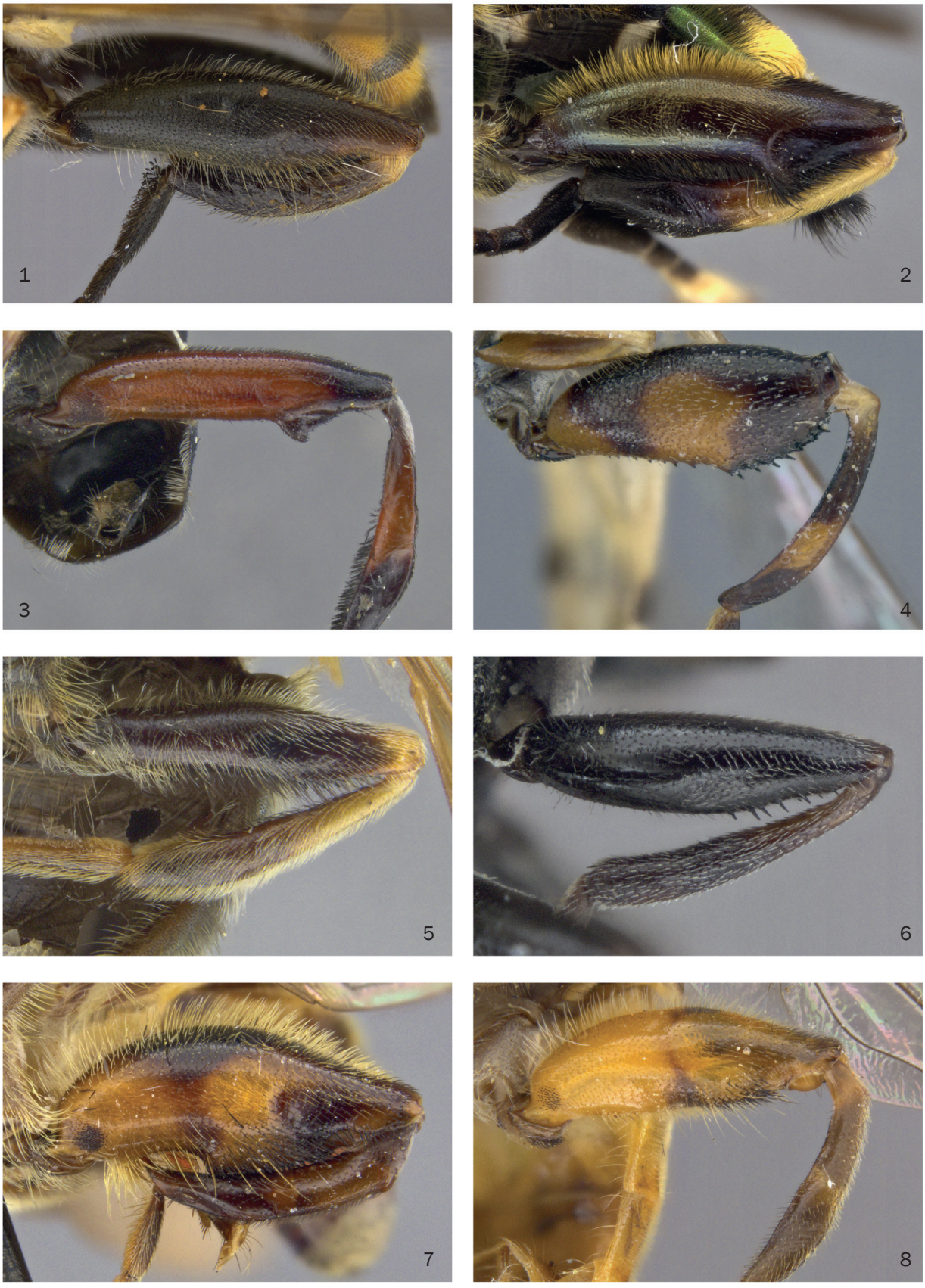


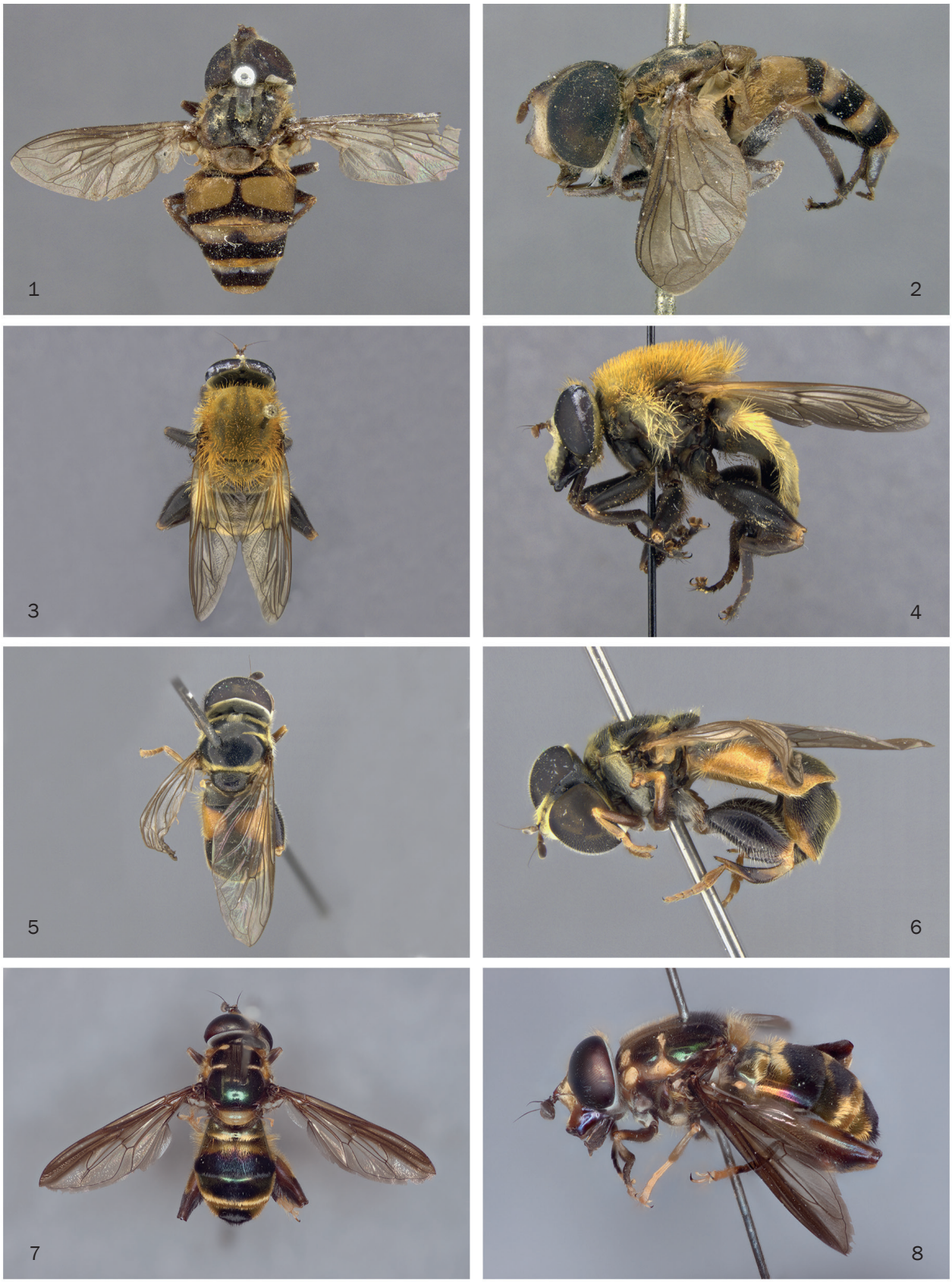
Figures 1-12. Syrphidae heads. 1-9 – Lateral view: 1 – *Ceriana ornata* (Saunders); 2 – *Chymophila fulgens* (Wiedemann); 3 – *Eristalinus (Lathyrophthalmus) aeneus* (Scopoli); 4 – *Keda conclusa* (Walker); 5 – *Matsumyia jesoensis* (Matsumura); 6 – *Rhingia* sp.; 7 – *Ornidia obesa* (Fabricius); 8 – *Paragus auritus* Stuckenberg; 9 – *Psilota* sp.; 10 – Anterolateral view of *Nepenthosyrphus* sp.; 11-12 – Ventral view: 11 – *Psilota* sp.; 12 – *Triglyphus primus* Loew.



Figures 1-8. Syrphidae metasternum and metaleg, lateral view. 1 – *Mesembrius* sp.; 2 – *Paratropidia multicolor* (Ferguson); 3 – *Phytomia (Dolichomerus) crassus* (Fabricius); 4 – *Syritta pipiens* (Linnaeus); 5 – *Azpeytia* sp.; 6 – *Myolepta difformis* (Strobl); 7 – *Mallota (Tigridemyia) curvigaster* Macquart; 8 – *Eristalinus (Merodonoides) fasciatus* (Macquart).

Figures 1-8. Syrphidae habitus, dorsal and lateral view. 1-2 – *Asiobaccha bicolor* Austen; 3-4 – *Dideoides coquilletti* (Goot); 5-6 – *Giluwea flavomaculata* Vockeroth; 7-8 – *Austrophilus terraereginae* (Ferguson).

Figures 1-8. Syrphidae habitus, dorsal and lateral view. 1-2 – *Axona chalcopyga* (Wiedemann); 3-4 – *Azpeytia* sp.; 5-6 – *Chalcosyrphus (Neploneura) victoriensis* Ferguson; 7-8 – *Dissoptera heterothrix* (Meijere).



Figures 1-8. Syrphidae habitus, dorsal and lateral view. 1-2 – *Keda conclusa* (Walker); 3-4 – *Matsumyia jesoensis* (Matsumura); 5-6 – *Nepenthosyrphus* sp.; 7-8 – *Paratropidia multicolor* (Ferguson).

Figures 1-10. Syrphidae wings, dorsal view. 1 – *Austrophilus terraereginae* (Ferguson); 2 – *Ceriana (Ceriana) abbreviata* Loew; 3 – *Microdon (Chymophila) fulgens* (Wiedemann); 4 – *Dissoptera heterothrix* (Meijere); 5 – *Eumerus argentipes* Walker; 6 – *Giluwea flavomaculata* Vockeroth; 7 – *Graptomyza brevirostris* Wiedemann; 8 – *Ornidia obesa* (Fabricius); 9 – *Psilota* sp.; 10 – *Dideopsis aegrota* (Fabricius).