

First record of the planthopper tribe Mnemosynini in Australia  
with the description of two new species  
(Hemiptera: Fulgoromorpha: Cixiidae)

Первое указание трибы Mnemosynini из Австралии  
с описанием двух новых видов  
(Hemiptera: Fulgoromorpha: Cixiidae)

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КЛЮЧЕВЫЕ СЛОВА: Auchenorrhyncha, Fulgoromorpha, Cixiidae, Mnemosynini, *Mnemosyne*, новые виды, Австралия.

ABSTRACT. Mnemosynini, a tribe comprising the extinct genus *Autrimpus* Szwedo, 2004 and the extant genus *Mnemosyne* Stål, 1866, was previously only known from the Afrotropical, Neotropical and Oriental regions. Here we report the first record of the tribe from Australia, in describing *Mnemosyne alexandri* sp.n. and *M. comata* sp.n., thus increasing the species recognised within the genus to 48.

РЕЗЮМЕ. Триба Mnemosynini, включающая ископаемый род *Autrimpus* Szwedo, 2004 и современный род *Mnemosyne* Stål, 1866, была до сих пор известна только из Афротропической, Неотропической и Ориентальной областей. В настоящей статье приводится первое указание трибы из Австралии и описываются новые виды — *Mnemosyne alexandri* sp.n. and *M. comata* sp.n., с учётом которых общее число видов рода возрастает до 48.

## Introduction

The planthopper family Cixiidae Spinola, 1839, is distributed world wide showing a particularly high diversity in the tropics [Emeljanov, 2002; Holzinger et al., 2002]. The genus *Mnemosyne* was created by Stål [1866a] and placed with *Cajeta* Stål 1866a in the Dictyopharidae. Muir [1923] transferred *Mnemosyne* into the family Cixiidae. Based on characters such as five carinae on the

mesonotum (present in most species of the genus), Emeljanov [1971] placed *Mnemosyne* in the tribe Pentastirini. Van Stalle [1986] characterized the tribe Pentastirini by the following synapomorphies: connection of the aedeagus with the pygofer, reduced ovipositor and valvulae II not corrugated. Since species of *Mnemosyne* have the aedeagus connected with the anal tube instead of the pygofer (as in all Pentastirini) this genus did not fit the tribe as defined by Van Stalle [1986]. Based on overall similarity and configuration patterns of male genitalia between *Mnemosyne* and other Pentastirini, Emeljanov [1993] decided to retain *Mnemosyne* within the limits of this tribe, but to create a new subtribe, the Mnemosynina. Szwedo [2004] raised the taxon to the level of a full tribe, Mnemosynini, to accommodate the extant genus *Mnemosyne* and the extinct species *Autrimpus sambiorum* Szwedo, 2004.

Validation of the genus name came with the description of the neotropical species *Mnemosyne cubana* Stål, 1866b. Further species [reviewed by Metcalf, 1936] preceded revisions of the Afrotropical region with 6 species [Van Stalle, 1985; Van Stalle & Lauterer, 1985], the Neotropical region with 23 species [Van Stalle 1987] and the Oriental region with 17 species [Van Stalle, 1988]. In his paper on Oriental species Van Stalle [1988] stated, “These [the Oriental species] occur between India and Sulawesi, and no *Mnemosyne* species have been recorded farther east than the latter or in Australia.”

During a study of the Australian Cixiidae two new species of *Mnemosyne* were discovered, which now represent the first record of the tribe Mnemosynini for Australia.

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## Material and methods

Preparation of male genitalia. Male specimens were softened for 1–2 days in a humid chamber, a plastic box containing a paper towel soaked with vinegar to prevent mould. During softening, mounted specimens were pinned to a piece of styrofoam. After softening, specimens were demounted and the pygofer carefully removed using forceps and pins. Specimens were then remounted and the pygofer transferred to a beaker containing hot soapy water for a few minutes to be softened further before examination. For the short term, genitalia were stored in cavity slides (square piece of plexiglass with a 14 mm hole drilled through it, glued onto a microscope slide) containing glycerol. For long term storage, male genitalia were transferred into micro-vials containing glycerol and re-associated with mounted specimens.

Distribution. The geographic distribution section accompanying the descriptions of genera lists the regions from which taxa have been recorded. Since vast parts of Australia have not been surveyed comprehensively, actual distributions may be much wider than indicated by the available material.

Terminology. The morphological terms applied here are illustrated in Figs 1–10.

The following measurements were taken in this study:

- body length: tip of head to tip of forewing
- width of vertex: width level of tip of basal emargination
- total length of vertex: apical transverse carina to most caudal limits of vertex
- median length of vertex: apical transverse carina to tip of basal emargination
- length of frons: apical transverse carina to frontoclypeal suture, in median line
- maximal width of frons: at level where frons is widest
- apical width of frons: length of apical transverse carina
- width of forewing: at level of apex of clavus
- length of forewing: base to tip of wing

ABBREVIATIONS: AM— Australian Museum, Sydney; ANIC — Australian National Insect Collection, CSIRO, Canberra; MAMU — Macleay Museum, University of Sydney; Qld — Queensland; QM — Queensland Museum, Brisbane; UQIC — University of Queensland Insect Collection, Brisbane.

## Taxonomy

### Genus *Mnemosyne* Stål, 1866

*Mnemosyne* Stål, 1866a: 150.

Type species: *Mnemosyne cubana* Stål, 1866b, by monotypy.

MORPHOLOGY. Head. Vertex with very obtusely angled basal emargination; lateral carinae slightly elevated; length of median carina about 3/4 of distance between basal emargination and subapical transverse carina; apical and subapical transverse carina connected by two small carinae. Frons partly visible in dorsal view; position of maximum width distinctly dorsad of centre of frontoclypeal suture; lateral carinae not elevated; frontoclypeal suture strongly semicircular bent upwards, median part just reaching lower margin of antennal scape. Median carina of postclypeus evanescent or absent, lateral carinae weakly developed. Rostrum very long, surpassing hind coxa (rarely surpassing hind femur).

Thorax. Pronotum with median carina; hind margin very obtusely angled. Mesonotum with 2–5 carinae; caudad portion distinctly elongate. Forewing without concavity at costal border; tubercles present in cells and along veins; Sc+R+M fused, forming short common stem; fork Sc+R distinctly distad of fork CuA1+CuA2; icu distad of apex of clavus; R apically bifid; MA apically bifid; MP apically trifid; MP1+MP2 (= M3+4) forking distinctly basad of MA1+MA2 (= M1+2); nodus of Y-vein distinctly distad of centre of clavus; 9 apical cells. Hind leg: tibia with 2 lateral spines and 6 apical teeth; 1<sup>st</sup> tarsomere with 5 apical teeth; 2<sup>nd</sup> tarsomere triangularly shaped with 5–6 apical teeth; tarsomeres without platellae.

Abdomen. Rows of trichobothria present on sternites.

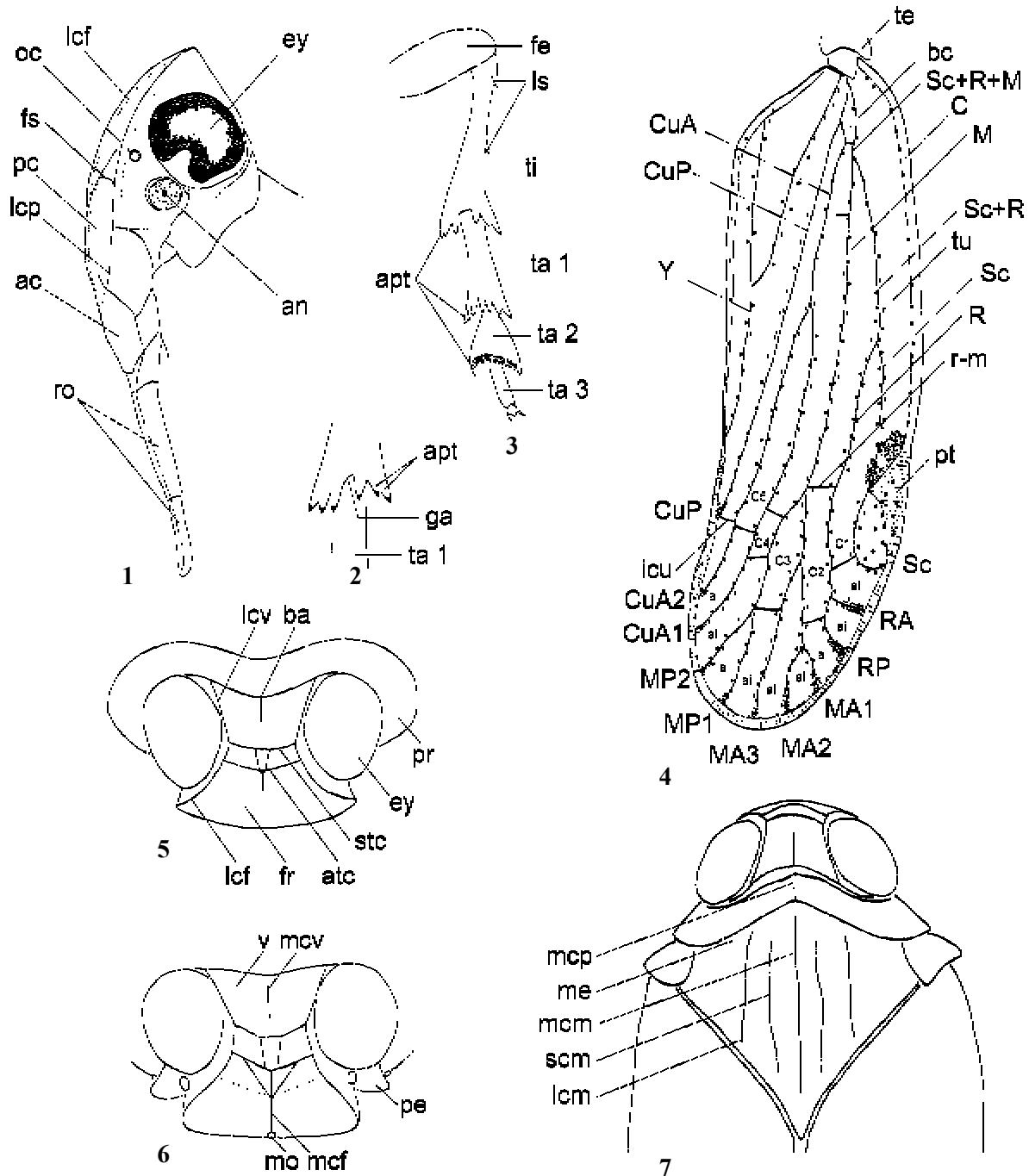
DISTRIBUTION. Afrotropical region (sub Saharan Africa), Australian region (Australia: Queensland), Neotropical region (Brazil, Colombia, Cuba, Dominican Republic, Ecuador, Guyana, Haiti, Panama, Peru, The Bahamas, Trinidad and Tobago, Venezuela) and Oriental region (Indonesia, India Malaysia, Philippines, Singapore, Vietnam).

REMARKS. Many specimens of Australian *Mnemosyne* have five carinae on the mesonotum, the median and sublateral transverse carinae, however, often are very indistinct. In some specimens the median and/or sublateral carinae are completely absent. The presence of only three carinae is a character state commonly found in neotropical species of *Mnemosyne*.

For reliable species identifications it is essential to check the male genitalia against the illustrations provided since further Australian species similar in appearance (but differing in the structure of the male genitalia) are likely to be found (see discussion section). Females can not be determined to species level with certainty.

Рис. 1–7. *Mnemosyne* spp.: 1 — голова, сбоку слева; 2 — задняя голень и первый тарзомер; 3 — задняя нога; 4 — переднее крыло; 5, 7 — *Mnemosyne alexandri* sp.n. (5 — голова, спереди; 7 — голова, передне- и среднеспинка, сверху); 6 — *Mnemosyne comata* sp.n., голова, спереди.

Сокращения: ac — антеклипеус, ap — антенна, ai — апикальная ячейка, арт — апикальные зубы, atc — апикальный поперечный киль, ba — базальная вогнутость, bc — базальная ячейка, C — коста, C1–C5 — субапикальные ячейки 1–5, CuA — передний кубитус, CuA1 — передний кубитус 1, CuA2 — передний кубитус 2, CuP — задний кубитус (= клавус), ey — глаз, fe — бедро, fr — лоб, fs — лобно-клипеальный шов, ga — промежуток в ряду апикальных зубов (= диастема по Емельянову), icu — интеркубитус, lcf — боковой киль лба, lcm — боковой киль среднеспинки, lcp — боковой киль постклипеуса, lcv — боковой киль темени, ls — боковые шипы задней голени, M — медиана, MA1 — передняя медиана 1, MA2 — передняя медиана 2, MA3 — передняя медиана 3, me — среднеспинка, mcf — срединный киль лба, mcm — срединный киль среднеспинки, mcr — срединный киль переднеспинки, mcv — срединный киль темени, mo — срединный глазок, MP1 — задняя медиана 1, MP2 — задняя медиана 2, oc — глазок, pc — постклипеус, pe — педицеллум, pg — переднеспинка, pt — птеростигма, r-m — поперечная жилка между радиусом и медианой, R — радиус, RA — передний радиус, RP — задний радиус, ro — хоботок, Sc — субкоста, Sc+R — ствол субкоста-радиус, Sc+R+M — ствол субкоста-радиус-медиана, scm — сублатеральный киль среднеспинки, stc — субапикальный поперечный киль, ta 1 — первый тарзомер, ta 2 — второй тарзомер, ta 3 — третий тарзомер, te — тегула, ti — голень, tu — зёрнышко, v — темя, Y — Y-жилка (анальная жилка).



Figs 1–7. *Mnemosyne* spp: 1 — head left lateral; 2 — hind tibia and 1<sup>st</sup> tarsomere; 3 — hind leg; 4 — forewing; 5, 7 — *Mnemosyne alexandri* sp.n. (5 — head frontal, 7 — head and thorax dorsal); 6 — *Mnemosyne comata* sp.n., head frontal.

Abbreviations: ac — anteclypeus, an — antennae, ai — apical cell, apt — apical teeth, atc — apical transverse carina, ba — basal emargination, bc — basal cell, C — costa, C1–C5 — subapical cells 1–5, CuA — cubitus anterior, CuA1 — cubitus anterior 1, CuA2 — cubitus anterior 2, CuP — cubitus posterior (= clavus), ey — eye, fe — femur, fr — frons, fs — frontoclypeal suture, ga — gap in row of apical teeth (= diastema sensu Emeljanov), icu — intercubitus, lcf — lateral carina of mesonotum, lcp — lateral carina of postclypeus, lcv — lateral carina of vertex, ls — lateral spines of hind tibia, M — media, MA1 — media anterior 1, MA2 — media anterior 2, MA3 — media anterior 3, me — mesonotum, mcf — median carina of frons, mcm — median carina of mesonotum, mcp — median carina of pronotum, mcv — median carina of vertex, mo — median ocellus, MP1 — media posterior 1, MP2 — media posterior 2, oc — ocellus, pc — postclypeus, pe — pedicellus, pr — pronotum, pt — pterostigma, r-m — crossvein between radius and media, R — radius, RA — radius anterior, RP — radius posterior, ro — rostrum, Sc — subcosta, Sc+R — ScR-stalk, Sc+R+M — ScRM-stalk, scm — sublateral carina of mesonotum, stc — subabical transverse carina, ta 1 — 1<sup>st</sup> tarsomere, ta 2 — 2<sup>nd</sup> tarsomere, ta 3 — 3<sup>rd</sup> tarsomere, te — tegula, ti — tibia, tu — tubercle, v — vertex, Y — Y-vein (anal-vein).

KEY TO AUSTRALIAN SPECIES OF *MNEMOSYNE* STÅL

- 1 Maximum width of frons less than 2 x its apical width; forewing bearing medium sized setae (length about 1/4 of eye diameter), remainder of body covered with short setae (length 1/6 of eye diameter or less); costal margin near base barely thickened; lateral carinae of frons strongly extending laterally, concealing entire pedicellus; phallotheca with two large spines; flagellum without spines .....  
 ..... *M. alexandri* Löcker, **sp.n.**
- Maximum width of frons more than 3 x its apical width; forewing and face bearing long setae (length more than 1/3 of eye diameter), remainder of body covered with shorter setae (length less than 1/4 of eye diameter); costal margin near base distinctly thickened; lateral carinae of frons slightly extending laterally, concealing only base of pedicellus; phallotheca without spines; flagellum with two spines. .... *M. comata* Löcker, **sp.n.**

*Mnemosyne alexandri* Löcker, **sp.n.**

Figs 5, 7, 11, 13–16, 21–23.

MATERIAL. Holotype, ♂: Australia, Qld: Koy Property at Brigooda, 26.16S 151.25E, intercept trap, vine scrub, 15.XII.1994–26.I.1995, G.B. Monteith (QM QMT123826). Paratypes: Australia, Qld: 1 ♀, as holotype (QM), 1 ♀, as holotype, 26.I. –20.IV.1995 (QM), 1 ♂, Meringa, 12.I.1948, B.C. Dodd (UQIC).

Material examined possibly of this species but excluded from type series. Australia, Qld: 1 ♂, 1 ♀, The Knoll, Tamborine Mtn, at light, 3.XII.1992, K.J. Lambkin, G. Sarnes (QM), 1 ♀, Mt. Glorious, 15.I.1963, G. Monteith (UQIC), 1 ♀, Toowoomba, 8.I.1964, J.C. Cardale (UQIC), 1 ♀, Carnarvon National Park, Mt Moffat Sect., Mt Moffat Road, dry creek, 25.03.52S 148.01.00E, malaise, 2.XII.1997, J. Skevington, C. Lambkin, S. Evans (UQIC), 2 ♀, Blackdown Tableland, Expedition Range, mv lamp, 5–6.XII.1979, M.A. Schneider, G. Daniels (UQIC), 1 ♀, Blackdown Tableland via Dingo, 1–6.II.1981, G.B. Monteith (QM), 1 ♀, Mimosa Ck, Expedition Ra., SW of Dingo, 1.XI.1981, D.C.F. Rentz, D.T. Gwynne (ANIC), 1 ♀, Expedition Ra. Nat. Pk, 25.13S 148.59E, Amphitheatre scrub, 520 m, vine for. intercept, 17.XII.1997–5.III.1998, Cook, Monteith (QM), 1 ♀, Kroombit Tops, Upper TA47 Ck, 45 km SSW Calliope, open forest, 9–19.XII.1983, G. Monteith, G. Thompson, 1 ♀, Bunya Mts, 12.II.1940, N. Geary (AM).

DESCRIPTION. Colour. Body mid to dark brown, carinae paler; legs light to dark brown; forewing hyaline, colourless with only a few dark brown marks, veins light to dark brown, tubercles mid or dark brown, pterostigma light to dark brown; abdominal sternites dark brown.

Morphology. Forewing bearing medium sized setae (length about 1/4 of eye diameter), remainder of body covered with very short setae (length 1/6 of eye diameter or less).

Head. Vertex (median length) 0.8x as long as wide; subapical transverse carina forking from lateral margin at about 3/4 of total length of vertex. Frons 0.8x as long as wide; maximum width 1.7–1.9x apical width; median carina evanescent (near frontoclypeal suture absent), not elevated, paler coloured than disc, apically (near or at apical transverse carina) forking into two branches; lateral carinae convex (evenly rounded), strongly extending laterally, concealing entire pedicellus; median ocellus present but indistinct, directly adjacent to frontoclypeal suture.

Thorax. Forewing 3.2–3.4x longer than wide; r-m1 slightly basad or slightly distad of fork MA+MP; costa with 15–30 tubercles; costal margin near base barely thickened. Hind leg: tibia with or without small gap in row of apical teeth.

Male genitalia. Anal tube as in Figs 25–26, 29; genital styles and ventromedian process as in Figs 27–28. Aedeagus (Figs 21–24): phallotheca with large bifurcate spine (a) arising

right lateral from base of phallotheca and large flattened spine (b) arising ventral from base of phallotheca; flagellum about midlength strongly bent and with serrate processes, without spines.

Body length. ♂ — 6.5–7.2 mm, ♀ — 6.9–7.1 mm.

ETYMOLOGY. Named in honour of Alexandr Emeljanov to record our admiration of his contribution to the knowledge of Fulgoromorpha.

REMARKS. The male from Tamborine mountain listed above as being excluded from the type series shows some variation from the type material in size (body length of 9.3 mm) and in the male genitalia. The genital styles and ventromedian process are somewhat differently shaped and the right lateral spine on the aedeagus is not bifurcate. Further material is needed to clarify whether this variant represents a distinct species. A female specimen (body length 9.3 mm) was collected during the same collecting event. Additional females from other localities with a body length varying from 7.8–9.2 mm were also excluded from the type series until male specimens from the same population can be found and perhaps associated with them.

*Mnemosyne comata* Löcker, **sp.n.**

Figs 6, 12, 17–20, 30–35.

MATERIAL. Holotype, ♂: Australia, Qld: Cairns (MAMU ASCTHE028947). Paratypes: Australia, Qld: 2 ♀, same data as holotype (MAMU).

Material examined possibly of this species but excluded from type series. Australia, Qld: 2 ♀, Mossman Bluff Track, 5–10 km W Mossman, flight intercept, 360 m, 20.XII.1989–15.I.1990, Monteith, Thompson, Anzses (QM), 1 ♀, Mossman Gorge, sweeping in rain forest, 28.X.1966, E.B. Britton (ANIC).

DESCRIPTION. Colour. Body light to mid brown; forewing hyaline, colourless with only a few dark brown marks, veins light to mid brown, tubercles concolorous with veins; pterostigma light to dark brown; abdominal sternites mid brown.

Morphology. Forewing and face bearing long setae (length more than 1/3 of eye diameter), remainder of body covered with very short setae (length less than 1/4 of eye diameter).

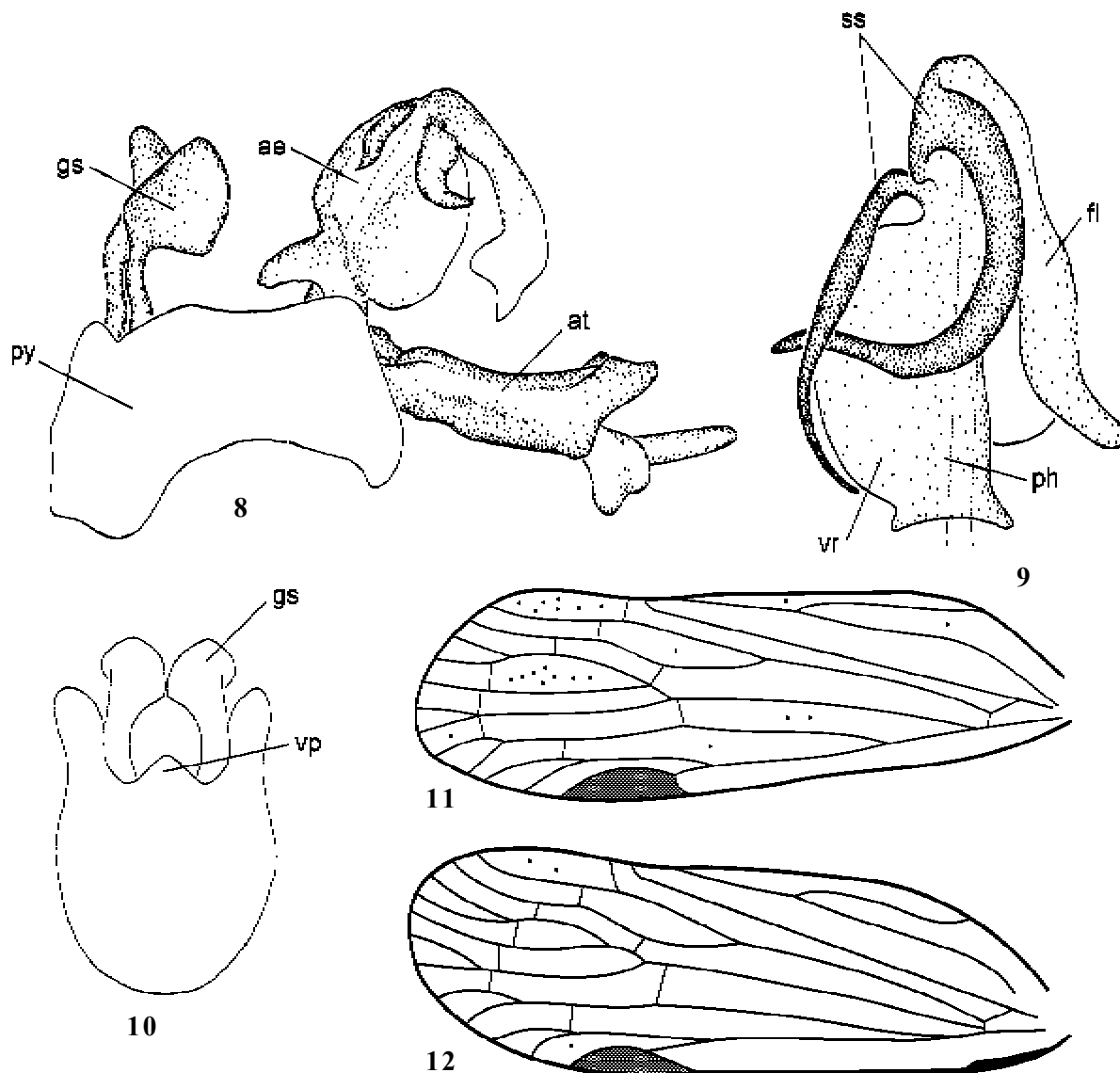
Head. Vertex (median length) 1.1x longer than wide; subapical transverse carina forking from lateral margin at about 5/6 of total length of vertex. Frons 1.1x longer than wide; maximum width 3.4x apical width; median carina present throughout frons, indistinct, slightly elevated, concolorous with disc, apically forking into three branches (Fig. 6); indistinct transverse carina in apical portion of frons visible (see dotted line in Fig. 6); lateral carinae convex (rectilinear apically) to s-shaped, slightly extending laterally, concealing only base of pedicellus; median ocellus present, more or less distinct, separated from frontoclypeal suture by at least its own diameter.

Thorax. Forewing 2.6x longer than wide; r-m1 distinctly basad of fork MA+MP; costa with 19–22 tubercles; costal margin near base distinctly thickened. Hind leg: tibia with small or large gap (at least as wide as base of third tooth from the external side) in row of apical teeth.

Male genitalia. Anal tube as in Figs 30, 33–34; genital styles and ventromedian process as in Figs 34–35. Aedeagus (Figs 31–32): phallotheca without any spines; flagellum apically pointed, with very long, slender spine (A) running backwards parallel to flagellum ending near apex of phallotheca and shorter spine (B) extending slightly further than apex of flagellum.

Body length. ♂ — 5.3 mm, ♀ — 6.1–7.4 mm.

ETYMOLOGY. The Latin term “comatus” means “with long hair”. Named after the presence of long setae on forewings and face.



Figs 8–12. *Mnemosyne* spp.: 8 — male genitalia right lateral; 9 — aedeagus right lateral; 10 — pygofer and genital styles ventral; 11 — *Mnemosyne alexandri* sp.n., forewing; 12 — *Mnemosyne comata* sp.n., forewing.

Abbreviations: ae — aedeagus, at — anal tube, fl — flagellum (moveable apical part of the aedeagus), gs — genital style, ph — phalotheca (periandrium; covering basal part of the aedeagus), py — pygofer, ss — sclerotised spine, vp — ventromedian process, vr — ventral ridge.

Рис. 8–12. *Mnemosyne* spp.: 8 — гениталии самца, справа сбоку; 9 — эдеагус, справа сбоку; 10 — пигофор и стилусы, снизу; 11 — *Mnemosyne alexandri* sp.n., переднее крыло; 12 — *Mnemosyne comata* sp.n., переднее крыло.

Сокращения: ae — эдеагус, at — анальная трубка, fl — жутик (подвижная верхняя часть эдеагуса), gs — стилус, ph — фаллотка (периандриум; скрывает базальную часть эдеагуса), py — пигофор, ss — склеротизованный шип, vp — вентромедиальный вырост, vr — вентральный гребень.

REMARKS. Three females were excluded from the type series until male specimens from the same population can be found and perhaps associated with them.

### Discussion

Additional species of *Mnemosyne* are expected from Australia. Among the material studied for this paper 12 females, belonging to three morphologically different groups, were identified that could represent undescribed

species. Two of these groups seem to be more closely related to *Mnemosyne alexandri* sp.n. and the other group to *M. comata* sp.n. Due to the absence of males these potentially new taxa are not described herein.

The two new Australian species show a high degree of morphological divergence. They differ from each other almost to the extent observed between many genera of Cixiidae, e.g., in major characters such as carination and proportions of vertex and frons, thickness of costal margin, degree of setation of several body parts,

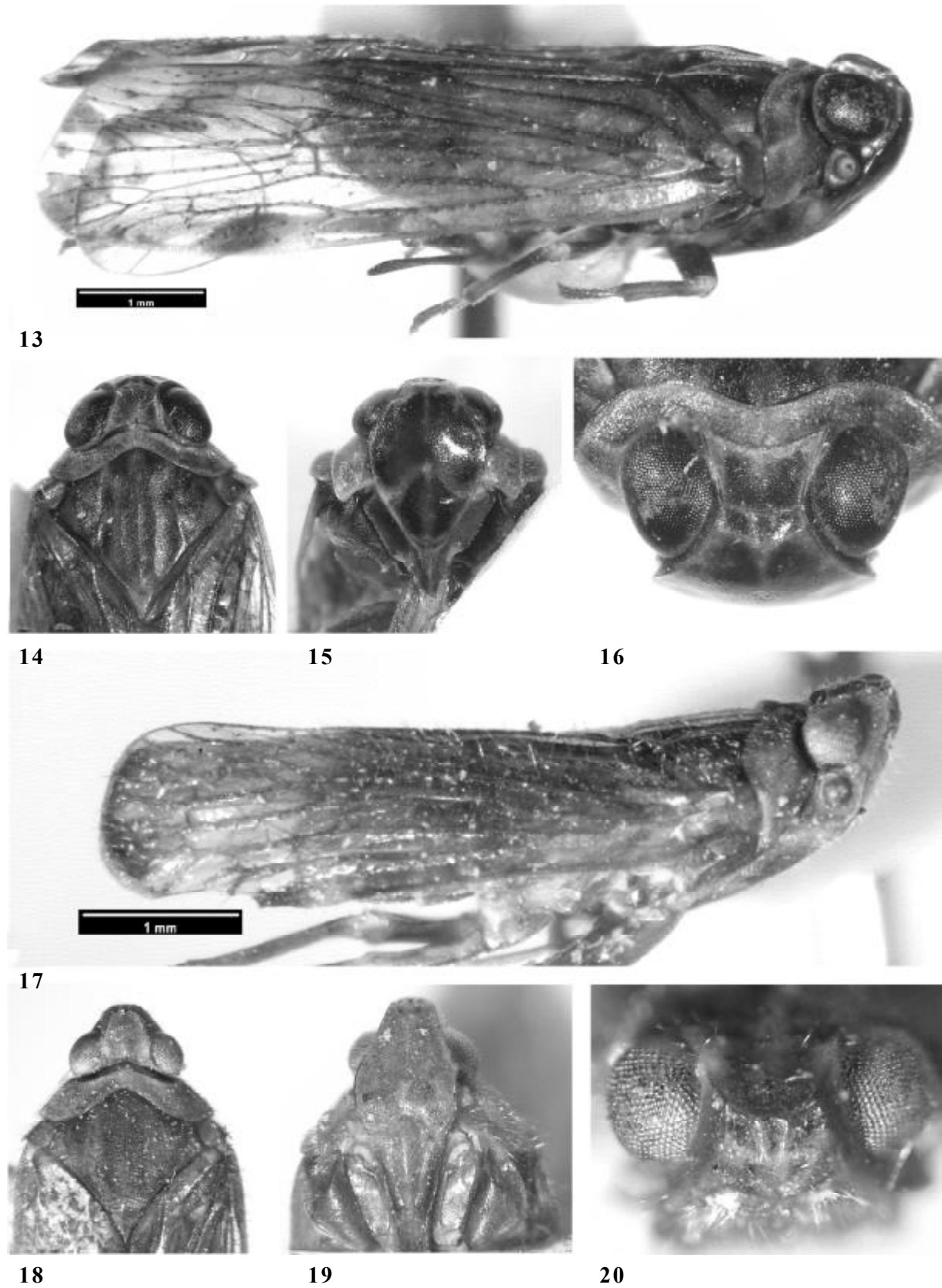
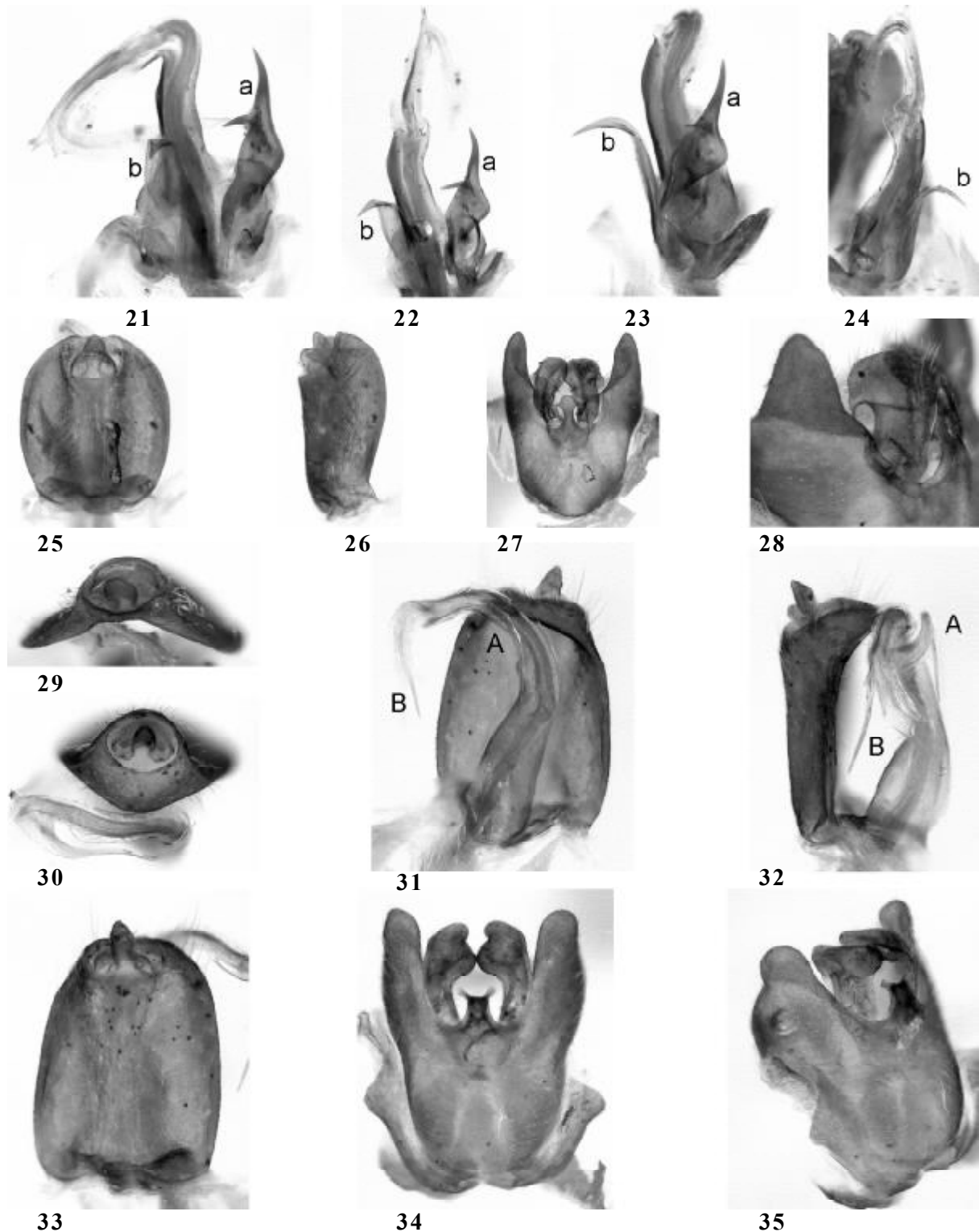


Fig. 13–20. *Mnemosyne alexandri* sp.n.: 13 — habitus; 14–16 — head; *M. comata* sp.n.: 17 — habitus; 18–20 — head.

Рис. 13–20. *Mnemosyne alexandri* sp.n.: 13 — внешний вид; 14–16 — голова; *M. comata* sp.n.: 17 — внешний вид; 18–20 — голова.



Figs 21–35. *Mnemosyne alexandri* sp.n.: 21–24 — aedeagus (21 — ventral, flagellum in resting position; 22 — ventral, flagellum extended; 23 — right lateral, flagellum in resting position; 24 — left lateral, flagellum extended); 25–26 — anal tube; 27–28 — genital styles; 29 — anal tube caudal; *M. comata* sp.n.: 30 — anal tube and aedeagus caudal; 31–32 — aedeagus (31 — ventral, resting position; 32 — left lateral, resting position); 33–34 — anal tube; 35–36 — genital styles.

Рис. 21–35. *Mnemosyne alexandri* sp.n.: 21–24 — эдеагус (21 — снизу, жгутик в покое; 22 — снизу, жгутик вытянут; 23 — справа сбоку, жгутик в покое; 24 — слева сбоку, жгутик вытянут); 25–26 — анальная трубка; 27–28 — стилусы; 29 — анальная трубка, сзади; *M. comata* sp.n.: 30 — анальная трубка и эдеагус, сзади; 31–32 — эдеагус, (31 — снизу, в покое; 32 — слева сбоку, в покое); 33–34 — анальная трубка; 35–36 — стилусы.

and they may represent different genera. Character states are also highly variable amongst described *Mnemosyne* species and Szwedo [2004; pers. comm. 2005] indicated that the genus *Mnemosyne* seems to be a complex of genera. Nevertheless, we decided to place the two new Australian species within *Mnemosyne* as a preliminary measure until a phylogenetic analysis including all species currently placed in *Mnemosyne* can be carried out and the taxonomic limits of the genus can be established.

A survey of the Afrotropical, Neotropical and Oriental literature failed to indicate any close relationship with taxa of any of these faunas. The two new Australian species of *Mnemosyne* appear morphologically highly divergent from the rest of the world fauna and may have evolved along completely different evolutionary lines.

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