

**AN ANNOTATED KEY TO THE SPECIES OF
ACANTHONEVRA MACQUART AND ALLIED GENERA
(DIPTERA: TEPHRITIDAE: ACANTHONEVRINI)**

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Abstract

Indo-Australian and East Asian fruit flies referred to the *Acanthonevra* complex of genera are reviewed and keyed. Recorded host plants are bamboos. The 49 recognised species are referred to nine genera: *Acanthonevra* Macquart (3 spp), *Chaetomerella* de Meijere (1 sp.), *Erectovena* Ito (2 spp), *Freyomyia* Hardy (3 spp), *Lenitovena* Ito (5 spp), *Ptilona* van der Wulp (8 spp), *Rioxoptilona* Hendel (17 spp), *Themara* Walker (9 spp) and *Yunacantha* Chen & Zia, stat. rev. (1 sp.). Three species (*Ptilona conformis* Zia, *Rioxoptilona ochroleuca* (Hering) and *Themara yunnana* Zia) are removed from synonymy. Six new synonyms and 26 new combinations are proposed, including the transfer of *Freyomyia manto* (Osten Sacken) and *F. vinnula* (Hardy) from *Rioxa* Walker. The type locality for *Acanthonevra fuscipennis* Macquart (= *A. normaliceps* Enderlein, syn. n.) is regarded as Java, not Bengal. A note on *Phorelliosoma* Hendel (= *Staurellina* Hering, syn. n.; = *Orienticaelum* Ito, syn. n.) is included.

Introduction

Korneyev (1999) provisionally established the limits of the *Acanthonevra* group of genera and referred the included genera to two subgroups; he also noted that *Acanthonevra sens. lat.* appeared to be polyphyletic, with its component species divided between the *Acanthonevra* and *Ptilona* subgroups. My own studies support this view and suggest that the Indo-Australian genera *Acanthonevra* Macquart, *Chaetomerella* de Meijere, *Erectovena* Ito, *Lenitovena* Ito, *Ptilona* van der Wulp, *Rioxoptilona* Hendel and *Themara* Walker form a complex of closely allied genera. All have generally dark-patterned wings with hyaline or yellow indentations and discal spots and, in all but a few species, a quadrate or elongate hyaline or yellow indentation at the base of the stigma (costal part of cell sc) (Figs 1-2). I also include in this complex *Freyomyia* Hardy and *Yunacantha* Chen & Zia, with the latter removed from synonymy with *Acanthonevra*.

Korneyev (1999) also suggested a close relationship between the *Acanthonevra* complex and *Homoiothemara* Hardy, a monotypic genus from Sabah, East Malaysia; however it has a different type of wing pattern, broadly protuberant eyes in both sexes and spermathecae with apical projections and appears to belong in the *Sophira* complex of genera.

Norrbom *et al.* (1999) listed the species then included within the above genera and that list is essentially followed here. However, several taxa listed under *Acanthonevra sens. lat.* have been referred to other genera, viz. *Dirioxa incerta* (Hardy) from Indonesian West Papua (Hancock and Drew 2003), *Euphranta notabilis* (van der Wulp) from Sumatra (Hancock and Drew 2004) and *Orienticaelum parvisetalis* (Hering) from China (Wang 1998), while *Pseudacidia uncinata* Hering from central Burma is here removed from *Acanthonevra sens. lat.* and referred to the *Sophira* complex.

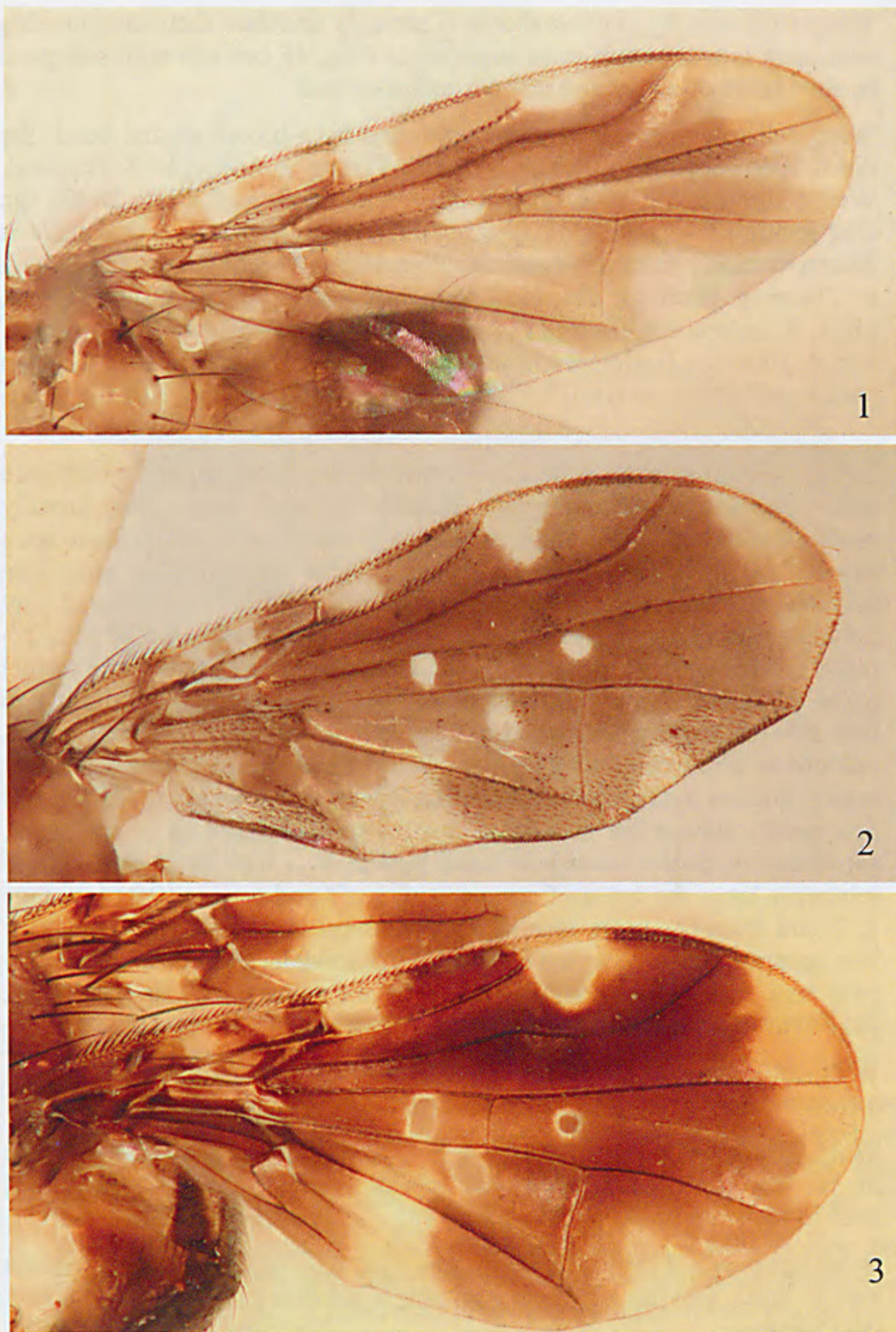
Biological information is scant. Several species of *Acanthonevra sens lat.* (*A. siamensis* Hardy, *Erectovena desperata* (Hering), *Rioxoptilona dunlopi* (van der Wulp), *R. gravelyi* (Munro), *R. hemileina* (Hering), *R. quatei* (Hardy) [as *A. ultima* Hering] and *R. vaga* (Wiedemann)) were collected resting beneath leaves of understorey plants in bamboo forests in Thailand (Hancock and Drew 1995a). One specimen of *Themara ampla* Walker and some two dozen of *T. hirtipes* (Rondani) were collected at cut bamboo shoots in Malaysia (Hancock and Drew 1994, D. Kovac and P. Dohm pers. comm.), suggesting an association with bamboo. Although several *T. hirtipes* and *T. hirsuta* (Perkins) were collected on the bark of felled trees in Sarawak (Perkins 1938), suggesting that this might be a likely host, specimens of *Sophira limbata* Enderlein [actually *S. l. borneensis* Hering] were also collected thus (Perkins 1938) and this might merely reflect an adult feeding site.

Ptilona confinis (Walker) and *P. conformis* Zia [as *P. persimilis* Hendel] were collected at cut bamboo shoots in Malaysia (Hancock and Drew 1994) and both bred from the internodes of dead bamboo culms (D. Kovac and P. Dohm pers. comm.). *Rioxoptilona dunlopi*, *R. ochropleura* (Hering) and *R. vaga* were collected at cut bamboo shoots and bred from decaying shoots in Thailand or Malaysia (Hancock and Drew 1994, 1995a), while *R. hemileina* also has been bred from dead bamboo shoots in Thailand (D. Kovac and P. Dohm pers. comm.). What appears to be *R. dunlopi* [as *Acanthonevra formosana* Enderlein] was bred from bamboo shoots, while *Ptilona persimilis* and *R. unicolor* (Shiraki) [as *R. speciosa* Hendel] were associated with bamboo in Taiwan (Yen *et al.* 1979). Identified host plants include *Bambusa vulgaris*, *Bambusa* sp. and *Dendrocalamus nudus* for *R. dunlopi* (Allwood *et al.* 1999), *Dendrocalamus giganteus* for *R. gravelyi* (Dohm *et al.* 2008), *Gigantochloa scortechinii* for *R. ochropleura* [as *Acanthonevra gravelyi*] (Dohm *et al.* 2008) and *Bambusa blumeana*, *Dendrocalamus pendulus* and *Gigantochloa scortechinii* for *R. vaga* (Permkam 2005, Dohm *et al.* 2008).

In order to aid identification of the nine genera and 49 species included in the *Acanthonevra* complex, an annotated key is provided below, updating the partial keys of Hardy (1973, 1974, 1986) and Wang (1998), wherein the taxa included here key to the genera *Acanthonevra*, *Ptilona*, *Themara*, *Freyomyia*, *Rioxa* [in part], *Sophira* [in part] and *Orienticaelum* [in part]. A major factor in the preparation of this key has been the examination of a series of syntypes of *Acanthonevra ultima* Hering in the Natural History Museum, London. Briefly described and with no published illustration (Hering 1941a), its identity has been a source of past confusion (*e.g.* Hancock and Drew 1995a).

Key to genera and species

- 1 Wing with vein R_{2+3} strongly undulate, the apex curving evenly forwards to meet costa almost at right angles (Fig. 2); cell dm with subapical hyaline spots not formed into a transverse band; male fore femur and tibia not densely setose ventrally *Acanthonevra* Macquart ... 2



Figs 1-3. *Acanthonevra fuscipennis* Macquart: wings of specimens from West Malaysia. (1) male; (2-3) females showing variation in costal cell pattern. Photographs by Scott Ginn (Australian Museum, Sydney).

- Wing with vein R_{2+3} not as above, if strongly undulate then straightening near apex to meet costa at an acute angle (Fig. 4); cell dm with subapical hyaline spots often formed into a transverse band 4
 - 2 Wing cell c with two pale spots separated by a brown medial band, the distal spot sometimes diffuse in males [Trang Province of S Thailand, West Malaysia, Sumatra, Java, Kalimantan and Brunei (Chua 2000); the type locality 'Bengale' (India) is regarded as an error, the type female is almost certainly from Java and all other Indian records appear to belong to *Themara yunnana*; *Trypeta (Acanthoneura) polyxena* Osten Sacken, 1881, *A. batata* Enderlein, 1911, *A. normaliceps* Enderlein, 1911, **syn. n.** and *A. synopica* Hering, 1952 are regarded as synonyms; this is the type species of *Acanthoneura* (Figs 1-3, with Fig. 2 most resembling the type)] *A. fuscipennis* Macquart, 1843
- [*A. fuscipennis* appears to be a very variable species: wing cell c with pale spots hyaline to yellowish and variable in size; wing apex broadly subhyaline to yellowish, often weakly so in males, with the extreme apex usually narrowly brown across apex of vein R_{4+5} and the pale area variably extending from just below apex of vein R_{2+3} to from mid way between veins R_{4+5} and M to tip of vein M; discal area usually with 2-3 large hyaline spots in cells br, r_{4+5} and dm, that in cell r_{4+5} above to just basad of DM-Cu crossvein, that in cell dm directly below or slightly to one side of R-M crossvein; spots in cell br and/or other cells often reduced or absent and with pattern often diffuse in males; cell m usually with a distinct hyaline indentation that is sometimes weak or absent; cell bcu mostly subhyaline or with subhyaline area reduced to a small spot, especially in males; costa and veins R_1 and R_{4+5} with setae distinct and relatively long; the types of *normaliceps* (♂♂) and *batata* (♀♀) (c.f. Figs 1, 3) are from the same locality (Soekaranda) in NE Sumatra; *synopica* was separated largely on the basis of its yellowish costal cells and apical pale area extending only mid way between veins R_{4+5} and M (Hering 1952) but was synonymised by Hardy (1986) and this is accepted here.]
- Wing cell c broadly pale medially, not with two pale spots separated by a brown medial band 3
 - 3 Wing apex broadly brown; discal area with 3 round hyaline spots in cells br, r_{4+5} and dm plus an additional spot at posterior apex of cell dm (at least in male) [S India; female unknown] *A. inermis* Hering, 1951
 - Wing apex with a brownish area along vein R_{4+5} crossing the subhyaline area to costa, leaving a hyaline spot above it and a subhyaline one below [N Thailand] *A. siamensis* Hardy, 1973
 - 4 Wing veins M normally and Cu_1 including basal portion always setose above; males usually with head broadened or eyes distinctly stalked; vein R_{2+3} undulate, usually strongly so *Themara* Walker ... 5

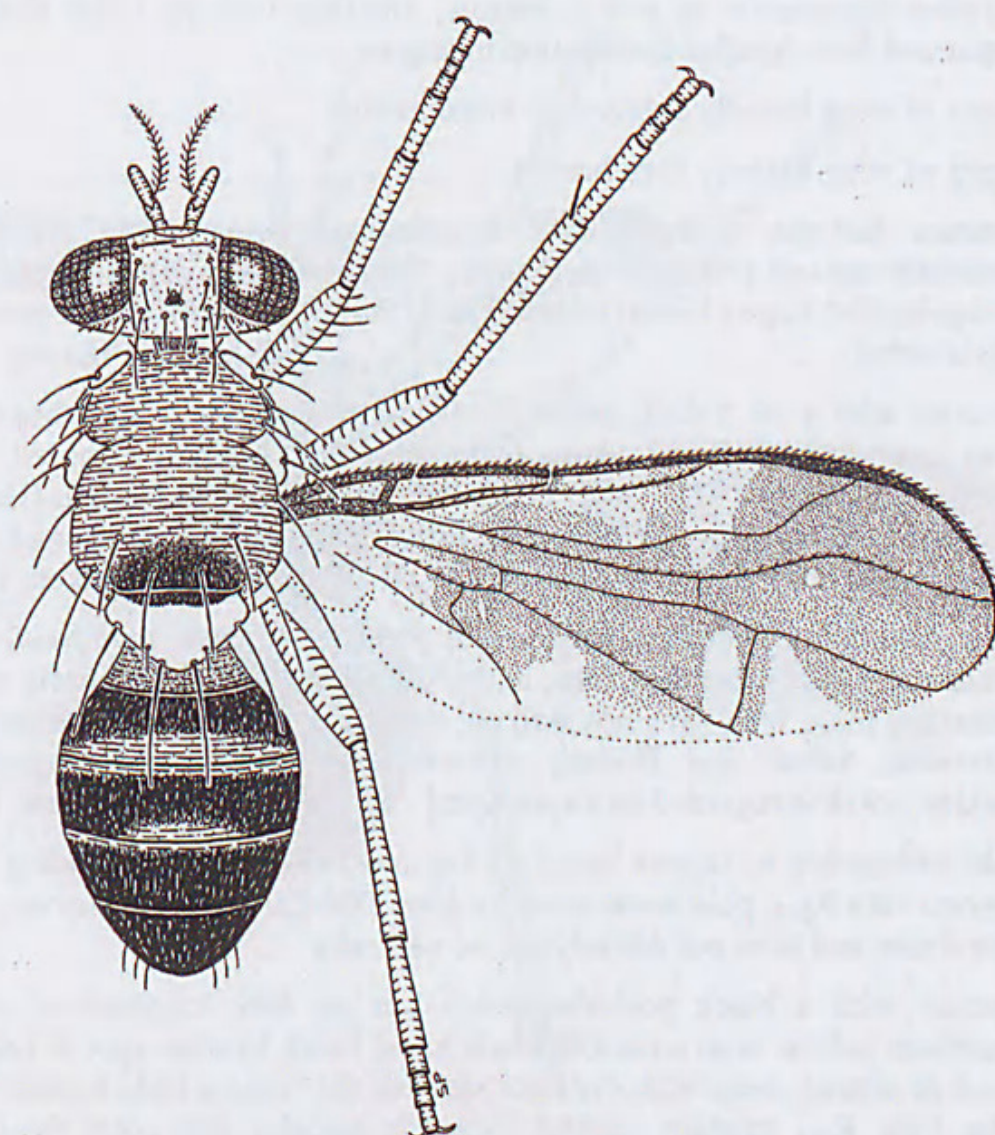


Fig. 4. *Themara ampla* Walker: male from West Malaysia.

- Wing veins M normally and Cu_1 entirely bare; males with head usually narrow and eyes not stalked; vein R_{2+3} variable in shape 13
- 5 Wing vein R_{2+3} weakly undulate; no pale indentations along costal margin but a hyaline spot in cell r_{2+3} above R-M crossvein; cell r_{4+5} with a large hyaline indentation filling most of cell [known only from Engano Island near Sumatra, Indonesia; male unknown] *T. extraria* Hering, 1952
- Wing vein R_{2+3} distinctly undulate but straightening at apex to meet costa at an acute angle; costal margin with hyaline or yellowish indentations; cell r_{4+5} at most with a small hyaline spot or patch in central region 6
- 6 Hyaline indentation in cell r_1 broad, not crossing vein R_{2+3} and united with hyaline indentation in stigma; male with eyes moderately stalked [Sumatra and associated islands] *T. jacobsoni* de Meijere, 1916

- Hyaline indentation in cell r_1 narrow, crossing vein R_{2+3} and distinctly separated from hyaline indentation in stigma 7
- 7 Apex of wing broadly subhyaline or yellowish 8
- Apex of wing entirely dark brown 9
- 8 Scutum fulvous, without dark longitudinal vittae; male with eyes distinctly stalked [Philippines (Luzon, Negros, Tawitawi); a record from Bougainville, Papua New Guinea (Hardy 1986) is doubtful and probably mislabelled] *T. lunifera* Hering, 1938
- Scutum with 4 or 5 dark longitudinal vittae; male with head broad but eyes not stalked [Philippines (Mindanao); a female recorded from Cambodia (Hardy 1973, 1974) is likely to be *Freyomyia vinnula* (Hardy); *T. ostensackeni* Hardy, 1974, **syn. n.** differs solely in the number of scutal vittae and is otherwise inseparable] *T. alkestis* (Osten Sacken, 1882)
- 9 Pale indentation in stigma narrow and confined to base; pale basal areas hyaline; DM-Cu crossvein bare; male fore femur and tibia densely setose ventrally; male with eyes not stalked, the frons slightly longer than wide [Sarawak, Sabah and Brunei; *Acanthoneura hirsuta* var. *nigrifacies* Perkins, 1938 is regarded as a synonym] *T. hirsuta* (Perkins, 1938)
- Pale indentation in stigma broad, filling most of cell and extending to or beyond vein R_{2+3} ; pale basal areas yellow; DM-Cu crossvein setose; male fore femur and tibia not densely setose ventrally 10
- 10 Scutum with a black posterior patch but no dark longitudinal vittae; scutellum yellow with a narrow black basal band; hyaline spot in cell r_{4+5} small or absent; male with eyes not stalked, the frons a little broader than long, vein R_{2+3} strongly curved forwards apically and costa thickened [West Malaysia, Singapore, Sumatra, Sarawak, Sabah and Brunei; *T. microcephala* Hering, 1939 is regarded as a synonym; this is the type species of *Themara* (Fig. 4)] *T. ampla* Walker, 1856
- Scutum with 4-5 dark longitudinal vittae; scutellum often laterally or entirely black; hyaline spot in cell r_{4+5} large and distinct; males with eyes often distinctly stalked 11
- 11 Both sexes with vein R_{2+3} undulate but not strongly curved forwards apically and costa not distinctly thickened; scutum with medial vitta present or absent; fore coxae and prosternum pale; face with a narrow dark band confined to oral margin; male eyes often very strongly stalked [SE China (Hainan), Thailand, Laos, S Burma, Sumatra, Java, Singapore, West Malaysia, Sarawak (type locality), Sabah, Brunei and Palawan; *T. enderleini* Hering, 1938, *T. palawanica* Hering, 1938 and *T. maculipennis* of Hancock and Drew 1994 are regarded either as synonyms or a misidentification (Fig. 5)] *T. hirtipes* Rondani, 1875

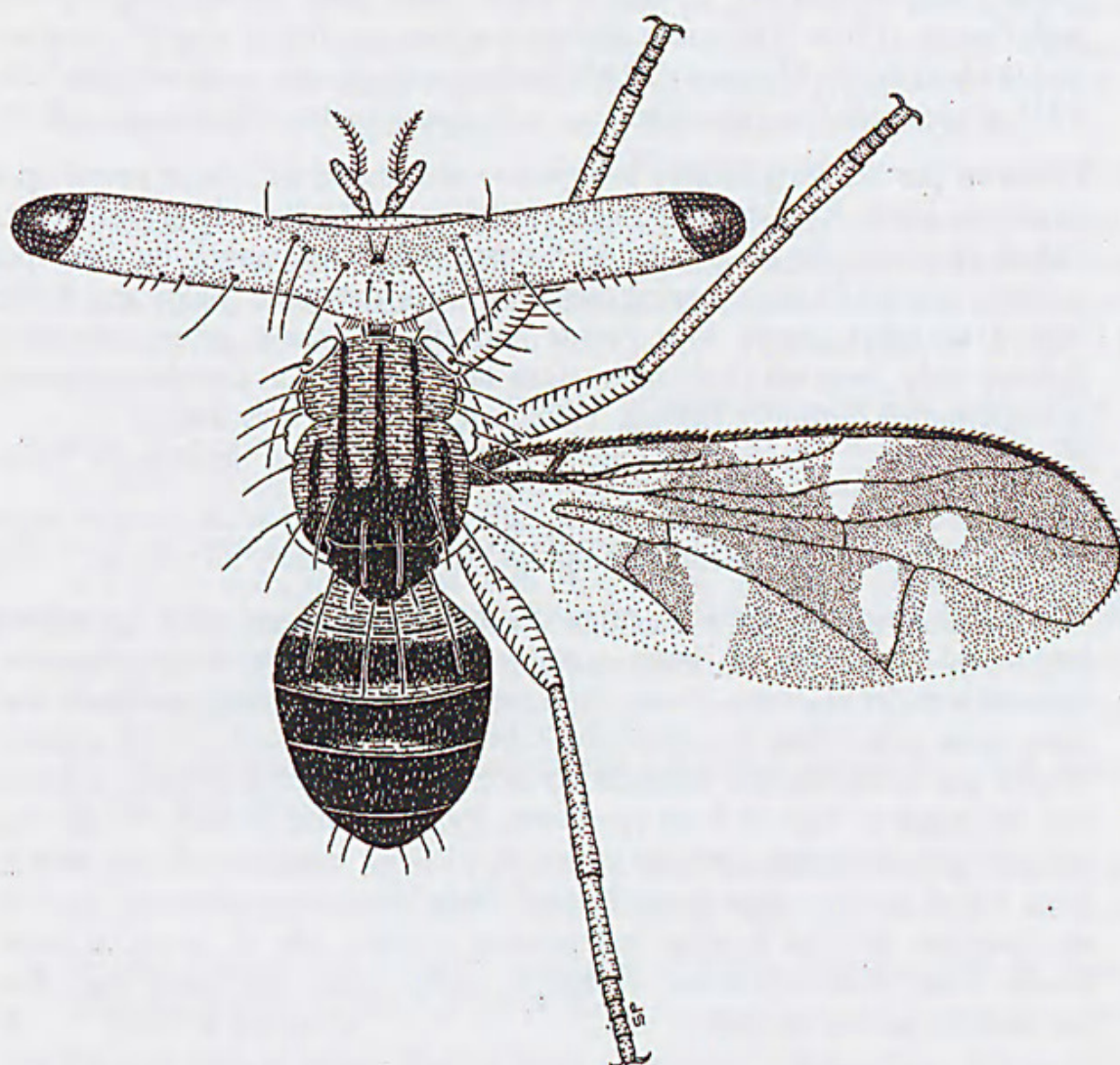


Fig. 5. *Themara hirtipes* Rondani: male from Sarawak.

- Male with vein R_{2+3} strongly curved forwards apically and costa often thickened; face either entirely pale or with the dark band reaching almost to antennae; male eyes not or less strongly stalked 12
- 12 Scutum with 4 or 5 dark vittae and pale or dark posteriorly; face pale in female, darker in male; male eyes not stalked, frons about twice as wide as long [southern China (Yunnan) and India (Assam, Bengal, Karnataka); *Acanthoneura fuscipennis* of Bezzi 1913 and *T. maculipennis* of Kapoor 1993 are regarded as misidentifications of this species, here removed from synonymy with *T. hirtipes*] *T. yunnana* Zia, 1963, **stat. rev.**
- Scutum normally with 5 dark vittae and dark posteriorly; face mostly dark; male with fore coxae and prosternum black and eyes strongly stalked [described from Java and recorded from Sumatra (Hardy 1986) and West Malaysia (Perkins 1938); records from India belong to *T. yunnana*, those from Singapore (Hardy 1986) and Sarawak (Hancock and

Drew 1994) belong to *T. hirtipes*, while those from Sabah (Hardy 1986) and Brunei (Chua 2002) are of females that are likely also *T. hirtipes*; *Achias horsfieldii* Westwood, 1850 and *Acanthoneura montina* Enderlein, 1911 are regarded as synonyms] *T. maculipennis* (Westwood, 1847)

- 13 Posterior part of wing largely subhyaline and united with large round spot in cell r_{4+5} ; vein R_{2+3} strongly undulate and curved forwards towards costa before straightening at apex to meet costa at an acute angle; hyaline spot at base of cell sc not crossing vein R_1 ; face, antennae, palpi and tibiae brown to black; male fore femur and tibia densely setose ventrally [known only from Mt Gede in western Java, Indonesia; female unknown; *Acanthoneura lieftincki* Hering, 1952 is regarded as a synonym]
..... *Chaetomerella nigrifacies* de Meijere, 1914
- Not as above; hyaline indentation in cell m not united with a single large spot in cell r_{4+5} ; face, antennae, palpi and tibiae normally all yellow ... 14
- 14 Wing with veins R_1 and R_{2+3} often distinctly bowed and with the stigma large and enclosing 2 large, narrowly separated hyaline triangular indentations from costa, if not then vein R_{2+3} moderately undulate and wing apex subhyaline to yellowish; R-M crossvein placed at outer quarter of cell dm ; outer hyaline indentation from costa directed towards apex of cell br , basal to line of R-M crossvein; hyaline band at apex of cell dm oblique and enclosing apex of vein Cu_1 to wing margin; cell r_{4+5} with a large round hyaline spot above line of DM-Cu crossvein and cell m with an elongate, oblique hyaline indentation; middle pair of scutellar setae absent; head relatively broad, at least in males; male fore femur and tibia not densely setose ventrally *Freyomyia* Hardy ... 15
- Not as above; vein R_{2+3} straight to moderately undulate; if hyaline band at apex of cell dm reaches wing margin then not enclosing apex of vein Cu_1 ; wing apex not subhyaline to yellowish; head not relatively broad 17
- 15 Wing with veins R_1 and R_{2+3} not distinctly bowed; stigma narrow and with the hyaline indentation passing through it united with the broad basal area; outer hyaline indentation from costa extending into apex of cell br ; wing apex subhyaline; scutum normally with 2 dark longitudinal vittae and a dark posterior margin [Philippines (Mindanao); female unknown; this is the type species of *Freyomyia*] *F. bivittata* Hardy, 1974
- Wing (at least in males) with veins R_1 and R_{2+3} distinctly bowed and with stigma large and enclosing 2 hyaline indentations, the inner not united with a large basal hyaline indentation through cell c ; cell br with an isolated hyaline spot near apex 16
- 16 Wing apex subhyaline (females) or yellowish (males); cell c with a hyaline apical patch separated from the medial indentation by a brown band [Philippines (Luzon, Negros, Mindanao); here transferred from *Rioxa* Walker] *F. manto* (Osten Sacken, 1882), **comb. n.**

- Wing apex yellowish (females) or brown (males); cell c with apex brown [Cambodia; here transferred from *Rioxa* Walker; a record of '*Themara alkestis*' from the same locality as the type male (Hardy 1973, 1974) is considered to be a misidentification of the female of this species]
..... *F. vinnula* (Hardy, 1973), **comb. n.**
- 17 Pleuroterga with fine, erect hairs; vein R_{2+3} straight; hyaline indentation at base of stigma often extending to vein R_{4+5} ; middle pair of scutellar setae absent; head with 1 pair of orbital setae; male fore femur and tibia densely setose ventrally *Ptilona* van der Wulp ... 18
- Pleuroterga bare; vein R_{2+3} straight or undulate; hyaline indentation at base of stigma not extending beyond vein R_1 or R_{2+3} ; middle pair of scutellar setae present; head with 2 pairs of orbital setae 25
- 18 Hyaline indentation at base of stigma ending in cell r_1 and not crossing vein R_{2+3} ; apex of cell dm with an oblique, medially constricted hyaline streak [S China (Yunnan), Thailand, Laos, West Malaysia and Brunei; *P. maligna* of Hardy 1973 is a misidentification, the species here removed from synonymy with *P. persimilis*] *P. conformis* Zia, 1965, **stat. rev.**
- Hyaline indentation at base of stigma extending to vein R_{4+5} and crossed by two dark veins 19
- 19 Hyaline indentation in cell r_1 crossing vein R_{4+5} into or across cell r_{4+5} and no isolated hyaline spot above DM-Cu crossvein 20
- Hyaline indentation in cell r_1 ending at or before vein R_{4+5} and an isolated hyaline spot above DM-Cu crossvein 22
- 20 Thorax with a lateral yellow band from postpronotal lobe across top of anepisternum to wing base; wing with hyaline indentation from cell r_1 ending before vein M and not united with large oval spot near apex of cell dm [NE Burma] *P. malaisei* Hering, 1938
- Thorax without a lateral yellow band from postpronotal lobe to wing base; wing with hyaline indentation from cell r_1 crossing vein M and united with spot or streak near apex of cell dm 21
- 21 Basal half of wing subhyaline; cell M without a large hyaline indentation; legs mostly black [Vietnam] *P. nigrifacies* Hardy, 1973
- Basal third of wing subhyaline; cell M with a large hyaline indentation; legs mostly yellow [Philippines (Mindanao)] *P. continua* Hardy, 1974
- 22 Cell dm with a round or oval hyaline spot at upper apex; cell cu_1 with a narrow and diffuse hyaline band from vein Cu_1 at middle of cell dm to wing margin at apex of vein A_1+Cu_2 23
- Cell dm with an elongate hyaline spot across all or most of apex; cell cu_1 with an isolated spot below vein Cu_1 near middle of cell dm 24

- 23 Hyaline indentation from stigma relatively broad, the spots in cells sc and r_1 rectangular, wider than long; 1 pair of frontal setae [NE India, S China, Taiwan, Philippines, Bangladesh, Burma, Thailand, Laos, Vietnam, West Malaysia, Sarawak, Brunei, Java, Kalimantan, Sulawesi and Ambon; *Themara alboguttata* Doleschall, 1858, *Trypeta basifascia* Walker, 1860, *Rioxa bimaculata* Walker, 1861, *P. brevicornis* van der Wulp, 1880, *P. nigriventris* Bezzi, 1913, *Acanthoneura melanopleura* Hering, 1951 and *P. armatipes* Hering, 1953 are regarded as synonyms; *P. brevicornis* is the type species of *Ptilona*] *P. confinis* (Walker, 1856)
- Hyaline indentation from stigma relatively narrow, the spots in cells sc and r_1 square in shape, as wide as long; 2 pairs of frontal setae [SW China (SE Xizang [Tibet])] *P. xizangensis* Wang, 1998
- 24 Cell cu_1 with a pair of distinct hyaline spots along wing margin [Taiwan] *P. persimilis* Hendel, 1915
- Cell cu_1 diffuse along wing margin, without a pair of distinct hyaline spots [NE Burma and S China; *P. maligna* Hering, 1938, **syn. n.** and *P. persimilis* of Wang 1998 are regarded respectively as a synonym and a misidentification, with *P. maligna* apparently the male] *P. dolorosa* Hering, 1938
- 25 Scutum with or without indistinct vittae, with a large black posterior patch and a black anterolateral band that includes postpronotal lobe and notopleuron; arista pubescent; vein R_{2+3} straight; hyaline indentation in cell r_1 short and triangular, not crossing cell r_{2+3} ; cells r_{4+5} and br each with a very small hyaline spot; hyaline indentations in cells m and cu_1 and band at apex of cell dm broad; middle scutellar setae well developed, about half length of apicals; abdomen largely black; male fore femur and tibia not densely setose ventrally [S China (Yunnan) and West Malaysia (Fig. 6)] *Yunacantha nigrolimbata* Chen & Zia, 1963
- Not as above; if scutum with a large black posterior patch then abdomen broadly yellow medially, hyaline indentation in cell r_1 crossing cell r_{2+3} , middle scutellar setae weak and either stigma entirely brown or cell r_{4+5} with an additional hyaline streak just distad of a large spot above DM-Cu crossvein; arista usually plumose; postpronotal lobes usually pale; vein R_{2+3} often undulate; cells dm and m with hyaline markings often narrow; male fore femur and tibia often densely setose ventrally 26
- 26 Frons with 2 pairs of distinct frontal setae; cell dm with a large rounded hyaline subapical spot placed below or very close to line of R-M crossvein; cell r_{4+5} with a large rounded hyaline spot placed above or very close to line of DM-Cu crossvein; hyaline indentation at base of stigma present but not crossing vein R_1 ; vein R_{2+3} straight; male fore femur and tibia densely setose ventrally; middle scutellar setae well developed, about half to two-thirds length of apicals *Erectovena* Ito ... 27

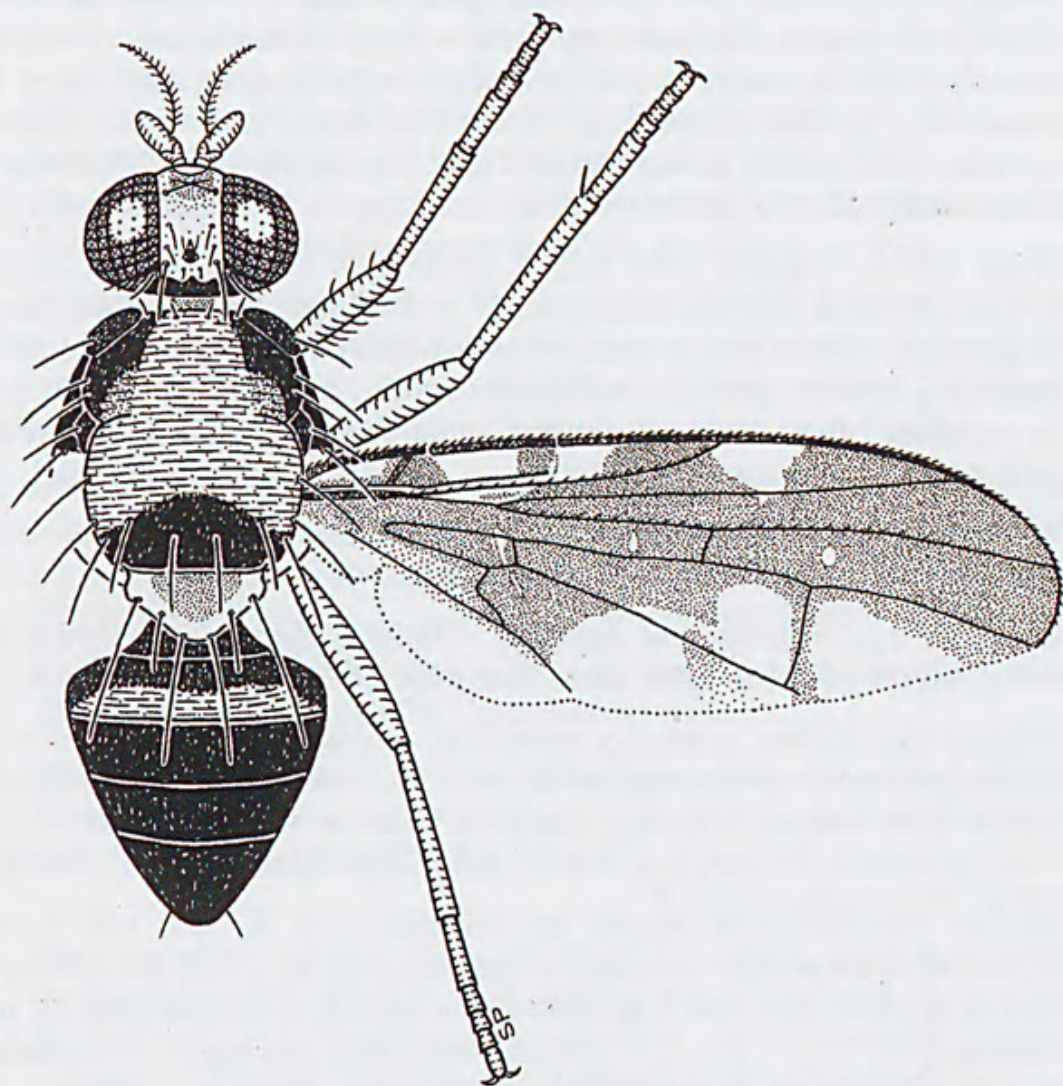


Fig. 6. *Yunacantha nigrolimbata* Chen & Zia: male from West Malaysia.

- Frons normally with 1 pair of distinct frontal setae, if with 2 distinct pairs then apex of cell dm with the hyaline spot or band placed distinctly beyond line of R-M crossvein and other characters not as above; male fore femur and tibia often without rows of dense ventral setae; middle scutellar setae often much reduced 28
- 27 Two isolated hyaline spots in cell r_{4+5} , the outer midway between inner spot and wing margin; cell br with a hyaline spot before R-M crossvein [E Russia, Japan, Korea, N & E China, Taiwan, Java (possibly introduced?); *Rioxoptilona speciosa* Hendel, 1915 (see Korneyev 1999) and *R. trigonina* Zia, 1963, **syn. n.** are regarded as synonyms; *R. speciosa* is the type species of *Erectovena*] *E. amurensis* (Portschinsky, 1892)
- Only a single hyaline spot in cell r_{4+5} ; cell br without a hyaline spot before R-M crossvein [S China (Yunnan), N Thailand, Laos, Vietnam]
..... *E. desperata* (Hering, 1939), **comb. n.**

- 28 Wing cell r_{4+5} with 2 (or 3) hyaline spots in central area beyond level of DM-Cu crossvein, the outer spot not a longitudinal streak; scutum not broadly black posteriorly; cell br with a large hyaline spot before R-M crossvein; hyaline indentation in cell m large and broad, normally expanded marginally to beyond half way to vein M; male fore femur and tibia usually densely setose ventrally *Lenitovena* Ito ... 29
- Wing cell r_{4+5} usually with only a single spot in central area above or beyond level of DM-Cu crossvein, if second spot present then this is a longitudinal streak and scutum broadly black posteriorly; cell br with or without a hyaline spot before R-M crossvein; hyaline indentation in cell m variable, often small or narrow; male fore femur and tibia with or without rows of dense ventral setae *Rioxoptilona* Hendel ... 33
- 29 Wing cell r_{2+3} with a quadrate hyaline indentation from costa below apex of vein R_{2+3} 30
- Wing cell r_{2+3} entirely dark apically, without a hyaline indentation from costa; middle scutellar setae weak, less than a third length of apicals ... 31
- 30 Hyaline indentation in stigma extending across vein R_1 into cell r_1 ; no additional hyaline spots at apices of cells r_{2+3} and r_{4+5} ; cell dm with apical hyaline band entire; vein R_{2+3} undulate [Burma; female unknown] *L. affluens* (Hering, 1951), **comb. n.**
- Hyaline indentation in stigma not crossing vein R_1 into cell r_1 ; with additional hyaline spots at apices of cells r_{2+3} and r_{4+5} ; cell dm with apical hyaline band divided into 2 isolated spots; vein R_{2+3} straight [Burma; male unknown] *L. ornatipennis* (Hering, 1951), **comb. n.**
- 31 Hyaline spots in cell r_{4+5} large, crossing or almost crossing cell, band at apex of cell dm broad and indentation in cell cu_1 not crossing into cell dm; wing base largely brown beyond base of cell c; vein R_{2+3} straight; arista pubescent; head with 2-3 pairs of weak frontal setae [Taiwan and Japan; placed in *Orienticaelum* Ito by Wang (1998) but here regarded as an aberrant species of *Lenitovena*] *L. varipes* (Chen, 1948), **comb. n.**
- Not as above; hyaline spots in cell r_{4+5} smaller, band at apex of cell dm narrow, often divided medially and indentation in cell cu_1 crossing into cell dm; arista plumose; normally only 1 pair of frontal setae 32
- 32 Vein R_{2+3} moderately undulate; wing base largely dark beyond base of cell c [E Russia, Japan, Korea, N China; the wing pattern is a little variable (Korneyev 1990) and *Acanthoneura trigona sinica* Zia, 1938 is regarded as a synonym; this is the type species of *Lenitovena*] *L. trigona* (Matsumura, 1905)
- Vein R_{2+3} straight; wing base hyaline to near apex of cell c [NE Burma] *L. ultima* (Hering, 1941), **comb. n.**

- 33 Wing with either stigma entirely brown or cell r_{4+5} with a hyaline streak just beyond the spot above DM-Cu crossvein; hyaline indentation in cell r_1 often crossing cell r_{4+5} and joining the subapical spot in cell dm; cell br without a spot before R-M crossvein; vein R_{2+3} straight; scutum with a large black posterior patch projecting anteriorly at least as postsutural vittae to level of notopleural calli; abdomen broadly yellow medially, black laterally; male fore femur and tibia not densely setose 34
- Not as above; wing with a hyaline or yellowish indentation at base of stigma; cell r_{4+5} with at most a single spot above or beyond DM-Cu crossvein; vein R_{2+3} often undulate; scutum without a large black posterior patch; abdomen largely black or transversely banded 36
- 34 Hyaline spot at base of stigma absent and no additional hyaline streak in cell r_{4+5} ; scutum with complete dark submedial vittae [West Malaysia, Sarawak, Sabah, Brunei; *Sophira* sp. near *concinna* of Hardy (1988: 114) also belongs here] *R. shinonagai* (Hardy, 1986), **comb. n.**
- Hyaline spot at base of stigma present; cell r_{4+5} with a hyaline streak just beyond the spot above DM-Cu crossvein 35
- 35 Hyaline indentation in cell r_1 extending across wing and united with hyaline band at apex of cell dm; scutum without dark submedial vittae; arista bare in apical half [S Burma and N Thailand; female unknown] *R. soluta* (Bezzi, 1913), **comb. n.**
- Hyaline indentation in cell r_1 not crossing vein R_{4+5} and not united with hyaline band at apex of cell dm although that band slightly overlaps vein M into cell R_{4+5} ; scutum with complete dark submedial vittae; arista pubescent in apical half [central Thailand; male unknown; this is possibly the female of *R. soluta*] *R. marginata* (Hardy, 1973), **comb. n.**
- 36 Wing distinctly narrow and elongate, vein R_{2+3} straight; hyaline indentations in cell c, stigma and cell r_1 broad and confined to cells; pattern dimidiate, brown to black from base to apex anteriorly and without hyaline spots in cells br and r_{4+5} , broadly hyaline without dark bands or patches posteriorly and including almost all of cell m; male fore femur with long, whitish cilia in addition to dense black setae; middle scutellar setae well developed [India, S China (Yunnan), Thailand, Vietnam, West Malaysia] *R. hemileina* (Hering, 1939), **comb. n.**
- Wing shape and pattern not as above, the posterior part of wing always with dark bands or patches intersecting it; hyaline indentation in cell r_1 often crossing vein R_{2+3} ; fore femur without long, whitish cilia 37
- 37 Hyaline indentation at base of stigma extending distinctly across cell r_1 to vein R_{2+3} 38
- Hyaline indentation at base of stigma confined to stigma, forming no more than a quadrate basal spot 43

- 38 Cell br with a hyaline spot before R-M crossvein; vein R_{2+3} straight to weakly curved 39
- Cell br without a hyaline spot before R-M crossvein; vein R_{2+3} weakly to distinctly undulate 40
- 39 Frons with 1 pair of frontal setae; middle scutellar setae very weak, less than a third length of apicals; scutum often darkened medially but without distinct postsutural dark vittae [NE India, S China (Yunnan), Bangladesh, Burma, Thailand, West Malaysia, Sumatra, Java; records of *Acanthonevra formosana* bred from bamboo in Taiwan (Yen *et al.* 1979) appear to belong here] *R. dunlopi* (van der Wulp, 1880), **comb. n.**
- Frons with 2 pairs of frontal setae; middle scutellar setae about half length of apicals; scutum with 5 dark postsutural vittae [Taiwan; records of *R. speciosa* associated with bamboo in Taiwan (Yen *et al.* 1979) appear to be this species] *R. unicolor* (Shiraki, 1933), **comb. n.**
- 40 Hyaline indentations in stigma and cell r_1 broad, separated by a brown band much narrower than either indentation; cell m almost entirely hyaline, the indentation reaching almost to vein M throughout its length [known only from Sumbawa, Indonesia; male unknown] *R. sumbawana* (Hering, 1941), **comb. n.**
- Hyaline indentations in stigma and cell r_1 separated by a brown band at least as wide as either indentation; cell m with hyaline indentation well separated from vein M over most of its length 41
- 41 Hyaline indentation across stigma+cell r_1 in each cell quadrate or narrow, not longer than wide and often yellowish; subscutellum and mediotergite yellow; male with fore femur and tibia not densely setose [S India] *R. imparata* (Hering, 1951), **comb. n.**
- Hyaline indentation across stigma+cell r_1 in each cell rectangular, longer than wide; subscutellum and mediotergite at least laterally red-brown to blackish-brown; male with fore femur and tibia densely setose 42
- 42 Hyaline indentation in stigma at least as broad as the band separating it from the indentation in cell r_1 ; middle scutellar setae a third to a half length of apicals; male fore femur swollen and with a row of short, black ventral setae [NE India, N Burma, N Thailand, Laos, Vietnam; previously confused with *R. ochropleura* and records from Malaysia and Indonesia refer to the latter species] *R. gravelyi* (Munro, 1935), **comb. n.**
- Hyaline indentation in stigma narrower than the band separating it from the indentation in cell r_1 ; middle scutellar setae very thin, about a fifth to a third length of apicals; male fore femur slender and without a row of short, black ventral setae in addition to the other rows [?Burma, West Malaysia, Sarawak, Sabah, Kalimantan, Java, Sumatra, Mentawai Is; the holotype was described from 'Burma' (Hering 1951) but was later stated

- to be from 'Java' (Hardy 1986) or Kambaiti in NE Burma (Norrbon *et al.* 1999) and is possibly mislabelled; it is here removed from synonymy with *R. gravelyi*] *R. ochropleura* (Hering, 1951), **stat. rev., comb. n.**
- 43 Vein R_{2+3} distinctly undulate; middle scutellar setae rudimentary, hair-like and less than a quarter length of apicals 44
- Vein R_{2+3} straight or slightly curved but not undulate; middle scutellar setae generally distinct, usually more than a third length of apicals 47
- 44 Hyaline spot in cell r_{4+5} placed above line of DM-Cu crossvein; spot in cell br before R-M crossvein present or absent 45
- Hyaline spot in cell r_{4+5} placed distinctly beyond line of DM-Cu crossvein; spot in cell br before R-M crossvein present 46
- 45 Hyaline indentation in cell r_1 not reaching vein R_{4+5} ; cell br without a hyaline spot before R-M crossvein [known with certainty only from the Moluccan island of Seram in Indonesia; records from Sabah, East Malaysia (see Hardy 1986) appear to belong to *R. continua*, as does Fig. 9a in Hardy 1986] *R. ceramensis* (de Meijere, 1913), **comb. n.**
- Hyaline indentation in cell r_1 extending to or across vein R_{4+5} and of roughly uniform width, not distinctly triangular and sometimes weakly united with spot near apex of cell dm; cell br often with a hyaline spot before R-M crossvein [Sabah] *R. continua* (Hardy, 1986), **comb. n.**
- 46 Hyaline indentation in cell r_1 extending into cell r_{2+3} but not reaching vein R_{4+5} and broadly triangular [E Russia, China, Korea, Japan, Ryukyu Islands, Taiwan, NE India, N Burma, N Thailand, Laos, Vietnam; *Acanthoneura pteropleuralis* Hendel, 1927, *A. melanostoma* Hering, 1941, **syn. n.** and *A. amamioshimaensis* Shiraki, 1968 are regarded as synonyms; the type of *A. melanostoma* has vein R_{2+3} undulate (Hering 1941b)] *R. formosana* (Enderlein, 1911), **comb. n.**
- Hyaline indentation in cell r_1 reaching vein R_{4+5} and narrowly triangular [Philippines (Mindanao)] *R. setosifemora* (Hardy, 1974), **comb. n.**
- 47 Head with 1 pair of frontal setae; scutum without dark vittae; cell dm with a round, medially placed subapical spot, sometimes absent; DM-Cu crossvein and/or apex of vein Cu_1 lying in a paler band; posterior hyaline indentation in cell cu_1 C-shaped and not extending across vein Cu_1 into cell dm [NE India, S China (Yunnan), Burma, Thailand, Vietnam, West Malaysia; *Trypeta mutyca* Walker, 1849, *Rioxa vidua* Bezzi, 1913, **syn. n.** and *Acanthoneura robusta* Zia, 1963 are regarded as synonyms; this is the type species of *Rioxoptilona*] *R. vaga* (Wiedemann, 1830)
- Head with 2 pairs of frontal setae, the lower pair often weak; scutum with 5 dark vittae; cell dm with an elongate subapical spot or band; DM-Cu crossvein and apex of vein Cu_1 not lying in a paler band 48

- 48 Cell dm with an elongate subapical band extending diffusely across vein Cu_1 to hind margin of wing; male fore femur and tibia not densely setose [SE China (Hainan), N Thailand and Vietnam; *Acanthonevra ultima* of Hancock and Drew 1995a and *A. unicolor* of Wang 1998 are regarded as misidentifications (Fig. 7)] *R. quatei* (Hardy, 1973), **comb. n.**
- Cell dm with an isolated subapical spot not crossing vein Cu_1 ; male fore femur and tibia densely setose [Borneo (Kalimantan, Sarawak and Sabah)] *R. scutellopunctata* (Hering, 1952), **comb. n.**

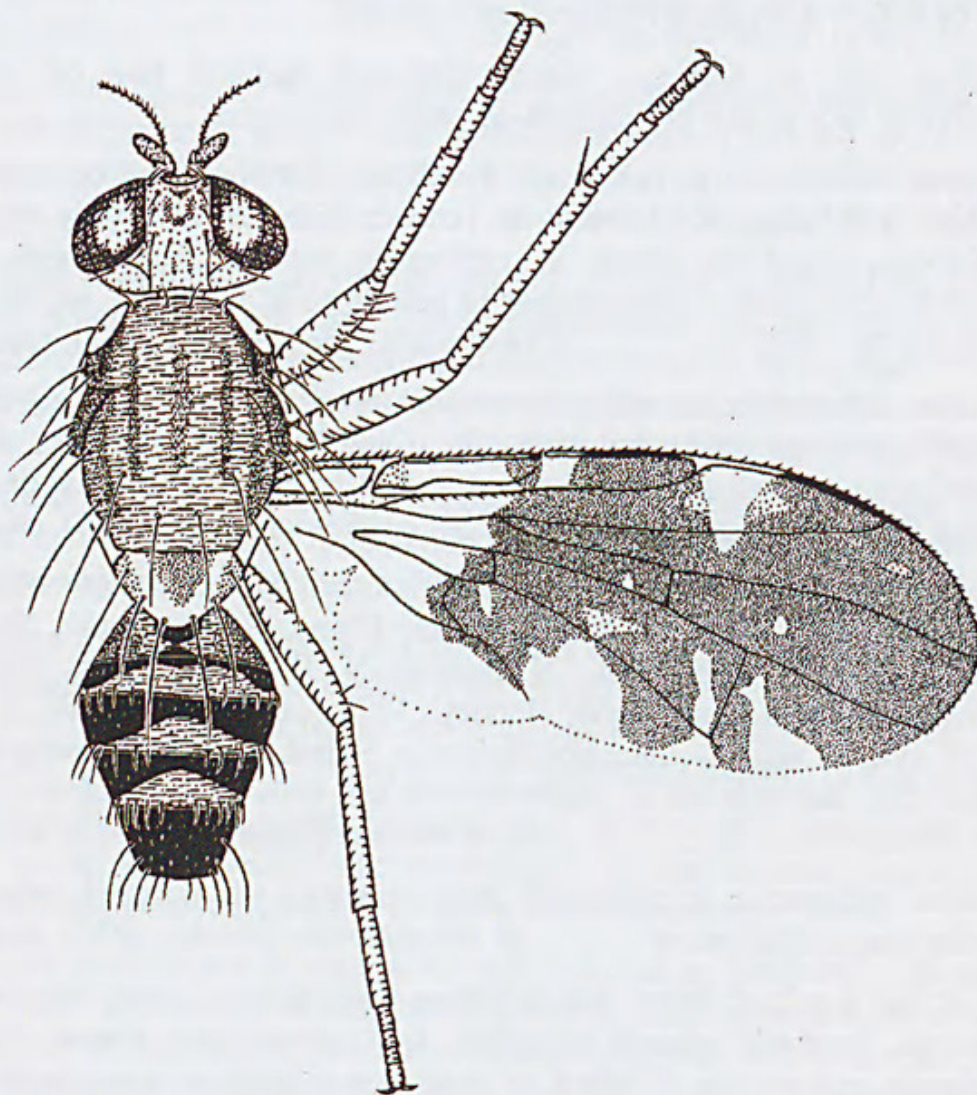


Fig. 7. *Rioxoptilona quatei* (Hardy): male from northern Thailand.

Discussion

Many of the characters in this complex of genera are variable and the use of some in generic diagnoses is questionable. For example, dense ventral setae on the fore femur and tibia of males occur throughout several genera (*Ptilona*, *Chaetomerella*, *Erectovena*, *Lenitovena*), in some species referred here to *Rioxoptilona* and in the apparently basal species of *Themara* (*T.*

hirsuta) which, to some extent, resembles *C. nigrifacies*. In *R. ochropleura* these setae are less well developed and the fore femur less swollen than in the apparently closely allied *R. gravelyi*. These setae are absent in *Acanthonevra*, *Freyomyia*, *Yunacantha*, some *Rioxoptilona* (including *R. vaga*) and all other species of *Themara* where males are known. *Freyomyia* appears to be closely related to *Themara*, differing primarily in the lack of setae on veins M and Cu₁ and the lack of a middle pair of scutellar setae.

Setal characters of the head and thorax are often highly variable: there is normally only 1 pair of frontal setae but in some species 2 pairs of distinct setae are present and in many other cases a weak or secondary seta is often present; anepimeral and additional anepisternal setae may be distinct, weak or absent. Most genera have 2 pairs of orbital setae but *Ptilona* has only one; it also lacks a middle pair of scutellar setae. All species have the stigma elongate (generally about as long as cell c), while vein R₂₊₃ may be straight or undulate, sometimes strongly so. The extent of the dark scutal vittae seen in many species is also infraspecifically variable; the medial vitta is often reduced or absent (resulting in a species having either 4 or 5 vittae) and occasionally they are absent altogether, resulting in an entirely pale scutum.

In this study, species are recognised as valid (and in some cases removed from synonymy) if they are allopatric with similar taxa and/or show definable differences; it is recognised that further material might show, in at least some cases (e.g. *P. persimilis*, *P. dolorosa* and *P. conformis*), that these differences are no more than infraspecific variation and it is hoped that the key provided here will enable such cases to be detected. Species synonymy has been maintained (or newly proposed) where the taxa are known to be sympatric and the differences appear to be infraspecific and not clearly definable.

Additional biological information might help to further elucidate the limits and relationships of the genera accepted here. An association with bamboo is suspected but not confirmed for *Acanthonevra*, *Chaetomerella*, *Freyomyia* and *Themara*. *Ptilona* larvae live semi-aquatically in the internodes of dead bamboo culms (D. Kovac and P. Dohm pers. comm.). The larvae of several species of *Rioxoptilona* are known to utilise damaged or decaying bamboo shoots; it is this host plant usage which suggests that the presence or absence of dense ventral setae on the male fore femur and tibia, coupled with the variability seen between such species as *R. gravelyi* and *R. ochropleura*, is of no use in defining genera. *Erectovena*, *Lenitovena* and *Yunacantha* are maintained as distinct genera pending the availability of host plant data, but it is likely that eventually some or all will be synonymised with *Rioxoptilona*.

The type locality of *Acanthonevra fuscipennis* Macquart

Macquart (1843) described *Acanthonevra fuscipennis* from 'Bengale' (i.e. Bengal in eastern India) but all subsequent records from India (e.g. Bezzi 1913, Kapoor 1993) refer to *Themara yunnana* and there is no actual evidence that it occurs there. Despite Macquart's very poor illustration, it

shows enough salient features to leave no doubt that his *A. fuscipennis* is the same species as that described and illustrated as *A. polyxena* (Osten Sacken) from Java (Osten Sacken 1881) and subsequently illustrated by van der Wulp (1899) from Mt Gede in Java. Given the widespread confusion between 'East India' and 'East Indies' during the 1800s, it is probable that Macquart's type also originated in Java. It is also likely that Macquart used the term 'Bengale' as an alternative to 'East India', since at the time the two names were essentially synonymous. Accordingly, Java, Indonesia is regarded here as the type locality for *A. fuscipennis*, with 'Bengal, India' considered an error. Specimens from Java tend to have the median brown band in wing cell c broader, with the hyaline spots consequently smaller, than in those from other areas but some variation is evident. As noted in the key, the taxa *A. batata* Enderlein, *A. normaliceps* Enderlein and *A. synopica* Hering are regarded as further synonyms of *A. fuscipennis*, which occurs from the extreme south of Thailand to Java and Borneo.

A note on *Phorelliosoma* Hendel

Phorelliosoma Hendel, 1914 (= *Staurellina* Hering, 1941, **syn. n.**; = *Mimosophira* Hardy, 1973; = *Orienticaelum* Ito, 1984, **syn. n.**) is an Oriental genus of acanthonevrines that includes two species formerly placed in *Acanthonevra* *sens. lat.* It is separated from the *Acanthonevra* complex by the following combination of characters: arista pubescent, head with 2 pairs each of frontal and orbital setae, scutum with no trace of a medial vitta, presutural and anepimeral setae absent, 3 pairs of scutellar setae, wing relatively narrow with the pattern *Lenitovena*-like (those species formerly placed in *Orienticaelum*) or reduced to isolated patches, cell c entirely and cell cu₁ almost entirely hyaline, vein R₄₊₅ sparsely setose to about r-m crossvein, cell c elongate and stigma about half to two-thirds its length.

Its generic relationships are uncertain, although the elongate and entirely hyaline cell c, plus the 4 scutal vittae present in some species, suggest a relationship with the *Sophira* complex. I can find no characters of generic value to separate the above synonyms and consider them to be congeneric. *Mimosophira* was placed as a synonym of *Phorelliosoma* by Wang (1998). *Chaetomerella varipes* Chen, placed in *Orienticaelum* by Wang (1998), shows many, but not all, of the above characters and is treated here as an aberrant species of *Lenitovena*; it has swollen fore femora with a row of ventral setae (Chen 1948), a typical *Acanthonevra*-complex scutal pattern (including a dark medial vitta) and cell c is dark basally and apically and about as long as the stigma. Six species of *Phorelliosoma* are recognised:

P. ambitiosum Hering, 1941 (NE India).

P. femoratum (Shiraki, 1933), **comb. n.** (Japan) [ex *Orienticaelum*].

P. hexachaeta Hendel, 1914 (= *Mimosophira rubra* Hardy, 1973) (Taiwan, Vietnam) [type species]. Records from SW China and NE Burma refer to *P. hilaratum* Hering.

P. hilaratum Hering, 1941 (NE Burma, SW China (SE Xizang [Tibet])). This species differs from *P. hexachaeta* in the absence of a pair of dark scutellar spots and a slightly more reduced wing pattern.

P. parvisetalis (Hering, 1939), **comb. n.** (China) [ex *Orienticaelum*].

P. trypetopsis (Hering, 1941), **comb. n.** (NE Burma) [ex *Staurellina*].

Acknowledgements

I thank Nigel Wyatt (Natural History Museum, London) for access to specimens in his care, Damir Kovac and Patrick Dohm (Forschungsinstitut Senckenberg, Frankfurt am Main) for biological information, K.J. David (National Research Centre for Citrus, Nagpur) for additional information on *Themara yunnana* and Scott Ginn (Australian Museum, Sydney) for the images of *Acanthonevra fuscipennis*. I also thank Zoë Simmons (Oxford University Museum of Natural History), Marc De Meyer (Royal Museum for Central Africa, Tervuren) and Federica Turco (Queensland Museum) for help in obtaining literature and Susan Phillips and Christine Lambkin for the habitus illustrations.

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