

Three new genera of Leptophlebiidae (Ephemeroptera) from New Zealand

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Three new genera—*Austroclima*, *Mauiulus*, and *Cryophlebia*—are established for species of Leptophlebiidae from New Zealand. The following new combinations are included: *Austroclima sepia* (Phillips) and *Cryophlebia aucklandensis* (Peters). *Atalophlebioides sepia* is redescribed as *Austroclima sepia* and a neotype is designated. Two new species, *Austroclima jollyae* and *Mauiulus luma*, are described. All life stages are described, and the relationships of each genus are discussed. Keys are given to male and female imagos, subimagos, and nymphs of each species, and to all New Zealand genera with species previously placed in *Atalophlebioides*.

INTRODUCTION

In their redescription of *Atalophlebioides*, Towns & Peters (1978) noted that *A. sepia* (Phillips) and *A. aucklandensis* Peters differ from the type species, *A. cromwelli* (Phillips), and should be excluded from the genus. In this paper new genera are established for *A. sepia* and *A. aucklandensis*, and *A. sepia* is fully described to overcome confusion caused by the absence of type specimens.

Most illustrations have been prepared by one of us (DRT). However, figures of *A. aucklandensis* are based on those prepared by Mrs Janice G. Peters for Peters (1971).

Methods and conventions used here follow Towns & Peters (1978). Sample sizes for measurements are given in Table 1. In species descriptions the mean of measurements is given in parentheses after the range; means are not provided for less than three measurements.

Abbreviations of collectors' names are as follows: ACM, A.C. McLellan; AH, A. Hirsch; BWH, B.W. Hayward; DRT, D.R. Towns; ELT, E.L. Towns; GCH, G.C. Hayward; GFE, G.F. Edmunds, Jr; ICM, I.C. McLellan; JAM, J.A. McLean; JCW, J.C. Watt; JGP, J.G. Penniket; JI, J. Illies; JIT, J.I. Townsend; JKG, J.K. Greenfield; JSD, J.S. Dugdale; KAJW, K.A.J. Wise; MB, M. Black; MJW, M.J. Winterbourn; MMN, M.M. Neill; MNC, M.N. Clout; MW, M. West; SEN, S.E. Nichols.

Austroclima n.gen.

IMAGO. Length: ♂ – body 7.2–10.5 mm, forewings 7.9–10.7 mm; ♀ – body 9.2–10.0 mm, forewings 10.3–11.2 mm.

Eyes: ♂ – fused to narrowly separated on meson of head, lower portion a little less than 3/4 to a little

less than 9/10 length of upper portion; ♀ – separated on meson of head by 3–4 × maximum width of eye.

Wings (Fig. 1–3). Forewings: width 1/3 (to a little more) length. Vein Rs forked 1/5 (to a little less) distance from base to margin. Vein MA forked half (to a little more) distance from base to margin, fork symmetrical. Vein MP not forked, MP₂ attached at base to CuA and MP₁ with a cross vein, attachment of MP₂ to MP₁ 1/4 to a little less than 1/3 distance from base to margin, base of MP₂ closer to CuA than MP₁. Vein ICu, attached at base to CuA and CuP with cross veins, remainder of Cu-A area as in Fig. 1; cross veins numerous. Hind wings: costal margin concave slightly apically to midlength; wing apex acute and rounded (Fig. 2, 3). Width of hind wings a little more than half length, length of hind wings a little less than 1/4 length of forewings. Vein Sc a little more than 8/10 to about equal length of wings, R₁ subequal to length of wings; cross veins numerous (Fig. 3).

Legs. Length ratios of segments in ♂ forelegs 0.51–0.60 : 1.00 (3.3–3.5 mm) : 0.06–0.07 : 0.35–0.44 : 0.23–0.42 : 0.21–0.33 : 0.11–0.13. Claws of a pair dissimilar, one apically hooked, the other obtuse, pad-like (Fig. 4).

Male genitalia (Fig. 5–8). Forceps: segment 2 equalling to 1 1/5 × length of segment 3 and 1/5 length of segment 1; apex of segment 3 slightly rounded, occasionally indented; base of forceps broad, inner margin forming an angular bend near midlength (Fig. 5). Styliiger plate 1/3 to a little more than half as long medially as maximum width, slightly concave at apex as in Fig. 5. Penis lobes divided from apex to styliiger plate, with a subapical dorsal spine near lateral margin of each lobe (Fig. 5, 7, 8).

Ninth sternum of ♀ entire, slightly concave apically (Fig. 11). Terminal filament a little longer than cerci.

MATURE NYMPH. Length: body 7.2–10.6 mm. Head prognathous. Antennae $1\frac{1}{2}$ –2× length of head.

Mouthparts (Fig. 15–21). Labrum: length half to a little less than $\frac{2}{3}$ maximum width; dorsal hair as in Fig. 15, and submedian, anteromedian, and anterolateral areas of hair ventrally; anteromedian emargination deeply cleft, with broad-based, blunt denticles as in Fig. 16 & 17; lateral margins angularly expanded (Fig. 15). Clypeus as in Fig. 15, its anterior margin shallowly concave. Left mandible (Fig. 18) with a single, small, marginal hair tuft, outer margin angular (Fig. 18); incisors with unserrated apical teeth; prosthecal tuft large (Fig. 18). Hypopharynx: lingua with well developed lateral processes, anterior margin deeply cleft, submedian lobes with paired, submedian, longitudinal rows of hairs on internal dorsal surface, apices approximately triangular (Fig. 20); superlingua as in Fig. 20, with a row of hairs along anterior margin and blunt lateral margins. Maxillae: apical half of galea-lacinia narrow, with a subapical row of 12–18 spines (Fig. 19); segment 2 of palpi about equal to length of segment 1, segment 3 half to $\frac{2}{3}$ length of segment 2 (Fig. 19). Labium as in Fig. 21; palpi broad, segment 2 subequal to length of segment 1, segment 3 a little less than half to $\frac{1}{2}$ length of segment 2; glossae small, dorsal to paraglossae; lateral margins of submentum with long spines (Fig. 21).

Pronotum with or without small spines on antero-lateral margin. Legs (Fig. 22): tibiae and tarsi in cross-section compressed, oval (Fig. 23, 24); apical half of femora indented, so tibia can draw into femur (Fig. 22); basal $\frac{1}{3}$ of femora with pointed spines on dorsal and ventral surface (Fig. 22, 36), and apical $\frac{2}{3}$ with blunt spines over surface (Fig. 34, 35); foretibiae with apically cleft, serrated spines on inner surface (Fig. 37, 38); apex of claws hooked and narrow, denticles on claws well developed and progressively larger apically (Fig. 25).

Gills (Fig. 27, 28) on segments 1–7 alike, progressively smaller posteriorly; dorsal and ventral portions of lamellae plate-like, each portion terminated in a long, slender, submedian filament; main trunk of tracheae towards midline of lamellae and extended to near filament apex; tracheae pigmented

and greatly branched. Abdomen with blunt postero-lateral projections on segments 8–9 (Fig. 26). Terminal filament a little longer than cerci, each segment with a distal whorl of small denticles.

EGG elongate oval to dorsoventrally compressed, with ridges of tubercles extended around margins to grouped near poles (Fig. 40–45).

ETYMOLOGY: 'australis', L., southern; 'clima', L., region or zone; feminine.

TYPE SPECIES: *Austroclima sepia* (Phillips) n.comb.; originally placed in *Deleatidium* (*Atalophlebioides*).

SPECIES INCLUDED: *Austroclima sepia* (Phillips) n.comb. and *A. jollyae* n.sp.

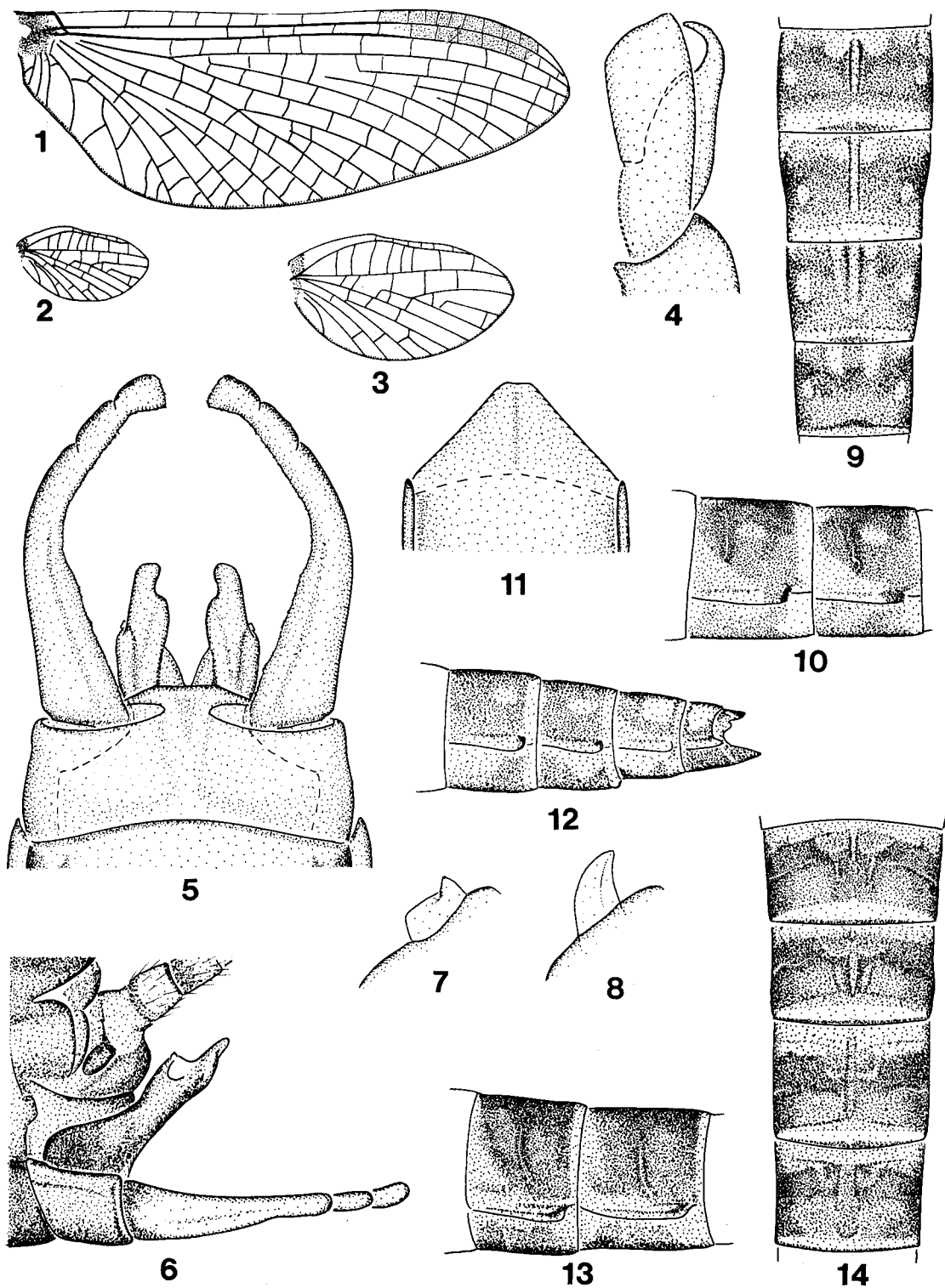
REMARKS. The type species, *Austroclima sepia*, was originally described in *Atalophlebioides*, a subgenus of *Deleatidium*, by Phillips (1930). Phillips placed all *Deleatidium* species with abdominal gills of double lamellae in *Atalophlebioides*, and those with abdominal gills of a single lamella in *Deleatidium* sensu stricto. Ulmer (1938), Traver (1946), and Peters & Edmunds (1964) considered *Atalophlebioides* worthy of generic rank, whereas Harker (1954) agreed with Phillips. Peters & Edmunds (1964) designated *A. cromwelli* (Phillips) as the type species of *Atalophlebioides*. In New Zealand the genus has also previously included *A. sepia* (Phillips) and *A. aucklandensis* Peters. Towns & Peters (1978) considered *Atalophlebioides* s.s. to be monotypic, and consequently excluded *A. sepia* and *A. aucklandensis* from the genus. *Atalophlebioides sepia* is therefore placed in *Austroclima*.

Table 1. Sample sizes for measurements used in the species descriptions of *Austroclima* and *Mauilulus*.

	<i>A. sepia</i>	<i>A. jollyae</i>	<i>M. luma</i>
	IMAGO		
Length of: ♂	3	5	5
♀	2	5	5
forelegs (♂)	1	4	3
wings (♂)	4	4	4
" (♀)	1	4	4
	NYMPH		
Length	18	10	10
Mouthparts measurements	5	5	5

Fig. 1–14. *Austroclima sepia* and *A. jollyae*. 1–7, *sepia*, ♂ imago: (1) forewing; (2) hind wing, enlarged; (4) fore claws; (5) genitalia, ventral view; (6) genitalia, lateral view; (7) spine on dorsolateral surface of penes. 8, *jollyae*, ♂ imago, spine on dorsolateral surface of penes. 9, 10, *sepia*, ♂ imago: (9) abdominal segments 3–6, dorsal view; (10) abdominal segments 5 and 6, lateral view. 11, 12, *sepia*, ♀ imago: (11) 9th sternum; (12) abdominal segments 6–10, lateral view. 13, 14, *jollyae*, ♂ imago: (13) abdominal segments 5 and 6, lateral view; (14) abdominal segments 3–6, dorsal view.

(Opposite page)



Austroclima can be distinguished from all other leptophlebiid genera by the following combinations of characters. In the imago: (1) hind wings with a concave costal margin and vein Sc more than 8/10 the maximum length of the wing (Fig. 3); (2) penes divided to styliger plate, and with a subapical dorsal spine near the lateral margin of each lobe (Fig. 5); (3) ninth sternum of female entire, concave apically (Fig. 11); (4) claws of a pair dissimilar, one pad-like, obtuse, the other apically hooked (Fig. 4). In the nymph: (1) labrum narrow, angularly expanded, and with a deep, narrow, anteromedian emargination (Fig. 15); (2) denticles on anterior margin of labrum broad-based (Fig. 16, 17); (3) mandibles with a single, small marginal hair tuft (Fig. 18); (4) galea-lacinia of maxillae narrow (Fig. 19); (5) submentum of labium with lateral spines (Fig. 21); (6) tibiae in cross-section oval, compressed (Fig. 24); (7) abdominal gills with double, plate-like lamellae (Fig. 27, 28); (8) abdominal segments 8 and 9 with blunt projections on their posterolateral margins (Fig. 26).

Austroclima appears to be most closely related to *Mauilulus* of New Zealand, but can be distinguished from it by the following characters. In the imago: (1) vein Sc of hind wing more than 8/10 length of wing (Fig. 3); (2) penes with dorsolateral spine on small accessory lobe (Fig. 5); (3) ninth sternum of female not convex (Fig. 11); (4) males and females with similar colour patterns (Fig. 10, 12). In the nymph: (1) abdominal gills plate-like (Fig. 27, 28); (2) outer margin of mandibles angular (Fig. 18); (3) segment 3 of labial palpi a little less than half to $\frac{1}{3}$ length of segment 2 (Fig. 21); (4) claws with large denticles (Fig. 25).

Austroclima and *Mauilulus* also appear to be related to two undescribed genera from Chile (M.L. Pescador, in prep.).

KEY TO SPECIES OF *Austroclima*

IMAGOS AND SUBIMAGOS

1. Abdominal terga of ♂ and ♀ brown, terga 3-9 with large, pale-brown maculae (Fig. 9, 10, 12); egg usually oval, with raised tubercles concentrated into ridges near poles (Fig. 40, 41).....*sepia*
- Abdominal terga of ♂ and ♀ dark brown, without pale-brown maculae (Fig. 13, 14); egg compressed, oval, with tubercles around margin (Fig. 44, 45).....*jollyae*

NYPHS

1. Abdominal gills oval, lamellae hyaline (Fig. 27); abdominal terga brown, usually with pale maculae on terga 3-7 (Fig. 46).....*sepia*
- Abdominal gills angularly expanded apically, lamellae darkly pigmented except for lateral margins (Fig. 28); abdominal terga dark brown, without pale maculae on terga 3-7 (Fig. 47).....*jollyae*

Austroclima sepia (Phillips) n.comb. (Fig. 1-7, 9-12, 15-27, 29, 30, 33, 34, 36, 37, 39, 40-43, 46)

Phillips, 1930: 383-4 (in *Atalophlebioides*, a subgenus of *Deleatidium*).

Peters & Edmunds, 1964: 238. —Peters, 1971: 51. —Tsui & Peters, 1975: 555. —Towns, 1978b: 410. —Towns & Peters, 1978: 610-11 (in *Atalophlebioides*).

MALE IMAGO (in ethanol). Length: body 7.2-9.1 (8.1) mm; forewings 7.9-9.9 (8.5) mm.

Head brown, darker between antennae. Upper portion of eyes orange-brown to pale brown, lower portion dark grey to black. Antennae brown. Basal half of ocelli black, apical half greyish-white.

Thorax. Pronotum brown, washed with black; meso- and metanotum dark brown washed with black, carinae and sutures of nota brown. Propleuron whitish to pale brown, washed with dark brown dorsally, meso- and metapleura dark brown washed with black, carinae darker, sutures paler. Sterna brown, washed with black, membranes paler. Legs yellowish-brown, brown at articulation of femora and tibiae, forelegs darker; coxae brown, washed with black. Length ratios of segments in forelegs 0.60 : 1.00 (3.5 mm) : 0.06 : 0.44 : 0.42 : 0.33 : 0.11. Wings (Fig. 1-3). Forewings: width 0.35-0.37 (0.36) length; longitudinal and cross veins brown; membrane hyaline to faintly tinted with brown, except wing base washed with pale brown; apical 1/3 of cells C and Sc translucent, whitish. Hind wings: vein Sc 0.83-0.88 (0.87) wing length, R₁ 0.96-1.00 (0.97) wing length. Colour of veins and membranes as in forewings. Width of hind wings 0.56-0.59 (0.58) length, length of hind wings 0.22-0.23 (0.22) length of forewings.

Abdomen dark brown; terga 2-7 with paired, pale, anterior, submedian maculae; terga 2-5 or 2-6 with pale longitudinal line edged with dark brown along midline; posterior margins of terga 1-5 and anterolateral $\frac{1}{4}$ of each tergum pale brown; terga 3-9 with large, pale brown, paired maculae as in Fig. 9. Spiracular area dark brown, tracheae hyaline (Fig. 10). Sterna pale brown, washed with darker brown; abdominal ganglia 2-7 dark brown to translucent. Genitalia (Fig. 5-7): pale brown; penes with a flattened projection terminated with a small spine on a broad-based accessory lobe on dorsolateral surface of each lobe (Fig. 5-7). Caudal filaments brown, darker annulations at articulations.

FEMALE IMAGO (in ethanol). Length: body 9.2-9.4 mm; forewings 11.2 mm.

Head pale brown, darker near ocelli. Eyes black. Basal half of ocelli black, apical half brownish to whitish grey. Antennae as in ♂ imago.

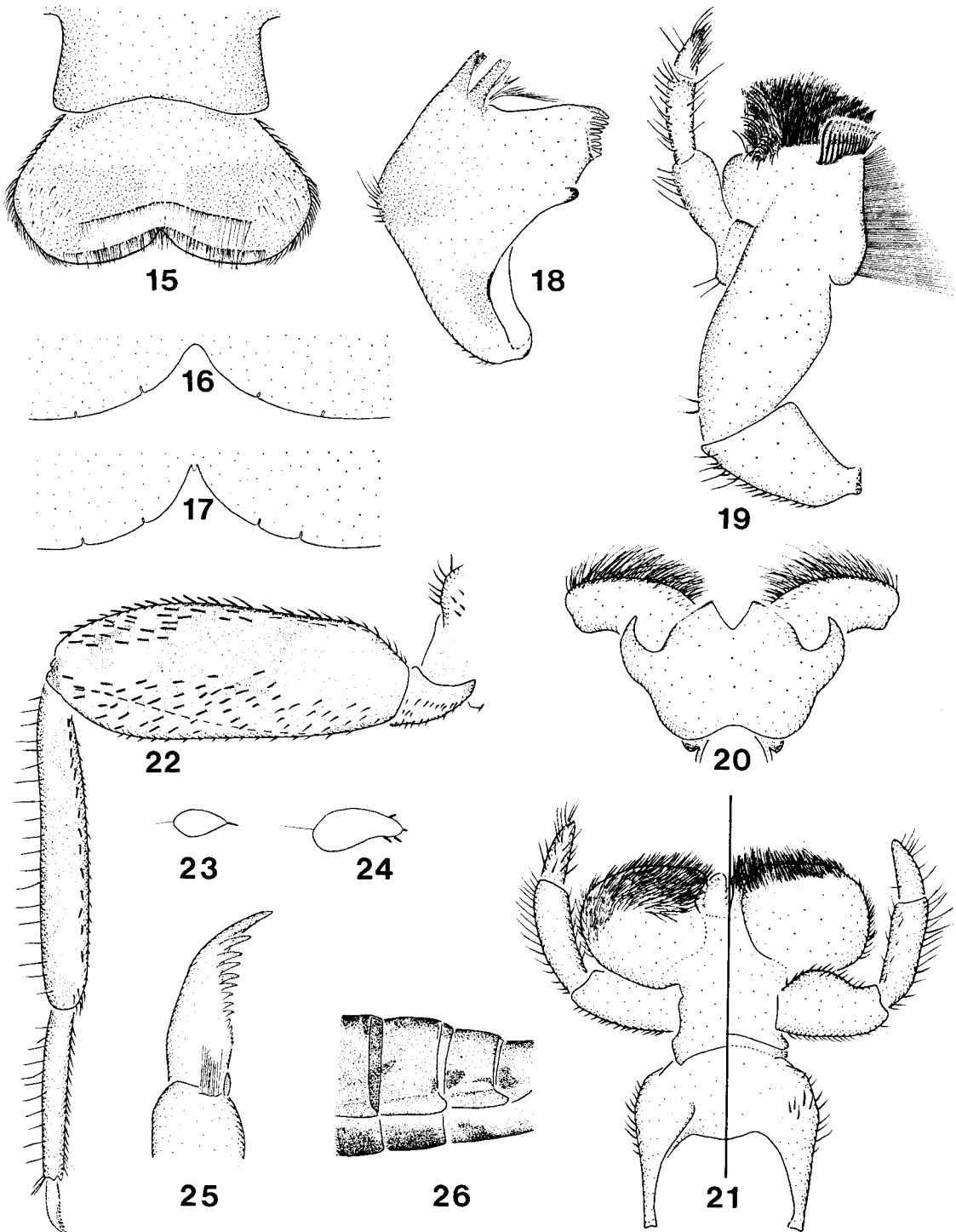


Fig. 15-26. *Austroclima sepia*, mature nymph: (15) labrum and clypeus, dorsal view; (16, 17) antero-median emargination of labrum, enlarged; (18) left mandible, dorsal view; (19) right maxilla, ventral view; (20) hypopharynx; (21) labium, dorsal (left) and ventral views; (22) foreleg; (23) cross section through tarsus; (24) cross section through tibia; (25) fore claw; (26) posterolateral projections of abdominal segments 8 and 9.

Thorax. Colour and markings as in ♂ imago, but paler. Legs: colour and markings as in ♂ imago. Wings. Forewings: width 0.37 length. Hind wings: vein Sc 0.88 length of wings, R₁ equal to length of wings. Width of hind wings 0.58 maximum length, length of hind wings 0.22 length of forewings. Colour and markings of fore and hind wings as in ♂ imago.

Abdomen. Colour and markings as in ♂ imago, but paler (Fig. 12). Ninth sternum concave apically, with a longitudinal groove along midline (Fig. 11). Caudal filaments brown, darker annulations at articulations.

MALE AND FEMALE SUBIMAGO (in ethanol). Head brown, markings as in ♂ and ♀ imago, Eyes of ♀ black, upper portion of eyes of ♂ orange-brown to brown, lower portion black, eyes of ♂ separated on meson of head by a little less than width of a lateral ocellus.

Thorax. Pronotum as in ♂ and ♀ imago; anterior 1/3 of mesonotum and area between outer parapsidal furrow and median notal suture brown to dark brown, except a narrow, pale band inside outer parapsidal furrow and along posterior 2/3 of median notal suture; mesonotum between outer parapsidal furrows and notal wing processes brown, darker brown to black anteriorly; lateral margins of basal humps of scutellum brown, dorsum of humps whitish, brown near midline; posterior scutellum grey, lateral margins brown (Fig. 33). Pleura pale brown, irregularly washed on margins with black. Sterna pale, except carinae and lateral lobes of furcasternum brown. Wings: longitudinal and cross veins and membrane of fore and hind wings brownish grey, base of forewings brown. Legs: colour and markings as in ♂ and ♀ imago.

Abdomen. Colour and markings of terga as in ♂ and ♀ imago, except general colour darker. Sterna 2-5 dark brown, anterior 1/4 to half paler; sterna 6-9 pale brown, with large, dark-brown, triangular maculae. Male genitalia whitish. Caudal filaments pale brown, with or without darker annulations at articulations.

MATURE NYMPH (in ethanol). Length: body 5.5-10.4 (7.1) mm.

Head yellow brown to brown, darker between ocelli. Colour of ocelli as in ♂ and ♀ imago. Eyes of ♀ black, upper portion of eyes of ♂ pale brown, lower portion black. Antennae pale brown.

Mouthparts. Labrum: length 0.50-0.63 (0.57) width (Fig. 15). Clypeus as in Fig. 15. Left mandible as in Fig. 18. Maxillae: galea-lacinia with a sub-apical row of 14-18 spines (Fig. 19); segment 2 of palpi 0.94-1.08 (1.02) length of segment 1, segment 3 0.55-0.67 (0.61) length of segment 2. Labium as

in Fig. 21; segment 2 of palpi 0.89-1.05 (0.98) length of segment 1, segment 3 0.60-0.75 (0.67) length of segment 2.

Thorax. Pronotum pale yellow-brown to dark brown, with darker submedian and lateral markings as in Fig. 46, and with scattered small spines on anterolateral margin. Mesothorax pale to dark brown, with or without darker markings on dorsum as in Fig. 46. Metathorax pale yellow-brown, darker on posterior margin. Legs: femora pale yellow brown, except basal half of femora of forelegs whitish ventrally, occasionally with a large, pale spot near apex; articulation of femora with tibiae dark brown; tibiae pale brown, paler near base and apex; tarsi pale brown, dorsum darker. Femoral and tibial spines as in Fig. 34, 36, 37, 39.

Abdomen. Colour and markings as in ♂ and ♀ imago (Fig. 46). Gills (Fig. 27): lamellae oval, translucent, whitish to hyaline; tracheal branches numerous, tracheae and branches darkly pigmented. Caudal filaments pale brown, with darker annulations at articulations.

EGG varying from elongate oval with polar regions rounded and raised tubercles concentrated into ridges near poles (Fig. 40, 41) to compressed, rectangular, with tubercles around margin (Fig. 43); chorion with vermiform sculpturing (Fig. 40, 41, 43).

TYPE DATA. Phillips (1930, p. 384) gives the type locality of *Deleatidium (Atalopplebioides) sepia* as "Streams round Wellington".

Phillips did not designate type specimens for *A. sepia*, and we have been unable to locate his material (see Towns & Peters 1978). However, among specimens loaned to us by Mr R.G. Ordish from National Museum of New Zealand collections is a pinned ♀ imago with the handwritten label "*Atalopplebia sepia*, ♀ imago, Khandallah, 28. 11. 28". This specimen may be part of Phillips's original series, but is destroyed beyond recognition. We have therefore determined the identity of *A. sepia* from colour patterns described for the species by Phillips (1930) and his figures of the abdominal gills and egg (Phillips 1930, fig. 16 and p. 383).

In the absence of Phillips's type specimens we designate the following specimen as neotype: ♂ imago, Cascade Stm, Auckland, reared from nymph, 7 Sep 1974, DRT.

MATERIAL EXAMINED. **North Island. ND.** Matauri Bay, Bay of Islands - 27 nymphs, 23 Aug 1966, MW; Okawakawa Stm, Waipoua State Forest - 6 nymphs, shallow stm 2 m wide, moderate flow, 5 Feb 1975, JCW, SEN. **AK.** Cascade Stm - 3 nymphs, 28 Aug 1974, DRT; 10 nymphs, 23 Jan 1974, DRT; 2 ♀ subimagos, reared from nymphs, 27 Oct 1975, DRT; 1 ♀ subimago, reared from nymph, 26 Oct 1975, DRT; 4 ♂ and 1 ♀ subimagos, light trap, 9 Feb 1977, MB; 3 ♂ imagos, 6 ♂ and 7 ♀ sub-

imagos, light trap, 9 Mar 1977, MB; 1 ♀ imago, reared from nymph, 30 Aug 1974, DRT; 1 ♀ imago, reared from nymph, 29 Oct 1975, DRT. Waitakere R. - 1 nymph, drift sample, 22-23 Apr 1974, DRT. Mokoroa Stm - Goldies Bush, 7 nymphs, 15 Oct 1966, JAM; above Fairy Falls, 1 nymph, 27 Mar 1960, KAJW. Kitekite Stm - 23 nymphs, 27 Dec 1976, DRT, ELT, GCH, BWH. Swanson - 1 nymph, no further data. Sunnyside, Henderson - 1 ♀ imago, at bridge, 15 Jan 1957, KAJW. Orere Point, Cashmore Bridge No. 1 - 5 nymphs, 29 Dec 1976, DRT, ELT, MNC. CL. Small silty trib. of Kauaeranga R. - 2 nymphs, 4 Jan 1977, DRT. Clear trib. of Kauaeranga R. - 2 nymphs, in overhanging and

emergent dead vegetation, 2 Jan 1977, DRT, ELT, GCH, BWH. Tarawaere Stm - 67 nymphs, 3 Jan 1977, DRT, ELT, GCH. Waterfalls Creek, trib. of Tarawaere Stm - 1 nymph, 3 Jan 1977, DRT, ELT, GCH. Atuatumoe Stm - 15 nymphs, 3 Jan 1977, DRT, ELT, GCH. Thames - 4 nymphs, May 1964, MJW. Takatakahia Stm - 2 nymphs, 15 Jan 1977, DRT, ELT. WO. Putaruru - 9 nymphs, 27 Aug 1966, JAM. Mapiu - 3 nymphs, 28 Mar 1967, JKG. Waitomo - 15 nymphs, 21 Nov 1966, JAM. Trib. of Waitomo R. 8 km south of Waitomo Cave - 15 nymphs, 10 Mar 1966, JGP. Waipa R. at Harapepe - 5 nymphs, 10 Mar 1966, GFE. TO. Ruapehu - 1 nymph, 2-3 Mar 1964, ? coll. Trib. of Pungapunga

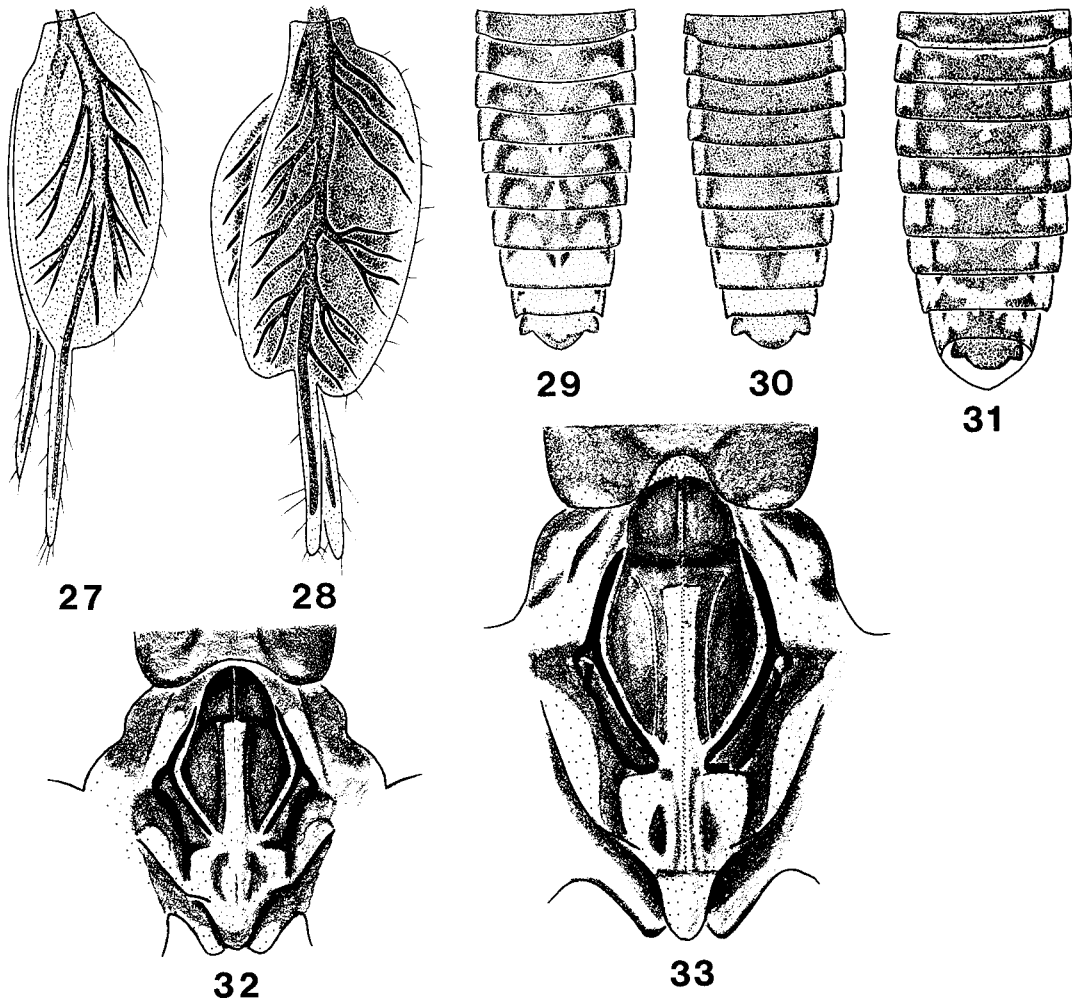


Fig. 27-33. *Austroclima sepia*, *A. jollyae*, and *Mauiulus luma*. 27, 28, abdominal gill 4, mature nymph, *A. sepia* (27) and *A. jollyae* (28). 29, 30, *A. sepia*, mature nymph, variations in abdominal colour pattern: (29) Arthur's Pass, N. Canterbury; (30) Takatakahia Stm, Coromandel. 31, 32, *M. luma*: (31) mature ♀ nymph, abdominal colour pattern (not to same scale as Fig. 29 & 30); (32) subimago, colour pattern of mesothorax. 33, *A. sepia*, subimago, colour pattern of mesothorax (to same scale as Fig. 32).

Stm, east of Taumarunui - 80 nymphs, 9 Mar 1966, GFE. Oturere Stm, 24 km south of Turangi - 1 nymph, 7 Mar 1966, GFE. Waihi Stm, 2 km south of Lake Taupo - 9 nymphs, 7 Mar 1966, GFE. Oruawai Stm nr Taumarunui - 29 nymphs, 9 Mar 1966, GFE. Trib. of Taringamotu R. 3 km E of Oruawai - 6 nymphs, 9 Mar 1966, GFE. Makahikatoa Stm, 22 km south of Turangi - 3 nymphs, 7 Mar 1966, GFE. Taringamotu R., 11 km north of Taumarunui - 1 nymph, 9 Mar 1966, GFE. TK. Huatoki Stm - 6 nymphs, 11 Oct 1957, AH. ? Mohau Stm - 2 nymphs, 26 Nov 1966, JAM. **South Island. NN.** Little Wanganui R. - 3 nymphs, 1 Jan 1973, ACM. Fletchers Creek, Inangahua West - 1 ♂ subimago, 25 Jan 1972, JSD. Burnettts Face, small stm - 1 ♀ subimago and 2 nymphs, 28 Jan 1973, ACM. Utopia, nr Westport - 4 nymphs, small stm 1 m wide, stony with liverworts, 24 Aug 1969, ACM, ICM. Ohikanau Terrace, nr Westport - 1 nymph, small trickle in forest, 25 Oct 1966, JI. Hope R. - 11 nymphs, 24 Oct 1966, JI. **NC.** Small stm in meadow at summit of Arthurs Pass, 914 m - 3 nymphs, 4 Mar 1966, GFE.

Association of nymphs and adults is by rearing.

Repositories (all specimens are in ethanol): neotype ♂ imago, 3 ♂ and 2 ♀ imagos, 5 ♂ and 4 ♀ subimagos, and 126 nymphs - Entomology Division, DSIR, Auckland; 1 ♀ imago, 1 ♂ and 2 ♀ subimagos, and 86 nymphs - National Museum of New Zealand, Wellington; 1 ♂ and 1 ♀ subimagos and 13 nymphs - Canterbury Museum, Christchurch; 1 ♂ and 2 ♀ subimagos and 11 nymphs - British Museum (Natural History), London; 1 ♀ imago, 1 ♂ and 2 ♀ subimagos, and 104 nymphs - Florida A & M University, Tallahassee; 1 ♂ and 1 ♀ subimago and 10 nymphs - Bernice P. Bishop Museum, Honolulu; 1 ♂ and 1 ♀ subimago and 153 nymphs - University of Utah, Salt Lake City.

INTRASPECIFIC VARIATION. Abdominal colour patterns of *A. sepia* vary from well marked (Fig. 29) to almost uniformly brown (Fig. 30). The most common colour pattern is illustrated in Fig. 46. Eggs are also variable; ♀ imagos and subimagos contain eggs which range from the more common highly ornamented types to the compressed types (Fig. 40-43), including some specimens containing two different types of egg (Fig. 42, 43).

REMARKS. *Austroclima sepia* can be distinguished from *A. jollyae* by the following characters. In the imago: abdomen of males and females brown, with paler dorsolateral maculae on terga 3-9 (Fig. 9). In the nymph: (1) abdomen brown, with paler dorsolateral maculae on terga 3-7 (Fig. 46); (2) lamellae of abdominal gills not darkly pigmented (Fig. 27). In the egg: shape oval, chorion with vermiform sculpturing and ridges of raised tubercles usually near poles (Fig. 40, 41).

The shape of the apex of the median lobes of the lingua is similar for both species of *Austroclima*, but within each species varies from strongly (Fig. 20) to weakly triangular.

Spines on the femora and tibiae of the nymphs are similar in *A. sepia* and *A. jollyae*, but particular

types of spines often have a different distribution in each species. However, these structures are fragile and commonly break during preparation for the SEM. Because of this, and the wide variety of spine types, we have not attempted a detailed comparison between species, or between the fore, middle, and hind legs within species. Several of the common, prominent spines of the forelegs of *A. sepia* and *A. jollyae* are shown in Fig. 34-39. These are useful as additional characters for comparison with other genera.

Penes of imagos of *A. sepia* and *A. jollyae* are almost identical, but sometimes can be distinguished by the shape of the subapical spines of each penis lobe (Fig. 7, 8). However, the spines are small, can be examined only at high magnification, and sometimes vary in shape.

BIOLOGY. *Austroclima sepia* occurs throughout New Zealand from near sea level to 1000 m. The species is most common in small (<10 m wide) forested streams where the watercourse forms small waterfalls or cascades. Nymphs often aggregate in clumps of the aquatic moss *Fissidens ridgulus*. In the Waitakere River system *A. sepia* nymphs were most abundant in the Cascade Stream, where water temperatures were rarely below 10°C or above 16°C throughout the year (see Towns 1976, 1978a).

Austroclima jollyae n.sp. (Fig. 8, 13, 14, 28, 35, 38, 44, 45, 47)

Towns, 1978b: 411. -Towns, 1979: [? page] (as *Atalophlebioides* sp. B).

MALE IMAGO (in ethanol). Length: body 8.8-10.5 (9.7) mm; forewings 10.3-10.7 (10.6) mm.

Head dark brown to black, except anterior and lateral margins pale to dark brown. Upper portion of eyes reddish-brown to pale brown, lower portion black. Antennae brown, flagellum paler. Basal half of ocelli black, apical half reddish-brown to greyish-white.

Thorax. Pronotum brown, irregularly washed with black medially and on posterior and lateral margins; mesonotum and scutellum dark brown, except small, pale-brown area on posterior mesonotum; sutures paler, carinae darker. Propleuron whitish to pale brown, washed with dark brown to black dorsally; meso- and metapleura dark brown, irregularly washed with black; sutures paler. Sterna pale to dark brown. Legs yellowish brown, forelegs darker; articulation of femora and tibiae and of tibiae and tarsi of forelegs brown; coxae brown, margins dark brown to black. Length ratios of segments in forelegs 0.51-0.59 : 1.00 (3.3-3.5 mm) : 0.06 : 0.35-0.38 : 0.23-0.33 : 0.21-0.27 : 0.11-0.13. Wings as in Fig. 1-3. Forewings: width 0.35-0.36

(0.36) length. Veins brown, membrane hyaline, faintly tinted with brown, brown at base, apical 1/3 of cells C and Sc translucent, whitish. Hind wings: vein Sc 0.86–0.96 (0.92) length of wing; R₁ 0.96–1.00 (0.98) length of wing; width of hind wings

0.56–0.61 (0.59) length, length of hind wings 0.22–0.23 (0.23) length of forewings. Colour of veins and membrane as in forewings.

Abdomen. Terga 1–9 dark brown, anterior 1/3 of terga 2–6 paler; terga 2–7 with paired, pale, sub-

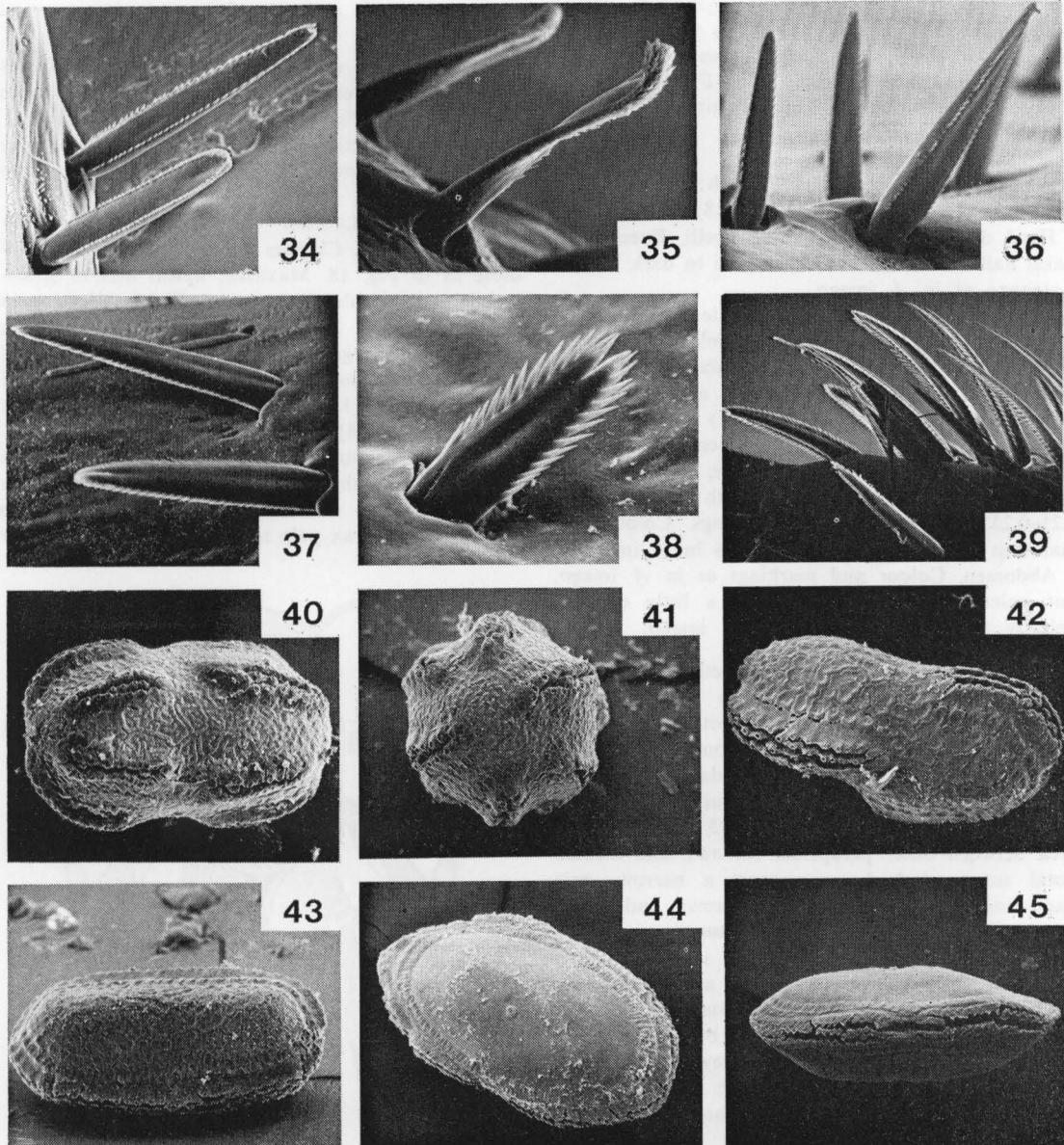


Fig. 34–45. Scanning electron micrographs of *Austroclima sepia* and *A. jollyae*. 34–39, spines of forelegs: (34) *sepia*, femur, dorsal ($\times 680$); (35) *jollyae*, femur, dorsal ($\times 720$); (36) *sepia*, femur, ventral ($\times 750$); (37) *sepia*, inner mid-tibia ($\times 980$); (38) *jollyae*, inner mid-tibia ($\times 2030$); (39) *sepia*, tibia-tarsus articulation ($\times 410$). 40–45, eggs: (40) *sepia*, from imago, lateral view ($\times 260$); (41) *sepia*, from imago, polar view ($\times 290$); (42, 43) *sepia*, from same subimago ($\times 250$ and $\times 230$ respectively; tubercles slightly damaged); (44) *jollyae*, from imago, dorsal view ($\times 200$); (45) *jollyae*, from imago, lateral view ($\times 180$; tubercles slightly damaged).

median maculae; terga 3-6 with a pale line edged with dark brown along midline; terga 2-5 with a pale-brown, posterior, transverse band as in Fig. 13 & 14; spiracular area dark brown, trachea brown. Sterna pale brown, each with an irregular, median, transverse brown band; abdominal ganglia brown to hyaline, terminal abdominal ganglion darker brown. Genitalia pale brown, penes with a pointed spine on a small, broad-based accessory lobe on dorsolateral surface of each lobe (Fig. 8). Caudal filaments pale brown, darker annulations at articulations.

FEMALE IMAGO (in ethanol). Length: body 7.2-10.0 (8.7) mm; forewings 10.3-11.1 (10.8) mm.

Head dark brown, black near ocelli. Eyes black. Basal half of ocelli black, apex pale to dark brown. Antennae as in ♂ imago.

Thorax. Colour and markings of terga and pleura as in ♂ imago, but paler. Legs: colour and markings as in ♂ imago, except articulations of tibiae and tarsi of forelegs paler. Wings as in Fig. 1-3. Forewings: width 0.34-0.36 (0.35) length. Hind wings: vein Sc 0.90-0.96 (0.93) length of wings; R₁ 0.99-1.00 (1.00) length of wings; width of hind wings 0.50-0.56 (0.54) length, length of hind wings 0.21-0.23 (0.22) length of forewings. Colour and markings of fore and hind wings as in ♂ imago.

Abdomen. Colour and markings as in ♂ imago, but paler. Ninth sternum entire, a little concave apically. Caudal filaments as in ♂ imago.

MALE AND FEMALE SUBIMAGO (in ethanol). Head. Colour of ocelli and antennae as in ♂ and ♀ imago. Eyes of ♀ black, upper portion of eyes of ♂ pale orange-brown, lower portion black.

Thorax. Pronotum brown to dark brown on lateral margins and with darker, paired, submedian lines along entire length; anterior 1/3 of mesonotum, area between outer parapsidal furrows, and median notal suture dark brown, except a narrow, pale band inside outer parapsidal furrows and along posterior 2/3 of median notal suture; mesonotum between outer parapsidal furrows and notal wing processes dark brown to black, as in Fig. 33; margins of basal humps of scutellum pale to dark brown; dorsum of humps whitish, brown each side of midline; posterior scutellum greyish-brown, lateral margins dark brown, as in Fig. 33. Pleura pale brown, irregularly washed with brown and dark grey. Sterna pale, margins dark brown, except lateral lobes of furcasternum brown. Legs: pale brown, except dorsal margin and apical 1/3 of femora dark brown and coxae greyish-brown; other markings as in ♂ and ♀ imago. Wings: longitudinal and cross veins pale, brownish, membranes of fore and hind wings brownish-grey, base of fore-

wings washed with pale brown.

Abdomen. Colour and markings of abdominal terga as in ♂ and ♀ imago, except pale mid-dorsal line less pronounced to absent, and general colour darker brown. Male genitalia pale, whitish to pale brown. Caudal filaments as in ♂ and ♀ imago.

MATURE NYMPH (in ethanol). Length: body 7.1-10.6 (9.7) mm.

Head. Pale to dark brown, darker between eyes on either side of midline; triangular black area between ocelli (Fig. 47). Ocelli whitish. Eyes of ♀ black, upper portion of eyes of ♂ dark brown to reddish-brown, lower portion black. Antennae pale brown.

Mouthparts. Labrum: length 0.50-0.59 (0.55) width (Fig. 15). Clypeus as in Fig. 15. Left mandible as in Fig. 18. Maxillae: apical half of galealacinia with a subapical row of 12-14 spines, as in Fig. 19; segment 2 of palpi 0.90-1.10 (1.00) length of segment 1, segment 3 0.50-0.54 (0.52) length of segment 2. Labium as in Fig. 21; segment 2 of palpi 0.90-1.10 (1.02) length of segment 1, segment 3 0.44-0.50 (0.48) length of segment 2.

Thorax. Pronotum rectangular (Fig. 47), pale to dark brown, with complex darker markings as in Fig. 47; spines of anterolateral margin few to absent; mesothorax pale to dark brown, with darker

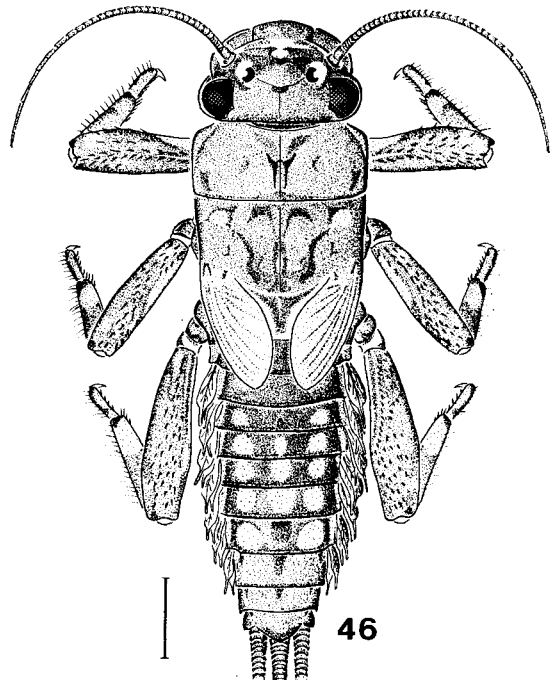


Fig. 46. *Austroclima sepia*, mature nymph (scale line 1 mm).

markings as in Fig. 47; metathorax pale to dark brown, Legs: femora pale brown, except femora of forelegs with basal 1/3 whitish-brown ventrally and a small, whitish-brown macula near apex; articulation of femora with tibiae and of tibiae with tarsi dark brown; tarsi pale brown, dorsum darker.

Abdomen. Terga 1-9 dark brown, darker near posterior margins and paler on lateral margins (Fig. 47); sterna pale brown. Gills (Fig. 28): lamellae angularly expanded apically, darkly pigmented except for outer margins, tracheae and tracheal branches black. Caudal filaments pale brown to brown, darker annulations at articulations.

EGG (Fig. 44, 45) oval, compressed, polar regions acute; raised tubercles around margin, broken at centre (Fig. 45); chorion surface smooth (Fig. 44, 45).

MATERIAL EXAMINED. **Holotype** ♂ imago, Cascade Stm, Auckland, reared from nymph, 31 Aug 1974, DRT; **allotype** ♀ imago, data as for holotype ex-

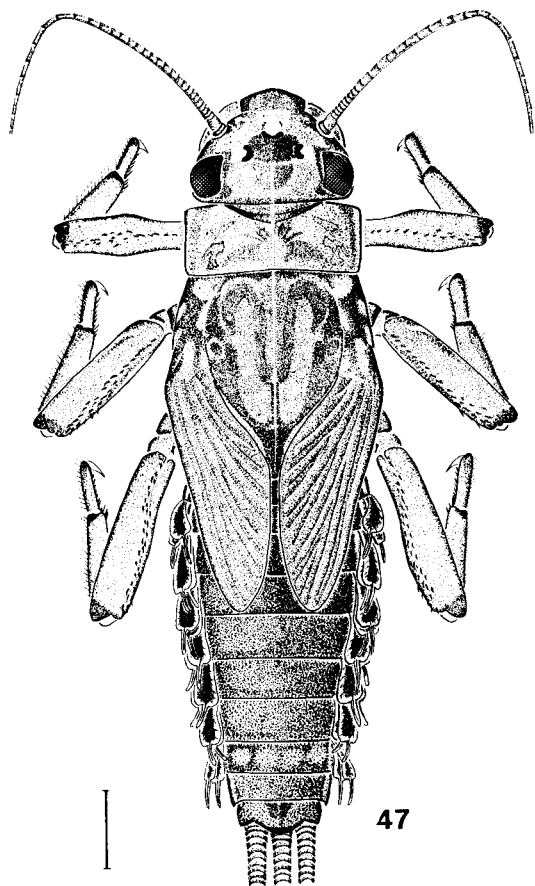


Fig. 47. *Austroclima jollyae*, mature nymph (scale line 1 mm).

cept 28 Mar 1975. **Paratypes**. **North Island**. **ND**. Okawakawa Stm, Waipoua State Forest - 1 nymph, shallow stm 2 m wide, moderate flow, 5 Feb 1975, JCW. **SEN. AK**. Cascade Stm, reared from nymph by DRT unless otherwise stated - 1 ♀ imago, 3 Sep 1974; 1 ♀ subimago, 4 Sep 1974; 1 ♂ imago, 3 Apr 1975; 1 ♂ imago, 10 Oct 1974; 1 ♂ imago, 14 Oct 1975; 1 ♂ imago, 26 Apr 1975; 1 ♀ imago, 18 Oct 1975; 1 ♂ imago, 16 Oct 1975; 1 ♂ imago, 7 Oct 1974; 1 ♂ and 1 ♀ imago, 15 Oct 1975; 2 ♂ imagos, 17 Oct 1975; 1 ♂ imago, 25 Sep 1974; 1 ♀ subimago, 31 Oct 1975; 1 ♀ imago, 2 Sep 1975; 1 ♂ and 1 ♀ imago, 16 Oct 1975; 2 ♀ imagos, 18 Oct 1975; 1 ♂ and 1 ♀ subimago, 30 Oct 1975; 24 ♂ and 14 ♀ subimagos, light trap, 9 Feb 1977, MB; 7 ♂ and 5 ♀ subimagos, light trap, 9 Mar 1977, MB; 3 nymphs, 28 Aug 1974, DRT; 5 nymphs, 22 Apr 1975, DRT. Kitekite Stm - 5 nymphs in aquatic moss and liverwort, 27 Dec 1976, DRT, ELT, BWH, GCH. Cascade below Kitekite Falls - 8 nymphs, 27 Dec 1976, DRT. Mokoroa Stm, Fairy Falls - 8 nymphs, 13 May 1964, JAM; 5 nymphs, 27 Mar 1960, KAJW. Upper Piha Stm - 46 nymphs, 18 Apr 1964, JAM. Karamatura Stm - 15 nymphs, 9 Mar 1964, JAM, Swanson - 7 nymphs, no further data. **CL**. Tarawaere Stm - 2 nymphs, 3 Jan 1977, DRT. **WO**. Putaruru - 2 nymphs, 18 May 1963, JAM. **South Island**. **NN**. L. Rotoroa by Gowar R. outlet - 5 ♀ imagos, 26 Nov 1972, ACM. Burnetts Face, small stm - 1 nymph, 28 Jan 1973, ACM. **BR**. Arnold R. - 4 ♀ imagos, Sep 1960, JGP; 1 ♂ subimago, 18 Sep 1960, JGP. **Kokiri**, Baxters Stm - 1 nymph, 7 Oct 1960, JGP. **WD**. Pivot Creek, Haast R. - 1 nymph, 28 Oct 1966, JIT. **NC**. Hawdon R. at junction with Sudden Stm - 11 nymphs, 3 Mar 1966, GFE. **CO**. Cardrona Vly - 6 nymphs, 29 Oct 1966, JIT. **SL**. Waipahi R., Kuriwao - 3 nymphs, 3 Sep 1966, JIT. **FD**. Manapouri Expedition - 4 nymphs, Jan 1970, ?coll.

Association of nymphs and adults is by rearing.

Repositories (all type specimens are in ethanol): holotype, allotype, 5 ♂ and 15 ♀ imaginal paratypes, 20 ♂ and 7 ♀ subimaginal paratypes, and 53 nymphal paratypes - Entomology Division, DSIR, Auckland; 1 ♂ and 1 ♀ imaginal paratype, 4 ♂ and 2 ♀ subimaginal paratypes, and 23 nymphal paratypes - National Museum of New Zealand, Wellington; 2 ♂ and 4 ♀ imaginal paratypes, 1 ♂ and 2 ♀ subimaginal paratypes, and 21 nymphal paratypes - Canterbury Museum, Christchurch; 1 ♂ and 1 ♀ imaginal paratype, 2 ♂ and 2 ♀ subimaginal paratypes, and 10 nymphal paratypes - British Museum (Natural History), London; 2 ♂ and 1 ♀ imaginal paratypes, 2 ♂ and 2 ♀ subimaginal paratypes, and 12 nymphal paratypes - Florida A & M University, Tallahassee; 1 ♀ imaginal paratype, 2 ♂ and 4 ♀ subimaginal paratypes, and 7 nymphal paratypes - Bernice P. Bishop Museum, Honolulu; 1 ♂ imaginal paratype, 1 ♂ and 3 ♀ subimaginal paratypes, and 11 nymphal paratypes - University of Utah, Salt Lake City.

Some specimens of *A. jollyae* are pale brown in general colour, but these may have faded in preservative. Fresh specimens collected by DRT were always distinctively dark brown.

ETYMOLOGY. This species is named in recognition of the considerable contribution made by the late Dr V.H. (Hilary) Jolly to New Zealand limnology.

REMARKS. *Austroclima jollyae* can be distinguished from *A. sepi*a by the following characters. In the imago: abdomen dark brown, without pale dorso-lateral maculae on terga (Fig. 13, 14). In the nymph: (1) abdomen dark brown (Fig. 47); (2) lamellae of abdominal gills angularly expanded apically and darkly pigmented except for margins (Fig. 28). In the egg: shape oval, compressed (Fig. 44, 45), chorion without sculpturing, and tubercles around margin (Fig. 45).

Mature nymphs of *A. jollyae* can be distinguished from *A. sepi*a by the wing pads. Those of *A. jollyae* are dark greyish-brown with the developing veins paler, whereas in *A. sepi*a they are usually yellowish-brown with the developing veins darker.

BIOLOGY. *Austroclima jollyae* occurs throughout New Zealand, and has been collected from near sea level to approximately 1000 m. Like *A. sepi*a, *A. jollyae* is most common in small, forested streams. Late-instar nymphs of *A. jollyae* are often abundant at waterfalls and cascades; in the Cascade Stream *A. jollyae* was more numerous in these habitats than was *A. sepi*a.

Mauiulus n.gen.

IMAGO. Length: ♂ - body 5.4-5.9 mm, forewings 6.1-7.1 mm; ♀ - body 3.9-6.1 mm, forewings 6.0-7.4 mm.

Eyes: ♂ - fused on meson of head, lower portion 2/3 to 3/4 length of upper portion; ♀ - separated on meson of head by 3-4 × maximum width of eye.

Wings (Fig. 48-50). Forewings: width a little more than 1/3 length. Vein Rs forked a little less than 1/5 distance from base to margin. Vein MA forked half (to a little more) distance from base to margin, fork symmetrical. Vein MP not forked, MP₂ attached at base to CuA and MP₁ with a cross vein, attachment of MP₂ to MP₁ 1/3 (to a little less) distance from base to margin, base of MP₂ closer to CuA than MP₁. Vein ICu, attached at base to CuA and CuP with cross veins, remainder of Cu-A area as in Fig. 48, cross veins few. Hind wings: costal margin convex, occasionally slightly concave at midlength, wing apex acute (Fig. 49, 50). Width half to a little less than 2/3 length, length of hind wings a little less than 1/5 length of forewings. Vein Sc a little more than 2/3 to a little less than 3/4 length of wings, R₁ a little less than length of wings; cross veins few (Fig. 49, 50).

Legs. Length ratios of segments in ♂ forelegs 0.49-0.56 : 1.00 (2.0-2.8 mm) : 0.05-0.06 : 0.35-0.40 : 0.31-0.37 : 0.25-0.28 : 0.10-0.12. Claws of a pair dissimilar, one apically hooked, the other obtuse, pad-like (Fig. 51).

Male genitalia (Fig. 52-53). Forceps: segment 2 equal to length of segment 3 and 1/5 length of segment 1; apex of segment 3 blunt, flattened; base of forceps broad, inner margin forming an angular bend near midlength (Fig. 52). Styliiger plate a little less than half as long medially as maximum width, slightly concave at apex as in Fig. 52. Penis lobes divided from apex almost to styliiger plate, with a subapical dorsal spine on a large accessory lobe near lateral margin of each lobe (Fig. 52, 53).

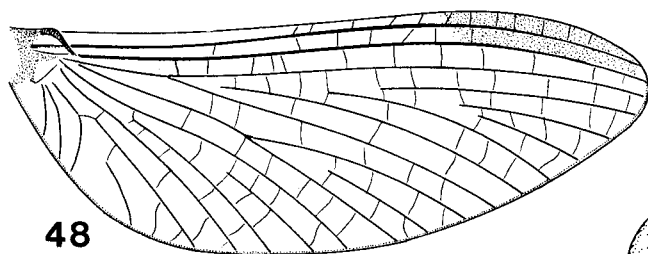
Ninth sternum of ♀ entire, slightly convex apically (Fig. 56). Terminal filament a little longer than cerci.

MATURE NYMPH. Length: body 4.2-5.5 mm. Head prognathous. Antennae 1½ to 2 × length of head.

Mouthparts (Fig. 59-64). Labrum: length a little less than half to a little more than 2/3 maximum width, dorsal hair as in Fig. 59, and submedian, anterosubmedian, and anterolateral areas of hair ventrally; anteromedian emargination deeply cleft, with broad-based, blunt denticles as in Fig. 59 & 60; lateral margins angularly expanded (Fig. 59). Clypeus as in Fig. 59, anterior margin shallowly concave. Left mandible (Fig. 61) with a single, small, marginal hair tuft, outer margin smoothly curved (Fig. 61); incisors with unserrated apical teeth; prosthecal tuft large (Fig. 61). Hypopharynx: lingua with well developed lateral processes, anterior margin deeply cleft (Fig. 63), submedian lobes with paired submedian longitudinal row of hair on internal dorsal surface and apices approximately triangular (Fig. 63); superlingua as in Fig. 63, with a row of hairs along anterior margin and blunt lateral margins. Maxillae: apical half of galea-lacinia narrow, with a subapical row of 10-13 spines (Fig. 62); segment 2 of palpi equal to 1 1/5 length of segment 1, segment 3 half to a little more than 2/3 length of segment 2 (Fig. 62). Labium as in Fig. 64; palpi broad, segment 2 9/10 to equal length of segment 1, segment 3 about 3/4 length of segment 2; glossae small, dorsal to paraglossae; lateral margins of submentum with long spines (Fig. 64).

Pronotum with small spines on anterolateral margin (Fig. 70). Legs (Fig. 65): tibiae and tarsi in cross-section oval, slightly compressed (Fig.

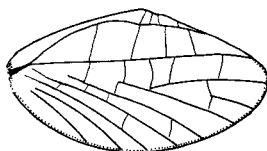
Fig. 48-58. *Mauiulus luma*, imago. 48-53, ♂: (48) orewing; (49) hind wing; (50) hind wing, enlarged; (51) fore claws; (52) genitalia, ventral view; (53) genitalia, lateral view. 54-56, ♀: (54) abdominal segments 3-6, dorsal view; (55) abdominal segments 6-10, lateral view; (56) 9th sternum. 57, 58, ♂: (57) abdominal segments 5 and 6, lateral view; (58) abdominal segments 1-10. (Opposite page)



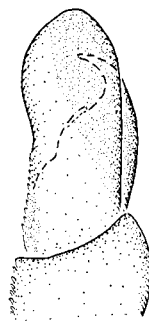
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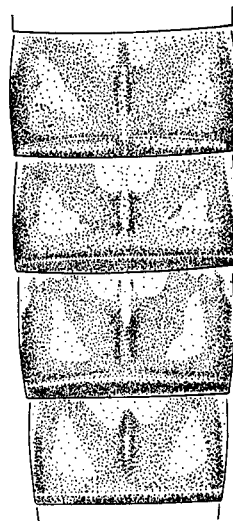
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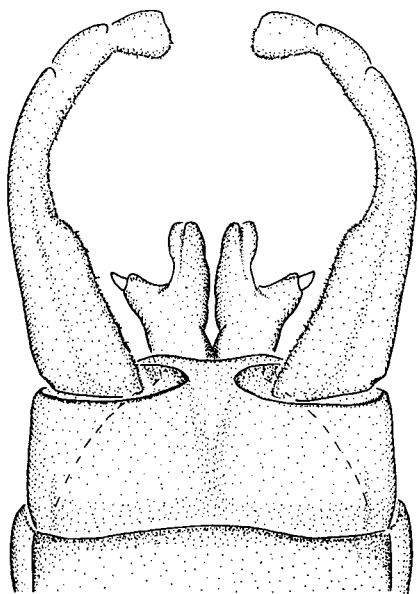
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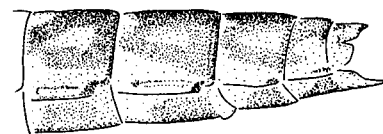
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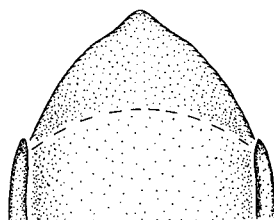
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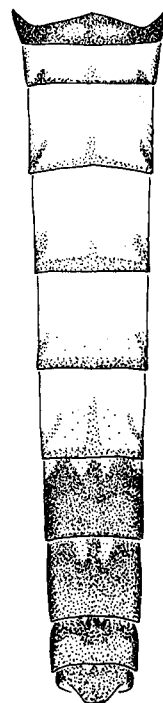
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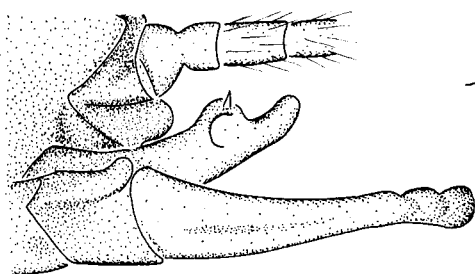
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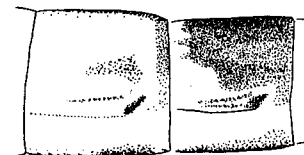
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65-67); apical 1/3 of femora indented, so tibia can draw into femur (Fig. 65); basal half of femora with pointed spines on dorsal and ventral surface (Fig. 65), and apical half with long, blunt spines over surface (Fig. 65, 71); foretibiae with finely bipectinate spines on inner surface as in Fig. 72; apex of claws hooked and narrow, denticles on claws small, numerous, progressively larger apically (Fig. 68).

Gills (Fig. 69) on segments 1-7 alike, progressively smaller posteriorly; dorsal and ventral portions of lamellae slender, smoothly tapered to apex, dorsal portion of lamella smaller than ventral portion; main trunk of tracheae pigmented, unbranched. Abdomen with blunt posterolateral projections on segments 8-9. Terminal filament a little longer than cerci, each segment with a distal whorl of small denticles.

EGG fusiform, 4 ridges of horizontal tubercles extended its entire length, vertical tubercles concentrated at poles (Fig. 78, 79).

ETYMOLOGY: 'Maui', a character in Maori mythology; 'ulus', L., a diminutive ending; masculine.

TYPE SPECIES: *Mauiulus luma* n.sp.

REMARKS. *Mauiulus* can be distinguished from all other leptophlebiid genera by the following combinations of characters. In the imago: (1) hind wings with a convex costal margin and vein Sc less than 3/4 maximum length of wings (Fig. 49, 50); (2) penes divided almost to styliiger plate and with a subapical dorsal spine on a large accessory lobe near lateral margin of each lobe (Fig. 52); (3) ninth sternum of female entire, convex apically (Fig. 56); (4) claws of a pair dissimilar, one pad-like, obtuse, the other apically hooked (Fig. 51). In the nymph: (1) labrum narrow, angularly expanded and with a deep, narrow, anteromedian emargination (Fig. 59); (2) denticles on anterior margin of labrum broad-based (Fig. 60); (3) mandibles with a single small, marginal hair tuft (Fig. 61); (4) galea-lacinia of maxilla narrow (Fig. 62); (5) submentum of labium with lateral spines (Fig. 63); (6) tibiae in cross-section oval, slightly compressed (Fig. 67); (7) abdominal gills with double, slender lamellae (Fig. 69); (8) abdominal segments 8 and 9 with blunt posterolateral projections.

Mauiulus, a monotypic genus, appears to be most closely related to *Austroclima*, but can be distinguished from it by the following characters. In the imago: (1) hind wings with a convex costal margin and vein Sc less than 3/4 length of wings; (2) penes with a dorsolateral spine on a large accessory lobe (Fig. 52); (3) ninth sternum of female convex apically (Fig. 56); (4) males and

females with dissimilar colour patterns (Fig. 44, 55, 58). In the nymph: (1) outer margin of mandibles smoothly curved (Fig. 61); (2) segment 3 of labial palpi about 3/4 length of segment 2; (3) claws with numerous small denticles (Fig. 68); (4) abdominal gills slender (Fig. 69).

Mauiulus luma n.sp. (Fig. 31, 32, 48-72, 78, 79)

Towns, 1978a: 367, 369. -Towns, 1978b: 411.

-Towns, 1979: [? page] (as *Atalophlebioides* sp. A).

MALE IMAGO (in ethanol). Head pale brown, irregularly washed with black. Upper portion of eyes pale brownish-orange, lower portion black. Basal half of ocelli black, apical half greyish-white.

Thorax. Pronotum pale brown to greyish-white, except black markings on either side of midline and on lateral margins of nota; mesonotum brown to pale brown, except margins on anterior mesonotum and carinae dark brown. Scutellum brown, except anterior scutellum dark brown near midline and posterior scutellum dark brown on dorsum. Pro-, meso-, and metapleura pale brown washed with dark brown to form an irregular lateral band from anterior propleuron to posterior metapleuron; sterna pale brown. Legs pale yellowish-brown, without markings; coxae pale brown, washed basally with dark brown. Wings. Longitudinal and cross veins colourless to faintly tinted with brown, membranes hyaline to translucent, except base of forewings washed with pale brown, and apical 1/3 of cells C and Sc of forewings translucent, whitish.

Abdomen (Fig. 57, 58). Tergum 1 pale to dark brown, with paired, rectangular, hyaline dorsal maculae (Fig. 58); terga 2-6 hyaline, with a narrow, transverse, posterior black band and a black diagonal posterolateral line; terga 7-10 yellowish-brown to dark brown, with paired, anterior, submedian, hyaline to pale-brown maculae; anterior 1/3 to 2/3 of each tergum darker (Fig. 58). Spiracular area on terga 1-7 to 1-8 black, tracheae hyaline. Sterna 2-6 hyaline; sterna 7-9 pale brown, washed with dark brown to black; abdominal ganglia pale brown to hyaline, terminal ganglion brown. Genitalia: styliiger plate pale to dark brown, forceps and penes pale, whitish. Caudal filaments white, with to without dark brown annulations at articulations.

FEMALE IMAGO (in ethanol). Head pale, yellowish brown to pale brown, an irregular, dark-brown band between eyes and dorsal to ocelli, irregular dark-brown markings on anterior and lateral margins of head. Eyes black. Antennae and ocelli as in ♂ imago.

Thorax. Colour and markings as in ♂ imago, except nota paler. Legs: pale yellowish-brown to

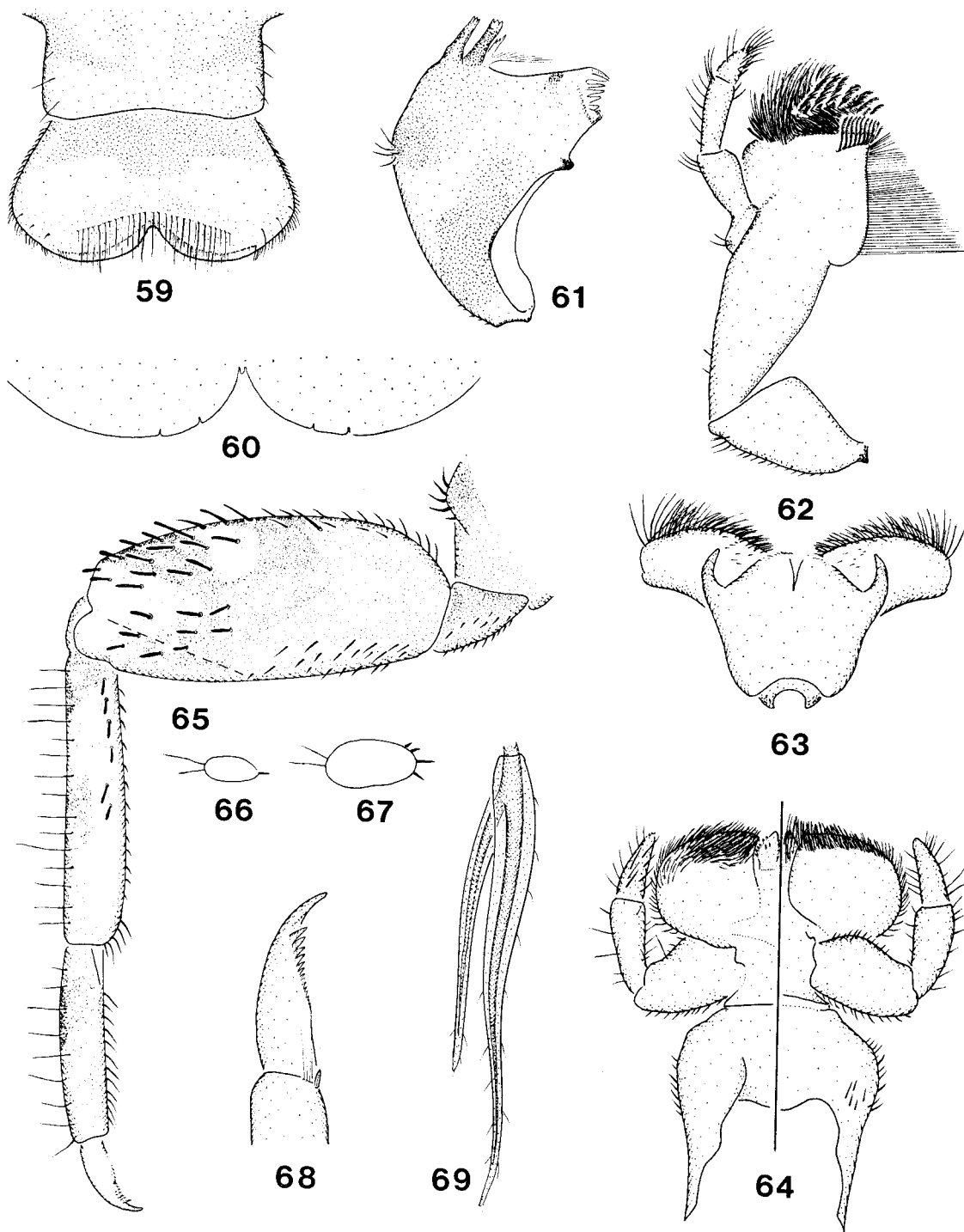


Fig. 59-69. *Mauiulus luma*, mature nymph: (59) labrum and clypeus, dorsal view; (60) anteromedian emargination of labrum, enlarged; (61) left mandible, dorsal view; (62) right maxilla, ventral view; (63) hypopharynx; (64) labium, dorsal (left) and ventral views; (65) foreleg; (66) cross-section through tarsus; (67) cross-section through tibia; (68) fore claw; (69) abdominal gill 4.

whitish, occasionally darker at articulation of femora and tibiae. Wings: colour and markings as in ♂ imago.

Abdomen (Fig. 54, 55). Terga 1–10 with a pale line edged with dark brown along midline and large, triangular, pale maculae dorsolaterally (Fig. 54); each tergum pale brown on lateral margins and with a narrow, dark-brown, transverse band on posterior margin; tergum 1 dark brown; terga 2–8 dark brown, with pale-brown anterior, submedian maculae (Fig. 54); terga 9 and 10 pale brown. Spiracular area dark brown, tracheae hyaline, edged with brown. Sterna pale brown to hyaline, irregularly washed with dark brown. Caudal filaments pale, whitish, brown annulations at articulations.

MALE AND FEMALE SUBIMAGO (in ethanol). Colour and markings of head, antennae, and ocelli as in ♂ and ♀ imago. Eyes of ♀ black, upper portion of eyes of ♂ pale brown, lower portion black, eyes of ♂ separated on meson of head by width of a lateral ocellus.

Thorax. Colour and markings of pronotum as in ♂ and ♀ imago; anterior 1/3 of mesonotum, area between outer parapsidal furrows, and median notal suture pale brown, except for a narrow, pale band inside outer parapsidal furrows and a broad, pale band along posterior 2/3 of median notal suture (Fig. 32); mesonotum between outer parapsidal furrows and notal wing processes dark brown to black; margins of basal humps of scutellum pale brown, remainder of humps whitish, except for dark-brown areas each side of midline (Fig. 32); posterolateral scutellum brown. Colour and markings of pleura as in ♂ and ♀ imago. Sterna pale, whitish, except lateral lobes of furcasternum pale brown. Legs: colour and markings as in ♂ and ♀ imago. Wings: longitudinal and cross veins translucent, whitish, except longitudinal veins of forewings tinged with brown; membranes translucent greyish-white, except base of forewings tinged with pale brown.

Abdomen. Colour and markings of terga as in ♂ and ♀ imagos, except terga 2–6 of ♂ yellowish; sterna whitish, irregularly washed with brown. Male genitalia pale, whitish. Caudal filaments as in ♂ imago.

MATURE NYMPH (in ethanol). Head pale to dark brown, darker between eyes on either side of midline (Fig. 70); clypeus occasionally paler, labrum pale brown, darker on margins and medially; mandibles whitish to pale brown, irregularly marked with darker brown (Fig. 59, 61). Ocelli as in ♂ and ♀ imago. Eyes of ♀ black, upper portion of eyes of ♂ pale to reddish-brown, lower portion black. Antennae pale brown.

Thorax. Pronotum pale brown, darker markings on lateral margins and near midline (Fig. 70); mesothorax pale brown, with blackish markings as in Fig. 70; metathorax pale brown. Legs: femora whitish to pale brown, irregular darker-brown markings near apex (Fig. 65, 70); tibiae whitish to pale brown, with to without basal half darker (Fig. 65); tarsi whitish to pale brown, with to without darker brown band near midlength.

Abdomen. Colour and markings as in ♂ and ♀ subimago, except tracheae dark greyish-brown to hyaline (Fig. 31, 70). Gills (Fig. 69): lamellae hyaline to whitish, tracheae darkly pigmented. Caudal filaments pale brown, unbanded to banded with whitish brown, darker annulations at articulations.

MATERIAL EXAMINED. **Holotype** ♂ imago, Cascade Stream, Auckland, reared from nymph, 1 Mar 1976. **DRT: allotype** ♀ imago, data as for holotype except 19 Mar 1974. **Paratypes. North Island. AK.** Cascade Stm, reared from nymph by DRT unless otherwise stated – 1 ♂ imago, 14 Mar 1974; 2 ♂ imagos, 23

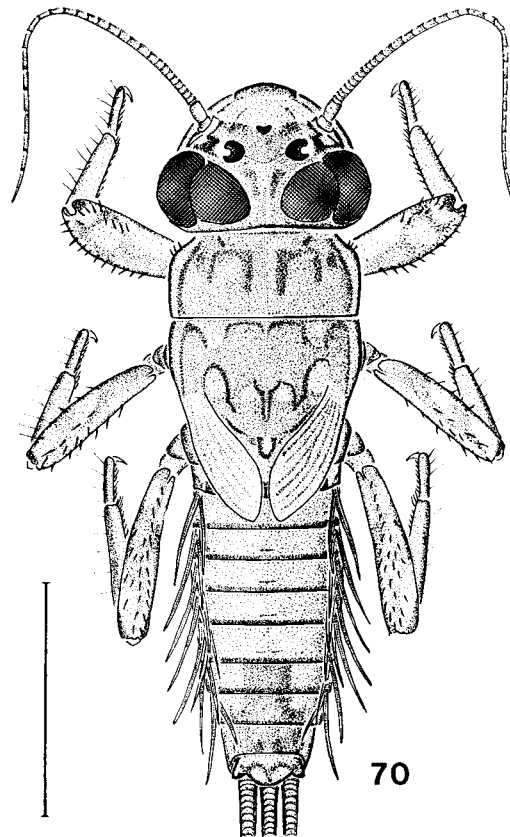


Fig. 70. *Mauiulus luma*, mature nymph (scale line 1 mm).

Feb 1976; 1 ♂ subimago, 25 Oct 1975; 1 ♂ subimago, 24 Feb 1976; 1 ♂ imago, 22 Apr 1975; 1 ♂ imago, 9 Mar 1974; 1 ♀ imago, 20 Feb 1976; 4 ♂ imagos, 8 ♂ and 5 ♀ subimagos, light trap, 9 Mar 1977, MB; 2 ♀ subimagos, light trap, 12 Nov 1975, DRT; 1 ♀ imago, 1 ♂ and 4 ♀ subimagos, light trap, 9 Feb 1977, MB; 1 ♂ subimago, 23 Mar 1976, DRT; 2 nymphs, 5-6 Mar 1974, DRT; 44 nymphs, in *Bostrychia harveyi*, 23 Feb 1976, DRT; 23 nymphs, in *Cladophora* sp., 23 Feb 1976, DRT; 4 nymphs, 23 Jan 1974, DRT; 2 nymphs, 31 Jan 1975, DRT. Waitakere R. - 3 ♂ and 1 ♀ subimagos, light trap, 8 Feb 1977, MB; 1 nymph, 31 Jan 1975, DRT. Small tributary of Waitakere R. near Anderson's Track - 1 ♂ imago, light trap, 16 Feb 1977, MB; 1 ♀ imago, light trap, 15 Mar 1977, MB. Cascade below Kitekite Falls - 2 nymphs, 27 Dec

1976, DRT. CL. Tairua R. - 2 nymphs, in riffle, 15 Jan 1977, DRT, ELT. WO. Waitomo - 1 nymph, 21 Nov 1966, JAM. Arapuni - 1 ♂ imago, 1 Feb 1966, MJW. Putaruru - 1 nymph, 27 Aug 1966, JAM. BP. Kaingaroa Forest, Ngapuketuru - 2 nymphs, pool on E side of lookout, 610 m, MMN. South Island. NN. Little Wanganui R., Karamea - 2 nymphs, 1 Jan 1973, ACM. BR. Arnold R. - 8 ♀ imagos, reared from subimagos, Sep 1960, JGP; 1 nymph, 27 Aug 1960, JGP. Kokiri - 2 ♀ imagos, 2 ♂ and 2 ♀ subimagos, 4 Mar 1966, GFE; 2 ♂ imagos, 25 Sep 1960, ? coll. WD. 1 ♂ and 2 ♀ imagos, Sep 1960, JGP; 1 nymph, Nov 1960, JGP.

Association of nymphs and adults is by rearing.

Repositories (all type specimens are in ethanol): holotype, allotype, 5 ♂ and 3 ♀ imaginal paratypes, 8 ♂ and 4 ♀ subimaginal paratypes, and 41

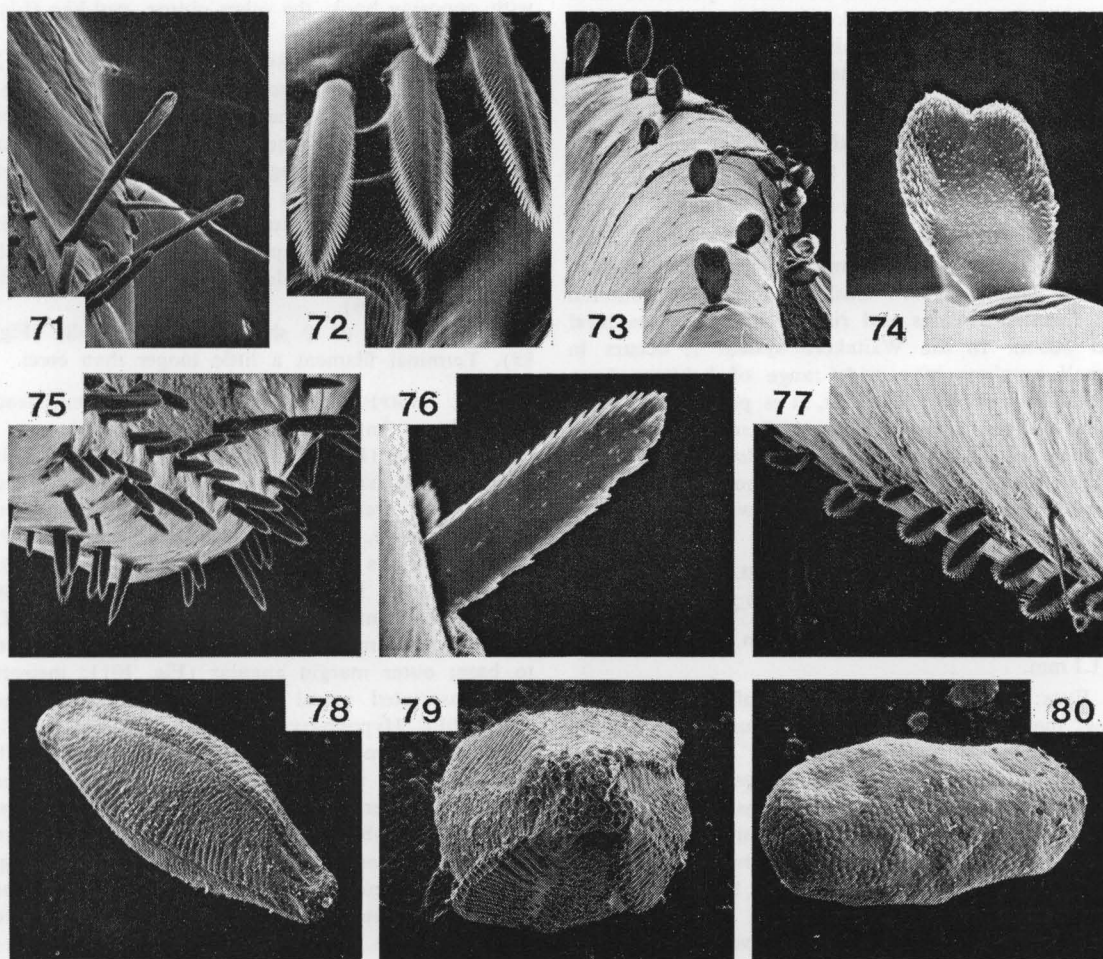


Fig. 71-80. Scanning electron micrographs of *Mauiulus luma* and *Cryophlebia aucklandensis*. 71-77, spines of legs: (71) *M. luma*, femur, dorsal ($\times 290$); (72) *M. luma*, tibia-tarsus articulation ($\times 860$); (73) *C. aucklandensis*, femur, dorsal ($\times 340$; field foreshortened); (74) *C. aucklandensis*, femur, dorsal ($\times 1410$); (75) *C. aucklandensis*, femur, ventral ($\times 365$; field foreshortened); (76) *C. aucklandensis*, femur, ventral ($\times 340$); (77) *C. aucklandensis*, inner mid-tibia ($\times 450$; field foreshortened). 78-80, eggs: (78) *M. luma*, from ♀ imago, lateral view ($\times 220$); (79) *M. luma*, from ♀ imago, polar view ($\times 375$); (80) *C. aucklandensis*, from subimago, lateral view ($\times 230$).

nymphal paratypes – Entomology Division, DSIR, Auckland; 2 ♂ and 2 ♀ imaginal paratypes, 1 ♂ and 2 ♀ subimaginal paratypes, and 15 nymphal paratypes – National Museum of New Zealand, Wellington; 1 ♂ and 8 ♀ imaginal paratypes, 2 ♂ and 3 ♀ subimaginal paratypes, and 3 nymphal paratypes – Canterbury Museum, Christchurch; 1 ♂ imaginal paratype, 1 ♂ and 1 ♀ subimaginal paratype, and 5 nymphal paratypes – British Museum (Natural History), London; 2 ♂ imaginal paratypes, 3 ♂ and 1 ♀ subimaginal paratypes, and 7 nymphal paratypes – Florida A & M University, Tallahassee; 1 ♀ imaginal paratype and 5 nymphal paratypes – Bernice P. Bishop Museum, Honolulu; 1 ♂ and 2 ♀ imaginal paratypes and 12 nymphal paratypes – University of Utah, Salt Lake City.

INTRASPECIFIC VARIATION. Most adults have pale-coloured caudal filaments, but some specimens have caudal filaments with dark-brown bands. The colour pattern of nymphal legs also varies; some specimens have well marked patterns, whereas on others they are indistinct.

ETYMOLOGY: 'luma', L., thorn, in reference to the narrow, pointed spine on the dorsum of each penis lobe; noun in apposition.

BIOLOGY. *Mauilulus luma* has been recorded from the northern North Island to the north-western South Island of New Zealand. It is most common in forested streams and rivers, from near sea level to 600 m. In the Waitakere system it occurs in small numbers in a wide range of habitats, from pools to cascades. However, it is particularly abundant in the heavily forested Cascade Stream in clumps of *Cladophora* sp. and *Bostrychia harveyi* forma *distans*, where flow rate is moderate (approximately 0.5 m/s) to slow (see Towns 1978a).

Cryophlebia n.gen.

IMAGO. Length: ♂ – body 6.0–9.2 mm, forewings 9.8–11.1 mm; ♀ – body 7.2–7.8 mm, forewings 10.0–11.1 mm.

Eyes: ♂ – separated on meson of head by a little less than width of a lateral ocellus, lower portion 3/4 length of upper portion; ♀ – separated on meson of head by 4× width of eye.

Wings (Fig. 81, 82). Forewings: width a little more than 1/3 length. Vein Rs forked a little less than 1/5 distance from base to margin. Vein MA forked half distance from base to margin, fork symmetrical. Vein MP not forked, MP₂ attached at base to CuA and MP₁ with cross veins, or attached

at base to CuA with cross vein, but not attached to MP₁; attachment of MP₂ to CuA a little less than 1/5 distance from base to margin, base of MP₂ closer to CuA than MP₁. Vein ICu₁ attached at base to CuA and CuP with cross veins, remainder of Cu-A area as in Fig. 81, cross veins numerous. Hind wings (Fig. 82): costal margin smoothly curved, wing apex rounded (Fig. 82); width a little more than half length, length of hind wings 1/4 length of forewings; vein Sc 9/10 length of wings, R₁ about equal length of wings; cross veins numerous.

Legs. Length ratios of segments in ♂ forelegs 0.53 : 1.00 (3.4 mm) : 0.05 : 0.29 : 0.26 : 0.18 : 0.08. Claws of a pair dissimilar, one apically hooked with opposing hook, the other obtuse, pad-like (Fig. 83).

Male genitalia (Fig. 84–86). Forceps: segment 2 a little longer than segment 3 and 1/4 length of segment 1; apex of segment 3 blunt; base of forceps broad, inner margin forming an extreme angular bend basally to midlength of segment 1. Styli: plate a little less than 1/3 as long medially as maximum width, apex concave as in Fig. 85. Penis lobes fused except for apical 1/4; a large, subapical, wide-based spine near dorsolateral margin of each lobe (Fig. 84, 86).

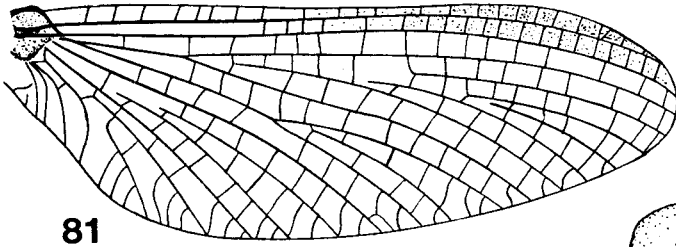
Ninth sternum of ♀ shallowly cleft apically (Fig. 89). Terminal filament a little longer than cerci.

MATURE NYMPH. Length: body 7.0–7.7 mm. Head prognathous. Antennae 3× length of head.

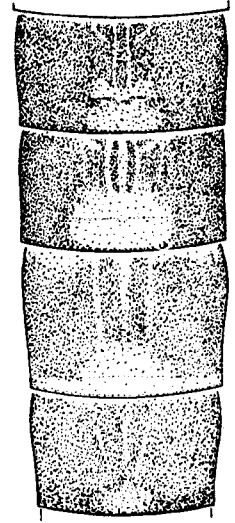
Mouthparts (Fig. 99–104). Labrum: length half width; dorsal hairs as in Fig. 100, submedian and anterolateral areas of hair ventrally; anteromedian margin concave, with blunt denticles as in Fig. 99; lateral margins broadly expanded (Fig. 100). Clypeus as in Fig. 100, anterior margin strongly concave. Left mandible (Fig. 101) with a hair tuft on mid outer margin and scattered hairs extended to base; outer margin angular (Fig. 101); incisors with unserrated apical teeth; prosthecal tuft large (Fig. 101). Hypopharynx: lingua with well developed lateral processes, anterior margin deeply cleft, cleavage lined with small hairs, submedian lobes with anterolateral margins sclerotised into ridges, with paired, submedian, longitudinal rows of hairs on internal dorsal surface, apices rounded (Fig. 102); superlingua as in Fig. 102, with a row of hairs along anterior margin and slightly concave lateral margins. Maxillae: apical half of galea-

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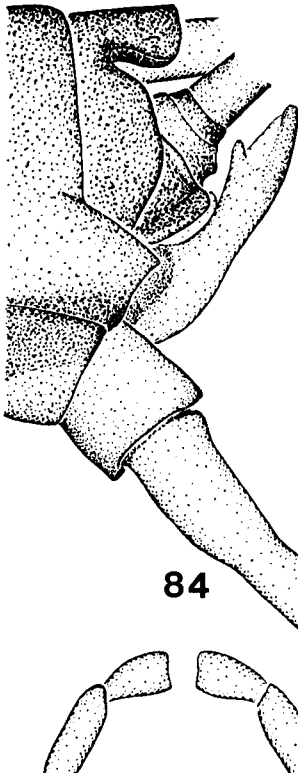
Fig. 81–91. *Cryophlebia aucklandensis*, imago. 81–86, ♂: (81) forewing; (82) hind wing; (83) fore claws; (84) genitalia, lateral view; (85) genitalia, ventral view; (86) penes, dorsal view. 87–89, ♀: (87) abdominal segments 4–7, dorsal view; (88) abdominal segments 6–10, lateral view; (89) 9th sternum. 90, 91, ♂: (90) abdominal segment 6, lateral view; (91) abdominal segments 4–7, dorsal view.



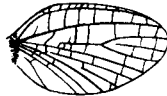
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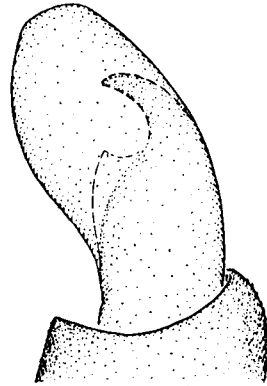
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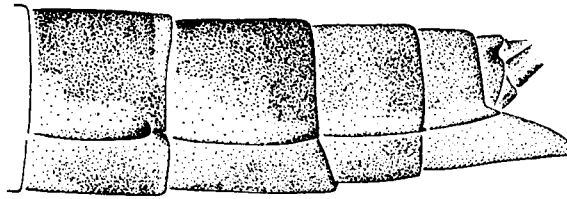
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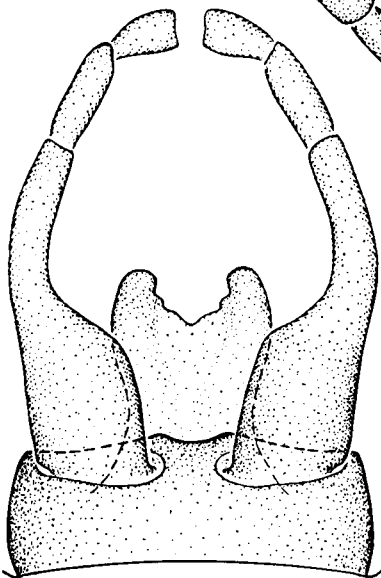
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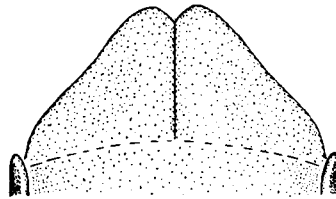
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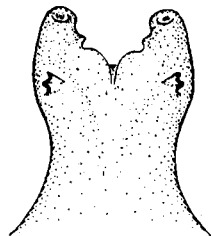
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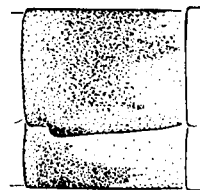
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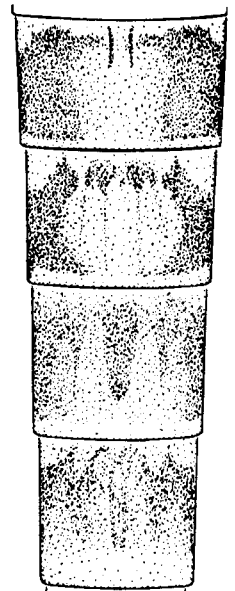
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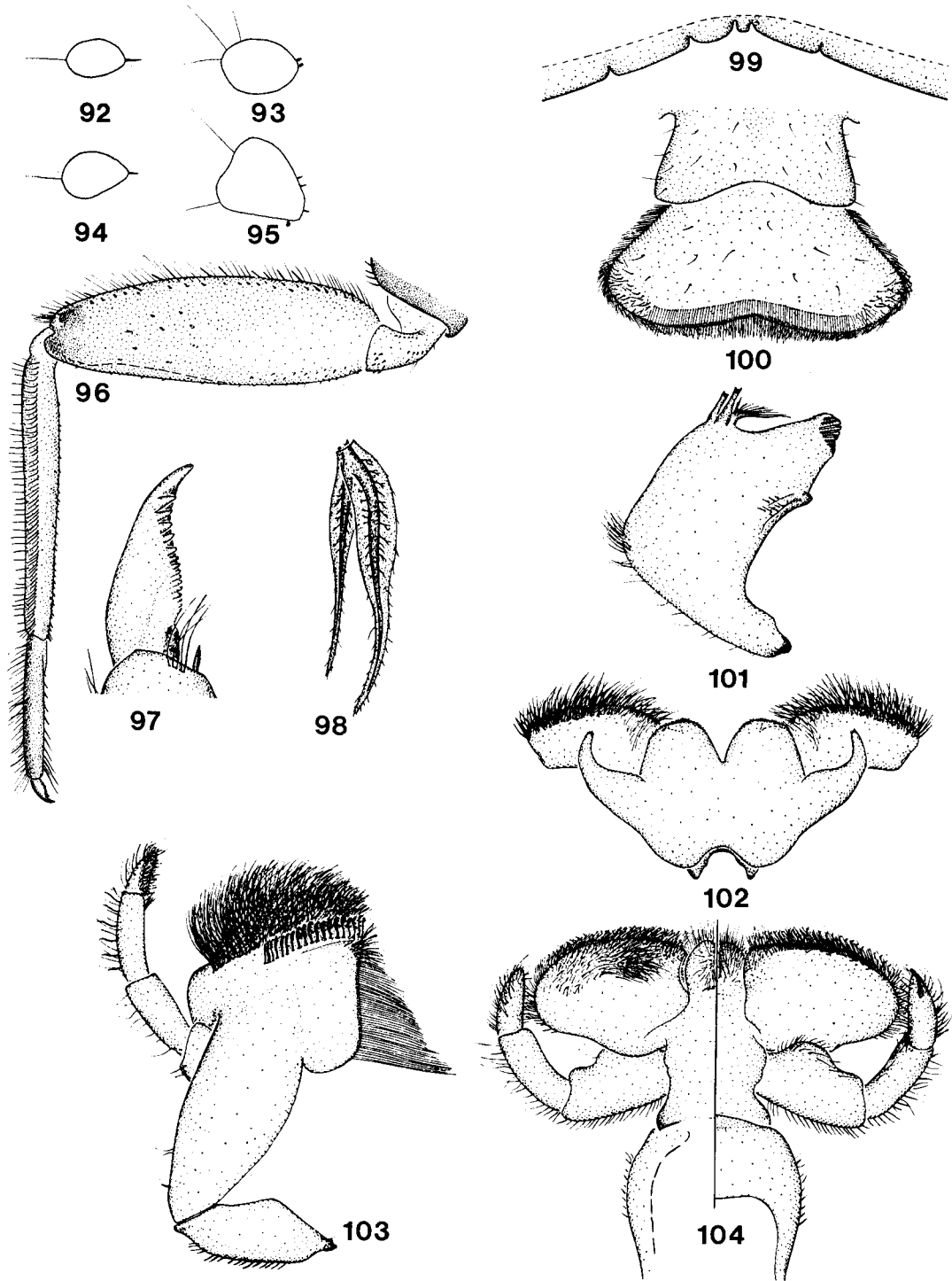
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Fig. 92-104. *Atalophlebioides cromwelli* and *Cryophlebia aucklandensis*, mature nymphs. **92, 93, A. cromwelli:** (92) cross-section through tarsus; (93) cross-section through tibia. **94-104, C. aucklandensis:** (94) cross-section through tarsus; (95) cross-section through tibia; (96) foreleg; (97) fore claw; (98) abdominal gill 4; (99) enlargement of anteromedian emargination of labrum; (100) labrum and clypeus, dorsal view; (101) left mandible, dorsal view; (102) hypopharynx; (103) right maxilla, ventral view; (104) labium.

lacinia expanded medially, with a subapical row of 21-23 spines (Fig. 103); segment 2 of palpi a little longer than segment 1; segment 3 half length of segment 2 (Fig. 103). Labium as in Fig. 104; palpi broad, segment 2 a little less than equal to $1\frac{1}{4} \times$ length of segment 1, segment 3 $\frac{2}{3}$ to $\frac{9}{10}$ length of segment 2; glossae dorsal to paraglossae, outer margins of paraglossae acute, rounded (Fig. 104); submentum with small lateral hairs and spines (Fig. 104).

Pronotum with small spines on anterolateral margin. Legs (Fig. 96): tibiae in cross-section triangular (Fig. 95), tarsi in cross-section oval (Fig. 94); apical $\frac{1}{3}$ of femora indented, so tibia can draw into femur (Fig. 96); femora with spatulate spines scattered over surface (Fig. 73, 74) and pointed

spines on ventral surface as in Fig. 75 & 76; foretibiae with spatulate and finely bipectinate spines on inner surface (Fig. 77); apex of claws hooked and narrow, denticles on claws progressively larger apically.

Gills (Fig. 98) on segments 1-7 alike, progressively smaller posteriorly; dorsal and ventral portions of lamellae slender, tapered towards apex; tracheae with main trunk along median line of lamellae and with fine lateral branches. Abdomen with posterolateral spines on segments 7-9. Terminal filament a little longer than cerci.

Egg elongate oval; chorion densely ornamented with raised tubercles (Fig. 80).

ETYMOLOGY: 'kryos', Gr., icy cold, in reference to the type locality, and 'phlebos', Gr., vein; feminine.

TYPE SPECIES: *Cryophlebia aucklandensis* (Peters) n.comb.; originally placed in *Atalophlebioides*.

REMARKS. *Cryophlebia aucklandensis* was originally described in *Atalophlebioides* by Peters (1971). In their revision of *Atalophlebioides*, Towns & Peters (1978) considered that *A. aucklandensis* should be excluded from the genus. Accordingly, *A. aucklandensis* is here placed in *Cryophlebia*, a monotypic genus restricted to the Auckland Islands, south of New Zealand.

Cryophlebia can be distinguished from all other leptophlebiid genera by the following combinations of characters. In the imago: (1) hind wings without a costal projection; (2) vein MP_2 of forewings not attached to MP_1 or attached to MP_1 (Fig. 81); (3) vein Sc of hind wings $\frac{9}{10}$ length of wings (Fig. 82); (4) penes fused except for apical $\frac{1}{4}$, and with a wide-based, subapical spine near dorsolateral margin of each lobe (Fig. 85, 86); (5) ninth sternum of female with a shallow apical cleft (Fig. 89); (6) claws of a pair dissimilar, one hooked with an opposing hook, the other pad-like, obtuse (Fig. 83). In the nymph: (1) antennae $3 \times$ length of head (Fig. 105); (2) labrum broadly expanded and with a concave anterior margin (Fig. 100); (3) denticles on anterior margin of labrum rounded (Fig. 99); (4) anterior margin of clypeus strongly concave (Fig. 100); (5) mandibles with a hair tuft near mid outer margin and scattered hairs extended to base (Fig. 101); (6) incisors of mandibles with unserrated apical teeth; (7) galea-lacinia of maxillae

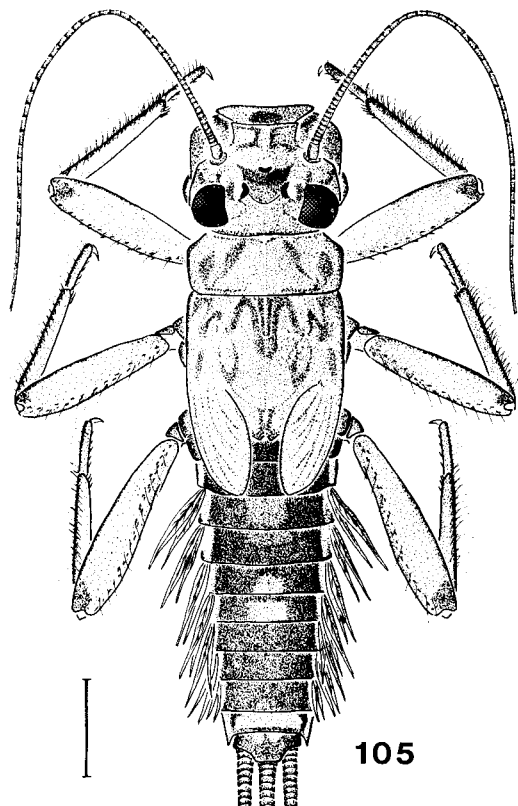


Fig. 105. *Cryophlebia aucklandensis*, mature nymph (scale line 1 mm).

broad (Fig. 103); (8) submentum of labium with small lateral spines (Fig. 104); (9) tibiae in cross section triangular (Fig. 103); (10) abdominal gills with double lamellae (Fig. 98); (11) abdominal segments 7-9 with posterolateral spines.

Cryophlebia appears to be related to *Atalophlebioides*, from which it can be distinguished by the following characters. In the imago: (1) penes fused except for apical 1/4, without a mid-ventral appendage (Fig. 85, 86); (2) ninth sternum of female apically cleft (Fig. 89); (3) claws without a small, apical hook on pad-like claw (Fig. 83). In the nymph: (1) labrum broadly expanded, its antero-medial margin shallowly concave; (2) anterior margin of clypeus strongly concave (Fig. 100); (3) marginal hairs extended to base of mandibles (Fig. 101), and incisors with unserrated apical teeth; (4) submentum of labium with small lateral spines (Fig. 104); (5) abdominal segments 7-9 with posterolateral spines; (6) antennae 3× length of head (Fig. 105); (7) tibiae in cross-section triangular (Fig. 95).

The original description of *C. aucklandensis* given by Peters (1971) is not repeated here. However, for comparison with other species previously placed in *Atalophlebioides* we have reproduced (slightly modified) figures used in the original description (Fig. 81-104) and added an illustration of the nymph (Fig. 105).

Characters distinguishing four New Zealand genera previously referred to *Atalophlebioides* are summarised in the key below; they apply to both imagos and subimagos unless otherwise stated. In all four genera imagos have wings with the membranes hyaline, and nymphs have abdominal gills with double lamellae.

KEY TO GENERA FROM NEW ZEALAND PREVIOUSLY REFERRED TO

Atalophlebioides Phillips

IMAGOS AND SUBIMAGOS

1. Penes divided to styliger plate (Fig. 5, 52); eggs elongate oval to fusiform, tubercles concentrated into ridges (Fig. 40-45, 78, 79).....2
—Penes fused to apex, to fused except for apical 1/4 (Fig. 85, 86); eggs elongate oval, closely packed raised tubercles over entire chorion (Fig. 80).....3
2. Vein Sc of hind wings >8/10 length of wing (Fig. 3); 9th sternum of ♀ slightly concave apically (Fig. 11); membrane of fore and hind wings of subimago brownish grey; egg oval to dorsally compressed, ridges of vertical tubercles around egg margin to concentrated near poles (Fig. 40-45).....*Austroclima*
—Vein Sc of hind wings <8/10 length of wing (Fig. 50); 9th sternum of ♀ convex apically (Fig. 56); membrane of fore and hind wings of subimago translucent greyish white; eggs fusiform, horizontal tubercles in ridges along length of egg (Fig. 78, 79).....*Mauilius*

3. Penes fused except for apical 1/4 and with subapical dorsal spine near lateral margin of each lobe (Fig. 85, 86); 9th sternum of ♀ apically cleft (Fig. 89); tarsal claws with a hook and a pad (Fig. 83); membranes of fore and hind wings of subimago pale yellowish-brown.....*Cryophlebia*
—Penes fused to apex and with mid-ventral appendage, without dorsal spines; 9th sternum of ♀ rounded to concave apically; tarsal claws with a hook, a pad, and a small accessory hook at apex of pad; membrane of fore and hind wings of subimago pale grey.....*Atalophlebioides* (see Towns & Peters 1978, fig. 4-7, 9)

NYPHPS

1. Posterolateral blunt projections on abdominal segments 8 & 9; tibiae in cross-section compressed, oval (Fig. 24, 67); denticles of labrum on submedian margin (Fig. 16, 17, 60).....2
—Posterolateral spines on abdominal segments 2-9 to 7-9; tibiae in cross-section triangular to broadly oval (Fig. 93, 95); denticles of labrum concentrated near midline (Fig. 99).....3
2. Abdominal gills plate-like, terminated in a long, slender filament (Fig. 27, 28); outer margin of mandibles angular (Fig. 18); body length of mature nymphs >5.5 mm.....*Austroclima*
—Abdominal gills slender, tapered towards apex (Fig. 69); outer margin of mandibles smoothly curved (Fig. 61); body length of mature nymphs <5.5 mm.....*Mauilius*
3. Posterolateral spines on abdominal segments 7-9; antennae 3× length of head (Fig. 105); tibiae in cross-section triangular (Fig. 95); incisors of mandibles with unserrated apical teeth.....*Cryophlebia*
—Posterolateral spines on abdominal segments 2-9; antennae 1½× length of head; tibiae in cross-section broadly oval (Fig. 93); incisors of mandibles with serrated apical teeth.....*Atalophlebioides* (see Towns & Peters 1978, fig. 16, 30)

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