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## The genus *Styringomyia* LOEW in Australia (Diptera: Tipuloidea: Limoniidae)

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**A b s t r a c t :** The crane fly genus *Styringomyia* is briefly introduced, the three species hitherto known from Australia are reviewed and the female of *S. bipunctata* is described for the first time. A further twelve Australian species are described as new, their affinities and distributions are discussed, and a key to the males of the 15 Australian species of *Styringomyia* is presented.

**K e y w o r d s :** *Styringomyia*, Limoniidae, new species, Australia

### Introduction

The genus *Styringomyia* was established by LOEW (1845) based on *S. venusta* LOEW, 1845, a resinous fossil species from Africa. The first extant species, *S. didyma*, was described more than 50 years later by GRIMSHAW (1901) from Hawaii. At present more than 160 extant species of *Styringomyia* (OOSTERBROEK 2018) are known from Afrotropical, Neotropical, Palaearctic, Oriental and Australasian-Oceanian regions.

EDWARDS (1914) and ALEXANDER (1956) are the most comprehensive papers on the genus, while EDWARDS (1924) and, more recently, RIBEIRO (2003) and PODENAS (2012) significantly clarified and improved information on male genital morphology and our understanding of the Neotropical and African fauna. Comparatively less is known about the pre-imaginal stages of *Styringomyia* however, and information is available for only two species (OOSTERBROEK & THEOWALD 1991). EDWARDS (1924) described the pupa of *S. ingrami* EDWARDS, and HYNES (1990) described the larva, pupa and larval habitats of *S. neocaledoniae* ALEXANDER.

As to the systematic position of the genus, the only effort so far to elucidate this using phylogenetic methods was made by OOSTERBROEK & THEOWALD (1991), who placed the genus at the base of the so-called higher Eriopterinae [= Chioneinae] clade, based on the presence, in the larvae, of reduced head capsule compared with the more massive head capsule of the lower Eriopterinae.

To date, only three species of *Styringomyia* have been recorded from Australia (THEISCHINGER 1996). However, through detailed examination of preserved and freshly collected Australian material, an additional twelve species of Australian *Styringomyia* have been discovered, all of them described in the present paper. Based on morphological characters, most particularly the structure of the male genitalia, this study has identified three groups of closely related Australian species, namely the *Styringomyia bancrofti* group, containing five species, the *Styringomyia terraereginae* group, contain-

ing two species and the *Styringomyia bipunctata* group, containing three species, with the remaining five Australian species remaining ungrouped.

This paper reviews the known Australian species with the female of *S. bipunctata* described for the first time, provides detailed descriptions of males and, where available, females of the newly discovered species, establishes and details the Australian species groups, their affinities and distributions and provides an identification key for male specimens of Australian *Styringomyia*.

### Material and methods

Pinned material and material in 70% ethanol from institutional and private collections were studied. Terminalia were cleared in 10% KOH, stored and photographed in glycerol. The hypopygia, when possible, were photographed in ventral and dorsal view, while female terminalia generally are presented in lateral view only.

The type material of the new species is lodged in the Australian Museum (AM) in Sydney, in the Australian National Insect Collection (ANIC) in Canberra and in the Museum of Victoria (MV) in Melbourne. Other material studied comes from the Alexander Collection (AC) in the Smithsonian Institution in Washington D.C. and the Swedish Museum of Natural History (NRM) in Stockholm.

Abbreviations as used in text: sn, denotes specimens for which gender cannot be determined due to age or damage.

### Systematics

#### Genus *Styringomyia* LOEW, 1845

*Styringomyia* LOEW, 1845: 6.

Type-species: *Styringomyia venusta* LOEW, 1845, by monotypy. Descriptive note in EDWARDS, 1911b.

*Styringia* BERENDT, 1845: 57. *Nomen nudum*.

*Idiophlebia* GRÜNBERG, 1903: 524. Type-species: *Idiophlebia pallida* GRÜNBERG, 1903 (= *Styringomyia didyma* GRIMSHAW, 1901), by monotypy.

*Pycnocyrtis* ENDERLEIN, 1912: 65. Type-species: *Pycnocyrtis annulipes* ENDERLEIN, 1912, by original designation.

*Mesomyites* COCKERELL, 1917: 377. Type-species: *Mesomyites concinna* COCKERELL, 1917, by monotypy.

*Styringomyia* ALEXANDER, 1972: 841. Unjustified emendation of *Styringomyia*.

#### D i a g n o s i s . Adult (Figs 1-4)

Detailed and accurate redescriptions of the diagnostic features of adult *Styringomyia* were made available by EDWARDS (1914, 1924) and ALEXANDER (1972). Emphasizing the morphology of the Neotropical species, RIBEIRO (2003) presented even more elaborate and useful descriptions. His terminology for morphological details of wing and terminalia (RIBEIRO 2003: Figs 7-9 and 27-29) is closely followed in this paper. For the present treatment diagnostic characters are given that enable identification of *Styringomyia* from all genera of Limoniidae known from Australia. These characters follow those presented in the key to Australian Limoniidae by THEISCHINGER (1996).

Front of head only moderately produced; rostrum shorter than remainder of head; antennae 16-segmented; eyes glabrous. Wing: Sc1 short, shorter than 1/2 length of wing; 3 branches of R reaching wing margin; Rs with 2 branches, anterior branch ending well before 2/3 length of wing; discal cell closed, quadrilateral or pentagonal; r-m not in alignment with Rs; CuA2 not fused with A1. The male terminalia are torted at 180 degrees, such that the abdominal sternite 9 occupies a dorsal position and tergites 9 and 10 occupy a ventral position. This torsion is not diagnostic for *Styringomyia* but found in a series of Chioneinae genera. The female terminalia are not torted and are, according to species group and species, highly variable.

Larva (Figs 5, 6)

The most comprehensive account of the immature stages of *Styringomyia* is given by HYNES (1990), in which the larva and pupa of *Styringomyia neocaledoniae* ALEXANDER, 1948, from New Caledonia are described and figures of key characters are provided.

The larva of *S. neocaledoniae* possesses a spiracular disk with seven fleshy lobes, three smaller dorsal, two larger lateral and two ventrolateral (HYNES 1990). In the absence of larval specimens of any other species this can only be assumed to be the common state for the genus. According to OOSTERBROEK & THEOWALD (1991) a seven lobed spiracular disk is seen in only one other genus, *Gonomyodes* ALEXANDER, 1948, however in this case the lobes are all of approximately equal size.

With respect to larval ecology, ALEXANDER (1919), EDWARDS (1924) and HYNES (1990) state that larvae of *Styringomyia* inhabit decaying organic materials such as wet leaf litter, fallen timber, banana fibres or palm fronds.

During examination of thousands of larvae of Australian Tipuloidea, forms with a seven lobed spiracular disk were not encountered. However, larvae examined have predominantly been from aquatic habitats or inundated soils, whereas habitats as described above were hitherto not targeted.

### ***Styringomyia bancrofti* group (Figs 7-23)**

Four species, *Styringomyia bancrofti*, *S. baroalba*, *S. collessi* and *S. remex*, have femora and tibiae yellowish with more or less complete, distinct dark rings and the wings spotted grey at the cross-veins. In the males sternite 9 terminates in two digitate lobes, each with apical seta and separated by a distinct median notch. These species also have approximately conical gonocoxites with wide mesal lobe and rather thick apical spine, and their gonostyli include several comb-shaped elements. The cerci of the known females are apparently bifurcate with each tip bearing an apical spine, the hypogynial valves are slightly and evenly curved dorsally and rather shallow. *S. edwardsorum* is also included in the group even though, owing to the nature of the preservation of the type material, some of the above characters cannot clearly be detected.

### ***Styringomyia bancrofti* EDWARDS (Figs 7-12)**

*Styringomyia bancrofti* EDWARDS, 1914: 222. Holotype: Australia, Queensland, Burpengary, Dr. T.L. Bancroft; in NHM; not seen.

**M a t e r i a l e x a m i n e d .** 1 paratype ♂: data as in holotype (AC). Two females recorded as *S. bancrofti* from Queensland, Meringa near Cairns by ALEXANDER (1920) are not considered here as males are not available from this locality.

The most diagnostic characters specified in the original Description are: "Legs with all the dark rings distinct, complete, the tips of all tarsal joints dark. Wings with normal venation and markings. In the hypopygium the upper claspers very much reduced."

**D i s c u s s i o n .** The males of *Styringomyia bancrofti*, *S. baroalba* nov.sp., *S. collessi* nov.sp., and *S. remex* nov.sp. share a bifid apex of sternite 9, a mesal expansion and subconical gonocoxites with a rather thick apical spine and complex gonostyli. The prominent element of the gonostyli bears long distinct setae along posterior margin only in *S. bancrofti* and it is produced only mesally as in *S. collessi* and *S. remex* versus produced mesally and laterally (double-winged) in *S. baroalba*.

***Styringomyia baroalba* THEISCHINGER & BILLINGHAM nov.sp. (Figs 13-16)**

**T y p e m a t e r i a l .** Holotype ♂: Australia, Northern Territory, Baroalba Creek Springs, 19 km NE by E of Mt Cahill, 29-x-1972 (ANIC). Paratypes: 6♂♂, 2♀♀, 1 sn, same data as holotype (ANIC); 1♂, same locality as holotype, 13-vi-1973, D.H. Colless (ANIC).

**D e s c r i p t i o n**

**Male (Figs 13, 14)**

**Head.** Including rostrum, palps, scape and pedicel mostly greyish yellow to greyish brown; antennal flagellum somewhat paler.

**Thorax.** Not a brownish yellow to dark greyish brown, scutum notably paler broadly along midline. Pleura and sterna yellowish brown to reddish brown and dark brown. Legs: coxae and trochanters brownish yellow; femora with two rather broad ill-defined and incomplete greyish brown rings, one slightly past (profemur), about at (mesofemur) or slightly before (metafemur) midlength, and one more or less subapical; tibiae dull yellow with rather narrow ill-defined greyish brown incomplete ring and pale greyish brown apex; tarsi dull yellow, only last segment and claws brown.

**Wings.** Slightly infumed with greyish yellow; spotted grey at the cross-veins. Halteres dull to brownish yellow.

**Abdomen.** Dull to pale brownish yellow.

**Hypogium.** Tergite 9/10 trapezoidal, apically tongue-shaped. Apical half of sternite 9 narrowly trapezoidal ending in two digitate lobes with apical seta and separated by U-shaped notch. Gonocoxites approximately conical with wide, rather obtuse mesal lobe in third quarter and thick apical spine about half as long as gonocoxite. Gonostyli complex, including a wide, winged, gutter-shaped element, two, possibly three, comb-shaped elements and a slim thumb-shaped mesal element that is not particularly modified. Aedeagus apically apparently bilobed, the lobes and the notch between them subtriangular.

**Dimensions.** Wing length 3.1-4.2 mm.

**Female (Figs 15, 16)**

**Head.** From much as in in male to dark greyish and brownish black.

**Thorax.** Not a and pleura from much as in in male to dark greyish and brownish black. Coxae and trochanters brownish yellow to greyish black; what is detectable of the dark rings on femora and tibiae slightly broader.

**Abdomen.** Much as in in male.

**Terminalia.** The cerci including apical spine reach backward well beyond the tips of the hypogynial valves.

Dimensions. Wing length 3.3-3.7 mm.

Variability. Very mature individuals can have head, thorax including coxae and trochanters very dark, nearly black, appearing even pruinulent.

Distribution. Northern; known only from Northern Territory (Map 1).

Etymology. Named after the type locality, Baroalba Creek Springs. Baroalba is used as a noun in apposition to the generic name.

Discussion. The males of *Styrgomyia baroalba* nov.sp., *S. bancrofti*, *S. collessi* nov.sp., and *S. remex* nov.sp. share a bifid apex of sternite 9, a mesal expansion and subconical gonocoxites with a rather thick apical spine and complex gonostyli. Only in *S. baroalba* the prominent element of the gonostyli is produced mesally and laterally (double-winged) versus produced only mesally in *S. bancrofti*, *S. collessi* nov.sp. and *S. remex* nov.sp. In *S. baroalba*, *S. collessi* and *S. remex* long distinct setae are absent along the posterior margin of the prominent element of the gonostyli versus present in *S. bancrofti*.

### ***Styrgomyia collessi* THEISCHINGER & BILLINGHAM nov.sp. (Figs 17-19)**

Type material. Holotype ♂: Australia, Queensland, Earl Hill N of Cairns, 8-v-1967, D.H. Colless (ANIC). Paratypes: all Australia, Queensland, D.H. Colless (ANIC): 1♂, 1♀, 3 sn, same data as holotype; 1♂, same locality as holotype, 11-v-1967; 1♂, 15.29°S/145.16°E, Mt Cook Nat Park, 12-v-1981, malaise trap; 1♂, 15.28°S/145.15°E, 1 km W of Cooktown, 12-v-1981; 1♂, 15.28°S/145.15°E, 1 km W of Cooktown, 12-v-1981, at light; 1♂, 1 km W of Cooktown, 13-v-1981, malaise trap.

### **Description**

#### **Male (Figs 17, 18)**

Head. Including rostrum, palps scape and antennae largely dull yellow and brown to brownish grey; scape and pedicel somewhat darker than antennal flagellum.

Thorax. Notula largely dull yellow to brownish grey; scutum laterally dull yellow, scutellum pale yellow. Pleura and sterna greyish yellow to pale greyish brown. Legs: coxae and trochanters brownish yellow; femora yellow with two rather incomplete broad, ill-defined brownish grey rings, one slightly beyond midlength (pro- and meso-femur) or slightly before midlength (metafemur) and one well subapical; tibiae dull yellow with pale greyish brown apex and with rather narrow ill-defined greyish brown ring just before midlength (this ring may be absent in metatibia); tarsal segments dull yellow with apex somewhat darkened, only last segment and claws greyish brown.

Wings. Very slightly infused with yellowish grey; spotted grey at the cross-veins. Halteres dull to greyish yellow.

Abdomen. Largely yellow; tergite 1 greyish brown; tergites 2-7 broadly greyish brown along apical margin; tergite 8 mid-dorsally widely greyish brown.

Hypopygium. Tergite 9/10 with base massive, truncate and apical section subtriangular. Sternite 9 with apical half approximately parallel sided, ending in two digitate lobes separated by deep U-shaped notch and each with long apical seta. Gonocoxites subconical with low, obtuse, mesal lobe in about third quarter and a stout apical seta almost half as long as gonocoxite and basally almost as thick as end of the gonocoxite. Gonostyli made up of at least three elements, one about trapezoidal, kind of connected to

what appears a distinct fork, one, or possibly more than one, complex of several comb-like/denticulate structures of various length, width and shape and one element, the most mesobasal, straight and narrowly conical. What can be detected in ventral view of the aedeagus, appears moderately wide with narrow rounded apex.

Dimensions. Wing length 3.7-4.3 mm.

Female (Fig. 19)

Head, Thorax and Abdomen. Coloration much as in male. Dark leg rings slightly broader.

Terminalia. The cerci including apical spine reach backward far short of the tips of the hypogynial valves.

Dimensions. Wing length 3.7 mm.

**D i s t r i b u t i o n .** North-eastern; known only from Queensland (Map 1).

**E t y m o l o g y .** This species is gratefully dedicated to the great Australian dipterist Donald Henry Colless (1922-2012).

**D i s c u s s i o n .** The males of *Styringomyia collessi* nov.sp., *S. bancrofti*, *S. baroalba* nov.sp. and *S. remex* nov.sp. share a bifid apex of sternite 9, a mesal expansion and sub-conical gonocoxites with a rather thick apical spine and complex gonostyli. The prominent element of the gonostyli in *S. collessi*, *S. baroalba* and *S. remex* nov.sp. does not bear long distinct setae along posterior margin as it does in *S. bancrofti* and it is only produced mesally as in *S. bancrofti* and *S. remex* versus produced mesally and laterally (double-winged) in *S. baroalba*. In *S. collessi* the mesal lobe of the prominent element of the gonostyli is rounded to truncate versus broadly triangular in *S. bancrofti* and sharply pointed in *S. remex*.

### ***Styringomyia remex* THEISCHINGER & BILLINGHAM nov.sp. (Figs 20-22)**

**T y p e m a t e r i a l .** Holotype ♂: Australia, Western Australia, Millstream, 7-iv-1971, at light, D.H. Colless (ANIC). Paratypes: Queensland: 1♂, Annan River, 3 km W by S of Black Mt, 28-ix-1980, malaise trap, D.H. Colless (ANIC); 1♂, 15.19°S/145.03°E Station Ck 7km WSW of Hope Vale Mission, 10-v-1981, D.H. Colless (ANIC); 2♂♂, Cape Tribulation, Daintree rainforest, Earthwatch Australia (AM). Northern Territory: 1♂, Arnhem Land, Marningrida, 23.iii.1961, dusk to 8:00 am, malaise trap, J.L. Gressitt (ANIC); 2♂♂, 1♀, 16 km E by N of Mt Cahill, 16-xi-1972, D.H. Colless (ANIC). Western Australia: 3♂♂, 3♀♀, 14.49°S/126.49°E, Carson escarpment, 9-15-viii-1975, I.F.B. Common & M.S. Upton (ANIC). Millstream, at light, D.H. Colless (ANIC): 1♂, 2♀♀, 25-x-1970; 10♀♀, 3 sn, 7-iv-1971; 1♂, 1♀, 8-iv-1971; 1♂, 1♀, 11-iv-1971. 1♂, Australia, Millstream, Crossing Pool, 21-x-1970, D.H. Colless (ANIC). West Kimberley, D.H. Colless (ANIC): 1♂, 1♀, 4 km SSW of Cape Bertholet, 18-iv-1977; 1♂, 2♀♀, 1 sn, same locality, 19-iv-1977; 3♂♂, 1♀, 5 km SSW of Cape Bertholet, 21-iv-1977; 1♀, 8 km S of Cape Bertholet, 22-iv-1977.

### **D e s c r i p t i o n**

Male (Figs 20, 21)

Head. Largely yellowish brown; rostrum, palps, scape and pedicel greyish brown.

Thorax. Notula largely dull yellow to pale greyish brown. Pleura and sterna dull yellow.

Legs: coxae and trochanters brownish yellow; femora yellow with two rather incomplete broad, ill-defined brownish grey rings, one slightly beyond midlength (pro- and mesofemur) or slightly before midlength (metafemur) and one well subapical; tibiae dull

yellow with pale greyish brown apex and with rather narrow ill-defined and incomplete greyish brown ring just before midlength (this ring may even be absent in metatibia); tarsal segments dull yellow with apex somewhat darkened, only last segment and claws greyish brown.

Wings. Very slightly infumed with pale yellowish grey; spotted grey at the cross-veins. Halteres dull to greyish yellow.

Abdomen. Largely yellow; tergite 1 greyish brown; tergites broadly greyish brown along apical margin, more or less broadly interrupted in midline, particularly posterior tergites often with broad greyish brown middorsal patch.

Hypopygium. Tergite 9/10 massive, subconical, apically narrowly rounded. Apical half of sternite 9 narrowly trapezoidal, the apex split by V-shaped notch into two digitate lobes, each with thin and moderately long apical seta. Gonocoxites subconical with low mesal parallelogram-shaped lobe for its third quarter from base and with moderately thick apical spine almost half as long as the whole gonocoxite. Gonostyli made up of at least three elements, one a curved wide-based narrow-tipped spherical triangle with a small spine on its distal margin, one a complex of several comb-like/denticulate structures of various length, width and shape and one, the most mesobasal, bowed and widely oar-shaped. What can be detected in ventral view of the aedeagus, appears rather wide and almost trilobed.

Dimensions. Wing length 3.5-4.0 mm.

Female (Fig. 22)

Head, Thorax and Abdomen. Coloration much as in male. Dark leg rings slightly broader. Abdomen often appearing almost black (containing eggs).

Terminalia. The cerci including apical spine reach backward far short of the tips of the hypogynial valves.

Dimensions. Wing length 3.4-3.7 mm.

**D i s t r i b u t i o n .** Northern; known from Western Australia, Northern Territory and Queensland (Map 1).

**E t y m o l o g y .** *Remex* (= Latin for oarsman), referring to the oar-shaped element of the gonostyli and used as a noun in apposition to the generic name.

**D i s c u s s i o n .** The males of *Styringomyia remex* nov.sp., *S. bancrofti*, *S. baroalba* nov.sp. and *S. collessi* nov.sp. share a bifid apex of sternite 9, a subapical mesal lobe of the subconical gonocoxites and complex gonostyli. The prominent element of the gonostyli in *S. remex*, *S. baroalba* and *S. collessi* does not bear long distinct setae along posterior margin as it does in *S. bancrofti* and it is only produced mesally as in *S. bancrofti* and *S. collessi* versus produced mesally and laterally (double-winged) in *S. baroalba*. In *S. remex* the mesal lobe of the prominent element of the gonostyli is sharply pointed versus broadly subtriangular in *S. bancrofti* and rounded to truncate in *S. collessi*.

### ***Styringomyia edwardsorum* THEISCHINGER & BILLINGHAM nov.sp. (Figs 23-25)**

**T y p e m a t e r i a l .** **Holotype** ♂: Australia, Northern Territory, Cobourg Peninsula Swamp at Black Point, 11°09'S/132°10'E, 8-viii-1996, I. Edwards (AM). **Paratypes**: 1 ♀, same data as holotype (AM).

**Description** (the unique specimens are preserved in ethanol, therefore much discoloured/bleached which is reflected in the overall description)

**Male** (Figs 23, 24)

**Head.** Including rostrum, palps and antennae pale yellowish brown.

**Thorax.** Pale yellowish brown, including coxae and trochanters, other leg segments missing.

**Wings.** Infused very pale yellowish brown; darkening on crossveins r-m detectable.

**Abdomen.** Pale yellowish brown.

**Hypopygium.** Tergite 9/10 very long, truncate with apical corners well rounded. Sternite 9 with apical half approximately parallel sided, ending in two very short digitate lobes separated by rather shallow V-shaped notch and each with apical seta. Gonocoxites subconical apparently with very large rounded mesal lobe making them look almost bilobed and with moderately stout and long, distinctly curved apical seta. Gonostyli, largely obscured dorsally by tergite 9/10 and ventrally by the large mesal lobe of the gonocoxites, and apparently made up of several elements, one looking flat, one more mesal, looking thumb-like, and two more lateral, one of them with three stout curved spines, and one including a longer slimmer curved spine and kind of a comb of slim shorter spines. What can be detected in ventral view of the aedeagus, is widening toward a truncate apex and shows three small, distinctly darkened areas.

**Dimensions.** Wing length ca 4.5 mm.

**Female** (Fig. 25)

**Head.** Much as in male.

**Thorax.** Much as in male, but hindlegs complete. Darkening (indicating incomplete ring) at about midlength of metafemora and apex of metatibiae detectable.

**Abdomen.** Much as in male

**Terminalia.** Cerci reaching backward somewhat beyond the slightly pointed tips of the almost straight hypogynial valves.

**Dimensions.** Wing length ca 4.0 mm.

**Distribution.** Northern; known only from Northern Territory (Map 1).

**Etymology.** This species is named for I. Edwards (gender and affiliation unknown) who collected the unique male and female of this species and to the well-known British entomologist F.W. Edwards (1888-1940) in recognition of his pioneering work on *Styringomyia*.

**Discussion.** Even though only dated material in ethanol of *Styringomyia edwardsorum* nov.sp. is available, making its affinities difficult to assess, it is included in the *S. bancrofti* group. The large tergite 9/10 and the large mesal lobe of the gonocoxites, both obscuring much of the gonostyli, make the male clearly stand out from the other species of the group.

### ***Styringomyia terraereginae* group (Figs 26-32)**

*S. terraereginae* and *S. aterrima* share partly strongly infused wings without distinct darker spots and largely dark legs without distinct darker rings in femora and tibiae. The



males share long slender gonocoxites with longer spine at about midlength and markedly shorter apical spine and gonostyli with three elements including a whip-like one.

### ***Styringomyia terraereginae* ALEXANDER (Figs 26-29)**

*Styringomyia terraereginae* ALEXANDER, 1924: 182. Holotype ♂: Australia, North Queensland, Gordonvale, ex scrub, November 1920, A.P. Dodd (AC).

*Material studied*. Queensland: holotype (see Figs 26-29).

The most valuable diagnostic characters specified in the original Description (ALEXANDER 1924) are: "Antennae with the first segment black, the remainder of the organ more brownish. Legs with the coxae black; trochanters brown; femora black, the fore femora paler at base, the posterior femora with a broad china-white ring before the equally broad black apex; tibiae and tarsi black, the extreme bases of the segments narrowly paler. Wings with the cephalic distal portion strongly infumed, a broad but incomplete hyaline band before the cord".

*Discussion*. *Styringomyia terraereginae* appears most similar to *S. aterrima* nov.sp. Diagnostic for male *S. terraereginae* are the white-banded metafemora and the basally distinctly expanded, apically very thin apical spine of the gonocoxites versus uniformly black metafemora and the normal shape of the apical spine on the gonocoxites in *S. aterrima*.

### ***Styringomyia aterrima* THEISCHINGER & BILLINGHAM nov.sp. (Figs 30-32)**

*Type material*. Holotype ♂: Australia, Queensland, 15.30°S/145.15°E, 1 km SE of Mt Cook, 13-x-1980, at light, D.H. Colless (ANIC). *Paratypes*: 1♀, same data as holotype (ANIC); 1♀, 15.04°S/145.07°E, Mt Webb Nat. Park, 29-iv-1981, malaise trap, D.H. Colless (ANIC).

### **Description**

#### **Male (Figs 30, 31)**

**Head.** Including rostrum, palps and antennae blackish brown to black; anterior portion of prescutum broadly brownish grey along midline.

**Thorax.** Blackish brown to black. Legs with coxae and trochanters blackish brown to black as are femur and tibia of mid-leg, remainder of legs missing.

**Wings.** Cell R2+3 and distal half of cell between R, Rs and R2+3 strongly infumed remainder markedly less so, except for proximal half of cell between R, Rs and R2+3 which appears hyaline.

**Abdomen.** Blackish brown to black.

**Hypopygium.** Tergite 9/10 trapezoidal, apically narrower with tip narrowly rounded. Apical half of sternite 9 trapezoidal, ending bilobed by shallow posteromedian excision. Gonocoxites long, slender with gonostyli originating at about one third their length from base; a moderately long and thick spine at about half length and a short, thick apical spine. Gonostyli including three elements, one short, strongly bowed and bifid, one short, sausage-shaped and hairy and one long, whip-like with basal half triangularly expanded and setose and apical half very thin, parallel sided, with long slightly curved subapical seta. What can be detected in ventral view of the aedeagus appears narrow with apex conical.

Dimensions. Wing length 3.8 mm.

Female (Fig. 32)

Head, Thorax and Abdomen. Coloration much as in male; legs brown to black, very base of tibiae somewhat lighter than remainder.

Terminalia. Cerci apparently two-segmented with the basal segment very large, reaching backward well beyond the tips of the slim, very slightly sinuously curved hypogynial valves.

Dimensions. Wing length 3.9-4.1 mm.

*Distribution*. North-eastern; known only from tropical Queensland (Map 2).

*Etymology*. *Aterrima* (= Latin, superlative of *ater*) meaning darkest referring to body including legs being dark.

*Discussion*. The male of *Styringomyia aterrima* nov.sp. appears most similar to *S. terraereginae* ALEXANDER. Diagnostic for *S. aterrima* are the uniformly black metafemora and the normal shape of the apical spine on the gonocoxites versus metafemora white-banded and apical spine of the gonocoxites basally distinctly expanded, apically very thin in *S. terraereginae*.

### ***Styringomyia bipunctata* group (Figs 33-44)**

The males of the three species, *Styringomyia bipunctata*, *S. coronata*, and *S. williamsi*, share a long wide tergite 9/10 with ear-like lateral expansions. Sternite 9 is trapezoidal, almost hemispherical ending in three lobes, the lateral ones strongly setose. The gonocoxites are evenly curved, almost conical with more than basal half markedly expanded and with rather slim apical spine. The gonostyli include only a single element, slightly curved, subbasally expanded, with some setae and short spines. The known females have apparently two-segmented cerci that reach backward well beyond the tips of the slightly sinuously curved, rather deep hypogynial valves.

### ***Styringomyia bipunctata* EDWARDS (Figs 33-36)**

*Styringomyia bipunctata* EDWARDS, 1924: 272. Holotype ♂: Australia, Queensland, Malanda, Mjöberg; in NRM.

*Material studied*. Queensland: holotype (see Fig. 33); 1 paratype ♂, Malanda, Mjöberg (AC); 1♂, 1♀, 17.37S°/145.34E°, B83, Massey Ck, 1000 m, malaise trap, 3-x-2-xi-1995, L. Umback (AM); 1♂, Sluice Ck, 8 km W by S Millaa Millaa, 25-iv-1981, at light, D.H. Colless (ANIC). 1♂, Mt Edith Forest Road 1 m. off Danbulla Road, 6-v-1967, D.H. Colless (ANIC); 1♀, Mt Edith 4-7 m. off Danbulla Road, 27-iv-1967, D.H. Colless (ANIC). 1♂, 1♀, 2 sn, Wongabel State Forest, 7-v-1967, D.H. Colless (ANIC). 1♂, 1 sn, Yungaburra (State Forest 452), 29-iv-1967, D.H. Colless (ANIC).

The most valuable diagnostic characters specified in the original Description of the male (EDWARDS 1924) are: "Legs uniformly yellow, except for the extreme tips of femora and tibiae. Wings with the usual dark spots over the crossveins. Hypopygium: Ninth tergite rather short, ending in three little triangular points. Ninth sternite very long, extending beyond the tips of the side-pieces, curled into a tubular shape, truncate and slightly blackened at the tip. Terminal projection of side-pieces rather long and stout, with one rather weak spine and a number of stiff hairs, two or three of which are thickened, black and almost spine-like."

From the Description above of the hypopygium and the now available material of *Styringomyia* from Australia it became obvious that EDWARDS (1924) when giving a correct treatment of the dorso-ventral orientation of the male terminalia in *Styringomyia* did not get it right in *S. bipunctata*. If this is taken into account, however, the original description is sufficient for a confident interpretation of the species.

ALEXANDER (1925, 1960) mentioned *S. bipunctata* in comparison with *S. mcgregori* ALEXANDER, 1925 and with *S. scalaris* ALEXANDER, 1960. The great differences between the male terminalia of these species have nothing to do with the fact that ALEXANDER identified a *Styringomyia* male from Brooklana, New South Wales as *bipunctata* (Figs 40-43). This specimen is actually *S. williamsi* nov.sp. as described below. Whereas *S. bipunctata* is a tropical species, *S. williamsi* is known to range from Goomburra in Queensland (27.978844°S/152.293154°E) to Minnamurra Falls (34°38'S/152°51'E) well south of Sydney. The two are apparently a pair of allopatric species occurring north, respectively south, of the Eungella - Paluma gap, a region where ecological and physiographic boundaries coincide with taxonomic discontinuities below the level of closely related species-pairs in Odonata, Plecoptera and Megaloptera (WATSON & THEISCHINGER 1984).

### Description

#### Male (Figs 33-35)

Hypopygium. Tergite 9/10 long and wide, largely parallel sided with ear-like lateral expansions in third quarter of its length. Sternite 9 widely trapezoidal, almost hemispherical ending in three narrow lobes, the median apparently with tip triangular, the lateral ones strongly setose; two moderately long and moderately thick subapical setae. Gonocoxites evenly curved, almost conical with basal three fourths markedly expanded and with rather slim apical spine and abundant setae along mesal face, particularly at the apical end of the expansion. Gonostyli a single element represented by a slightly curved lobe triangularly expanded subbasally, with abundant setae and two large apical spines and one subapical spine bearing a secondary spine. What is detectable of the aedeagus appears moderately wide and obtusely conical.

#### Female (Fig. 36)

Head. Including rostrum and antennae yellowish to pale greyish brown, palps somewhat darker and postocular section greyish brown.

Thorax. Largely brownish yellow. Legs pale brownish yellow with extreme tip of femora and tibiae slightly darkened and last tarsal segment and claws dark greyish brown.

Wings. Infused with pale greyish and with somewhat darker spots on crossveins.

Abdomen. Largely dull yellow with tergites almost wholly greyish brown.

Terminalia. As specified under *S. bipunctata* group.

Dimensions. Wing length 4.0-4.5 mm.

Distribution. North-eastern; known only from tropical Queensland (Map 3).

Discussion. *Styringomyia bipunctata*, *S. williamsi* nov.sp. and *S. coronata* nov.sp. are a closely knit group of species with sternite 9 of male ending in three small extensions and tergite 9/10 very long and truncate if the 180 degrees torsion of the male terminalia in *Styringomyia* is correct and consistent (EDWARDS 1924, RIBEIRO 2003) and

if we can assume (based on fresh material of three species) that EDWARDS (1924) nevertheless got the dorsoventral orientation of the hypopygium wrong in the Description of *S. bipunctata*. *S. bipunctata* can be distinguished from *S. williamsi*, its closest ally, possible its sister taxon, by the longer, less flat and narrower median extension of male sternite 9 and by its geographical distribution (more northern, tropical) versus more southern. Both, *S. bipunctata* and *S. williamsi* have the three extensions of sternite 9 shorter and the thinner apical portion of the gonocoxites markedly shorter than *S. coronata*.

***Styrgomyia williamsi* THEISCHINGER & BILLINGHAM nov.sp. (Figs 37-43)**

**Type material.** Holotype ♂: Australia, New South Wales, Otford, 7-x-1961, D.K. McAlpine (AM). Paratypes: New South Wales: 1♂, Barrington House, 13-xi-1967, N. Dobrotworsky (ANIC); 1♂, Bruxner Park, Coff's Harbour, 1-xi-1965, M.S. Upton (ANIC); 1♂, Bruxner Park, 16-iv-1970; 2♂♂, same locality (1) & (2), 19-iv-1970, D.H. Colless (all ANIC); 1♂, 1♀, in copula, Bruxner Park, nr Coff's Harbour, 7-ix-1983, Daniels & Schneider (ANIC). Dorrigan N.P., North Brother Mtn, 450 m, subtropical rainforest, malaise trap: 1♂, 7♀♀, 29-xii-1998-4-i-1999; 1♂, 1♀, 14-28-i-1999; 5♂♂, 31♀♀, 1-30-iii-1999; 9♀♀, 25.xi-24-xii-1999; all G. Williams (AM). 1♂, 18 mi. Dorrigo-Coramba Rd, 18-iv-1970, D.H. Colless (ANIC); 1♂, Minnamurra Falls, near Kiama, 9-ii-1962, D.K. McAlpine (AM); 1♀, 15-xi-1960, I.F.B. Common & M.S. Upton (ANIC); 2♂♂, 1♀, 3 sn, Nanack Fire Rd, 29 mi. Dorrigo-Coramba, 18-iv-1970, D.H. Colless (ANIC); 1♂, Otford, 10-ii-1962, D.K. McAlpine (AM); Port Macquarie, Sea Acres NR, 10m, subtropical rainforest, malaise trap: 21♀♀, 14-28-ii-1999; 5♀♀, 11-25-xi-1999; all G. Williams (AM). Queensland: 2♂♂, Cunningham Gap, 2,500', 5-iv-1969, N. Dobrotworsky; 1♂, same locality, 23-ii-1962, I.M. Mackerras (all ANIC); 1♂, 1♀, Dalrymple Creek at Goomburra Valley Campground, Goomburra (27.978844°S/152.293154°E), 29-iv-2017, Z. Billingham (MV).

**Description**

Male (Figs 37, 38, 40-43)

Head. Including rostrum, palps and antennae pale yellowish brown to greyish brown.

Thorax. Notula largely pale greyish brown; two dorsal lines and sides of scutum somewhat darker; pronotum, lateral margins of presutural portion of scutum, two spots on postsutural portion of scutum and scutellum bright to dull yellowish white. Pleura and sterna greyish brown. Legs pale to dull greyish yellow with only extreme tip of femora and tibiae more or less distinctly darkened and last tarsal segment and claws dark greyish brown.

Wings. Very slightly infused greyish yellow and with darker grey spots at crossveins.

Abdomen. Largely brownish yellow with apical  $\frac{1}{2}$  to  $\frac{3}{4}$  of tergites dark greyish brown.

Hypopygium. Tergite 9/10 long, wide, truncate, slightly narrowing from base to apex sided with small ear-like expansions slightly past third quarter of its length. Sternite 9 widely trapezoidal, almost hemispherical ending in three lobes, the median very short and wide and flat, the lateral ones short and strongly setose; two moderately long and rather thin subapical setae. Gonocoxites curved, almost conical with more than the basal three fourths markedly expanded and with rather slim apical spine and abundant setae along the mesal face at the apical end of the expansion. Gonostyli a single element represented by a slightly curved lobe triangularly expanded subbasally, with abundant setae and two large apical spines and a subapical one bearing a secondary spine. What is detectable of the aedeagus appears flat and wide.

Dimensions. Wing length 5.1-5.5 mm.

## Female (Fig. 39)

Head. Including rostrum and antennae yellowish to pale greyish brown, palps somewhat darker and postocular section greyish brown.

Thorax. Largely brownish yellow. Legs pale brownish yellow with extreme tip of femora and tibiae slightly darkened and last tarsal segment and claws dark greyish brown.

Wings. Infused with pale greyish and with somewhat darker spots on crossveins.

Abdomen. Largely dull yellow with tergites almost wholly greyish brown.

Terminalia. As specified under *S. bipunctata* group.

Dimensions. Wing length 4.7-5.5 mm.

**Distribution.** South-eastern; known from south-eastern Queensland and New South Wales (Map 3).

**Etymology.** This species is gratefully dedicated to G. Williams who collected and made available for study the bulk of the material.

**Discussion.** *Styringomyia williamsi* nov.sp., *S. bipunctata*, and *S. coronata* nov.sp. are a closely-knit group of species with sternite 9 of male ending in three small extensions (see also under *S. bipunctata*). *S. williamsi* can be distinguished from *S. bipunctata*, its closest ally, possible its sister taxon by the shorter, flatter and wider median extension of sternite 9 and by its more southern versus tropical distribution. Both, *S. bipunctata* and *S. williamsi* have the three extensions of sternite 9 shorter and the thinner apical portion of the gonocoxites markedly shorter than *S. coronata*.

***Styringomyia coronata* THEISCHINGER & BILLINGHAM nov.sp. (Fig. 44)**

**Type material.** Holotype ♂: Australia, Queensland, Upper Freshwater Ck, Whitfield Range nr Cairns, 15-xii-1974, Moulds (AM). Paratype: 1♀, same data as holotype (AM).

**Description** (of the unique male (Fig. 44) preserved in ethanol, therefore much discoloured/bleached which is reflected in the overall description)

Head. Including rostrum, palps and antennae pale yellowish brown.

Thorax. Pale yellowish brown.

Wings. Infused pale yellowish brown.

Abdomen. Pale yellowish brown.

Hypopygium. Tergite 9/10 long and wide, largely parallel sided with ear-like expansions in third quarter of its length. Sternite 9 widely trapezoidal, almost hemispherical ending corona-shaped in three narrow lobes, the median very long and narrow, the lateral ones strongly setose; two very long moderately strong subapical setae. Gonocoxites evenly curved, almost conical with basal two thirds distinctly but not particularly expanded and with rather slim apical spine and abundant setae along all of mesal face. Gonostyli a single element represented by a slightly curved lobe triangularly expanded subbasally, with abundant setae and two large apical spines and one subapical bearing a secondary spine. What is detectable of the aedeagus appears long and very narrow.

Dimensions. Wing length 4.3 mm.

## Female

Head, Thorax and Abdomen. Coloration even paler than in male.

Terminalia lost.

Dimensions. Wing length 4.5 mm.

**Distribution.** North-eastern; known only from Queensland (Map 3).

**Etymology.** Coronatus (=Latin, participle perfect) meaning crowned and referring to the distinctly trifid sternite 9 of the male.

**Discussion.** *Styringomyia coronata* nov.sp., *S. bipunctata* and *S. williamsi* nov.sp. are a closely-knit group of species with sternite 9 of male ending in three small extensions and tergite 9 very long with ear-like lateral extensions (see also under *S. bipunctata*). *S. coronata* can be distinguished from both, *S. bipunctata* and *S. williamsi*, by having the three extensions of sternite 9 longer and the thinner apical portion of the gonocoxites markedly longer.

### Ungrouped species

Five species, *Styringomyia rose*, *S. flagro*, *S. naso*, *S. danbulla* and *S. kimberley* do not share the diagnostic characters of any of the above species groups, nor do they possess common traits that may suggest their own natural grouping. Instead these species appear as a mixed group with likely affinities to Pacific and Oriental species. *S. rose*, may be close to the *S. bancrofti* group, *S. naso* shows affinity with several Papuan species, *S. danbulla* with several possibly circum-Pacific species and *S. flagro* with a number of Oriental species. *S. kimberley* however appears isolated in Australia and possibly other geographic regions.

### *Styringomyia rose* MARTIN, THEISCHINGER & BILLINGHAM nov.sp. (Figs 45-47)

**Type material.** **Holotype** ♂: Australia, Northern Territory, Koongarra, 15 km E of Mt Cahill, 15-xi-1972, D.H. Colless (ANIC). **Paratypes**: 3♀♀, same data as holotype (ANIC).

### Description

Male (Figs 45, 46)

**Head.** Including rostrum, palps and antennae dark brownish grey to black, a fine pale grey midline in posterior half.

**Thorax.** Brownish grey to black. Base of coxae and trochanters of fore- and midleg greyish brown, approximately basal half of femora and very base of tibiae paler; coxa and trochanter of hindleg dark yellow, remainder missing.

**Wings.** Hyaline without infumation or clouds. Halteres grey.

**Abdomen.** Tergites brown to black, sternites pale to dark brown.

**Hypopygium.** Tergite 9/10 largely parallel sided, apically tongue-shaped. Sternite 9 apically narrow, ending in two long digitate lobes, each with apical, subapical and basal seta, the lobes separated by U- to V-shaped notch. Basal two thirds of gonocoxites stout, apical third digitate with apical spine moderately thick and slightly more than half as long as gonocoxites. Gonostyli complex, including a wide, apically trifid element with two branches pointed and the third whip-like with subapical seta, and at least two, possibly three, comb-like elements of different size and shape, partly toothed, partly setose. What is detectable in ventral view of the aedeagus distinctly trilobed.

Dimensions. Wing length 3.3 mm.

### Female (Fig. 47)

Head, Thorax and Abdomen. Coloration generally somewhat paler than in male; midline of head less distinct; hind leg similar to fore- and mid-leg; abdomen pale to medium brown.

Terminalia. Cerci apparently bifurcate with each lobe bearing an apical spine and reaching backward approximately as far as the tips of the apically slightly sinuously curved hypopygial valves.

Dimensions. Wing length 2.6-3.0 mm.

**D i s t r i b u t i o n**. Northern; known only from Northern Territory (Map 4).

**E t y m o l o g y**. This species is named for Rose, wife of John Martin, junior author of the present paper.

**D i s c u s s i o n**. The male of *Styringomyia rose* nov.sp. shares a bifid apex of sternite 9, and complex gonostyli with the species of the *S. bancrofti* group. In *S. rose*, however, the base of the gonocoxites is stout and the apical section is digitate with a moderately thick spine versus more conical with mesal expansion and thicker spine. Also, the aedeagus is much more prominent (trilobed) in *S. rose* than in the species of the *S. bancrofti* group. *Styringomyia rose* may well be the sister taxon of the *S. bancrofti* group.

### ***Styringomyia flagro* THEISCHINGER & BILLINGHAM nov.sp. (Figs 48-50)**

**T y p e m a t e r i a l**. **Holotype** ♂: Australia, Northern Territory, 22 km WSW of Borroloola, 16-iv-1976, at light, D.H. Colless (ANIC). **Paratypes**: Queensland: 1♂, 3♀♀, Annan River, 3 km W by S of Black Mt, 27-ix-1980, at light; 3♂♂, 2♀♀, 1 sn, same locality 28-ix-1980, malaise trap, D.H. Colless (ANIC); 1♂, 2♀♀, Annan R 3 km W by S of Black Mt, 26-iv-1981, at light, D.H. Colless (ANIC); 1♂, Palm Ck, 12 mi. S of Miriam Vale, 6-v-1970, Z. Liepa (ANIC); 1♂, 13 m. W of Ravenshoe, Mt Garnet Rd, 2-v-1967, D.H. Colless (ANIC). Northern Territory: 1♂, Batten Creek 31 km WSW of Borroloola, 15-iv-1976, D.H. Colless (ANIC); 3♂♂, 1♀, same data as holotype (ANIC). Western Australia: 3♂♂, 7♀♀, Drysdale Survey 1975 – Site B1, 14.49°S/126.49°E, Carson escarpment, 9-15-viii-1975, I.F.B. Common & M.S. Upton (ANIC).

### **D e s c r i p t i o n**

#### **Male (Figs 48, 49)**

Head. Largely brown and yellow; rostrum, palps, scape and pedicel dark brown, antennal flagellum greyish yellow.

Thorax. Nota, pleura and sterna largely grey and medium brown to blackish brown; top faces of postsutural portion of scutum paler grey and top of scutellum dull yellow. Legs: coxae and trochanters brownish yellow; femora yellow with two rather incomplete broad, ill-defined brownish grey rings, one slightly beyond midlength (pro- and meso-femur) or slightly before midlength (metafemur) and one well subapical; tibiae dull yellow with pale greyish brown apex and with rather narrow ill-defined and incomplete greyish brown ring just before midlength (this ring may be absent in metatibia); tarsal segments dull yellow with apex darkened, only last segment and claws greyish brown.

Wings. A2 performing a distinct, almost right, angle before entering wing margin, a stump arising from the angle and a more or less dark spot around this stump. Membrane very slightly infumed with yellowish grey; spotted also distinctly grey at the cross-veins. Halteres dull to greyish yellow.

Abdomen. Largely greyish to brownish yellow; tergites 2-8 somewhat darker along apical margin, sometimes also broadly darker along midline.

Hypopygium. Tergite 9/10 long and massive, apically narrowly rounded. Sternite 9 with apical half very narrowly triangular, the apex rounded with two short setae close to each other. Gonocoxites with basal two thirds moderately wide and apical one third moderately wide, almost conical with rather short thin apical spine. Gonostyli comprising three elements, one short and sausage-shaped, one massive and distinctly longer, the surface somewhat convoluted, the apical margin denticulate with the denticles inclined and appearing rather small, to erect and appearing larger, and one whip-like element with basal and apical half parallel sided, the apical half not much thinner than the basal half, and with a thin subapical seta. What can be detected in ventral view of the aedeagus rather wide.

Dimensions. Wing length 3.8-4.4 mm.

Female (Fig. 50)

Head. Much as in male.

Thorax. Similar to male, but pleura and sterna brownish yellow.

Abdomen. Yellowish to greyish brown, often appearing almost black (containing eggs).

Terminalia. Cerci apparently bifurcate with each lobe bearing an apical spine, and not reaching backward as far as the tips of the slim, very slightly dorsally curved hypogynial valves.

Dimensions. Wing length 3.4-3.7 mm.

**D i s t r i b u t i o n .** Northern; known from Western Australia, Northern Territory and Queensland (Map 4).

**E t y m o l o g y .** Flagro (= Latin, ablative singular of flagrum) meaning with a whip, referring to the most prominent element of the gonostyli being whip-like.

**D i s c u s s i o n .** In Australia *Styringomyia flagro* nov.sp. is apparently the only species of the genus with A2 distinctly angled and with arising stump at the angle. It shares these characters and the narrow sternite 9 and the prominent whip-shaped element of the gonostyli of the male at least with several Oriental species, in particular *S. ceylonica* EDWARDS, 1911 (Fig. 51) from Ceylon. The whip-shaped element of the gonostyli is slightly wider in basal half, narrower in apical half, but parallel sided in both halves in *S. flagro* versus more conical as a whole in the Asian species.

### ***Styringomyia naso* THEISCHINGER & BILLINGHAM nov.sp. (Figs 52-55)**

**T y p e m a t e r i a l .** Holotype ♂: Australia, Queensland, Moses Ck 4 km N by E of Mt Finnigan, 15-x-1980, at light, D.H. Colless (ANIC). Paratypes: Queensland: 1♂, 1 sn, Bamboo Ck, near Miallo, N of Mossman, 25-iv-1967, D.H. Colless (ANIC); 2♂♂, 5♀♀, 12.44°S/143.14°E, 3km ENE of Mt Tozer, 28-vi-4-vii-1986, malaise trap, D.H. Colless (ANIC); 1 sn, 12.43°S/143.17°E, 9 km ENE of Mt Tozer, 5-10-vii-1986, malaise trap, D.H. Colless (ANIC); 1♀, 12.43°S/143.18°E, 11 km ENE of Mt Tozer, 11-16-vii-1986, malaise trap, D.H. Colless (ANIC).

### **D e s c r i p t i o n**

Male (Figs 52-54)

Head. Greyish brown and pale greyish yellow; palps yellowish brown, antennae with



scape and pedicel largely brown and flagellum greyish yellow.

Thorax. Notum brownish grey to blackish brown, spotted with dull yellow and pale brown, scutellum rather light to bright yellow; pleura pale greyish yellow, sternum dull yellow to pale yellowish brown. Legs largely dull yellow, femora with two wide greyish brown to brownish black rings, one before (hindleg) to past midlength (pro- and mid-leg) and one subapical, tibiae with a greyish brown ring before midlength and apex greyish brown, and the tarsal segments with more or less distinctly darkened apex and last tarsal segment and claws grey to blackish brown.

Wings. Faintly yellowish-tinged with darker greyish clouds over cross-veins, particularly r-m, the apex of the discoidal cell and at some longitudinal vein endings. Halteres dark yellow.

Abdomen. Dorsally dull yellow to brownish yellow, all tergites distinctly darker along apical and lateral margins; sternites dull yellow.

Hypopygium. Tergite 9/10 trapezoidal, apically narrower with tip rather long and narrowly rounded. Apical half of sternite 9 parallel sided to trapezoidal, apically rounded with tip slightly bilobed by shallow posteromedian excision, at least one rather long subapical seta each side. Gonocoxites short, largely stout with only apical one sixth thin, a long thick apical spine and a markedly thinner subapical spine. Gonostyli complex, apparently including two sausage-shaped elements, one very short and thin and the other moderately long and thicker, two rather short comb-shaped elements, a long whip-like element with basal half much thicker than apical half, approximately ten setae at the end of basal section and long subapical seta, and a massive flat element, laterally rather sinuous but the mesal face with strong spine-like nose at about midlength well separated from a more basal wide tooth which is again separated from an even more basal narrow tooth; the apex of the massive element denticulate. What can be detected in ventral view of the aedeagus appears slightly bilobed to possibly trilobed.

Dimensions. Wing length 3.0-5.0 mm.

Female (Fig. 55)

Head, Thorax and Abdomen. Coloration much as in male except for the more posterior portion of abdomen which usually appears very dark (egg development).

Terminalia. Cerci bifurcate, each lobe bearing an apical spine and reaching backward beyond the tips of the hypogynial valves.

Dimensions. Wing length 3.0-4.7 mm.

**D i s t r i b u t i o n .** North-eastern; known only from Queensland (Map 4).

**E t y m o l o g y .** Naso (= Latin, ablative singular of *nasus*) meaning with a nose referring to the nose on the largest element of the gonostyli.

**D i s c u s s i o n .** The male of *Styringomyia naso* nov.sp. appears close to *S. ensifera* EDWARDS, 1924 (Fig. 56), *S. ensiferoides* ALEXANDER, 1947 and *S. multisetosa* ALEXANDER, 1963 (Fig. 57), all from New Guinea. The distinct spine-shaped nose close to the remaining mesal armature of the most prominent element of the gonostyli is diagnostic for *S. naso*.

***Styringomyia danbulla* THEISCHINGER & BILLINGHAM nov.sp. (Figs 58, 59)**

**Type material.** Holotype ♂: Australia, Queensland, Mt Edith Forest Road 1½ m. off Danbulla Road, 6-v-1967, D.H. Colless (ANIC). Paratypes: Queensland: 1♂, same data as holotype (ANIC).

**Description**

Male (Figs 58, 59)

Head. Including rostrum, palps and antennae medium to dark brown.

Thorax. Not generally brownish yellow to dark brown; scutum widely paler along midline, seamed rather narrowly by markedly darker. Pleura and sterna pale greyish yellow to brownish yellow. Legs greyish yellow to brownish yellow; indistinct, rather wide slightly darker rings in pro- and mesofemur past midlength and apically, in pro- and mesotibia before midlength and apically; such rings hardly detectable in hindleg; apical tarsal segments greyish brown in all legs.

Wings. Very slightly infused with pale yellowish grey. Halteres pale brownish grey.

Abdomen. Dull greyish yellow.

Hypopygium. Apical half of tergite 9/10 setose, approximately parallel sided, truncate, posteromedially topped with rounded lobe. Apical half of sternite 9 setose, obtusely subtriangular. Gonocoxites with basal five sixths wide, apical sixth very narrow, bearing an apical and dorsally a subapical substantial spine. A third dorsal spine of similar size, close to the end of the expanded basal section. Gonostyli including two large elements with abundant retrose setae, one very long, mesobasally widely rounded, apically rather pointed with a long subapical seta, the other shorter and more squarish, and two smaller elements, the more posterior a curved blade with long thick setae and the more anterior a thin rod with claw-like apex. Aedeagus small with apex rounded and somewhat bowed ventrally.

Dimensions. Wing length 4.1-4.4 mm.

Female unknown.

**Distribution.** North-eastern; known only from Queensland (Map 4).

**Etymology.** Named after an area close to the type locality. Danbulla is used as a noun in apposition to the generic name.

**Discussion.** *Styringomyia danbulla* nov.sp. does not appear close to any other Australian species. There are, however, two similar species known from New Caledonia, *S. neocaledoniae* ALEXANDER, 1948 (Fig. 60), and *S. bidentata* HYNES, 1987 (Fig. 61). One apical, one subapical and one more basal dorsal spine on the gonocoxites distinguish male *S. danbulla* from *S. neocaledoniae* [basistyle (=gonocoxite) terminating in two modified setae] and from *S. bidentata* [basistyle (=gonocoxite) terminating with small thick tubercle bearing two long, modified setae, the bases of which are contiguous]. Also, the largest element of the male gonostyli of *S. danbulla* is basally markedly wider and apically markedly narrower than in both New Caledonian species. Three spines on the gonocoxites, as in *S. danbulla*, are present in *S. idioformosa* HYNES, 1987 (Fig. 62) from the Solomon Islands.

***Styringomyia kimberley* THEISCHINGER & BILLINGHAM nov.sp. (Figs 63-65)**

**Type material.** Holotype ♂: Australia, Western Australia, West Kimberley, 4 km SSW of Cape Bertholet, 19-iv-1977, at light, D.H. Colless (ANIC). Paratypes: Western Australia: 1♂, 3♀♀, same data as holotype (ANIC); 5♂♂, 6♀♀, same locality and collector as holotype, 18-iv-1977; 1♂, West Kimberley, 5 km SSW of Cape Bertholet, 21-iv-1977, D.H. Colless (all ANIC).

**Description****Male (Figs 63, 64)**

**Head.** Largely yellowish white to dull whitish yellow with top, rostrum, palps and antennae yellowish brown to pale brownish grey and postocular section medium to dark brown.

**Thorax.** Notula largely brownish grey; anterior pronotum, paratergite, scutellum and mediotergite dull yellowish white; two markedly darker brownish grey stripes each side on presutural section of scutum; postsutural section of scutum broadly dull whitish yellow along midline and laterally. Pleura pale greyish brown. Sterna pale greyish yellow. Legs pale to dark greyish brown.

**Wings.** Slightly tinged with pale greyish yellow, no dark spots. Halteres greyish white to pale yellowish grey.

**Abdomen.** Brownish yellow to very pale greyish brown, tergites markedly darker at lateral edges.

**Hypopygium.** Apical half of tergite 9/10 widely truncate, seemingly with or without tiny backward directed lobe each side. Apical half of sternite 9 rather wide, subtriangular, setose. Gonocoxites with basal half stout, apical half very slender, digitate, setose but without distinct apical spine. Gonostyli a somewhat convoluted complex of a more dorsal structure with several small spines and lobes including one that is backward directed, a rather large mesal plate, rounded anteriorly and with a small spine posteriorly, bearing short thin setae in between, and a small, bowed, obtusely pointed more interior rod. Aedeagus hardly detectable from ventral view.

**Dimensions.** Wing length 4.7-5.1 mm.

**Female (Fig. 65)**

**Head, Thorax.** Coloration similar to male but contrasts weaker.

**Abdomen.** Coloration similar to male but when containing eggs very dark, often almost black.

**Terminalia.** Cerci with large ventrobasal lobe and slender apex, reaching backward well beyond tips of obtusely pointed, slightly ventrally curved, deep hypogynial valves.

**Dimensions.** 3.7-3.9 mm.

**Distribution.** North-western; known only from the Kimberley (Map 4).

**Etymology.** Named after the type locality of this species. Kimberley is used as a noun in apposition to the generic name.

**Discussion.** Close relatives of *Styringomyia kimberley* nov.sp. are not known. In the male the lack of a distinct apical spine on the gonocoxites, and the particular gonostyli with very prominent ventral plates are unique at least amongst the Australian *Styringomyia* species.

### Key to the species of *Styringomyia* known from Australia (males only)

- 1 Gonocoxites without distinct apical spine (Fig. 66); femora and tibiae rather pale without distinct incomplete dark rings or tip; no distinct wing spots ..... *kimberley*
- Gonocoxites with distinct apical spine (Figs 67-70, 74, 75, 77-81); femora and tibiae rather dark or pale with distinct incomplete dark rings or tip ..... 2
- 2 Gonocoxites with 3 spines, 1 apical, 2 dorsal; gonostyli including large elements with abundant retrose setae (Fig. 67) ..... *danbulla*
- Gonocoxites with 1 or 2 spines, none of them dorsal; gonostyli not including elements with abundant retrose setae ..... 3
- 3 Gonocoxites with 2 spines, 1 apical, 1 ventral (Figs 68-70) ..... 4
- Gonocoxites with apical spine only ..... 6
- 4 Gonocoxites plump, hardly longer than subapical spine (Fig. 68); femora and tibiae rather pale with distinct incomplete dark rings; wings with indistinct spots ..... *naso*
- Gonocoxites slender, more than twice as long as subapical spine (Figs 69, 70); pro and meso femora and tibiae rather dark without distinct darker rings; wings partly distinctly darkened but without spots ..... 5
- 5 Apical spine of gonocoxite basally not expanded (Fig. 69) ..... *aterrima*
- Apical spine of gonocoxite basally expanded (Fig. 70) ..... *terraereginae*
- 6 Apex of sternite 9 simple and narrow; gonostyli with long, slender whip-like element (Fig. 71) ..... *flagro*
- Apex of sternite 9 complex, bilobed or trifid; gonostyli without long, slender whip-like element (Figs 72, 73) ..... 7
- 7 Apex of sternite 9 bilobed (Fig. 72) femora and tibiae dark without distinct rings or pale with distinct incomplete rings ..... 8
- Apex of sternite 9 trifid (Fig. 73); femora and tibiae pale with apex darker ..... 13
- 8 Gonocoxites without mesal expansion, their basal two thirds plump, the apical third digitate (Fig. 74); femora and tibiae dark without distinctly darker incomplete rings; wings not spotted ..... *rose*
- Gonocoxites subconical with mesal expansion (Figs 23, 75-78); generally, femora and tibiae pale with darker incomplete rings and wings spotted ..... 9
- 9 Mesal expansion of gonocoxites very large, in ventral view obscuring much of the gonostyli (see Fig. 23) ..... *edwardsorum*
- Mesal expansion of gonocoxites of moderate size, in ventral view not obscuring much of gonostyli (Figs 75-78) ..... 10
- 10 Prominent element of gonostyli with several distinct long setae along posterior margin (Fig. 75) ..... *bancrofti*
- Prominent element of gonostyli without distinct long setae along posterior margin (Figs 76-78) ..... 11
- 11 Prominent element of gonostyli double-winged, gutter-shaped (Fig. 76) ..... *baroalba*
- Prominent element of gonostyli mesally pointed or rounded (Figs 77, 78) ..... 12
- 12 Prominent element of gonostyli mesally pointed (Fig. 77) ..... *remex*
- Prominent element of gonostyli mesally rounded (Fig. 78) ..... *collessi*
- 13 Less than basal two thirds of gonocoxites expanded; median process of sternite 9 long and narrow (Fig. 79) ..... *coronata*
- Basal three fourths of gonocoxites significantly expanded; median process of sternite 9 moderately long and wide or short and flat (Figs 80, 81) ..... 14
- 14 Median process of sternite 9 moderately long and wide (Fig. 80) ..... *bipunctata*
- Median process of sternite 9 short and flat (Fig. 81) ..... *williamsi*

### Distributions of *Styringomyia* species recorded from Australia

The Australian species of *Styringomyia* are predominantly found north of the tropic of Capricorn, with only *S. bancrofti* and, to a greater extent, *S. williamsi* extending south along the eastern slopes of the Great Dividing Range. The five species of the *S. bancrofti* group have a wide northern distribution (Map 1), the two species of the *S. terraereginae* group are entirely north-eastern tropical (Map 2), the three species of the *S. bipunctata* group are distributed along the eastern coast and Great Dividing Range (Map 3), while the five ungrouped species also have a wide northern distribution (Map 4).

Species of *Styringomyia* appear to exist in relative isolation with sympatry only observed for *S. remex* and *S. kimberley* at Cape Bertholet in West Kimberley and for *S. remex* and *S. flagro* at Annan River, near Black Mt, in tropical north-eastern Queensland.

### Acknowledgements

Together with numerous other Limoniidae, the late Donald Henry Colless left to the senior author a rich collection of *Styringomyia*, mostly collected by himself in northern Australia, for study. Some specimens were contributed by Max Moulds (Kuranda) and Geoff Williams (Tarree). Jon Gelhaus (Philadelphia), Sigita Podenas (Vilnius) and Yngve Brodin (Stockholm) provided photographs of type material in their care. Piotr Oosterbroek (Amsterdam) and Sigita Podenas (Vilnius) read the manuscript and gave invaluable suggestions to improve it. The kind support of all of them is greatly appreciated.

### Zusammenfassung

Die Gattung *Styringomyia* LOEW wird kurz vorgestellt. Die bisher von Australien bekannten Arten werden untersucht, und 12 Arten werden als neu beschrieben. Alle Arten werden illustriert und ihre verwandtschaftlichen Beziehungen und Verbreitung werden diskutiert. Ein Schlüssel für die Identifikation der Männchen der nun von Australien bekannten *Styringomyia* Arten wird präsentiert.

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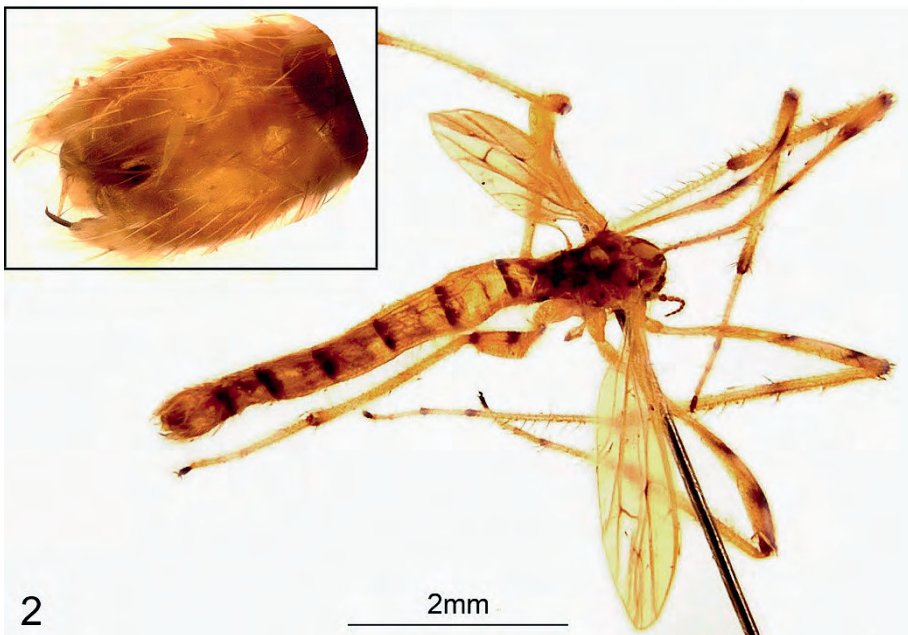
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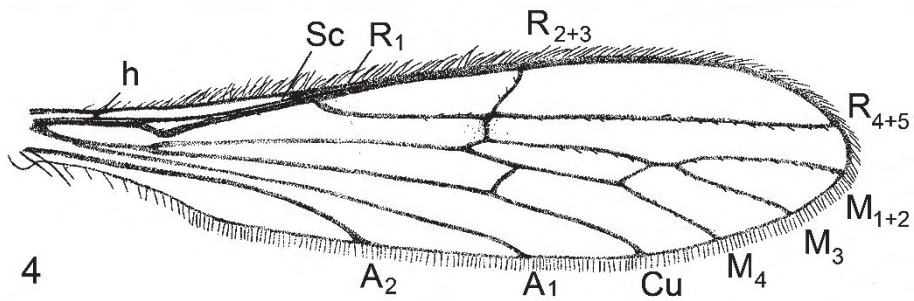
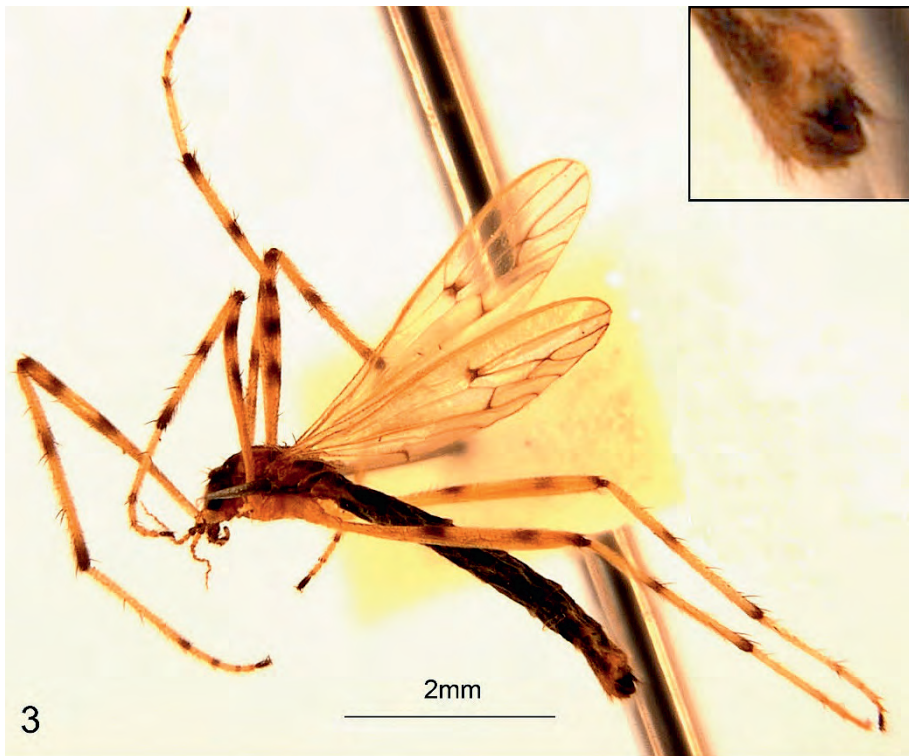
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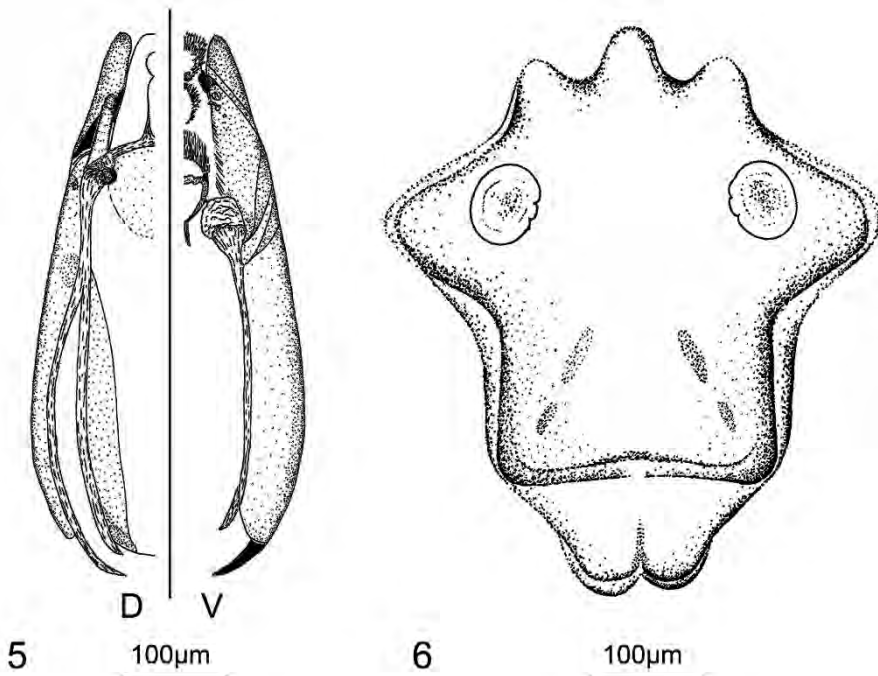


**Figs 1, 2:** *Styringomyia* sp., male, habitus plus inset hypopygium: (1) *S. baroalba* nov.sp.; (2) *S. collessi* nov.sp.

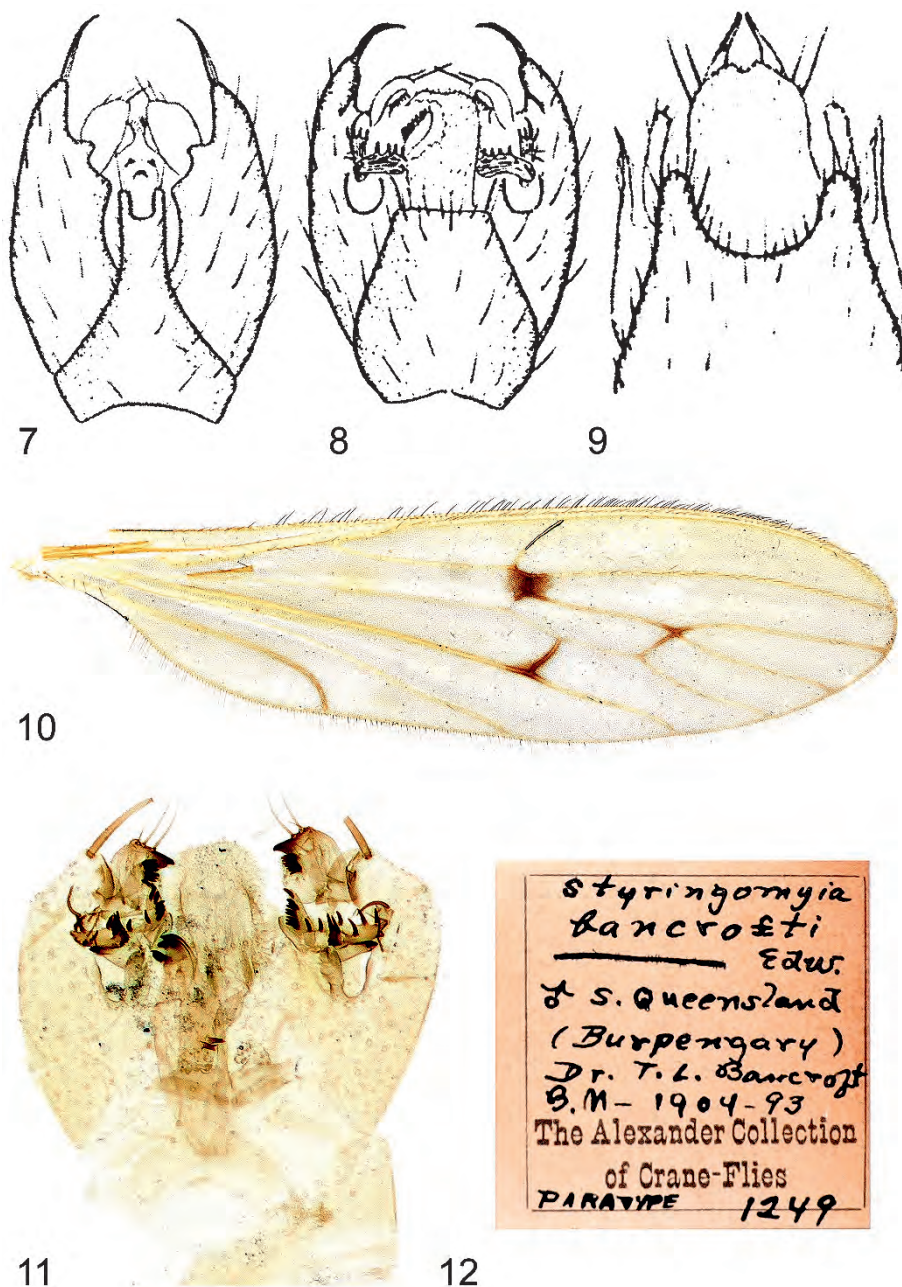




**Figs 3, 4:** *Styringomyia* sp., (3) *S. remex* nov.sp., female, habitus plus inset terminalia; (4) *S. paulista* ALEXANDER, wing venation (modified from RIBEIRO 2003).

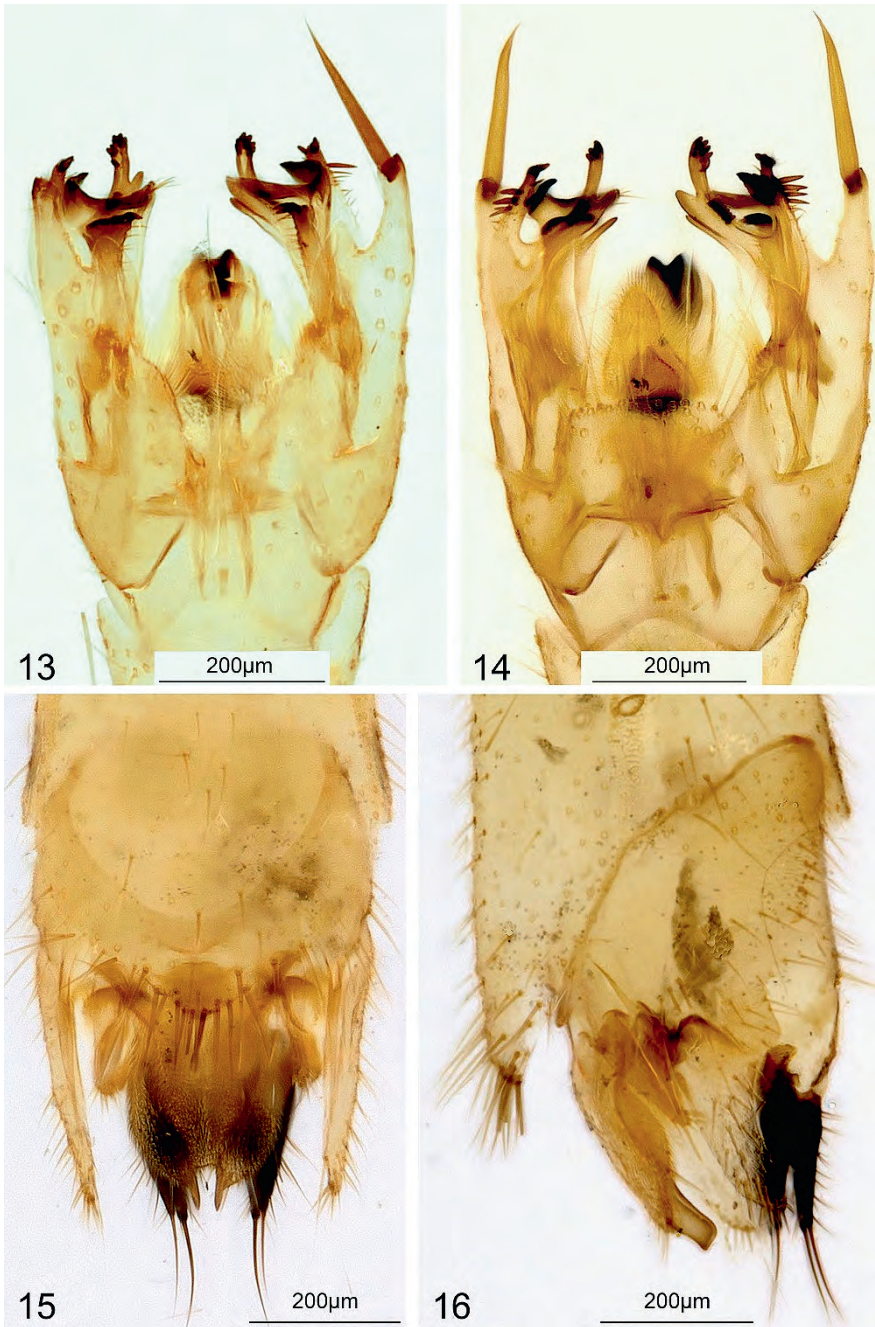


**Figs 5, 6:** *Styringomyia neocaledoniae* ALEXANDER, larva, modified from HYNES (1990): (5) head capsule; (6) spiracular disc. (D = dorsal; V = ventral).



**Figs 7-12:** *Styringomyia bancrofti* EDWARDS: (7-9) terminalia, modified from EDWARDS (1924): (7, 8) male: (7) ventral; (8) dorsal; (9) female dorsal; (10-12) paratype male: (10) wing; (11) terminalia, ventral; (12) label.

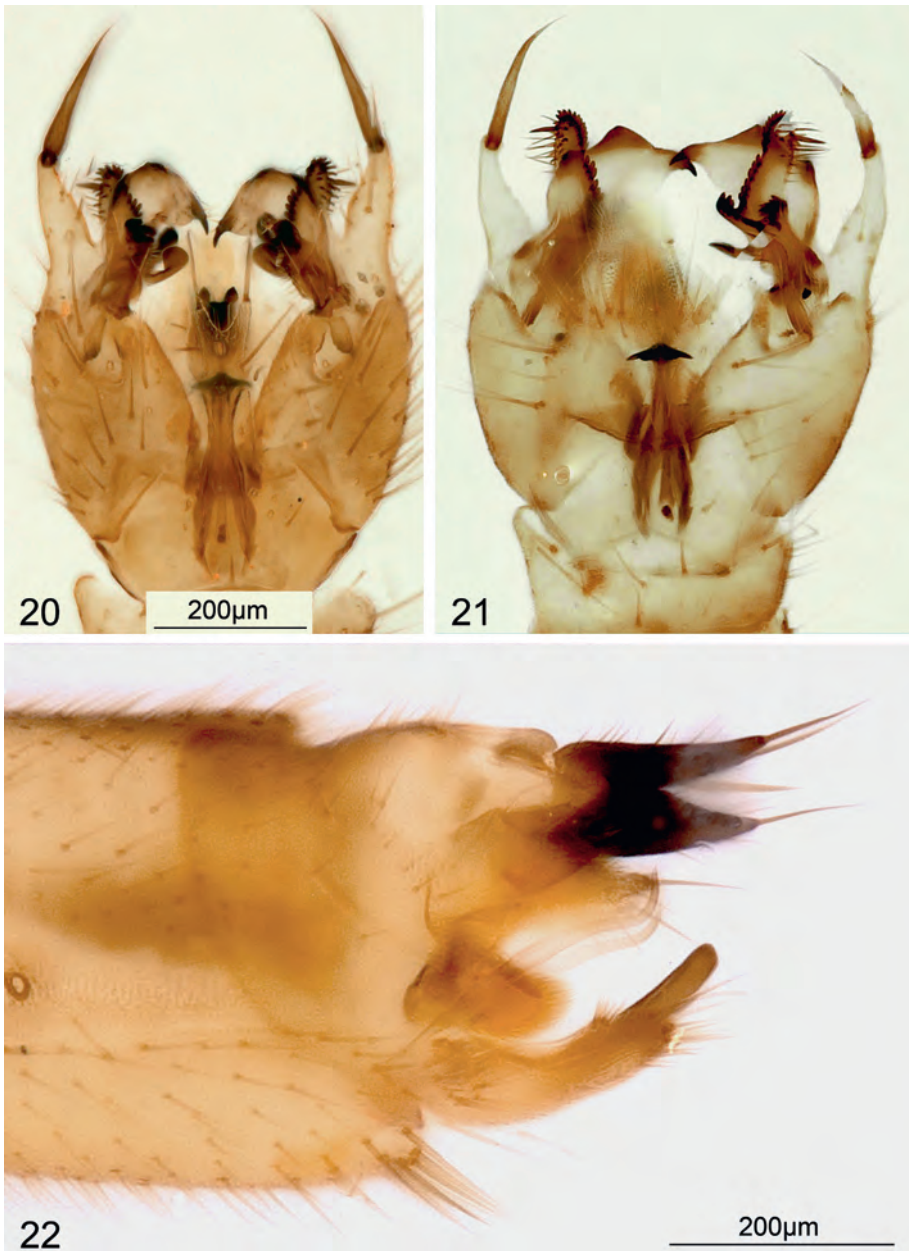




**Figs 13-16:** *Styringomyia baroalba* nov.sp., terminalia: (13, 14) male: (13) ventral; (14) dorsal; (15, 16) female: (15) ventral; (16) lateral.



**Figs 17-19:** *Styringomyia collessi* nov.sp., terminalia: (17, 18) male: (17) ventral; (18) dorsal; (19) female, lateral.



**Figs 20-22:** *Styringomyia remex* nov.sp., terminalia: (20, 21) male: (20) ventral; (21) dorsal; (22) female, lateral.



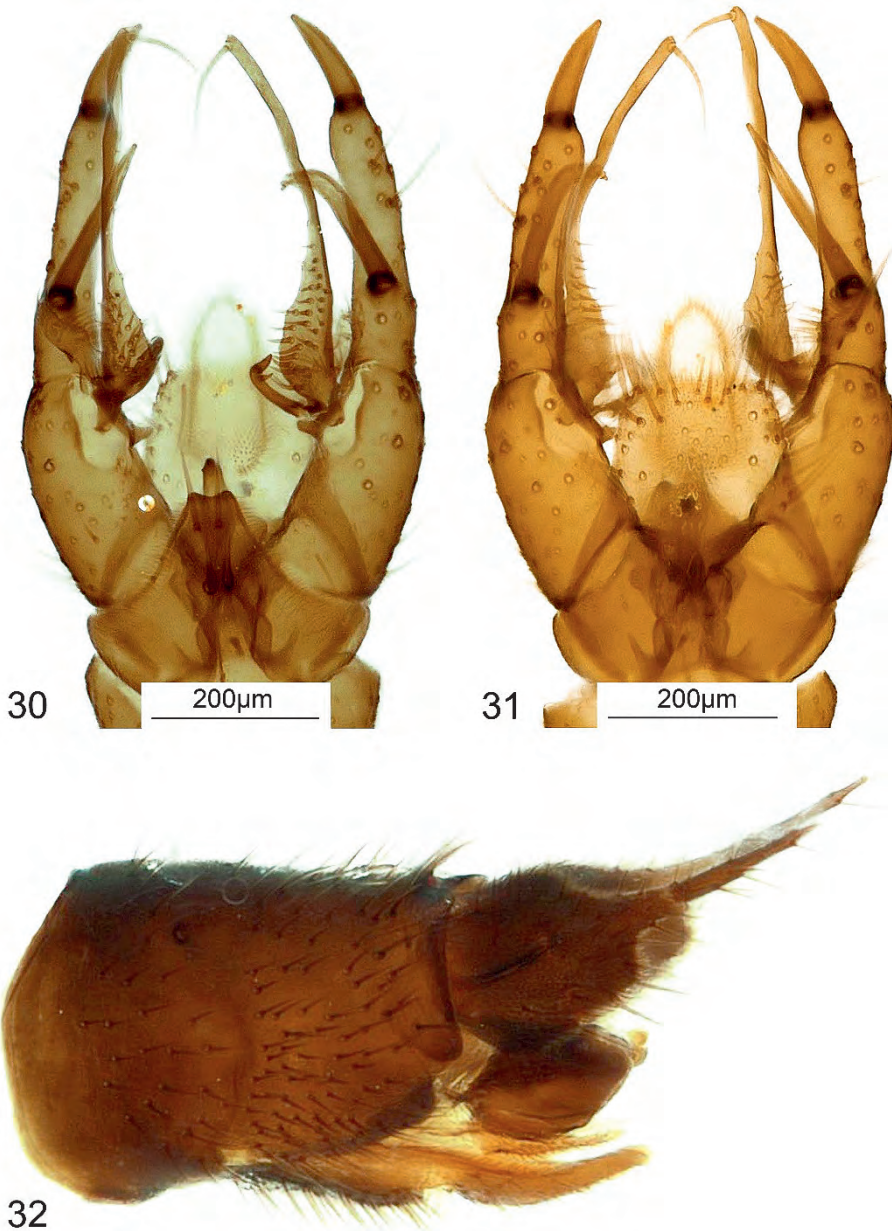


**Figs 23-25:** *Styringomyia edwardsorum* nov.sp., terminalia: (23, 24) male: (23) ventral; (24) dorsal; (25) female, lateral.



**Figs 26-29:** *Styringomyia terraereginae* ALEXANDER, holotype male: (26) wing; (27) terminalia, ventral; (28) leg; (29) label.

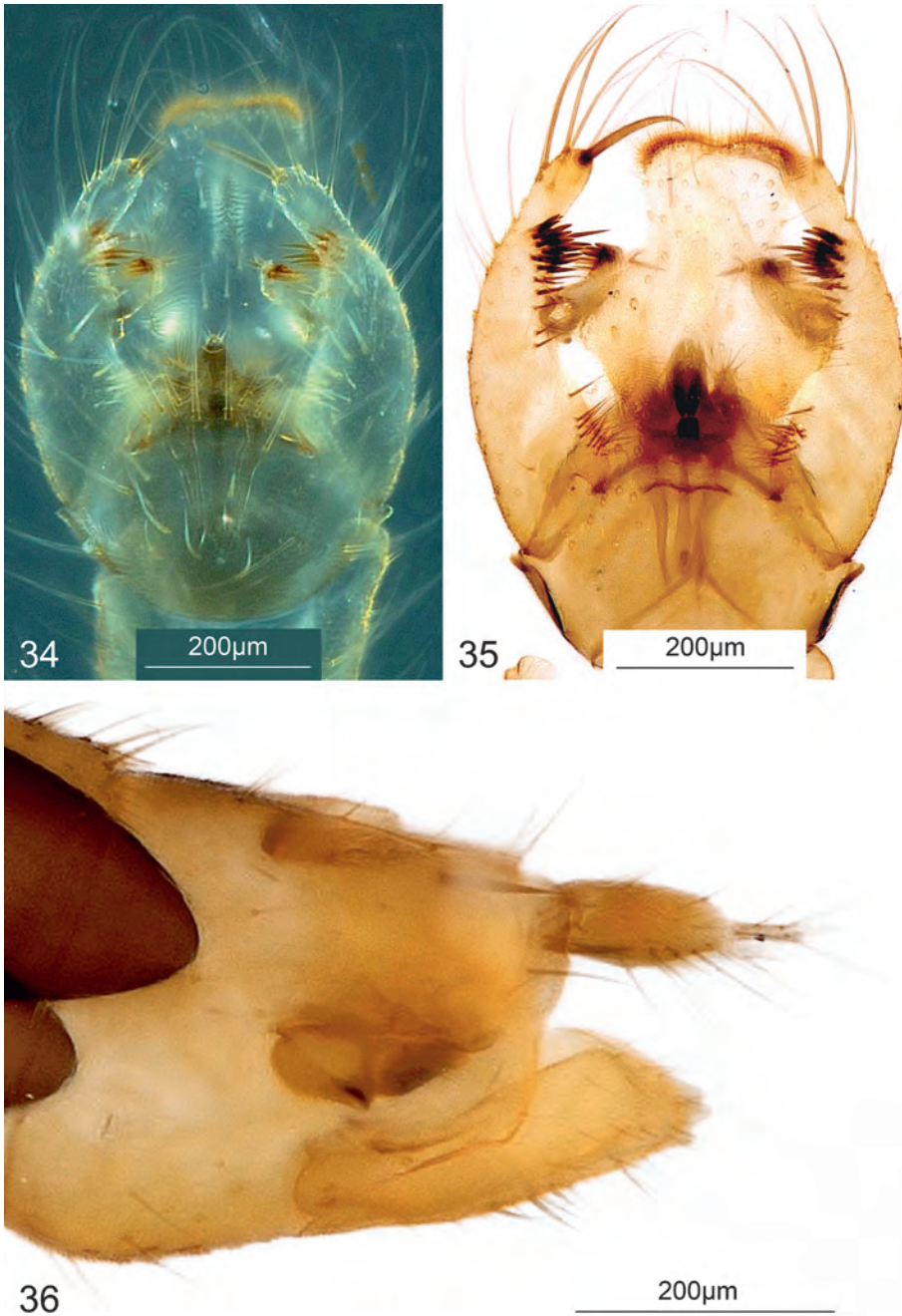




**Figs 30-32:** *Styringomyia aterrima* nov.sp., terminalia: (30, 31) male: (30) ventral; (31) dorsal; (32) female, lateral.

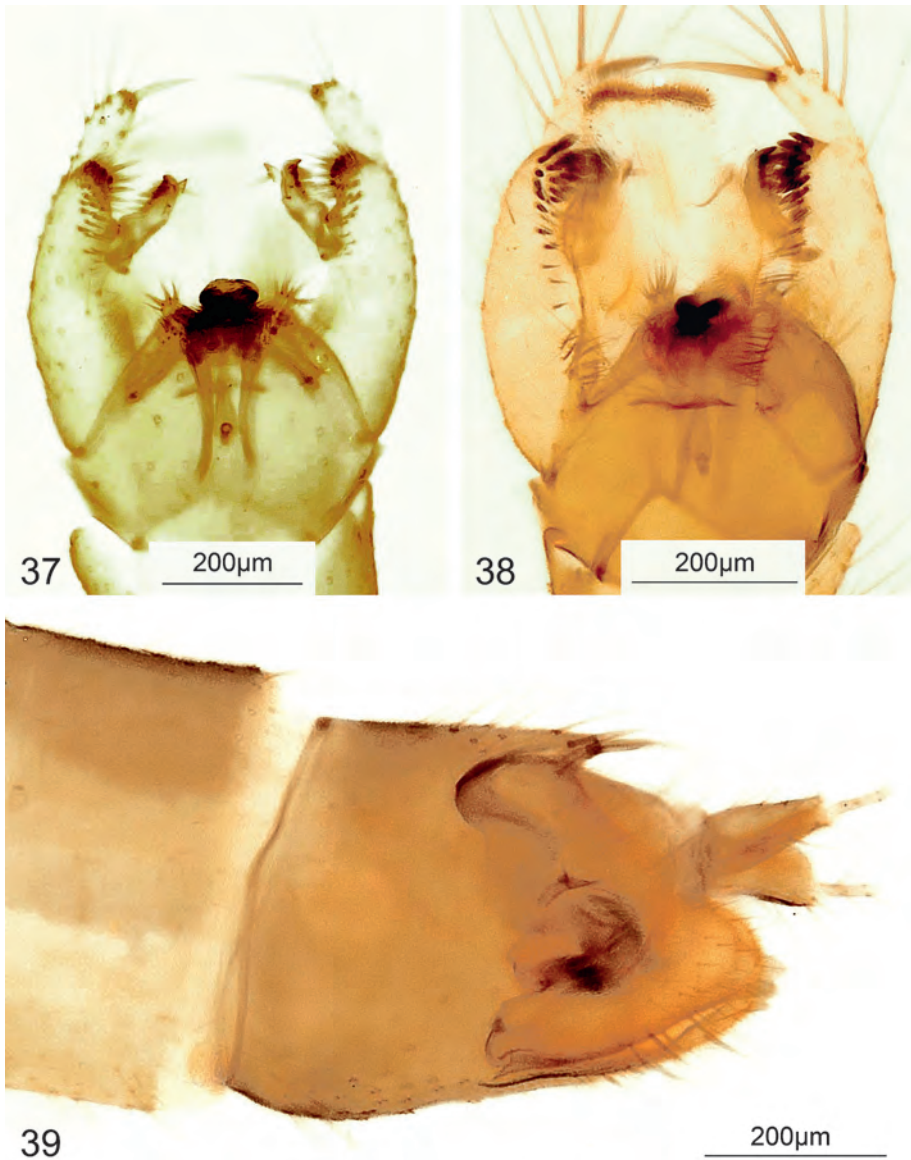


Fig. 33: *Styringomyia bipunctata* EDWARDS, holotype male, habitus, label and terminalia inset.

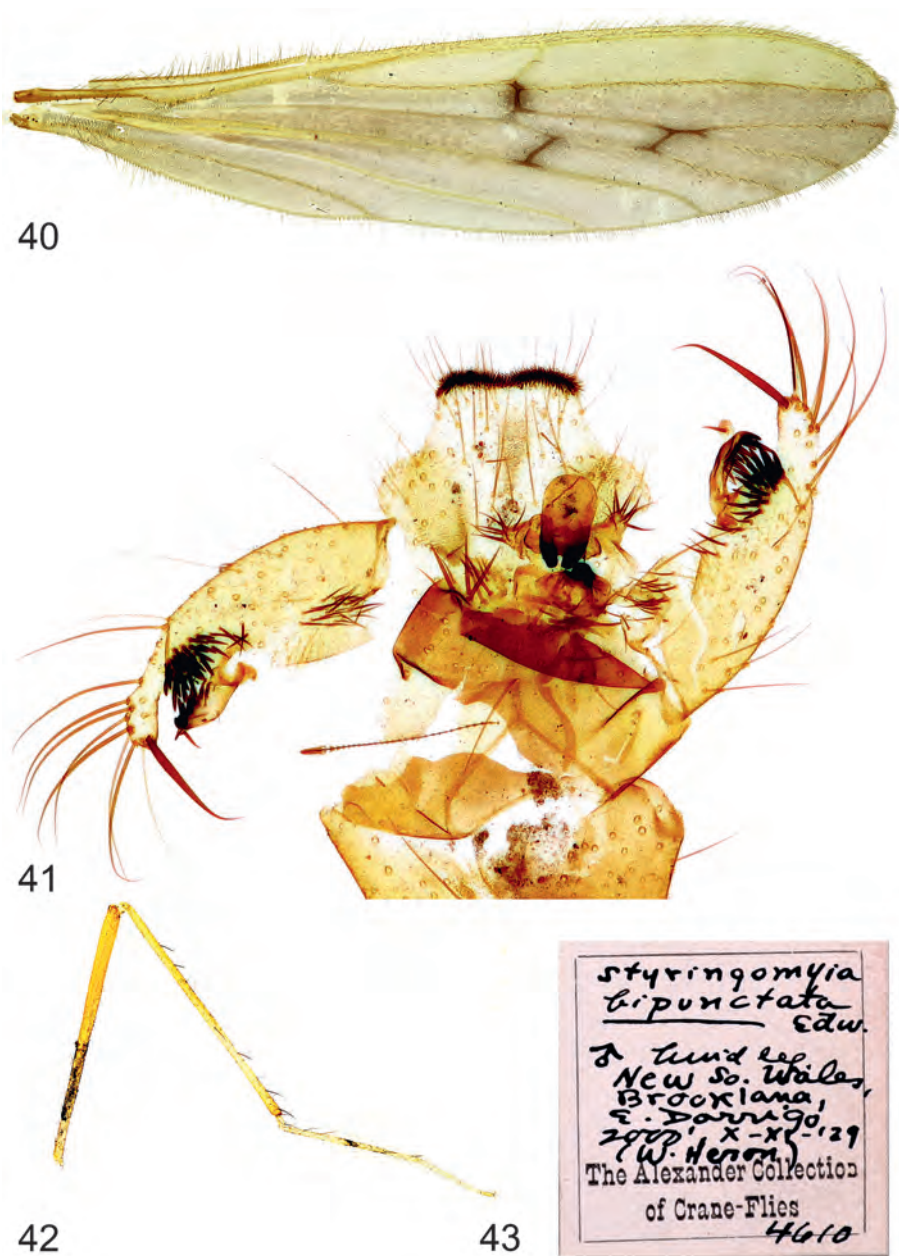


**Figs 34-36:** *Styringomyia bipunctata* EDWARDS, terminalia: (34, 35) male: (34) ventral; (35) dorsal; (36) female, lateral.

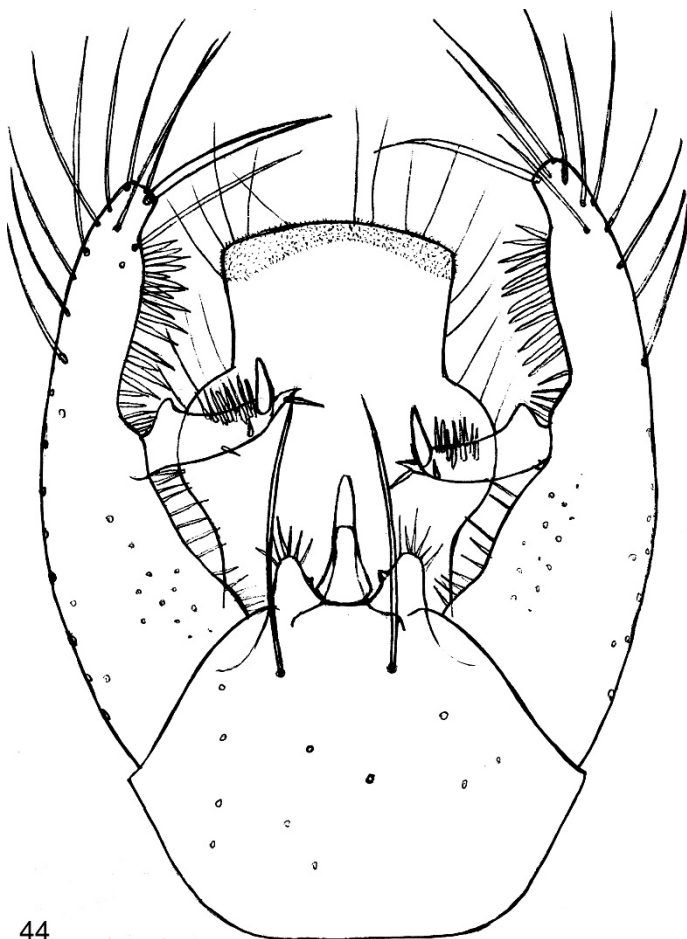




**Figs 37-39:** *Styringomyia williamsi* nov.sp., terminalia: (37, 38) male: (37) ventral; (38) dorsal; (39) female, lateral.

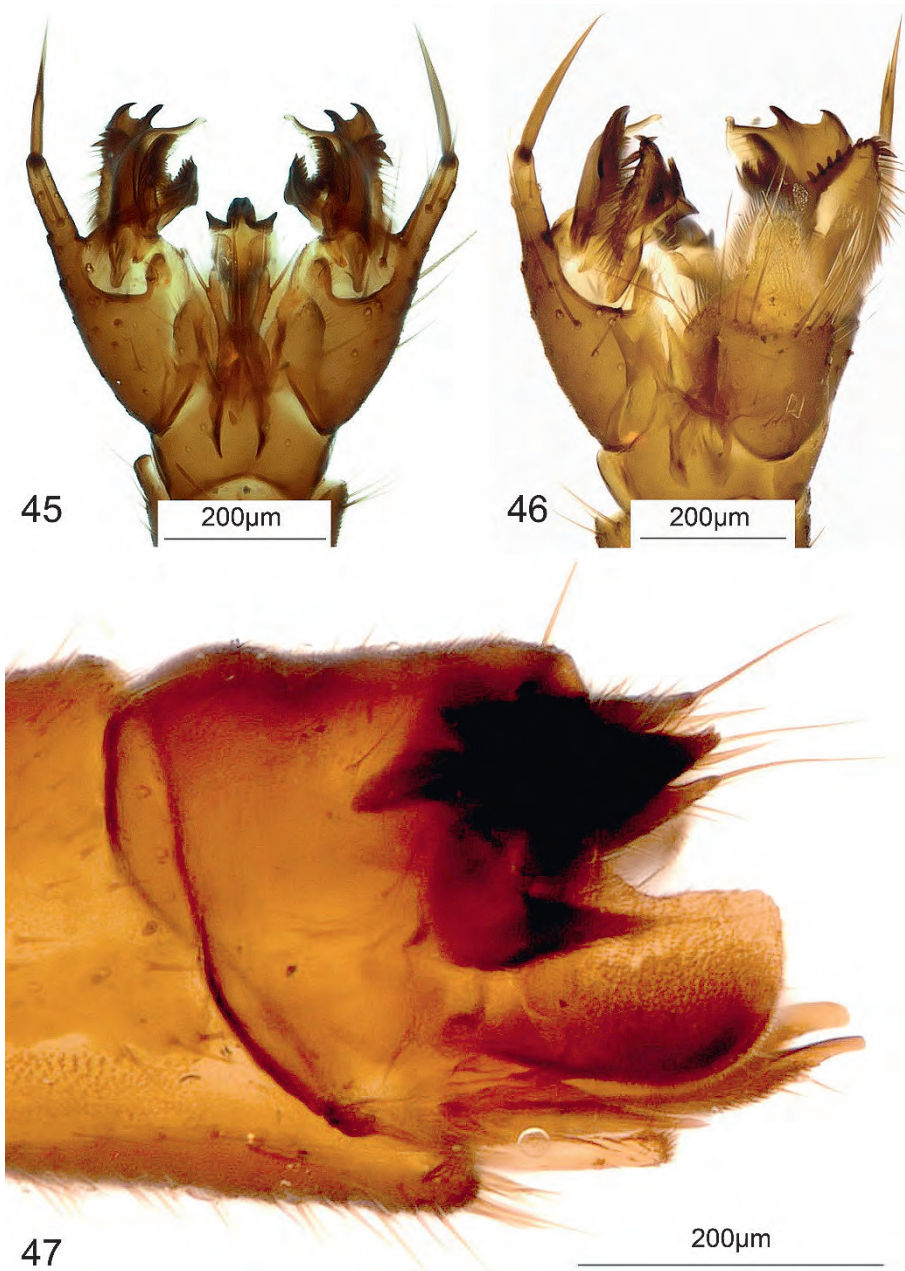


**Figs 40-43:** *Styringomyia williamsi* nov.sp. (interpreted as *Styringomyia bipunctata* EDWARDS): (40) wing; (41) terminalia; (42) leg; (43) label.



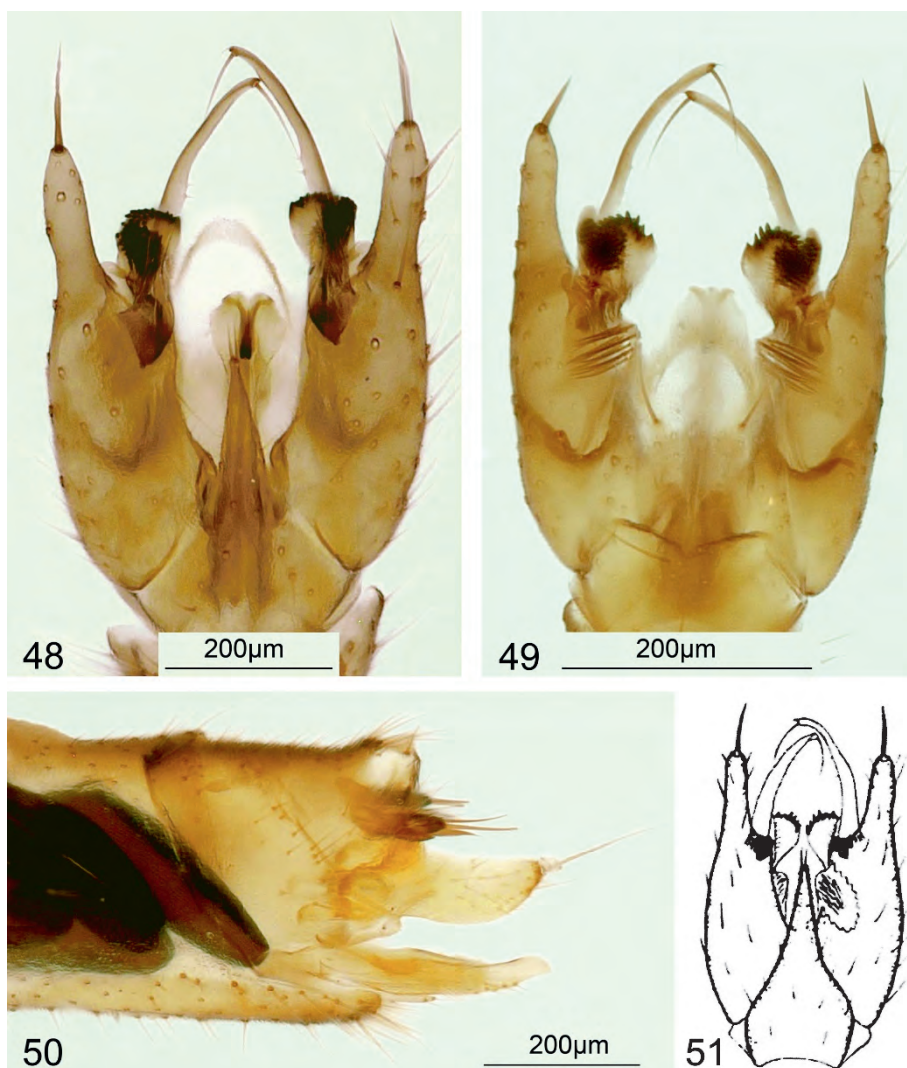
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**Fig. 44:** *Styringomyia coronata* nov.sp., male, terminalia, ventral.



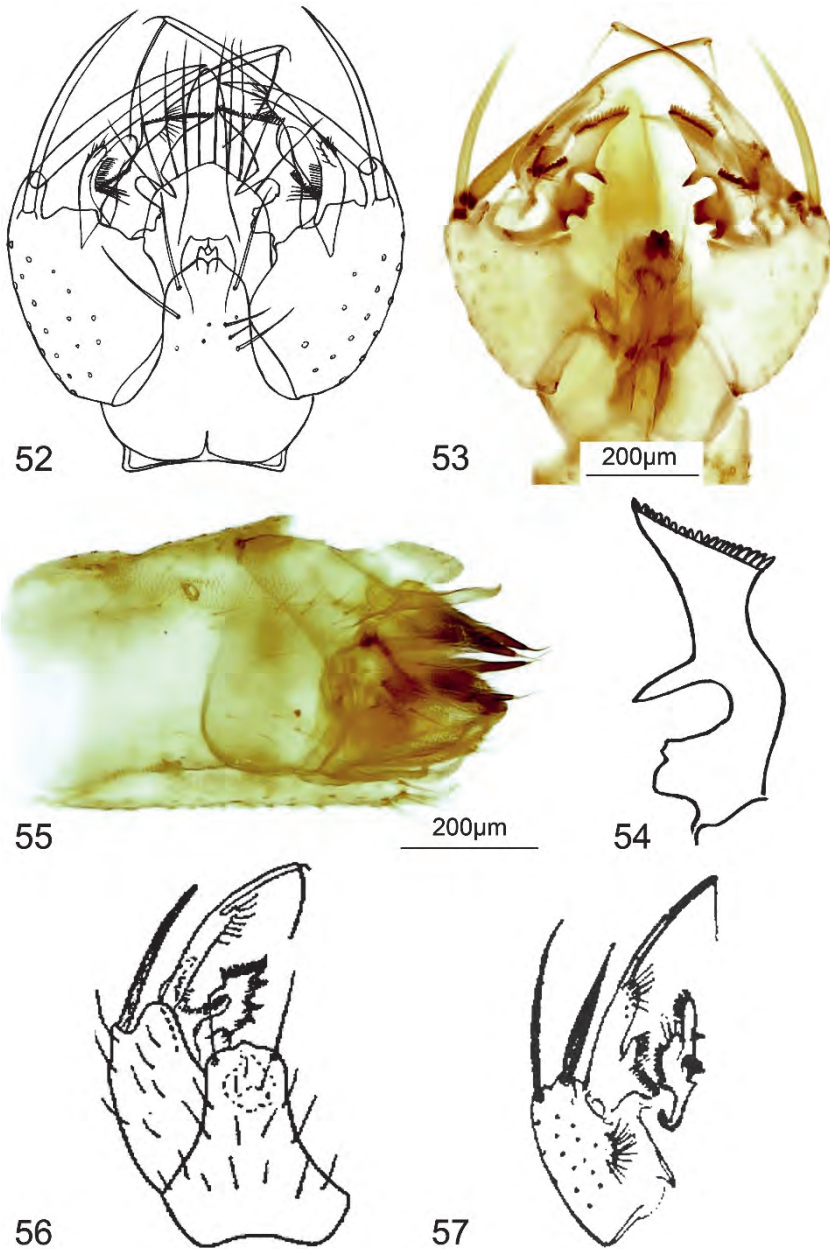
**Figs 45-47:** *Styringomyia rose* nov.sp., terminalia: (45, 46) male: (45) ventral; (46) dorsal; (47) female, lateral.



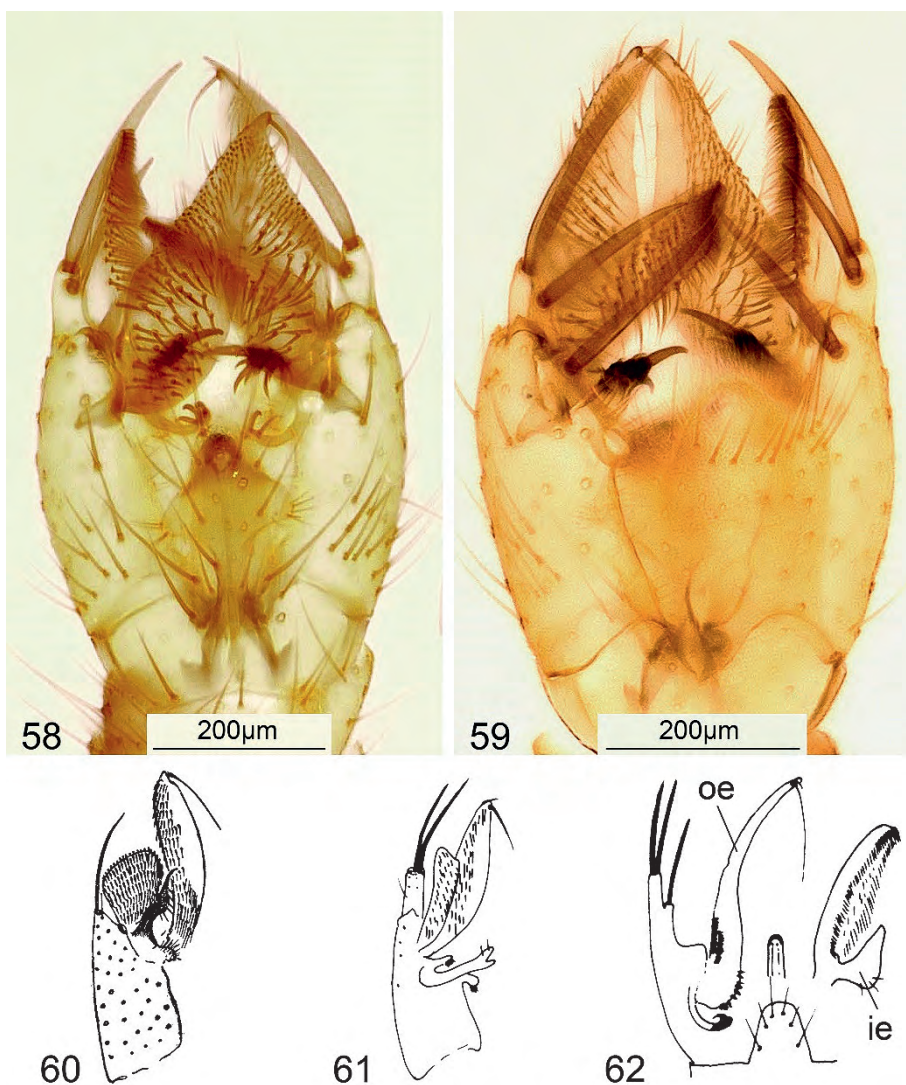


**Figs 48-51:** *Styringomyia* sp., terminalia: (48-50) *S. flagro* nov.sp.: (48, 49) male: (48) ventral; (49) dorsal; (50) female, lateral; (51) *S. ceylonica* EDWARDS, male, ventral, modified from EDWARDS (1911).

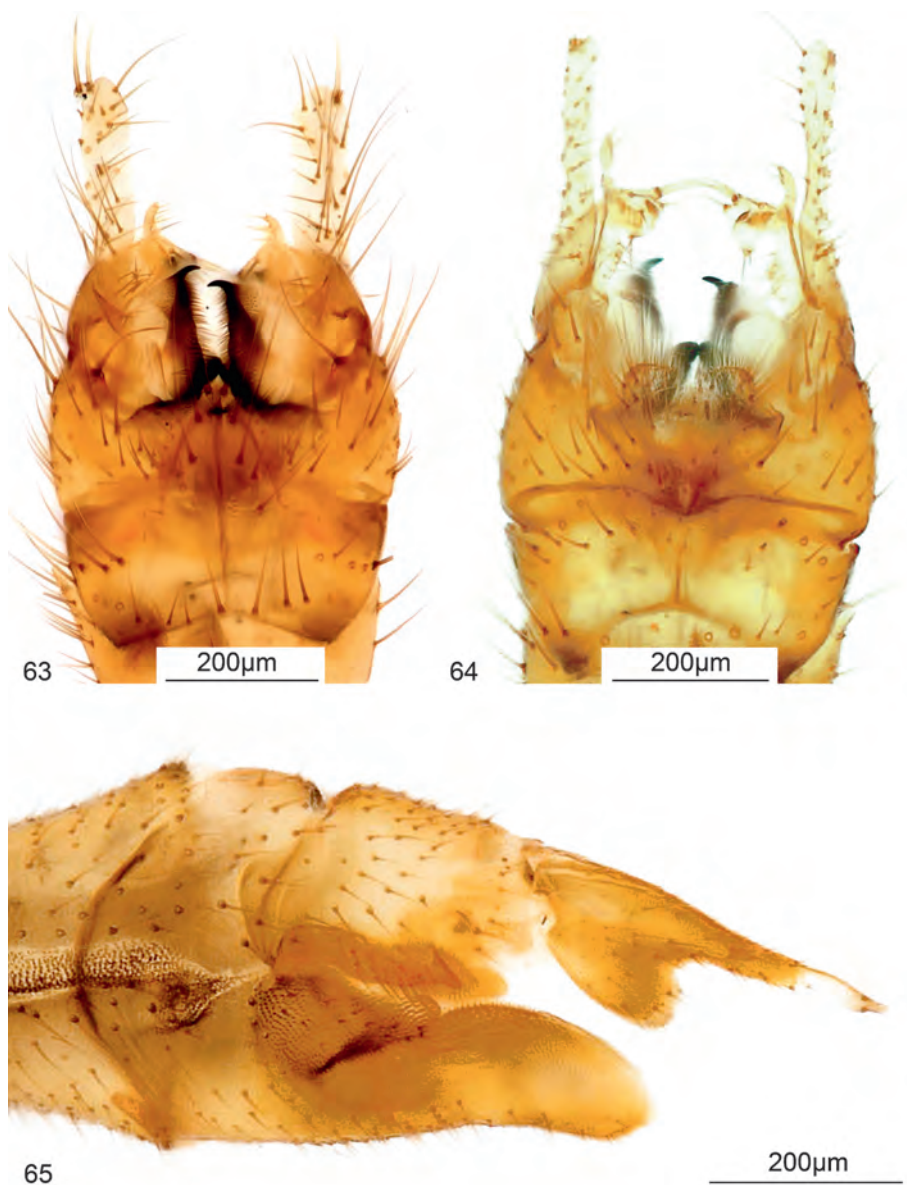




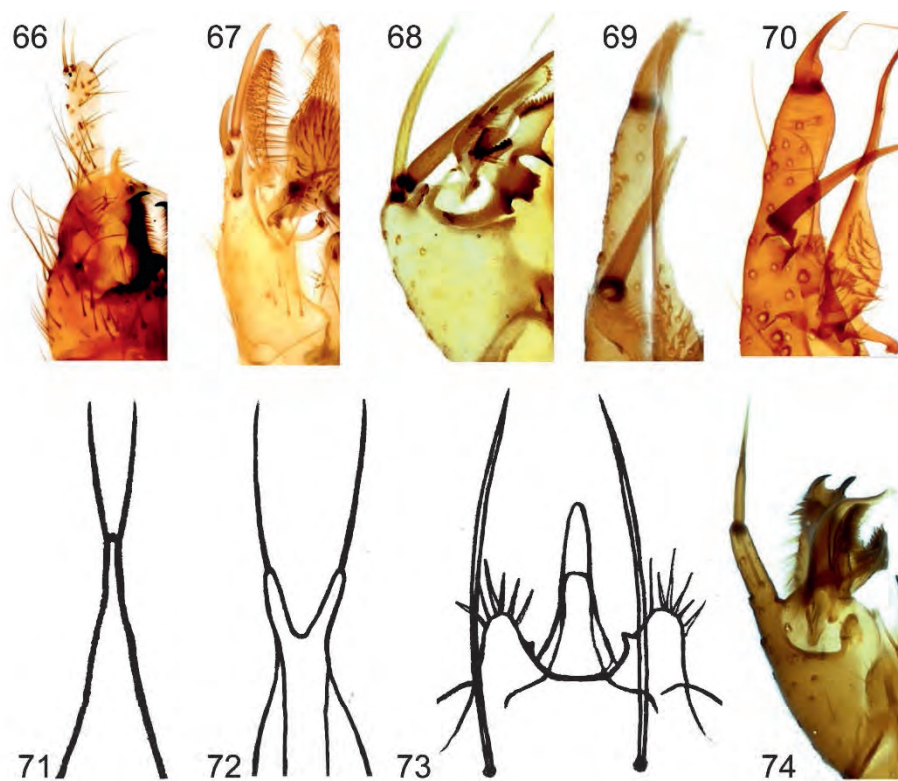
**Figs 52-57:** *Styringomyia* sp., terminalia: (52-55) *S. naso* nov.sp.: (52-54) male: (52) ventral; (53) dorsal; (54) part of gonostylus, ventral; (55) female, lateral; (56) *S. ensifera* EDWARDS, male, details, modified from EDWARDS (1924); (57) *S. multisetosa* ALEXANDER, male, details, modified from ALEXANDER (1964).



**Figs 58-62:** *Styringomyia* sp., male terminalia: (58, 59) *S. danbulla* nov.sp.: (58) ventral; (59) dorsal; (60) *S. neocaledoniae* ALEXANDER, modified from ALEXANDER (1948); (61, 62) modified from HYNES (1987): (61) *S. bidentata* HYNES; (62) *S. idioformosa* HYNES. Abbreviations as used in figures: ie, inner element of gonostylus; oe, outer element of gonostylus.

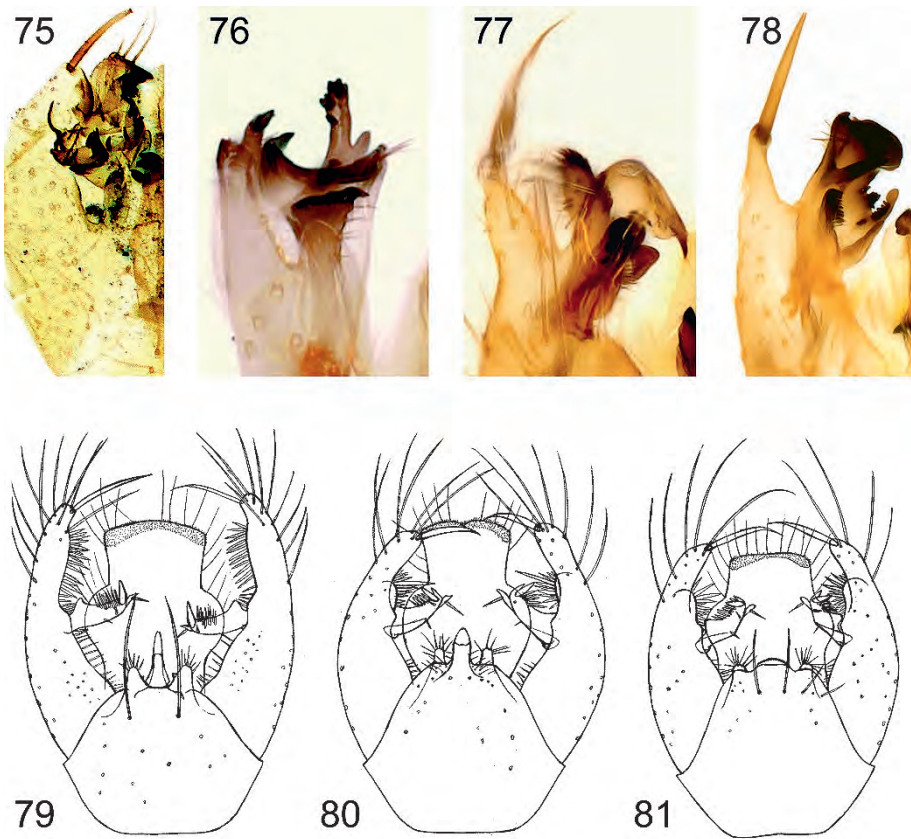


**Figs 63-65:** *Styringomyia kimberley* nov.sp., terminalia: (63, 64) male; (63) ventral; (64) dorsal; (65) female, lateral.

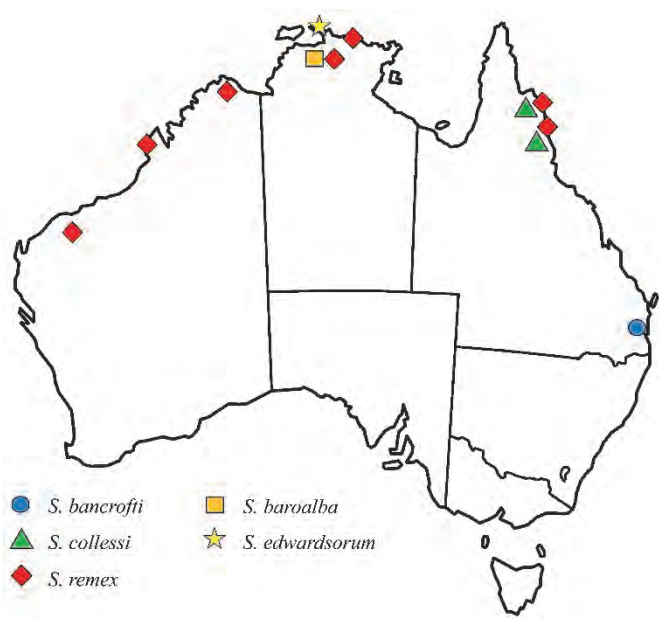


**Figs 66-74.** *Styringomyia* sp., male, hypopygial details: (66) *S. kimberley*; (67) *S. danbulla*; (68) *S. naso*; (69) *S. aterrima*; (70) *S. terraereginae*; (71) *S. flagro*; (72) *S. remex*; (73) *S. coronata*; (74) *S. rose*.





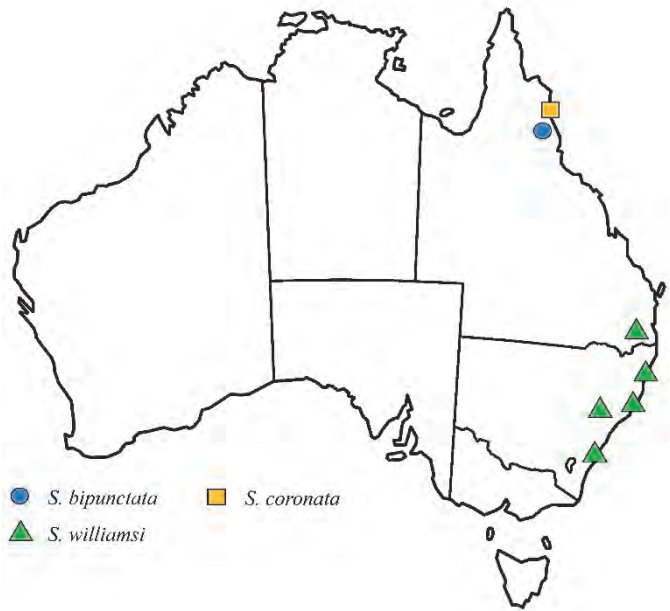
**Figs 75-81:** *Styringomyia* sp., male, hypopygial details or hypopygium: (75) *S. bancrofti*; (76) *S. baroalba*; (77) *S. remex*; (78) *S. collessi*; (79) *S. coronata*; (80) *S. bipunctata*; (81) *S. williamsi*.



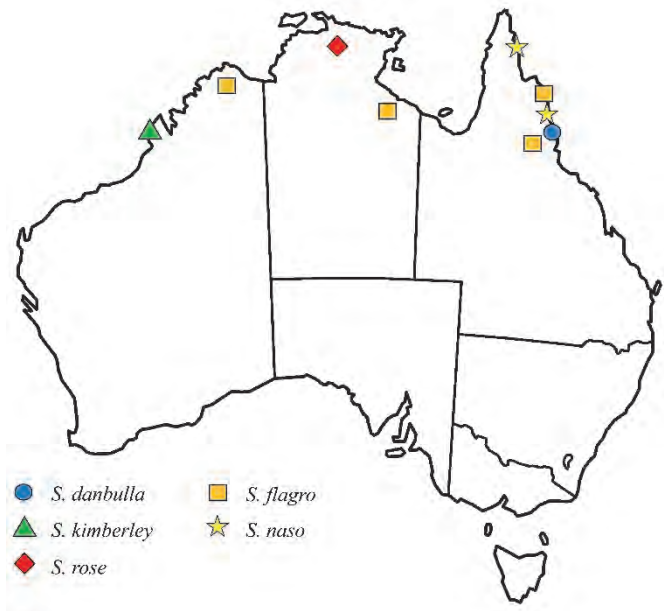
**Map 1:** Distribution of the species of the *Styringomyia bancrofti* group: *S. bancrofti*, *S. baroalba*, *S. collessi*, *S. remex*, *S. edwardsorum*.



**Map 2:** Distribution of the species of the *Styringomyia terraereginae* group: *S. terraereginae*, *S. aterrima*.



**Map 3:** Distribution of the species of the *Styringomyia bipunctata* group: *S. bipunctata*, *S. williamsi*, *S. coronata*.



**Map 4:** Distribution of the ungrouped *Styringomyia* species: *S. rose*, *S. flagro*, *S. naso*, *S. danbulla*, *S. kimberley*.

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