Memoirs of Museum Victoria 65: 43–50 (2008)

ISSN 1447-2546 (Print) 1447-2554 (On-line)
http://www.museum.vic.gov.au/memoirs/index.asp

Marmenuera, a new genus of leptophlebiid mayfly (Insecta: Ephemeroptera) endemic to Tasmania.

J.C. Dean[1], G.N.R. Forteath[2] & A.W. Osborn[2]

[1] Environment Protection Authority, Freshwater Sciences Unit, Ernest Jones Drive, Macleod, Victoria, 3085, Australia (john.dean@epa.vic.gov.au)
[2] Honorary Research Fellow, Queen Victoria Museum and Art Gallery, Wellington Street, Launceston, Tasmania, 7250, Australia

Abstract Dean, J.C., Forteath G.N.R. and Osborn, A.W. 2008. *Marmenuera*, a new genus of leptophlebiid mayfly (Insecta: Ephemeroptera) endemic to Tasmania. *Memoirs of Museum Victoria* 65: 43–50.

The genus *Marmenuera* gen. nov. is established to accommodate two species of leptophlebiid mayfly, both of which are endemic to Tasmania. Adults and nymphs of *M. ida* (Tillyard) and *M. tillyardi* sp. nov. are described and figured.

Keywords Mayflies; Australia; taxonomy; *Marmenuera*; *M. tillyardi* sp. nov.; *M. ida* (Tillyard); Leptophlebiidae.

Introduction

The generic taxonomy of leptophlebiid mayflies of Australia, although still incomplete, has been advanced in recent years. A preliminary generic key to nymphs (Dean, 1999) included 15 described and eight undescribed leptophlebiid genera. Of the eight undescribed genera, three have since been described (*Loamaggalangta* Dean et al., 1999, *Kaninga* Dean, 2000 and *Manggabora* Dean and Suter, 2004), a fourth is described below and "Genus S" from southwest Australia has previously been referred to *Loamaggalangta* (Dean, 2000).

The present paper erects a new genus to accommodate two species of Leptophlebiidae from Tasmania. The nymphs of these species were designated Genus W sp.AV1 and Genus W sp.AV2 by Dean (1999). Recent biological studies in Lake Pedder and several inflowing streams provided an opportunity to rear out adults of both species. Repositories of type and other material are abbreviated as follows: Museum of Victoria (MV); Australian National Insect Collection, Canberra (ANIC); British Museum of Natural History (BMNH). Abbreviations of life stages of examined material are: N, nymph; MI, male imago; FI, female imago; MS, male subimago; FS, female subimago.

Taxonomy

Order Ephemeroptera, Family Leptophlebiidae, Subfamily Atalophlebiinae

Genus ***Marmenuera*** gen. nov.

Diagnostic features. *Imago.* Forewing (figs 1, 3, 17, 19): membrane hyaline, cells in apical third of wing translucent white; veins brown, many crossveins suffused with dark brown pigmentation; length-width ratio of forewing slightly less to slightly greater than 3.0; four to seven costal crossveins basal to the bulla, 11–19 distal to the bulla; MA forked at 0.40–0.43 wing length; MP_2 attached by crossvein to MP_1 at 0.18–0.20 wing length; base of ICu_1 linked to both CuA and CuP by a crossvein; ICu_1 and ICu_2 strongly diverging as wing margin approached. Hindwing (figs 2, 4, 18, 20): 0.22–0.26 length of forewing; length/width ratio 1.6–1.9; costal margin with shallow concavity at about midlength, costal space broader both basal and distal to the concavity; vein Sc joining costal margin at 0.8–0.85 wing length; 7–13 costal crossveins and 6–11 subcostal crossveins. Legs: yellow or medium brown, all femora with two strongly developed dark brown bands, one at midlength and the other near the apex; tarsal claws similar, each claw with an apical hook and opposing ventral flange (fig. 9); forelegs of male with ratios of segment lengths 0.81–0.86, 1.00, 0.05–0.07, 0.34–0.35, 0.34–0.38, 0.26–0.30, 0.11–0.23. Male genitalia (figs 7, 8, 24, 25): claspers three-segmented, basal segment narrowing abruptly at about midlength; penes lobes fused in basal half, widely separated apically; each lobe relatively broad and approximately parallel-sided, with three moderate sized ventral spines close to inner margin and slightly posterior to where the lobes separate (fig. 8). Female

sternum nine with apical margin deeply excised (Fig. 10). S*ubimago*. Wings pale fawn/white, brown blotches and/or suffusions similar in distribution and intensity to corresponding imago. *Mature nymph*. Head prognathous; antennae at least half length of body. Mouthparts: clypeus with lateral margins sub-parallel; labrum (figs 12, 27) slightly wider than clypeus, width 1.7–1.9 times length along median line, anterior margin with shallow to moderate mesal concavity, frontal setae arranged as single row, sub-apical setae arranged in a single row set back from anterior margin at about 0.9x labrum length; mandibles with outer margin somewhat angular at midlength, gently curved basally and distally, a tuft of long setae around midlength and a sparser series of long setae basal to the tuft, incisors slender, prostheca strongly developed; maxillae quadrate, subapical row of 30–35 pectinate setae, palp moderately short, three segmented, terminal segment almost as long as middle segment, middle segment bearing simple setae only; labium with glossae elongate, turned under ventrally, palp three-segmented, terminal segment almost as long as middle segment and with series of small spine-like setae along inner margin, submentum with fringe of long setae along lateral margins. Legs banded; femora moderately broad (figs 13, 28); tarsal claws smooth, without ventral teeth (figs 14, 29). Abdominal segments without setae on lateral margins, postero-lateral spines on segments 7–9; posterior margins of abdominal terga with series of long, robust spines interspersed with minute spines (fig. 15). Gills present on abdominal segments 1–7; each gill lanceolate, lateral tracheae strongly developed (fig. 16). Caudal filaments about 1½ times length of body; each segment with apical whorl of both stout spine-like setae and fine hair-like setae, spine-like setae predominating near base of each filament but becoming shorter towards midlength where the hair-like setae predominate.

Type species. *Marmenuera tillyardi* sp.nov.

Etymology. The generic name is derived from "mar.me.nuer", the western Tasmanian aboriginal word for "country" or "tribal territory" (Plomley 1976, p.191), and pertains to the endemicity of the genus to Tasmania.

Remarks. The genus *Marmenuera* can be distinguished from all other leptophlebiid genera by the following combination of characters. Imago: (1) basal half of forewing with costal crossveins heavily suffused with dark brown, often with brown pigmentation more extensive; (2) forewing with ICu_1 attached to CuA and CuP by crossveins; (3) ICu_1 and ICu_2 strongly diverging as wing margin approached; (4) hindwing with shallow concavity at about midlength, and Sc joining wing margin at 0.8–0.85 wing length; (5) tarsal claws similar; (6) male genitalia with penes fused in basal half and widely separated apically, with three moderate-sized ventral spines situated slightly posterior to where the lobes separate; (7) female sternum nine with apical margin deeply excised. Nymph: (1) labrum slightly wider than clypeus; (2) width of labrum 1.7–1.9 times length along median line; (3) labium with glossae elongate and turned under ventrally; (4) terminal segment of labial palp with series of small spine-like setae along inner margin; (5) submentum with fringe of long setae along lateral margins; (6) tarsal claws smooth; (7) gills lanceolate, moderately broad; (8) posterior margins of abdominal terga with row of stout spines interspersed with small spines.

Marmenuera does not fit into any of the leptophlebiid lineages defined by Pescador and Peters (1980), and Towns and Peters (1980), and its closest relatives are probably here in Australia. The genus appears most closely related to *Loamaggalangta* Dean, Forteath and Osborn and *Bibulmena* Dean. The three genera share many characters, including attachment of the base of ICu_1 to the CuA–CuP crossvein in the forewing, similar tarsal claws in the imago, a deeply excised sternum nine in the female, similarities in the nymphal mouthparts (in particular the elongate and underturned glossae, the fringe of setae on the lateral margins of the submentum and the small spine-like setae along the inner margin of segment 3 of the labial palps) and smooth tarsal claws in the nymph. Christidis (2005) placed *Bibulmena* and *Loamaggalangta* at the base of a large clade containing many of the Australian leptophlebiid genera, but found no support for the grouping of these two genera into a monophyletic clade. The character states listed above are perhaps primitive and not synapomorphies.

Marmenuera tillyardi sp.nov.

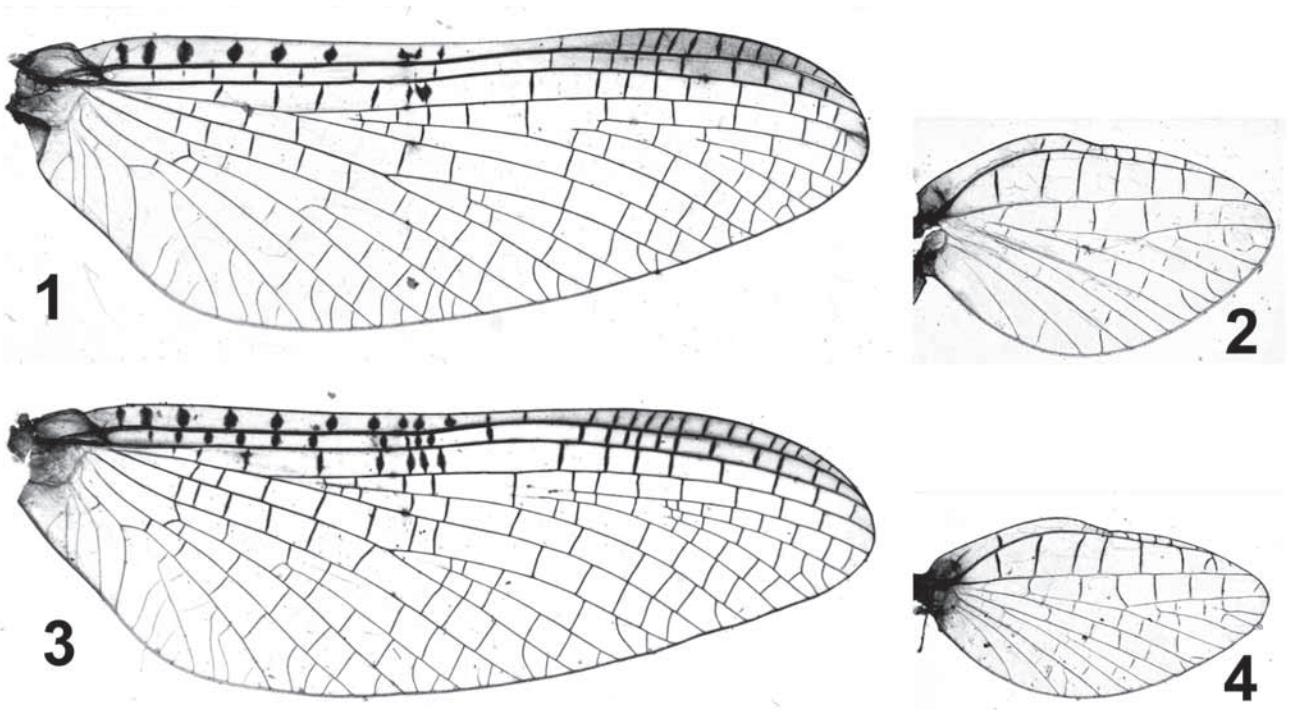
Figures 1–16

Genus W sp.AV1 Dean 1999, p. 86, figs 239–41.

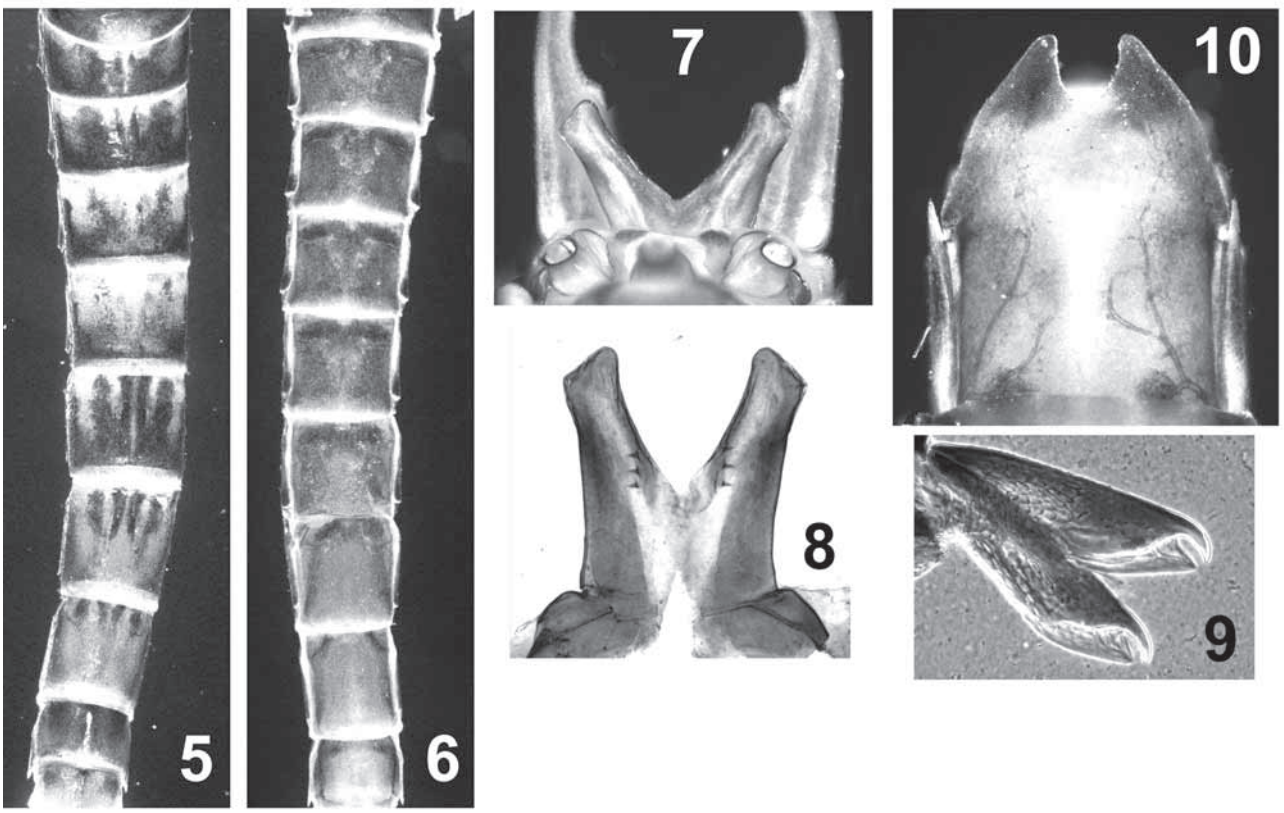
Types. Holotype: Male imago (reared from nymph), Tasmania, un-named creek flowing into Lake Pedder (Tasmap 1:25 000 series, Serpentine 4026, Grid reference 55G 4184 52606), collected 28 Jan 2006, emerged 30 Jan 2006, A. Osborn and N. Forteath (MV, T-20000). Paratypes: Male imago and female imago (both reared from nymph), same location as holotype, collected 28 Jan 2006, emerged 19 Mar 2006 and 23 Feb 2006 respectively, A.Osborn & N.Forteath (MV, T-20001 and T-20002 respectively); male imago and female imago (both reared from nymph), same location as holotype, collected 5 Jan 2006 and 28 Jan 2006 respectively, emerged 14 Jan 2006 and 13 Feb 2006 respectively, A.Osborn and N.Forteath (ANIC).

Material examined. Tasmania. 6 MI, 12 FI (all reared from nymphs), un-named creek flowing into Lake Pedder (type locality), 28 Jan 2006, emerged various dates, A. Osborn and N. Forteath; 3 MI, 1 FI (all reared from nymphs), same location, 25 Jan 1998, N. Forteath; 1 FI (reared from nymph), same location, 23 Feb 1998, N. Forteath; 1 MI, 1 FI (both reared from nymphs), same location, 4 Mar 1998, N. Forteath; 2 MI, 2 FI (all reared from nymphs), same location, 5 Jan 2006, A. Osborn and N. Forteath; 1 MS, 1 FS (both reared from nymphs), 4 N, same location, 27 Dec 1997, N.Forteath; 2 N, Piney Creek, Heamskirk Rd, 27 Oct 1994, MRHI; 1 FI, 1 FS (both reared from nymphs), Lake Pedder, Trappes Bay, 4 Mar 1998, N. Forteath; 1 MI, 2FI (all reared from nymphs), Lake Pedder, Serpentine Arm, Apr 2005, N.Forteath.

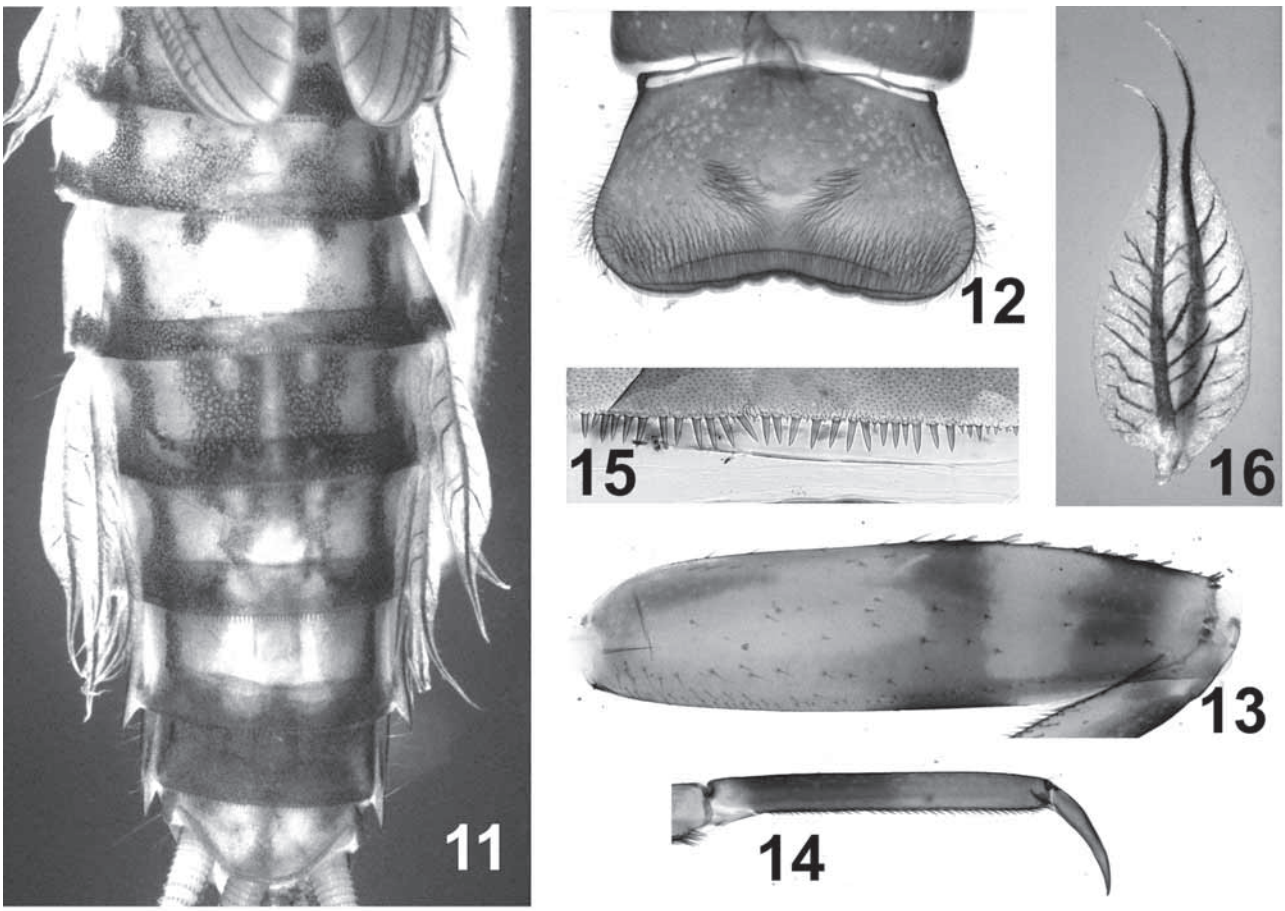
Description. *Male imago*: Length: body 8.8–10.2 mm., forewing 8.8–10.1 mm., caudal filaments 12.4–14.2 mm. Eyes: upper lobes pale pink/brown, separated mesally by a distance approximately 1/8 of the diameter of the upper lobe in dorsal view; lower lobes grey. Thorax: medium-dark brown; pronotum with narrow raised carina along median line, dark brown markings medially on posterior half of segment, dark brown



Figures 1–4. *Marmenuera tillyardi*. Male imago: 1, forewing; 2, hind wing. Female imago: 3, forewing; 4, hind wing.



Figures 5–10. *Marmenuera tillyardi*. Male imago: 5, abdomen, dorsal; 6, abdomen, ventral; 7, penes, dorsal; 8, penes, ventral, slide preparation; 9, foretarsal claw. Female imago: 10, sternum nine.



Figures 11–16. *Marmenuera tillyardi*. Nymph: 11, abdomen, dorsal; 12, labrum; 13, forefemur; 14, foretarsus; 15, posterior margin of abdominal segment four; 16, gill, abdominal segment four.

along lateral margins and curved dark brown band parallel to lateral margin approximately midway between margin and medial carina. Legs: predominantly medium brown, tending to paler in apical half of tibiae and tarsi; all femora with two broad dark brown bands, one just beyond midlength and the other sub-apical; tarsal claws similar, each claw with terminal sclerotised hook and opposing ventral process. Forewing (fig. 1): membrane hyaline, stigmatic region opaque, white; costal crossveins in basal half of wing heavily suffused with dark brown, subcostal and R_1–R_2 crossveins in basal half of wing less strongly suffused with dark brown, crossveins near MA fork not suffused with brown. Abdomen: terga generally reddish-brown with dark brown markings, tergum 6 with four conspicuous dark brown longitudinal bands extending over most of the segment (fig. 5), segment 7 with similar bands but restricted to anterior half of the segment, segment 8 with dark markings only adjacent to the anterior margin; sterna reddish brown, inconspicuous paler markings on segments 2-5 (fig. 6), darker brown markings poorly defined. Genitalia (figs 7, 8): penes lobes fused basally, widely separated apically; each lobe relatively broad and approximately parallel-sided, apically truncate, outer margin somewhat angular just before apex; three moderate sized ventral spines close to inner margin posterior to where the lobes separate.

Female imago. Length: body 10.1–12.2 mm; forewing 10.0–11.8 mm; caudal filaments 13.4–16.4 mm. General colour similar to male imago. Forewing: membrane slightly opaque; costal, subcostal and R_1–R_2 crossveins all surrounded by suffusion of dark brown, more strongly developed than in male. Abdomen: medium reddish-brown, terga with darker brown markings, sterna medium reddish-brown, no strong markings; sternum nine deeply cleft (fig. 10). *Subimago*. Wings pale fawn/yellow, brown blotches and/or suffusions similar in distribution and intensity to corresponding imago. *Mature nymph*. Body length ranging from about 10 to 13 mm.; antennae about half length of body; cerci about 1½ times length of body, terminal filament a little longer. General colour yellow with dark brown markings; abdomen with conspicuous pattern of dark brown and yellow, abdominal segments 6 and 9 darker than remaining segments (fig. 11); all legs with dark

banding. Mouthparts: labrum (fig. 12) a little broader than clypeus; maximum width 1.7–1.9 times length along median line; maximum width at about 3/4 labrum length, basal to this the lateral margins relatively straight and diverging; anterior margin shallowly concave, with five well developed medial denticles; single row of setae close to frontal edge of labrum, sub-apical setal fringe also consisting of a single row set back from anterior margin at about 0.9 labrum length. Legs relatively slender; forefemora length 3½–4 times width (Fig. 13), outer margin with moderate number of short, spine-like setae and also longer, hair-like setae; foretarsus (fig. 14) with 30–40 ventral spines; tarsal claws smooth, without ventral teeth. Postero-lateral spines on abdominal segments 7 (small) and 8-9 (relatively large); posterior margins of abdominal terga with series of large, conspicuous spines interspersed with the occasional shorter spine (fig. 15). Gills lanceolate, lateral tracheae moderately developed (fig. 16).

Etymology: The species is named for R.J.Tillyard, who first recognised that this was probably an undescribed species (see below).

Remarks. When describing *Atalophlebia ida*, Tillyard (1936) referred to specimens from Cradle Mountain which were smaller and less spotted than the type series. It now seems likely that these belong to the species herein described as *M. tillyardi*, and Tillyard's decision not to describe the male imago of *A. ida* based on the Cradle Mountain material has been proven taxonomically astute.

Scholes (1961) recommended that the imago and subimago of *A. ida* should be referred to as the "Large Speckled Spinner" and "Large Speckled Dun" respectively, and we suggest that "Lesser Speckled Spinner" and "Lesser Speckled Dun" are appropriate common names for the imago and subimago of *Marmenuera tillyardi*. This reflects both the smaller size of the new species and the reduced wing pigmentation.

Marmenuera ida (Tillyard)

Figures 17–29

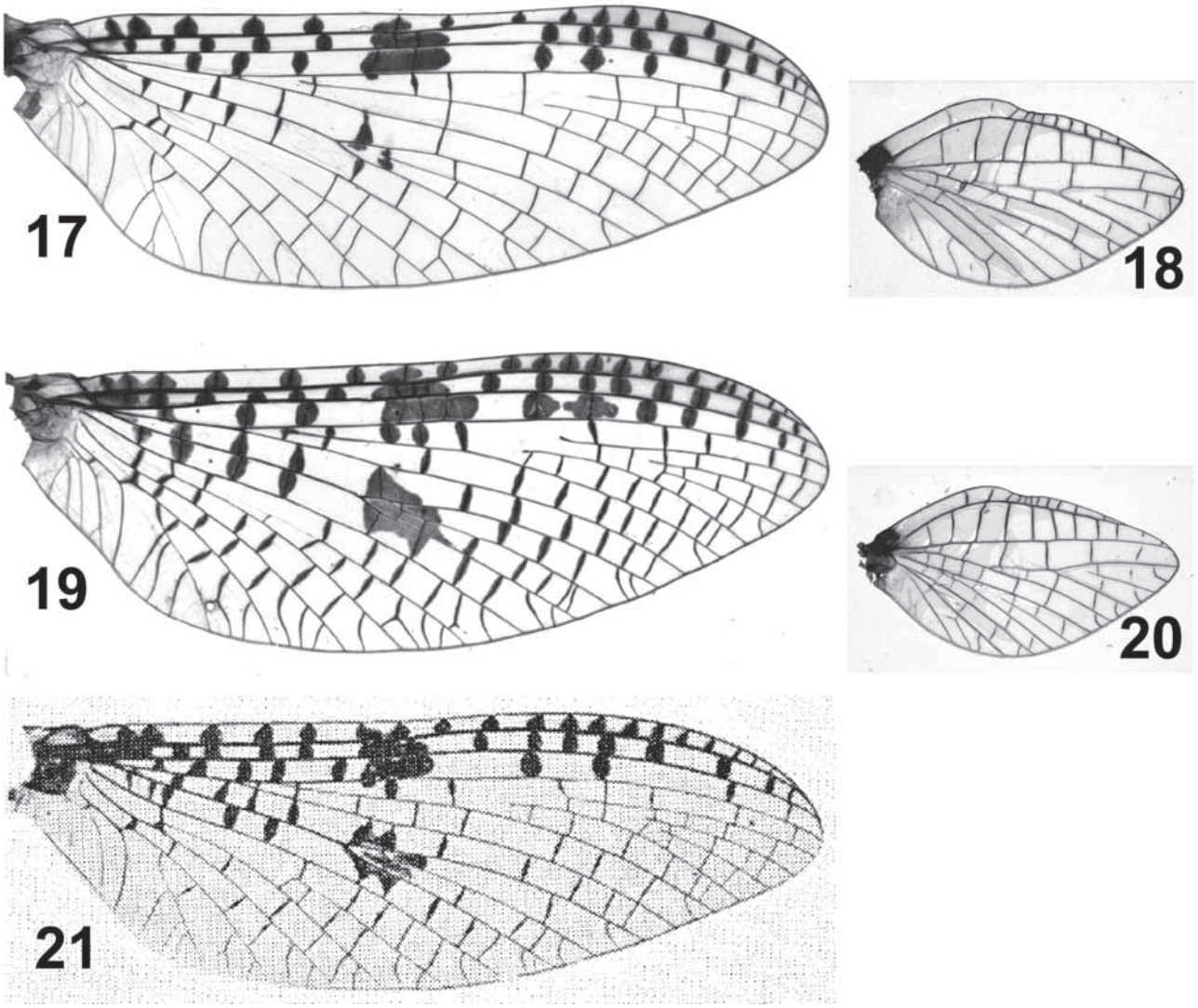
Atalophlebia ida Tillyard, 1936: p. 42, fig. 7, plate I(10).
Massartellopsis ida Scholes, 1961: p. 30, plate 2.
Genus W sp.AV2 Dean, 1999: p. 86, figs 242, 243.

Types. Holotype: female imago, Tasmania, Dee Bridge, 7 Feb 1933, R. J. Tillyard (BMNH). Paratypes: five female imagos, collected with holotype (BMNH); one male subimago, Lake St Clair, 6 Feb 1933, R. J. Tillyard (BMNH). Types not examined.

Material examined. Tasmania. 5N, Lake Pedder, Trappes Inlet, February and April 1997, N. Forteath; 3FI (2 reared), 1FS (reared), same location, 1 Feb 1998, N. Forteath; 1MS (reared), same location, 12 Jan 1998, N. Forteath; 1MS (reared), same location, 4 Mar 1998, N. Forteath; 6MI,5FI (all reared), 21N, same location, Nov–Dec 2006, N. Forteath and A. Osborn; 1N, Lake Lilla, Cradle Mountain, 25 Mar 1998, J. Dean; 1N, Dip River Falls, 31 Oct 1998, D. Cartwright; 4FI, Huon River Crossing, 16 Feb 1971, A. Neboiss; 1MI, 1MS, 1FS, D'Entrecasteaux Passage, Exit Cave, Jan1993, A. Clarke.

Description. Male imago. Length: body 11.0–12.4 mm, forewing 11.2–12.0 mm, caudal filaments 18.4–24.2 mm. Eyes: upper lobes pale pink/brown, in contact on meson of head, lower lobes grey. Thorax: medium-dark brown; pronotum with narrow raised carina along median line, dark brown markings medially on posterior margin, along lateral margins and parallel to lateral margin approximately midway between margin and medial carina. Legs: predominantly yellow, all femora with two broad dark brown bands, one just beyond midlength and the other subapical; tarsal claws similar, each claw with terminal sclerotised hook and opposing ventral process. Forewing (fig. 17): membrane hyaline, stigmatic region slightly opaque, white; all costal, subcostal and R_1–R_2 crossveins heavily suffused with dark brown, crossveins in vicinity of MA fork also strongly suffused with dark brown; large brown blotch filling area between veins Sc and R_2 at midlength of wing. Abdomen: strongly contrasting pattern of dark brown and yellow; terga 2-7 yellow in anterior half and dark brown in posterior half, yellow colouration extended back as narrow band along median line (fig. 22), extent of yellow colouration increasing from segments 6 to 8, segments 9 and 10 predominantly brown; sterna reddish brown, pale yellow along lateral margins, segments 2-7 with two pairs of small pale spots, the anterior pair more widely eparated than the posterior pair (fig. 23). Genitalia (figs 24–25): penes lobes fused basally, widely separated apically; each lobe relatively broad, apex rounded and turned slightly inwards, sub-apically with outer margin evenly curved, three moderate sized ventral spines posterior to where the lobes separate. *Female imago*. Length: body 11.6–14.8 mm.; forewing 12.0–14.2 mm; caudal filaments 18.2–22.2 mm. Forewing: pigmentation more extensive than in male; dark brown suffusions around costal, subcostal and R_1–R_2 crossveins broad, almost circular; large brown blotch surrounding MA fork. General colour and abdominal markings similar to male imago. *Mature nymph*. Body length ranging from 12–16 mm; antennae a little over half length of body; cerci about 1¼–1½ body length, terminal filament a little longer. General colour yellow with brown markings; abdomen with conspicuous pattern of dark brown and yellow, segments 2-8 yellow towards anterior margin and dark brown to the posterior (fig. 26); all legs yellow with dark banding. Mouthparts: Labrum (fig. 27) a little broader than clypeus; maximum width 1.7–1.9 times length along median line; maximum width at about 2/3 labrum length, basal to this the lateral margins relatively straight and diverging; anterior margin moderately concave, with five well developed medial denticles. Legs moderately broad (fig. 28); forefemora length a little over 3 times width, outer margin bearing moderate length spine-like setae and also some longer, hair-like setae; fore-tarsus with 15–20 ventral spines (fig. 29); tarsal claws smooth, without ventral teeth. Postero-lateral spines on abdominal segments 7 (small) and 8-9 (relatively large); posterior margins of abdominal terga with series of large, conspicuous spines interspersed with the occasional shorter spine. Gills lanceolate, lateral tracheae moderately developed.

Remarks. Although the holotype has not been examined the description and, in particular, the image of the female forewing presented by Tillyard (1936) leave no doubt as to the identity of this species. The species is readily distinguished from *M. tillyardi* in the adult by the abdominal colour pattern, the more extensive pigmentation of the forewing and the structure of the



Figures 17–21. *Marmenuera ida*. Male imago: 17, forewing; 18, hindwing. Female imago: 19, forewing; 20, hindwing; 21, forewing, holotype.

male genitalia, and in the nymph by the abdominal colour pattern and the structure of the labrum and foreleg. Scholes (1961) referred this species to the genus *Massartellopsis*, presumably based on advice from Edgar Riek (CSIRO Division of Entomology), but it is now known that the genus *Massartellopsis* is endemic to South America.

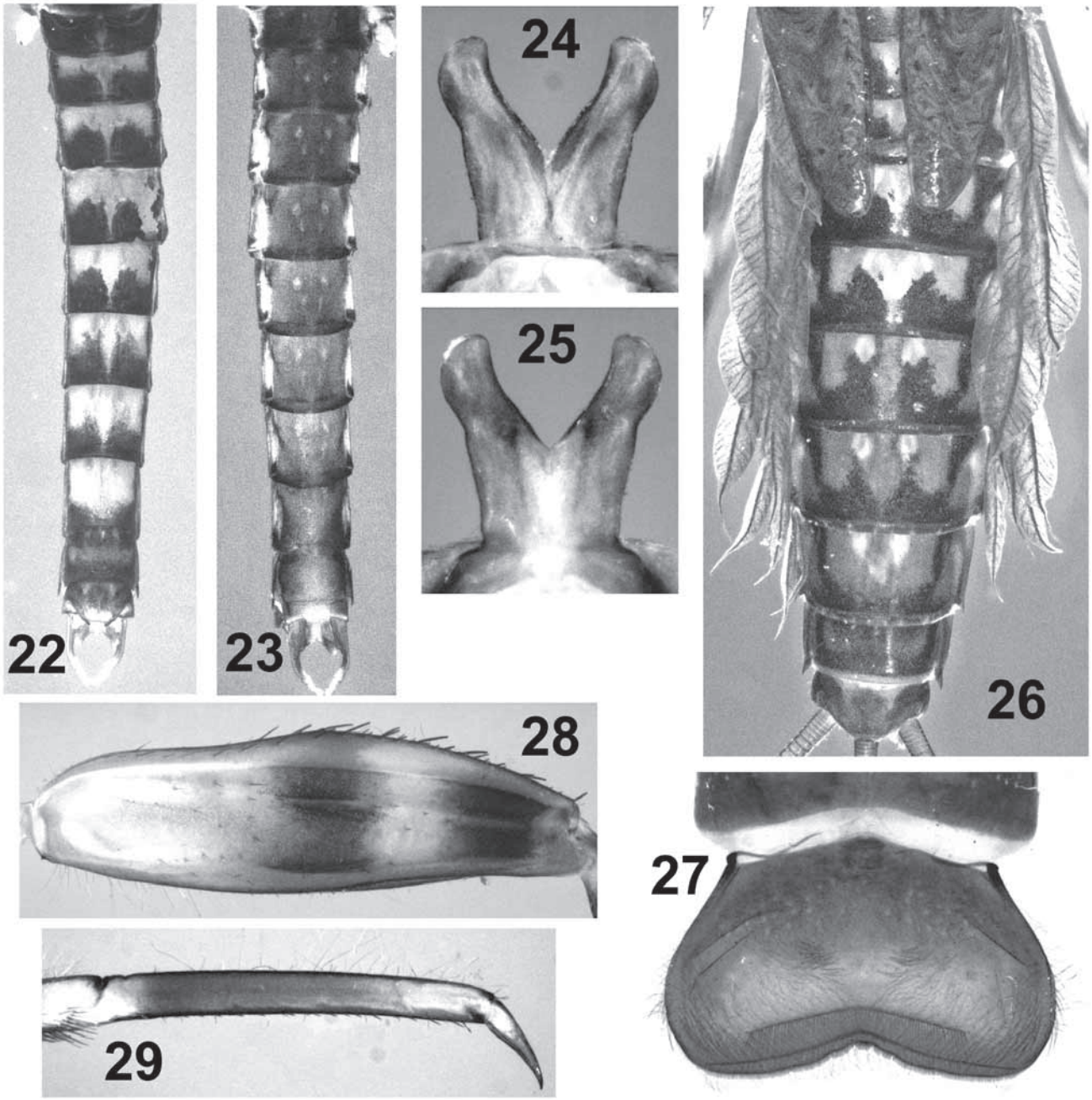
Scholes (1961) suggested the common names "Large Speckled Spinner" and "Large Speckled Dun" for the imago and subimago respectively of *Marmenuera ida*, and we consider this appropriate.

Keys to species

1. Adults 2
– Nymphs 3

2. Forewings heavily pigmented, crossveins around MA fork suffused with brown (figs 17,19); male imago with outer margin of penes lobes evenly rounded (fig. 24) ..... *Marmenuera ida*
– Forewings lightly pigmented, crossveins around MA fork not suffused with brown (figs 1,3); male imago with outer margin of penes lobes angular (fig. 7) ..... *Marmenuera tillyardi*

3. Foretarsus with 15–20 ventral spines (fig. 29); forefemur with spines along outer margin relatively long (fig. 28) ..... *Marmenuera ida*
– Foretarsus with 30–40 ventral spines (fig. 14); forefemur with spines along outer margin relatively short (fig. 13) ..... *Marmenuera tillyardi*



Figures 22–29. *Marmenuera ida*. Male imago: 22, abdomen, dorsal; 23, abdomen, ventral; 24, penes, dorsal; 25, penes, ventral. Nymph: 26, abdomen, dorsal; 27, labrum; 28, forefemur; 29, foretarsus.

Acknowledgments

We are indebted to the Tasmanian Hydroelectric Commission and the W. D. Booth Charitable Trust for support of field work undertaken on Lake Pedder by A. Osborn and N. Forteath. The Council and Editor of the Royal Society of Tasmania are thanked for permission to reproduce Plate I Figure 10 from Tillyard (1936). Preparation of the manuscript was supported by the Environment Protection Authority of Victoria.

References

Christidis, F. 2005. Phylogenetic relationships of the Australian Leptophlebiidae (Ephemeroptera). *Invertebrate Systematics* 19: 531–39.

Dean, J.C. 1999. *Preliminary keys for the identification of Australian mayfly nymphs of the Family Leptophlebiidae*. Identification Guide no. 20. Cooperative Research Centre for Freshwater Ecology, Albury, New South Wales. Pp iii + 91.

Dean, J.C. 2000. Descriptions of new Leptophlebiidae (Insecta: Ephemeroptera) from Australia. II. *Kaninga*, a new monotypic genus from south-western Australia. *Records of the Western Australian Museum* **20**: 87-94.

Dean, J.C.; Forteath,G.N.R. and Osborn, A.W. 1999. *Loamaggalangta pedderensis* gen. & sp.nov.: A new mayfly from Tasmania (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). *Australian Journal of Entomology* 38: 72–76.

Dean, J.C. and Suter P.J. 2004. Descriptions of new species and a new genus of leptophlebiid mayflies (Insecta: Ephemeroptera) from the Northern Territory, Australia. *Memoirs of the Museum of Victoria* 61: 111–18.

Pescador, M.L. and Peters, W.L. 1980. Phylogenetic relationships and zoogeography of cool-adapted Leptophlebiidae (Ephemeroptera) in southern South America. Pp. 43–56 in: Flannagan, J.F. and Marshall, K.E. (eds), *Advances in Ephemeroptera Biology*. Plenum Press: New York.

Plomley, N.J.B. 1976. *A word-list of the Tasmanian Aboriginal Languages*. Foot & Playsted: Launceston. Pp xv + 486.

Scholes, D. 1961. *Fly-fisher in Tasmania*. Melbourne University Press: Carlton. Pp xiv + 208.

Tillyard, R.J. 1936. The trout-food insects of Tasmania. Part II: A monograph of the mayflies of Tasmania. *Papers and Proceedings of the Royal Society of Tasmania*. 1935: 23–59.

Towns, D.R. and Peters, W.L. 1980. Phylogenetic relationships of the Leptophlebiidae of New Zealand (Ephemeroptera). Pp 57–69 in: Flannagan, J.F. and Marshall, K.E. (eds), *Advances in Ephemeroptera Biology*. Plenum Press: New York.