

***Austalis*, a new genus of flower flies (Diptera: Syrphidae) with revisionary notes on related genera**

F. CHRISTIAN THOMPSON

Systematic Entomology Laboratory, PSI, Agricultural Research Service, U. S. Department of Agriculture,
NHB-0169 Smithsonian, Washington, D. C. 20560 USA (cthompso@sel.barc.usda.gov)

Abstract

A new genus and species of flower flies are described from the Australian biotic region (*Austalis* Thompson & Vockeroth, type *Eristalis resolutus* Walker; *Austalis rhina* Thompson (Solomon Is.)). A key is provided to the groups of the subtribe Eristalina, along with nomenclatural notes and checklist of genus-group names. Five genus-group names and 1 species-group name are synonymized (*Pseudomeromacrus* Li, 1994 = *Eristalinus* (*Merodonoides* Curran, 1931)); *Cryptoeristalis* Kuznetsov 1994 = *Eristalis* (*Eoseristalis* Kanervo, 1938)); *Paramesembrius* Shiraki 1930, *Klossia* Curran, 1931 & *Catacores* Hull, 1944 = *Kertesziomyia* Shiraki, 1930; *Eristalis maritima* Hull, 1945 = *Austalis resoluta* (Walker, 1858)).

Key words: Taxonomy, Syrphidae, key, Australian Region, rat-tailed maggots

Introduction

Eristaline flower flies are among the most common and conspicuous flower flies. These flies are common pollinators almost wherever flowers are found, being absent only in truly arid areas and the Polar Regions. The larvae of eristaline flower flies are filter feeders in all kinds of aquatic media. Occasionally these larvae are accidentally swallowed by humans, thus, causing myiasis. Otherwise, the larvae contribute to the purification of water by filtering out microorganisms and other products. These flies are currently placed into 16 genera and 400 species.

The concept denoted by the name *Eristalis* has been very broad, including a diverse array of species. Over the years, particularly while preparing species catalogs (Knutson, et al., 1975; Thompson, et al. 1976; Smith & Vockeroth, 1980; Thompson & Vockeroth, 1989), Vockeroth and I have developed new definitions for the natural groups covered by

this term of convenience. We were not able to properly document our classifications, given the time limitation and format of these catalogs. These new concepts are here defined by the key. This paper represents part of the one that we have frequently referred to as being in preparation and in press (Thompson 1972: 139, 1981: 147) and describes a group of *Eristalis* species endemic to the Australian Region.

Eristalis was established by Latreille (1804) and was used in differing senses by early authors (Fabricius, Meigen and Fallén). Fabricius (1805: 231) considered *Musca nemorum* Linnaeus to be the typical species and defined the genus broadly. Meigen (1822: 382) characterized Fabricius' interpretation as "ein Mischmasch" and restricted the name to those species with sinuate vein R4+5 and a petiolate cell R1. Fallén (1816-17) and Zetterstedt (1838, 1843, 1849, 1859) used the name in the sense of *Cheilosia* Meigen and placed the rat-tailed maggots (eristaline species) in *Syrphus*. Curtis (1832) designated *Musca tenax* Linnaeus the type species of *Eristalis*, thus fixing Meigen's concept under our rules of nomenclature. Subsequent workers accepted and followed Meigen's definition. Rondani (1857) and Mik (1897) divided the broad concept of *Eristalis* into subgroups, based on characters of the eyes (maculation, pilosity, condition in males) and arista (pilosity). Their work, however, was largely ignored (see Verrall (1901: 496) for a review of the early history of the genus). In this century only three authors have investigated the systematics of *Eristalis* in detail, all from a regional view. Hull (1925) studied the New World species and defined species groups based on color pattern. Shiraki (1930) studied the Far East species, creating a new subgeneric classification based on the characteristics of the eyes and arista. Kanervo (1938) proposed a new classification for the Palaearctic species based on a study of the male genitalia. Hull (1949) provided a world overview of the genera of flower flies, including a key to genera. Despite all these various studies, most workers still used *Eristalis* in a very broad sense of almost any flower fly with a petiolate cell R1, sinuate R4+5 vein and a tuberculate face. Only a few groups have been recognized for species with specializations.

All the genera related to *Eristalis* are placed in their own subtribe, Eristalina. The larvae are aquatic and have a distinctive habitus, usually being referred to as rat-tailed maggots. The adults of "rat-tailed maggots" are placed into the tribe Eristalini, which in turn is divided into 3 groups: those related to *Sericomyia* Meigen (here subtribe Sericomyiina) which have vein R 2+3 straight or at most slightly sinuate, cell R1 open and metafemur without basolateral setose patch; those related to *Helophilus* Meigen (subtribe Helophilina), which have vein R 2+3 strongly sinuate, cell R1 open and metafemur with basolateral setose patch; and those related to *Eristalis* (subtribe Eristaliina), which have vein R2+3 sinuate, cell R1 usually petiolate and metafemur with basolateral setose patch. The monophyly of Sericomyiina is demonstrated by asymmetric male genitalia of its members. The subtribe Helophilina are merely a grade (paraphyletic group). The Eristalina are considered monophyletic as most members have cell R1 petiolate. Unfortunately, this character is variable in the genus *Kertesziomyia* Shiraki. This is a summary and synthesis of the tra-

ditional morphological characters of the adults (see Thompson 1972) and larvae (see Rotheray & Gilbert 1999). Molecular data also supports these groupings (see Ståhls 1999).

The key to the genera of the Eristalina and the concepts it defines were developed by J. R. Vockeroth and myself in 1971 when we were cataloging the Oriental species (Knutson et al. 1975). Not all the groups that Vockeroth recognized are here keyed nor named. Vockeroth, for example, felt that the species related to *Eristalis conducta* Walker formed a distinct group, but I include them in *Kertesziomyia*. Likewise, he believed that *Eristalis plumipes* Bezzi and related Afrotropical species deserved recognition as a separate genus, but they are here included as the *dasyops* species group. Further, he recognized that *Palpada* Macquart could be broken down into four distinct groups, two of which have no names. Also, as we both recognized that the bright metallic Oriental-Australian species were unique, the name and concept of *Austalis* must be recognized as belonging to both of us.

Not all the groups are formally named nor are of equivalent rank, as my own research on the higher classification of flower flies remains incomplete. These matters required a full cladistic analysis and are left to Christian Kassebeer, who is revising the tribe Eristalini for his PhD thesis.

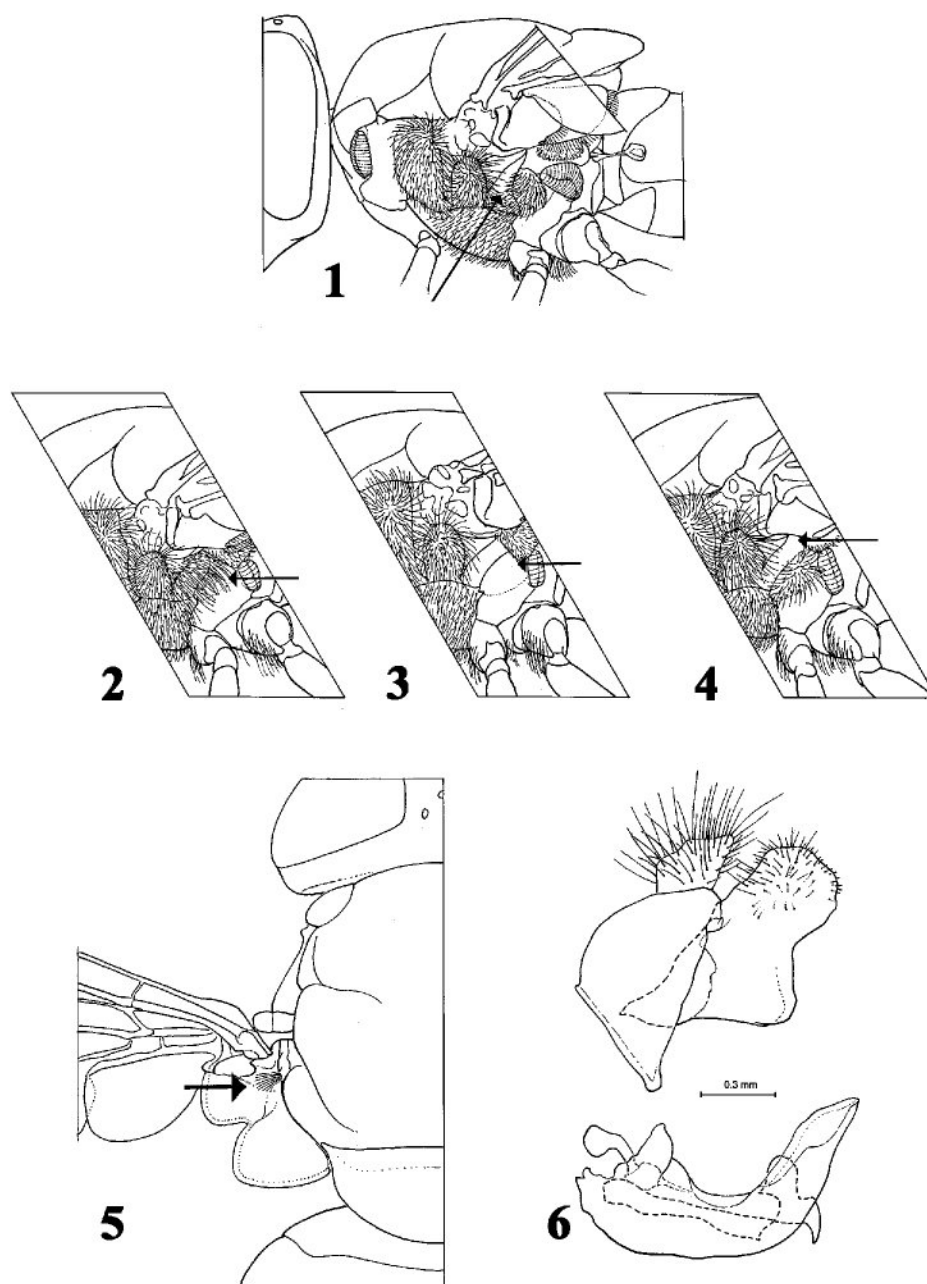
Format

Terminology follows Thompson (1999b). The format for and abbreviations found in the synonymies follow Thompson (2002). In the material examined section, the use of ellipses follows standard English practice and merely indicates that the missing information is the same as that in the preceding record. The acronyms used for collections follow the standard of the BioSystematic Database of the World Diptera (Thompson 1999a), and their equivalents are given in the acknowledgements.

Key to the groups of the subtribe Eristalina

1. Anepimeron with triangular portion bare (Figs. 1, 3-4) 6
- Anepimeron with triangular portion pilose (Fig. 2) 2
2. Postalar pile tuft absent; eye bare, without maculation; wing brown, completely microtrichose; scutellum with marginal sulcus *Solenaspis*
- Postalar pile tuft present (Fig. 5); eye with maculae; wing hyaline; scutellum without marginal sulcus 3
3. Wing densely and uniformly microtrichose on apical half *Eristalinus* (*Helophilina*)
- Wing bare or sparsely microtrichose 4
4. Metafemur thickened, distinctly arcuate; 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 *Eristalinus (Merodonoides)*
- Metafemur at most very slightly thickened, not arcuate; metatibia not carinate nor compressed ventrally; eye usually densely pilose, with pili much longer than ommatidial diameter; male metatrochanter simple 5
5. Eye punctate (with spots) *Eristalinus (Eristalinus)*
- Eye fasciate and punctate (with bands and bands) *Eristalinus (Eristalodes)*
6. Katepimeron bare (Fig. 3) 13
- Katepimeron pilose (Fig. 4) 7
7. Meron bare posteroventrally, without pile anterior or ventral to metathoracic spiracle (Fig. 4); eye pilose; arista pilose *Eristalis*
- Meron pilose posteroventrally, with pile anterior or ventral to spiracle 8
8. Eye pilose, at least some pile dorsally, frequently densely pilose; arista bare 12
- Eye usually bare, if with a few distinct pili, then arista pilose 9
9. 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 gen. nov.*
- 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 10
10. Arista bare; wing microtrichose on apical half; precallar depression bare or with at most a few pili mesially; male holoptic *Senaspis*
- Arista pilose, with short to moderately long pili; wing at least bare apicoposteriorly; precallar depression with many stiff pili posteriorly 11
11. Front with strongly rugose area dorsal to antenna; male holoptic *Phytomia*
- Front not rugose; male dichoptic *Simoides*
12. Face drawn out into a long slender porrect snout *Lycastirrhyncha*
- Face not drawn out into a snout *Palpada*
13. Postalar pile tuft present (Fig. 5); eye bare *Kertesziomyia*
- Postalar pile tuft absent 14
14. Eye pilose 20
- Eye bare 15
15. Wing with a stigmatic crossvein between Sc and R1 apically 19
- Wing without stigmatic crossvein 16
16. Face concave, straight or produced anteroventrally, without a tubercle 18
- Face with distinct tubercle 17
17. 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*



FIGURES 1-6. 1-4. Thoracic pleurae of eristaline flies. Arrows point to the critical areas, 1. *Austalis rhina*, sp. nov., arrow pointing to bare anterodorsal area of the posterior anepimeron, 2. *Eristalinus aeneus* (Scopoli), arrow pointing to pilose katepimeron, 3. *Eristalis (Eoseristalis) arbustorum* (Linnaeus), arrow pointing bare posterior anepimeron and meron, 4. *Eristalis (E.) tenax* (Linnaeus), arrow pointing to bare posterior anepimeron, but pilose katepimeron; 5. Thorax, dorsal view, *Eristalinus aeneus* (Scopoli), arrow pointing to postalar pile turf; 6. Male genitalia, lateral view, *Austalis rhina*, sp. nov. Figures 1-5 are from Thompson & Rotheray (1998).

- Wing brown on anterior half; basoflagellomere small, only about as long as metathoracic spiracle; katepisternum continuously and densely pilose; plumula well developed, multibranched *Axona*
- 18. Mesonotum unicolorous; vein R4+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 *Dissoptera*
- Mesonotum vittate; R4+5 strongly sinuate; crossvein r-m apical, beyond middle of discal cell; wing entirely microtrichose; male holoptic; body without specialized pile *Keda*
- 19. Mesonotum and frequently abdomen with patches of dense subappressed tomentose yellow pile; male metafemur usually not enlarged, never with basolateral tubercle *Meromacrus*
- Without tomentose pile; male metafemur enlarged, with basolateral tubercle "*Senaspis*" *apophysata*
- 20. Metatibia not compressed nor carinate; wing bare apically *Eristalis* (*Eoseristalis*)
- Metatibia compressed and carinate on basoventral 1/3; wing microtrichose on apical 1/3 or more 21
- 21. Metafemur greatly swollen; wing dark brown on anteroapical 1/3; cell R2+3 bulbous apically; male dichoptic *Meromacroides*
- Metafemur not greatly swollen; wing hyaline; cell R2+3 not bulbous apically; male holoptic "*Eristalis*" *dasyops* group

Austalis Thompson & Vockeroth, gen. nov.

Type-species: *Eristalis resolutus* Walker

Head: face broadly pilose and pollinose laterally, usually shiny and bare medially, rarely entirely pollinose, straight except for medial tubercle and slight anterior production at antennal pits; tentorial pit short, extending along ventral third of eye; facial stripes indistinct; frontal prominence low, on dorsal third of head; eye bare, holoptic to broadly dichoptic in males; antenna short, about 1/4 as long as face; basoflagellomere oval, slightly longer than broad; arista variable, from bare to plumose.

Thorax: slightly longer than broad, with long pile; anterior anepisternum bare; katepisternum continuously pilose from ventral to dorsal margin; anepimeron with dorso-medial and posterior portions bare; without a postalar pile tuft; katepimeron pilose dorsally; metathoracic pleuron bare; metathoracic spiracle large, usually larger than basoflagellomere; plumula long and multibranched; scutellum without apical sulcus. Legs: simple; metafemur not swollen; metatibia without basal nor apical carina nor apical dens. Wing: usually partially microtrichose; cell R1 closed and petiolate; cell R4+5 petiolate, with petiole as long as stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval to suboval.

Austalis is readily distinguished from all other eristaline syrphids by the pilosity of the pleuron (Fig. 1), having the unique combination of pilose posteroventral anepimeron along with pilose katepimeron. These flies are also typically bright metallic in coloration. Ferguson (1926: 153), while recognizing a broad definition for *Eristalis*, did recognize that the species with metallic coloration formed a distinct group. He, however, declared that *pulchellus* had "no very close relationship."

Little is known of the life histories of the species of *Austalis*. Our only source of information is what has been recorded on specimen labels and unfortunately there is not much beyond the standard locality, date and collector data. However, there is a series of specimens of a few species which were collected by H. Roberts as part of an ecological study of Geschis Seed Orchards in Papua New Guinea. His work indicated that the adults are not uncommon pollinators of *Eucalyptus*.

Etymology. The name *Austalis* is an arbitrary combination of letters created to be similar to *Eristalis* and the Australasian Region where the group occurs. The name is to be treated as feminine.

Eristalis is a Latin noun of feminine gender (Lewis & Short 1879: 657, Brown 1956: 339), however the International Commission of Zoological Nomenclature (ICZN 1993: 256) as well as various authors (Fabricius, Meigen, and others) treated the name as of masculine gender. As the Code (ICZN 1999: 34, see Art. 30.1.1) clearly states that genus-group names based on Latin nouns take the gender accorded to them by Latin dictionaries (such as Harpers' (Lewis & Short 1879)), *Eristalis* is feminine regardless of the Commission's own declaration.

Austalis includes the following species, all of which represent new nomenclatural combinations: *aequipars* Walker (1864: 210, *Eristalis*); *bergi* Curran (1947: 12, *Eristalis*); *caledonica* Bigot (1884: 339, *Eristalomyia*); *calliphoroides* Shiraki (1963: 165, *Eristalis*); *ciliata* Meijere (1913: 355, *Eristalis*); *conjuncta* Ferguson (1926: 155, *Eristalis*); *copiosa* Walker (1852: 249, *Eristalis*); *cupreoides* Goot (1964: 220, *Eristalis*); *erythrogyga* Walker (1864: 211, *Eristalis*); *inscripta* Doleschall (1857: 407, *Eristalis*); *latilimbata* Meijere (1913: 354, *Eristalis*); *lucilioides* Walker (1861: 284, *Eristalis*); *luciliomima* Hull (1944: 46, *Eristalis*); *muscooides* Walker (1858: 96, *Eristalis*); *muscomima* Hull (1944: 48, *Eristalis*); *postscripta* Walker (1864: 210, *Eristalis*); *pulchella* Macquart (1846: 255, *Eristalis*); *refulgens* Doleschall (1858: 96, *Eristalis*); *resoluta* Walker (1858: 95, *Eristalis*; = *maritima* Hull, 1945: 210, *Eristalis*, **syn. nov.**); *rhynchops* Bezzi (1928: 80, *Eristalis*); *roederi* Bergroth (1894: 72, *Eristalis*); *smaradgi* Walker (1849: 631, *Eristalis*); and *triseriata* Meijere (1913: 353, *Eristalis*). In addition, another dozen species are known from the Oriental and Australian Regions and will be described in a subsequent revision of the genus (Thompson, in preparation).

***Austalis rhina* Thompson, sp. nov.**

Male.—*Head* (Fig. 7): metallic greenish black; face silvery-white pollinose and pilose laterally and ventrad antenna, shiny and bare medially and along oral margin, produced strongly anteriorly, with low indistinct tubercle; gena very narrow, silver-white pollinose and pilose; lunule orange; frons narrowly silvery-white pollinose laterally, shiny medially, black pilose; vertex dull brownish-black pollinose, black pilose; eyes broadly dichoptic, separated by 1/4 head width, bare; antenna orange except basoflagellomere brownish dorsally, black pilose on basal segments, basoflagellomere with large basoventral sensory pit on inner side; arista orange, bare; occiput silvery pilose and pollinose on ventral 2/3, becoming sparsely pollinose on dorsal 1/3 with a row of black cilia.



FIGURE 7. Head, lateral view, *Austalis rhina*, sp. nov.

Thorax. Metallic greenish-black; scutum shiny except for dull black pollinose vittae and sparsely silvery pollinose on postpronotum and notopleuron, with a pair of narrow submedial pollinose vittae extending about 2/3 distance to scutellum, with a broader and interrupted sublateral pollinose vittae; postalar callus yellow pilose; scutellum shiny, yellow pilose; pleuron sparsely gray pollinose, yellow pilose; calypter white except apically

brownish black on ventral margin; plumula white; halter orange; mesothoracic spiracular fringe brown; metathoracic spiracular fringe brown. Legs: Coxae dark greenish black, silvery pollinose, yellow pilose; trochanter brownish black, shiny, yellow pilose; pro & mesofemora dark brownish black on basal 1/3, orange apically, orange pilose; metafemur swollen, dark greenish black on basal 4/5, orange apically, shiny, yellow pilose except for black apicoventral spinose pile; tibiae orange, orange pilose; pro & mesotarsi orange except apical tarsomeres slightly brownish dorsally, orange pilose; metatarsus brownish dorsally, orange ventrally, black pilose. Wing: tegula orange; basicosta orange and black pilose; microtrichose except bare basomedially; bare apical 1/2 of cell R1, apical 4/5 of cell R2+3, apical 2/3 of cell R4+5, apical 1/3 of DM and along apical and posterior margin of cell CuA1; alula bare except apical 1/2 microtrichose.

Abdomen: dark green, shiny and with dull black pollinose maculae; 1st tergum shiny except medial 1/3, yellow pilose; 2nd tergum black pollinose except triangular shiny basolateral macula and apical margin, yellow pilose except short appressed black pilose medially; 3rd & 4th terga shiny basally and apically, black pollinose medially, orange pilose on shiny areas and black pilose elsewhere; male genitalia black, dull pollinose, yellow pilose; sterna metallic green, shiny except sparsely pollinose on 2nd sternum, yellow pilose. Male genitalia (Fig. 6).

Female.—Similar except for normal sexual dimorphism, barer wing (basal 2/3 of cell C, all of cells R1, R2+3, R4+5, basomedial 2/3 of DM, basomedially of cell CuP & CuA1); 5th tergum dark green, dull pollinose except narrowly shiny apically.

Types. Holotype male from **SOLOMON ISLANDS**: Gizo Island, Gizo, 0-200 m, Dec 1975, light trap, N. L. H. Kraus deposited in the Bishop Museum, Honolulu. Paratypes. 4 males with the same data as the holotype (BPBM & USNM); Gizo Island, Gizo, January 1974, N. L. H. Kraus (2 male, 3 females, BMNH & USNM); ..., Gizo, 0-140 m, Dec 1980, N. L. H. Krauss (2 males, BPBM & USNM). Buka Island, Buka Agricultural Station, 6-10 Dec 1959, T. C. Maa (2 males, 15 females, BPBM). Bougainville, Simba Mission, 29 June 1956, E. J. Ford, Jr. (4 females, BPBM), ..., 2 July 1956, E. J. Ford, Jr. (1 female, BPBM); ..., Arawa, 4 km n of Kleta, 9-13 July 1965, R. W. Crosskey (1 female, BMNH); ..., Kieta, 26 June 1956, E. J. Ford, Jr. (1 male, BPBM). New Georgia Island, Munda, 0-200 m, Nov 1975, N. L. H. Krauss (1 male, BPBM). Santa Isabel, Tamatahi, 450 m, 3 July 1960, C. W. O'Brien (1 male, 3 females, BPBM). Florida Island Group, Hanavaivine, Small Nggela, 15 Sept 1960, C. W. O'Brien (1 female, BPBM); ..., Halteta, 200-250 m, 10 Oct 1964, R. Straatman, Malaise trap (1 female, BPBM). Guadalcanal, Poha, Sept 1944, J. Laffoon, Cat.# 191 (1 female, USNM).

Etymology: The epithet, *rhina*, is an adjective from the Greek for nose and refers to the facial shape of the species.

Austalis rhina is readily distinguished from other species by its dichoptic males and snout-like face. This striking species is restricted to the Solomon Islands.

Nomenclatural checklist and notes

For each genus and subgenus (name in bold), the distribution (biotic regions only) and number of species are given. For each name, the name, author, year, page and status is given. For available genus-group name (except replacement names and emendations), the type-species is given with the manner of its fixation. Notes are inserted as necessary. Arrangement is alphabetic.

Axona. Australasian & Oriental Regions; 2 species

Axona Walker 1864: 211, type: *Axona volucelloides* Walker (Monotypy) = *chalcopyga* Wiedemann.

Note: *Axona* Walker is not preoccupied by *Axona* Stål (Hemiptera) as the former was published in April and the latter in the Fall (after September, the date of the preface to Stål's Hemiptera Africana, vol. 1).

Digulia. New Guinea; 1 species

Digulia Meijere 1913: 357, type: *Digulia kochi* Meijere (Monotypy).

Dissoptera. Australian & Oriental Regions; 7 species

Dissoptera Edwards 1915: 400, type: *Dissoptera pollinosa* Edwards (Monotypy) = *heterothrix* de Meijere.

Xenozoon Hull 1949: 401, type: *Dissoptera maritima* Hull (Original designation).

Note: The genus *Xenozoon* Hull (1949: 401) based on *Dissoptera maritima* Hull does not differ from *Dissoptera* Edwards and was therefore synonymized with the latter by Thompson & Vockeroth (1989: 449).

Eristalinus. Palaearctic, Afrotropical, Oriental to New Guinea; introduced into Nearctic, Neotropics, Australia, New Zealand; 100 species.

Eristalinus. Distribution as genus; 81 species

Eristalinus Rondani 1845: 453, type: *Musca sepulchralis* Linnaeus (Subsequent monotypy, Rondani 1857: 38).

Lathyrophthalmus Mik 1897: 114, type: *Conops aeneus* Scopoli (Original designation).

Metalloeristalis Kanervo 1938: 43 (as a subgenus), type: *Conops aeneus* Scopoli (Original designation).

Oreristalis Séguy 1951: 16. *Nomen nudum*.

Note: *Eristalis polychromata* Brunetti (1923, *Eristalis*), listed as an unplaced species of *Eristalis* (Knutson et al. 1975), is a species of *Eristalinus* (*Eristalinus*).

Eristalodes. Palaearctic, Afrotropical, Oriental; introduced into USA and Chile; 13 species.

Eristalodes Mik 1897: 114, type: *Eristalis taeniopus* Wiedemann (original designation).

Helophilina. Afrotropical; 1 species.

Helophilina Becker 1922: 68, type: *Helophilina taeniaticeps* Becker (Monotypy) = *smaragdinus* Macquart.

Sarnia Curran 1927: 73, type: *Eristalis smaragdinus* Macquart (Original designation).

Merodonoides. Afrotropical, Oriental; 5 species.

Merodonoides Curran 1931b: 333, type: *Merodonoides circularis* Curran (Original designation) = *multifarius* Walker.

Velocimyia Hull 1937: 13, type: *Velocimyia velox* Hull (Original designation) = *abdominalis* Hervé-Bazin.

Pseudomeromacrus Li 1994: 146, type: *Pseudomeromacrus setipenitus* Li (Original designation) = *multifarius* Walker. **Syn. nov.**

Eristalis. All regions; 99 species.

Eoseristalis. Holarctic, Neotropical, Afrotropical, Oriental; 97 species.

Eoseristalis Kanervo 1938: 40, type: *Eristalis cerealis* Fabricius (Original designation).

Cryptoeristalis Kuznetsov 1994: 231, type: *Musca oestracea* Linnaeus (Original designation).

Syn. nov.

Notes: *Cryptoeristalis* is group established for those species of *Eristalis* which are bumble-bee mimics (long-pilose species) and, hence, is not recognized. *Eristalis simulata* Brunetti (1923, *Eristalis*) is a synonym of *Eristalis (Eoseristalis) curvipes* (Schiner).

Eristalis. Palaearctic, Afrotropical and Oriental; introduced into Nearctic, Neotropical, Australian; 2 species.

Tubifera Meigen 1800: 34, type: *Musca tenax* Linnaeus (Subsequent designation by Coquillett 1910: 618).

Elophilus Meigen 1803: 274, type: *Musca tenax* Linnaeus (Subsequent designation by Latreille 1810: 443).

Helophilus Leach 1817: 159, emendation of *Elophilus*.

Eristalis Latreille 1804: 194, type: *Musca tenax* Linnaeus (Subsequent designation by Curtis 1832: 432).

Cristalis Wiedemann 1828: x, misspelling.

Eristaloides Rondani 1845: 453, type: *Musca tenax* Linnaeus (Subsequent designation by Coquillett 1910: 540).

Eristalomya Rondani 1857: 40, type: *Musca tenax* Linnaeus (Original designation).

Eriops Lioy 1864: 743, type: *Musca tenax* Linnaeus (Subsequent designation by Goffe 1946: 29).

Eristalomyia Scudder 1882: 127, emendation of *Eristalomya*.

Keda. Oriental to New Guinea; 1 species

Keda Curran 1931a: 331, type: *Eristalis simpliciceps* Meijere (Original designation) = *conclusa* Walker).

Kertesziomyia. East Palaearctic, Oriental to New Guinea; 14 species.

Pseuderistalis Shiraki 1930: 148 (as a subgenus), type: *Pseuderistalis bicolor* Shiraki (Original

designation).

Kertesziomyia Shiraki 1930: 151, type: *Eristalis violascens* Kertész (Original designation).

Paramesembrius Shiraki 1930: 176 (as a subgenus), type: *Tubifera abdominalis* Sack (subsequent designation of Shiraki 1969: 227). **Syn. nov.**

Klossia Curran 1931b: 370, type: *Klossia dimidiata* Curran (Original designation) = *singularis* Walker. **Syn. nov.**

Kertesziomyia Neave 1939: 825, misspelling.

Catacores Hull 1944: 205, type: *Axona cyanea* Brunetti (Original designation). **Syn. nov.**

Notes: The genus *Kertesziomyia* (previously as *Pseuderistalis*) is well defined by having a postalar pile tuft but lacking the pile on posterior portions of the anepimeron and having no pattern on the eyes (as in *Eristalinus*, the only other genus with a postalar pile tuft). *Kertesziomyia* probably should be broken up into a number of subgenera, but this is left to other workers. Here I note only that *Kertesziomyia*, *Pseuderistalis*, *Paramesembrius*, and *Klossia* all fit our definition of *Kertesziomyia*, and therefore, are regarded as new synonyms. As *Kertesziomyia* was proposed as a genus and both *Pseuderistalis* and *Paramesembrius* as subgenera, the name *Kertesziomyia* must be used as the senior name for the enlarged group.

The species which I include in *Kertesziomyia* are: 1) Those previously listed in *Pseu-doeristalis* (see Knutson et al. 1975: 358; Thompson & Vockeroth 1989: 451-452); and 2) *aeneicincta* Meijere (1929, *Eristalis*), *distincta* Meijere (1913, *Eristalis*), *formosana* Shiraki (1930, *Eristalis*), *neptuna* Meijere (1911, *Eristalis*), *penangensis* Curran (1931b, *Eristalis*) and *perakensis* Curran (1928, *Eristalis*). These are represent new nomenclatural combinations.

The types of *Eristalis aeneicinctus* Meijere (1929: 380) were studied and a male from Buru has been labeled as lectotype to fixed and stabilize the concept of this species. The label data for the lectotype are: "Buru 1921 / Station 1 / leg. J. Toxopeus / 300 M / 8 - III," "Eristalis / aeneicinctus / det. de Meijere. / Type [in Meijere's hand except last line]. The lectotype is deposited in Zoölogisch Museum, Amsterdam (ZMAN).

Lycastirrhyncha. Neotropical; 5 species.

Lycastirrhyncha Bigot 1859: 307, type: *Lycastirrhyncha nitens* Bigot (Monotypy).

Licastrirrhyncha Williston 1908: 256, misspelling.

Lycastirrhyncha Curran 1934: 264, misspelling.

Meromacroides. Afrotropical; 1 species

Meromacroides Curran 1927: 69, type: *Eristalis meromacriiformis* Bezzi (Original designation).

Meromacrus. Southern Nearctic, Neotropical; 43 species

Plagiocera Macquart 1842: 119, type: *Milesia cruciger* Wiedemann (Original designation) = *acutus* Fabricius. Preoccupied by Klug 1834 (Hymenoptera).

Meromacrus Rondani 1848: 70, type: *Meromacrus ghiliani* Rondani (Monotypy).

Pteroptila Loew 1866: 165, type: *Pteroptila decora* Loew (Subsequent designation by Coquil-

lett 1910: 598).

Plagiacera Stahl 1883: 97, misspelling.

Pteroptilia Bigot 1883: 224, misspelling.

Promilesia Lynch Arribalzaga 1892: 241, type: *Promilesia nectarinoides* Lynch Arribalzaga (Monotypy).

Metameromacrus Hull 1942: 1, *nomen nudum*.

Thalamopales Hull 1949: 401, type: *Helophilus scitus* Walker (Original designation).

Palpada. Southern Nearctic, Neotropical; 85 species.

Palpada Macquart 1834: 512, type: *Palpada scutellata* Macquart (Monotypy) = *scutellaris* Fabricius.

Doliosyrphus Bigot 1882: 120, type: *Doliosyrphus scutellatus* Bigot (Subsequent designation by Williston 1887: 178).

Dolyosyrphus Bigot 1883: 228, misspelling.

Phytomia. Eastern Palaearctic, Afrotropical, Oriental to New Guinea; 15 species.

Pachycephalus Wiedemann 1830: 152, type: *Eristalis chrysopygus* Wiedemann (Subsequent designation by Knutson, et al. 1975: 356). Preoccupied Stephens 1826.

Phytomia Guerin-Meneville 1833: 509, type: *Eristalis chrysopygus* Wiedemann (Monotypy).

Phytomyia Scudder 1882: 263, emendation for *Phytomia*.

Phytomyia Kertész 1910: 244, emendation for *Phytomia*.

Megaspis Macquart 1842: 87, type: *Eristalis chrysopygus* Wiedemann (Original designation).

Dolichomerus Macquart 1850: 436, type: *Syrphus crassus* Fabricius (Original designation).

Streblia Enderlein 1938: 237, type: *Eristalis natalensis* Macquart (Original designation).

Senaspis. Afrotropical; 14 species.

Senaspis Macquart 1850: 437, type: *Senaspis flaviceps* Macquart (Original designation).

Protylocera Bezzi 1912: 415, new name for *Senaspis*.

Triatylosus Hull 1949: 398, type: *Xylota dibaphus* Walker (Original designation).

Simoides. Afrotropical; 7 species.

Simoides Loew 1858: 382, type: *Eristalis crassipes* Fabricius (Subsequent designation by Hull 1949: 399).

Simioides Hull, 1949: 399, misspelling.

Note: The valid name of the type species of *Simoides* is incorrectly given as *pachymera* Wiedemann by various authors (Curran 1939: 10; Smith & Vockeroth 1980: 506 & Peck 1988: 193). The valid name is *Simoides crassipes* (Fabricius). Wiedemann (1830: 171) selected *Eristalis crassipes* Fabricius (1805: 237) as senior to *Merodon crassipes* Fabricius (1805: 196) when he considered both names to apply to species of *Eristalis* and renamed *Merodon crassipes* as *Eristalis pachypus* (now *Meromacrus pachypus*).

Solenaspis. Oriental to New Guinea; 1 species.

Solenaspis Osten Sacken 1881: 442, type: *Solenaspis beccarii* Osten Sacken (Monotypy) = *nitens* Bigot.

"*Eristalis*" *dasyops* group

Note: This group consists of *apis* Curran (1939, *Eristalis*), *dasyops* Wiedemann (1819, *Eristalis*), *plumipes* Bezzi (1912, *Eristalis*), and *pallidibasis* Bigot (1891, *Simoides*).

"*Senaspis*" *apophysata* group

Note: Bezzi (1915: 64) noted that his *Protylocera apophysata* did not fit *Senaspis*, but required a new genus. Again I leave this action to Kassebeer.

Acknowledgements

I thank David Yeates and Peter Cranston, CSIRO Entomology, Canberra (Australian National Insect Collection, ANIC); Neal L. Evenhuis, Bishop Museum, Honolulu (BPBM); David Grimaldi, American Museum of Natural History, New York (AMNH); Herman de Jong, Zoölogisch Museum, University of Amsterdam, Amsterdam (ZMAN); Richard Vane-Wright, The Natural History Museum, London (formerly the British Museum (Natural History) (BMNH)); J. M. Cummings and J. R. Vockeroth, Canadian National Collection, Agriculture Canada, Ottawa (CNC); Chen Young, Carnegie Museum of Natural History, Pittsburgh (CM); Marion Kotrba, formerly Zoologisches Museum, Humboldt University, Berlin (ZMHU), now Zoologische Staatssammlung, Munich; for permission to study material in their care [other collection acronyms used are USNM for United States National Museum (= the National Museum of Natural History, Washington)].

I am greatly indebted to Professor H. Don Cameron, University of Michigan, Ann Arbor, for his advice on the classical languages and confirmation of the gender of *Eristalis*. I also thank Martin Hauser, University of Illinois, Urbana; Graham Rotheray, National Museums of Scotland, Edinburgh; and Michael Schauff, Allen Norrbom, and Alma Solis, Systematic Entomology Laboratory, USDA, Washington; for their critical reviews of the manuscript.

References

- Becker, T. (1922) Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitel von F. Werner unternommenen zoologischen Expedition nach dem anglo-ägyptischen Sudan (Kordofan) 1914. VI. Diptera. *Denkschriften der Kaiserlichen Akademie der Wissenschaften, Wien*, 98[1923], 57–82. Publication date is from the separate which issued before the journal volume.
- Bergroth, E. (1894) Ueber einige australische Dipteren. *Stettiner Entomologische Zeitung*, 55, 71–75.
- Bezzi, M. (1912) Ditteri raccolti da Leonardo Fea durante il suo viaggio nell'Africa occidentale.

- Parte 1^a: Syrphidae. *Annali del Museo civico di Storia naturale di Genova*, 45, 400–443.
- Bezzi, M. (1915) *The Syrphidae of the Ethiopian region based on material in the British Museum (Natural History), with descriptions of new genera and species*. British Museum (Natural History), London, 146 pp.
- Bezzi, M. (1928) *Diptera Brachycera and Athericera of the Fiji Islands based on material in the British Museum (Natural History)*. British Museum (Natural History), London, viii + 220 pp.
- Bigot, J.M.F. (1859) Diptërorum aliquot nova genera. *Revue et Magasin de Zoologie*, (2) 11, 305–315.
- Bigot, J.M.F. (1882) Diagnoses de genres et espèces inédit de Syrphides. 2^e partie. *Annales de la Société Entomologique de France*, (6) 2 (Bulletin), cxx–cxxi.
- Bigot, J.M.F. (1883) Diptères nouveaux ou peu connus. 21^e partie, XXXII: Syrphidi (1^{re} partie). Espèces nouvelles. *Annales de la Société Entomologique de France*, (6) 3, 221–258.
- Bigot, J. M. F. (1884) Diptères nouveaux ou peu connus. 23^e partie, XXXII: Syrphidi (2^e partie). Espèces nouvelles, N^o 11. *Annales de la Société Entomologique de France*, (6) 3, 315–356.
- Bigot, J.M.F. (1891) Voyage de M. Ch. Alluaud dans le territoire d'Assinie 8^e mémoire (Afrique occidentale) en juillet et août 1886. Diptères. *Annales de la Société Entomologique de France*, 60, 365–386.
- Brown, R.W. (1956) *Composition of scientific words*. Published by Author, Baltimore, 882 pp.
- Brunetti, E. (1923) Pipunculidae, Syrphidae, Conopidae, Oestridae. Diptera. Vol. 3. In: [Shipley, A. E.] (ed.), *The Fauna of British India, including Ceylon and Burma*. Taylor & Francis, London, xi + 424 pp., 6 pls.
- Coquillett, D.W. (1910) The type-species of the North American genera of Diptera. *Proceedings of United States National Museum*, 37, 499–647.
- Curran, C.H. (1927) Diptera of the American Museum Congo Expedition. Part I. — Bibionidae, Bombyliidae, Dolichopodidae, Syrphidae, Trypaneidae. *Bulletin of the American Museum of Natural History*, 57, 33–89.
- Curran, C.H. (1928) The Syrphidae of the Malay Peninsula. *Journal of the Federate Malay States Museum*, 14, 141–324, 2 pls.
- Curran, C.H. (1931a) Additional records and descriptions of Syrphidae from the Malay Peninsula. *Journal of the Federated Malay States Museum*, 16, 290–338.
- Curran, C.H. (1931b) Records and descriptions of Syrphidae from North Borneo including Mt. Kinabalu. *Journal of the Federate Malay States Museum*, 16, 333–376.
- Curran, C.H. (1934) Diptera of Kartabo, Bartica District, British Guiana. *Bulletin of the American Museum of Natural History*, 66, 287–532.
- Curran, C.H. (1939) Records and descriptions of African Syrphidae. — IV (Diptera). *American Museum Novitates*, 1026, 1–10.
- Curran, C.H. (1947) The Syrphidae of Guadalcanal with notes on related species. *American Museum Novitates*, 1364, 1–17.
- Curtis, J. (1832) *British Entomology: Being Illustrations and Descriptions of the Genera of Insects Found in Great Britain and Ireland*. Vol. 9. Published by author, London, pls. 384–433.
- Doeschall, C.L. (1857) Tweede bijdrage tot de kennis der dipteren fauna van Nederlandsch Indië. *Natuurkundig Tijdschrift voor Nederlandsch-Indië*, 14, 377–418.
- Doeschall, C.L. (1858) Derde bijdrage tot de kennis der dipteren fauna van Nederlandsch Indië. *Natuurkundig Tijdschrift voor Nederlandsch-Indië*, 17, 73–128.
- Edwards, F.W. (1915) Report on the Diptera collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. With a section on the Asilidae by E.E. Austen. *Transactions of the Zoological Society of London*, 20, 391–424.
- Enderlein, G. (1938) Beiträge zur Kenntnis der Syrphiden. *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin*, 1937, 192–237.

- Fabricius, J.C. (1805) *Systema Antliatorum Secundum Ordines, Genera, Species Adiecta Synonymis, Locis, Observationibus, Descriptionibus*. Reichard, Brunsvigae [=Brunswick]. 373 pp., + 30 pp.
- Fallén, C.F. (1816-1817) *Syrphici Sveciae*. Pp. 1–22 [1816.06.08]; 23–62 [1817.05.17]. Lundae (= Lund).
- Ferguson, E.W. (1926) Revision of Australian Syrphidae (Diptera). Part i. *Proceeding of the Linnean Society of New South Wales*, 51, 137–183.
- Goffe, E.R. (1946) The genera in Syrphidae of Liroy, 1864 (Diptera). *Journal of the Society for British Entomology*, 3, 27–30.
- Goot, V.S. van der (1964) Fluke's catalogue of Neotropical Syrphidae (Insecta, Diptera), a critical study with an appendix on new names in Syrphidae. *Beaufortia*, 10, 212–221.
- Guérin-Méneville, F.E. [1833] Insectes. In: Bélanger, C., *Voyage aux Indes-Orientales, par le nord de l'Europe, les provinces de Caucase, la Géorgie, l'Arménie et la Perse, suivi de détails topographiques, statistiques et autres sur le Pégou, les îles de Java, de Maurice et de Bourbon, sur le Cap-de-Bonne Espérance et Saint-Hélène, pendant les années 1825, 1826, 1827, 1828 et 1829, publié sous les auspices de LL. EE. MM. les Ministres de la Marine et de l'Intérieur*. (Zool.). H. Bertrand, Paris, p. 441–512.
- Hippa, H., Nielsen, T.R. & Steenis, J. van. (2001) The West Palaearctic species of the genus *Eristalis* Latreille (Diptera, Syrphidae). *Norwegian Journal of Entomology*, 48, 289–327.
- Hull, F.M. (1925) A review of the genus *Eristalis*. *Ohio Journal of Science*, 15, 11–43 [Part 1], 285–310 [Part 2].
- Hull, F.M. (1937) New species of exotic syrphid flies. *Psyche*, 44, 12–32.
- Hull, F.M. (1942) The flies of the genus *Meromacrus*. *American Museum Novitates*, 1200, 1–19.
- Hull, F.M. (1944) Some flies of the family Syrphidae in the British Museum (Natural History). *Annals and Magazine of Natural History*, (11) 11, 21–61.
- Hull, F.M. (1945) New syrphid flies. *Entomological News*, 56, 182–187, 210–217.
- Hull, F.M. (1949) The morphology and inter-relationship of the genera of syrphid flies, recent and fossil. *Transaction of the Zoological Society*, 26, 257–408.
- International Commission on Zoological Nomenclature. (1993) Opinion 1747. *Eristalis* Latreille, 1804, *Helophilus* Fabricius, 1805, *Xylota* Meigen, 1822 and *Eumerus* Meigen, 1822 (Insecta, Diptera): conserved. *Bulletin of Zoological Nomenclature*, 50, 256–258.
- International Commission on Zoological Nomenclature. (1999) *International Code of Zoological Nomenclature*. 4th Edition. International Commission on Zoological Nomenclature, London, xxx + 306 pp.
- Kanervo, E. (1938) Zur Systematik und Phylogenie der westpaläarktischen *Eristalis*-Arten (Dipt. Syrphidae) mit einer Revision derjenigen Finnlands. *Annales Universitatis Turkuensis* (A), 6(4), 1–54.
- Klug, J.C. (1834) Uebersicht der Tenthredineten der Sammlung. *Jahrbücher der Insectenkunde, mit besonderer Rücksicht auf die Sammlung im Königl. Museum zu Berlin*, 1, 223–253, pl. 2, figs 5–10.
- Kuznetzov, S. (1994) *Cryptoeristalis*, a new subgenus of *Eoseristalis* Latreille (Diptera: Syrphidae), with a description of a new species from Caucasus. *Dipterological Research*, 5, 231–238.
- Kertész, K. (1910) *Catalogus dipterorum hucusque descriptorum*. Vol. 7. Lipsiae, Budapestini (= Leipzig, Budapest), 470 pp.
- Knutson, L.V., Thompson, F.C. & Vockeroth, J.R. (1975) Family Syrphidae. In: Delfinado, M.D. & Hardy, D.E. (eds.) *A Catalog of the Diptera of the Oriental Region*. Vol. II. Suborder Brachycera through division Aschiza, suborder Cyclorrhapha. University of Hawaii Press, Honolulu, pp. 307–374.
- Latreille, P.A. (1804) Tableau méthodique des Insectes. In: *Nouveau dictionnaire d'histoire*

- naturelle, appliqué aux arts, principalement à l'économie rurale et domestique*. Vol. 24: Tableaux méthodiques d'histoire naturelle. Déterville, Paris, pp. 129–200.
- Latreille, P.A. (1810) *Considérations générales sur l'ordre naturel des animaux composant les classes des Crustacés, des Arachnides, et des Insectes; avec un tableau méthodique de leurs genres, disposés en familles*. Schoell. Paris, 444 pp.
- Leach, W.E. (1817) Insecta. In Brewster, D. (ed.), *The Edinburgh Encyclopedia*. Vol. 12, part 1. ILE–JUD. Baldwin, Edinburgh, pp. 155–164.
- Lewis, C.T. & Short, C. (1879) *Harpers' Latin Dictionary*. A new Latin Dictionary found on the translation of Freund's Latin=German Lexicon edited by E. A. Andrews, LL.D. Revised, enlarged, and in great part rewritten. Harper & Brothers, New York, xiii + 2,019 pp.
- Li Q. (1994) Notes on a new genus and species of Syrphidae from China (Insecta: Diptera). *Entomologia Sinica*, 1, 146–149.
- Lioy, P. (1864) I ditteri distribuiti secondo un nuovo metodo di classificazione naturale. *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti*, (3) 9, 719–771.
- Loew, H. (1858) Bidrag till kännedomen om Afrikas Diptera [part]. *Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar, Stockholm*, 14[1857], 337–383.
- Loew, H. (1866) Diptera Americae septentrionalis indigena.—Centuria sexta. *Berliner Entomologische Zeitschrift*, 9[1865], 127–186.
- Lynch Arribáizaga, F. (1892) Dipterologia Argentina (Syrphidae) [part]. *Anales de la Sociedad científica Argentina*, 33, 236–253.
- Macquart, J. (1834) *Histoire naturelle des insectes. Diptères. Tome première*. Ouvrage accompagné de planches. Roret, Paris, 578 pp.
- Macquart, J. (1842) Diptères exotiques nouveaux au peu connus. Tome deuxième.—2^e partie. *Mémoires de la Société (Royale) des Sciences, de l'Agriculture et des Arts, Lille*, 1841(1), 65–200. [Reprinted separately with pagination 5–140, Roret, Paris, 1842.]
- Macquart, J. (1846) Diptères exotiques nouveaux ou peu connus. Supplément. [1]. *Mémoires de la Société (Royale) des Sciences, de l'Agriculture et des Arts, Lille*, 1844, 133–364, 20 pls.
- Macquart, J. (1850) Diptères exotiques nouveaux ou peu connus. 4.^e supplément. *Mémoires de la Société (Royale) des Sciences, de l'Agriculture et des Arts, Lille*, 1849, 309–479. [Reprinted with pagination 5–161, Roret, Paris.]
- Meigen, J.W. (1800) *Nouvelle classification des mouches à deux ailes (Diptera L.) d'après un plan tout nouveau*. Perronneau, Paris, 40 pp.
- Meigen, J.W. (1803) Versuch einer neuen Gattungs-Eintheilung der europäischen zweiflügeligen Insekten. *Magazin für Insektenkunde*, 2, 259–281.
- Meigen, J.W. (1822) *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten*, Vol. 3. Schultz, Hamm, pp. 155–164.
- Meijere, J.C.H. de (1906) Diptera. Résultats de l'Expédition Scientifique Néerlandaise à la Nouvelle-Guinée en 1903 sous les auspices de Arthur Wichmann. *Nova Guinea*, 5, 67–99.
- Meijere, J.C.H. de (1908) Studien über südostasiatische Dipteren. III. *Tijdschrift voor Entomologie*, 51, 191–332.
- Meijere, J.C.H. de (1911) Studien über südostasiatische Dipteren. VI. *Tijdschrift voor Entomologie*, 54, 258–432.
- Meijere, J.C.H. de (1913) Diptera. I. Résultats de l'Expédition Scientifique Néerlandaise à la Nouvelle-Guinée en 1907 et 1909 sous les auspices de Dr. H.A. Lorentz. *Nova Guinea*, 9, 305–386.
- Meijere, J.C.H. de (1929) Fauna Buruana. Syrphiden nebst einigen Brachyceren Orthorrhaphen. *Treubia*, 7, 378–387.
- Mik, J. (1897) Einige Bemerkungen zur Dipteren-Familie der Syrphiden [concl.]. *Wiener Entomologische Zeitung*, 16, 113–119.
- Neave, S.A. (1939) *Nomenclator Zoologicus*. Vol. II. D–L. Zoological Society of London, London, 1,025 pp.

- Osten Sacken, C. R. von der (1881) Enumeration of the Diptera of the Malay Archipelago collected by Prof. Odoardo Beccari, Mr. L. M. d'Albertis and others. *Annali del Museo Civico di Storia Naturale di Genova*, 16, 393–492.
- Peck, L.V. (1988) Family Syrphidae. In: Soos, A. (Ed.), *Catalogue of Palaearctic Diptera*. Vol. 8, 363 pp. Akadémiai Kiadó, Budapest, pp. 11–230.
- Rondani, C. [1845] Ordinamento sistematico dei generi italiani degli insetti ditteri [concl.] *Nuovi Annali delle Scienze Naturlì, Bologna* (2) 2 [1844], 443–459.
- Rondani, C. (1848) Esame di varie specie d'Insetti ditteri brasiliani. *Studi Entomologici, Turin*, 1, 63–112.
- Rondani, C. (1857) *Dipterologiae Italicae prodromus*. Vol. 2: Species Italicae ordinis dipterorum in genera characteribus definita, ordinatim collectae, methodo analitica distinctae, et novis vel minus cognitis descriptis. Pars prima: Oestridae, Syrphidae, Conopidae, 264 pp., 1 fig. Stocchi, Parmae (= Parma).
- Rotheray, G. & Gilbert, F. (1999) Phylogeny of Palaearctic Syrphidae (Diptera): evidence from larval stages. *Zoological Journal of the Linnean Society, London*, 127, 1–112.
- Scudder, S.H. (1882) Nomenclator zoologicus. Part 1. Supplemental list of genera in zoology. *Bulletin of the U. S. National Museum*, 19(1), 1–367.
- Séguy, E. (1951) Trois nouveaux syrphides de Madagascar (Dipt.). *Revue française d'Entomologie*, Paris, 18, 14–18.
- Shiraki, T. (1930) Die Syrphiden des japanischen Kaiserreichs, mit Berücksichtigung benachbarter Gebiete. *Memoirs of the faculty of Science and Agriculture, Taihoku Imperial University*, 1, i–xx + 1–446.
- Shiraki, T. (1969) *Fauna Japonica*. Syrphidae (Insecta: Diptera). Vol. 2. Biogeographical Society of Japan, Tokyo, [x] + 272 pp., 47 pls.
- Shiraki, T. (1963) Diptera: Syrphidae. *Insects of Micronesia*, 13, 129–187.
- Smith, K.V.G. & Vockeroth, J.R. (1980) Family Syrphidae. In: Crosskey, R.W. (Ed.), *Catalogue of the Diptera of the Afrotropical Region*. British Museum (Natural History), London, pp. 488–510.
- Stahl, A. (1883) *Fauna de Puerto-Rico*. Clasificación sistématica de los animales que corresponden á esta fauna y catálogo del gabinet zoológica del doctor A. Stahl en Bayamón. Boletín Mercantil, Puerto Rico, 248 pp.
- Ståhls, G., Rotheray, G., Hippa, H., Muona, J. & Gilbert, F. (1999) On the phylogeny of hoverflies (Diptera, Syrphidae) using molecular and morphological characters. In: Ståhls, G. (Ed.) *Systematics of Syrphidae and taxonomy of Cheilosia (Diptera): morphological and molecular evidence*. Helsinki, pp. 1–68.
- Thompson, F.C. (1972) A contribution to a generic revision of the Neotropical Milesinae (Diptera: Syrphidae). *Arquivos de Zoologia*, 23, 73–215.
- Thompson, F.C. (1981) The flower flies of the West Indies (Diptera: Syrphidae). *Memoir of the entomological Society of Washington*, 9, 1–200.
- Thompson, F.C. (1999a) Data dictionary and standards for fruit fly information database. *Myia*, 9, 49–63.
- Thompson, F.C. (1999b) A key to the genera of the flower flies (Diptera: Syrphidae) of the Neotropical Region including descriptions of new genera and species and a glossary of taxonomic terms. *Contributions on Entomology, International*, 3, 321–378.
- Thompson, F.C. & Rotheray, G. (1998) Family Syrphidae. In Papp, L. & Darva, B. (Eds.), *Contributions to a Manual of Palaearctic Diptera (with special reference to flies of economic importance)*. Vol. 3, Higher Brachycera. Science Herald, Budapest, pp. 81–139.
- Thompson, F.C., Vockeroth, J.R. & Sedman, Y.S. (1976) Family Syrphidae. *A Catalogue of the Diptera of the Americas South of the United States*, 46, 1–195.
- Thompson, F.C. & Vockeroth, J.R. (1989) Family Syrphidae. In Evenhuis, N.L. (Ed.), *Catalog of*

- the Diptera of the Australasian and Oceanian Regions. Bishop Museum Special Publication*, 86, 1–1155.
- Verrall, G. (1901) Platypezidae, Pipunculidae, and Syrphidae of Great Britain. Vol. 8. In his *British Flies*. Gurney & Jackson, London, 691 pp.
- Walker, F. (1849) *List of the Specimens of Dipterous Insects in the Collection of the British Museum*. Part III. British Museum, London. Pp. [3] + 485–687.
- Walker, F. (1852) Diptera. Part III. In: [Saunders, W.W. (ed.)], *Insecta Saundersiana: or characters of undescribed insects in the collection of William Wilson Saunders, Esq., F.R.S., F.L.S., &c.* Vol. 1. Van Voorst, London, , pp. 157–252.
- Walker, F. (1858) Catalogue of the dipterous insects collected in the Aru Islands by Mr. A.R. Wallace, with descriptions of new species [part]. *Journal and Proceedings of the Linnean Society of London, Zoology*, 3, 77–110.
- Walker, F. (1861) Catalogue of the dipterous insects collected in Batchian, Kaisaa and Makian, and at Tidon in Celebes, by Mr. A. R. Wallace, with descriptions of new species. *Journal and Proceedings of the Linnean Society of London, Zoology*, 5, 270–303.
- Walker, F. (1864) Catalogue of the dipterous insects collected at Waigiou, Mysol, and North Ceram, by Mr. A. R. Wallace, with descriptions of new species. *Journal and Proceedings of the Linnean Society of London, Zoology*, 7, 202–238.
- Wiedemann, C.R. (1819) Beschreibung neuer Zweiflügler aus Ostindien und Afrika. *Zoologisches Magazin*, Kiel, 1(3), 1–39.
- Wiedemann, C.R.W. (1828) *Aussereuropäische zweiflügelige Insekten*. Erster Theil. Schulz, Hamm. xxxii + 608 p., 7 pls.
- Wiedemann, C.R.W. (1830) *Aussereuropäische zweiflügelige Insekten*. Zweiter Theil. Schulz, Hamm. xii + 684 pp., 5 pls.
- Williston, S.W. [1887] Synopsis of the North America Syrphidae. *Bulletin of the United States National Museum*, 31[1886], i–xxx + 1–335.
- Williston, S.W. (1908) *Manual of North American Diptera*. 3rd edition. J. T. Hathaway, New Haven, 495 pp.
- Zetterstedt, J.W. (1838) Dipterologis Scandinaviae. Sect. 3: Diptera. In his *Insecta Lapponica*. Voss, Lipsiae [=Leipzig], pp. 477–868.
- Zetterstedt, J.W. (1843) *Diptera Scandinaviae. Disposita et descripta*. Vol. 2. Officina Lundbergiana, Lundae [=Lund], pp. 441–894.
- Zetterstedt, J.W. (1849) *Diptera Scandinaviae. Disposita et descripta*. Vol. 8. Officina Lundbergiana, Lundae [=Lund], pp. 2,935–3,366.
- Zetterstedt, J.W. (1859) *Diptera Scandinaviae. Disposita et descripta*. Vol. 13: Sup. 4. Officina Lundbergiana, Lundae [=Lund], pp. v–xvi + 4,943–6,190.