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Review of the Australian endemic odontocerid genus *Barynema* and status of Australian *Marilia* (Trichoptera)

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Abstract

Wells, A. and St Clair, R.M. 2021. Review of the Australian endemic odontocerid genus *Barynema* and status of Australian *Marilia* (Trichoptera). *Memoirs of Museum Victoria* 80: 101–112.

In this review of Australian Odontoceridae, we revise details of the two established species in the endemic genus *Barynema* Banks – *B. costatum* Banks and *B. australicum* Mosely – and describe six new congeners: *B. paradoxum* sp. nov., *B. lorien* sp. nov., *B. lobatum* sp. nov., *B. dilatatum* sp. nov., *B. dolabratum* sp. nov. and *B. goomburra* sp. nov. For the only other odontocerid genus recorded for Australia, *Marilia* Müller, we discuss the present status of the three described species – *M. bola* Mosely, *M. aenigmata* Neboiss and *M. fusca* Kimmins – and outline our efforts and those of others to resolve problems of species delimitation based on morphology. We select a new replacement name for *Marilia fusca* and provide brief notes on the larvae of both genera.

Keywords

venation, COI data, distributions, homonym

Introduction

The family Odontoceridae is one of several groups among Australian Trichoptera, upon which Arturs Neboiss (late of Museums Victoria) made some preliminary studies but then set them aside. In 2003, he published a new Tasmanian species of *Marilia* Müller, 1878 (*M. aenigmata*), thus bringing to three the Australian species reported for this genus. *Barynema* Banks, 1939, the only other odontocerid genus recorded for Australia, is endemic, comprising two established species. Discrimination between adult males of these two *Barynema* species and a further six species, newly described here, is reasonably easy based on male genitalic features, augmented for some by thoracic features, but this is not so for discrimination between adult specimens referable to *Marilia*.

The genus *Marilia* has almost a worldwide distribution. Features of the genus are discussed in detail in works by Oláh and Johanson (2010) and Yang et al. (2017). Oláh and Johanson (2010) found that “[m]any species have similar male genitalia, and it is difficult to differentiate all species by examining the phallic apparatus alone” (p. 73). Working with east Asian species, they advocated discrimination of species based on combined genitalic features and cephalic setal wart patterns.

The three species of *Marilia* described from Australia – *Marilia bola* Mosely, 1953, and *M. fusca* Kimmins, 1953 (both described in the work by Mosely and Kimmins, 1953), and *M. aenigmata* – all have very uniform male and female

genitalia. Differentiation of the first two appears, on paper, to be relatively simple. Males of *Marilia bola* have the eyes holoptic (almost touching the vertex) and a tuft of long setae on the anal lobe of the hind wing, whereas males of *M. fusca* have the eyes dichoptic (not approximated) and lack the tuft of setae on the wing. The female of *M. bola* was described and illustrated, but not the female of *M. fusca*. Neboiss, in describing the Tasmanian *M. aenigmata*, gave a small table of comparison of features of all three species, noting that *M. aenigmata* exceeds *M. bola* in size and, in comparison with *M. bola*, lacks Fork 3 in the female forewing and has hindwing Fork 1 sessile, not stalked (petiolate).

Confusing any simple separation of species, however, in preliminary studies on Australian *Marilia* specimens in the considerable Museums Victoria collection, Brian Armitage (in 1990) recognised two major sets among *Marilia* specimens from sites along the length of the Great Dividing Range, from central Victoria to far north-eastern Queensland, and labelled specimens accordingly. He designated these *Marilia* Sp. A and *Marilia* Sp. B, based mainly on wing features. In several samples from a single site, he recognised both forms. Males of both sets have the compound eyes holoptic and, in their genitalic features, exhibit no clearly consistent differences. Females are inseparable on genitalic features. Both sexes of *Marilia* Sp. B have Fork 1 in the hind wing petiolate, and the associated females have forewing Fork 3 present. Thus, *Marilia* Sp. B could be *Marilia bola*.

Armitage's Sp. A has Fork 1 in the hindwing sessile and the associated females lack forewing Fork 3. It shares these wing features and genitalic characteristics with *M. fusca* and *M. aenigmata*. However, the eyes of the type specimen of *M. fusca* as described by Kimmins (in the work by Mosely and Kimmins, 1953) are dichoptic; thus, *Marilia* sp. A is not conspecific with *M. fusca*. Or, conceivably, it could be if the situation is as Oláh and Johanson (2010) determined for their newly described South-East Asian species *Marilia malickyi* – that there is “[i]ntraspecific variation in the interocular distance” (p. 74). Armitage's Sp. A does conform morphologically with *M. aenigmata*. The body size of mainland specimens varies considerably, with many being much smaller than the Tasmanian specimens.

The only specimens in the available collections that concur completely with the description of *M. fusca* are in several small samples collected from streams in the Mount Spec State Forest (to the north of Townsville in north-east Queensland) and a stream near Tully. Surprisingly, no dichoptic males have been identified among samples from further south to the Sydney region or the Oxley Rivers region of New South Wales from whence the type and paratypes, respectively, were taken, nor further to the north in Queensland.

None of this is particularly satisfactory and does not corroborate the equally unsatisfactory preliminary results from the limited patchy and geographically scattered COI data from adults and larvae that are available on the Biodiversity of Life Database (BOLD; <http://www.boldsystems.org>). The BOLD data suggest there are at least eight species of *Marilia* in Australia, most with large genetic distances of at least 10% between them. This is apparent from the very limited number of specimens available for genetic analysis. More collecting and analysis will probably reveal further species. Three specimens from north-east Queensland, from localities from which specimens identified by Armitage as sp. B were collected, have venation that differs from both *M. aenigmata* and *M. bola*.

Similarly puzzling is the available information on larvae of Australian species of *Marilia*. Larvae and pupae from the Yarra River at Reefton, Victoria, were described by Drecktrah (1990) as those of *M. fusca*. He gave no indication of how the identification was made, and it is impossible to be certain from the anterior view if the pupal head illustrated by Drecktrah would have emerged as female or male, holoptic or dichoptic. It now seems very unlikely that the larvae described by Drecktrah are *M. fusca*. In 2004, Dean et al. published a key for discrimination of late instar larvae of *Barynema* and *Marilia*, and separation of three species of *Marilia*, identified as *M. bola*, *M. fusca* and *M. aenigmata*; photographic images are given to illustrate diagnostic features used in the key. *Marilia fusca* and *M. aenigmata* were separated in the key simply by geography, and the authors comment that their larvae are similar and may eventually be found to be the same species. In recent collecting of *Marilia* larvae from New South Wales and Queensland, St Clair (unpublished) has noticed further small differences. Identification of larvae of *Marilia* species is

therefore not possible until larvae can be associated with known adults. All available specimens can be assigned to two larval types that align with the names given by Dean et al. (2004). These are probably better labelled “*Marilia* larval sp. 1” (was *bola*) and “*Marilia* larval sp. 2” (was *fusca*) since such confusion is now recognised. Further studies involving association of adults and close morphological examination of larvae are required.

Marilia fusca is a junior secondary homonym of the name *Anisocentropus fuscus* Banks, 1905 (synonymised with *Marilia flexuosa* Ulmer, 1905, by Betten, 1934), so here we select a replacement name.

Overall this is a confusing mix, probably only solved by a thorough and comprehensive combined morphological and molecular phylogenetic study. For the present, it is not possible to assign Australian specimens of *Marilia* to species. Thus, we can offer no further insight into Australian *Marilia*. The late Arturs Neboiss would understand.

Material and Methods

Most of the material studied is in the collection of Museums Victoria, Melbourne (NMV) and bears the standard NMV registration number. Genitalic specimens that were macerated and cleared by Neboiss are tagged with PT-numbers and several others have WTH (Wet Tropics Heritage) numbers or BOLD identifications. A small number of specimens are in the Australian National Insect Collection (ANIC), Canberra, or will be lodged in the Queensland Museum (QM). Images of types in the Natural History Museum, London (BMNH) were provided by Dr Ben Price. Other images were taken at ANIC by AW and were prepared using a stereomicroscope linked to a Leica Application Suite (version 4.2) to integrate multiple images; some of the images are of cleared, others of intact, specimens. Plates were prepared in Adobe Photoshop (version 12).

The terms applied to wings follow Mosely and Kimmins (1953), and the terms applied to genitalic structures follow Yang et al. (2017), save for structures that in ventral view appear beside the phallus, for which we follow Mosely and Kimmins in using the term “upper penis cover”. This latter structure could represent tergite X or the phallobase, but it appears to arise further ventrad than one would expect for the former and to be independent of the phallus, so probably is not homologous with the latter.

Taxonomy

Marilia Müller

Marilia fusca Kimmins (in the work by Mosely and Kimmins, 1953: 167, fig. 112).

Marilia disjuncta nom. nov., new replacement name for *Marilia fusca* Kimmins, preoccupied by *Anisocentropus fuscus* Banks, 1905, a junior synonym of *Marilia flexuosa* Ulmer, 1905.

***Barynema* Banks**

Figures 1–35

Barynema Banks 1939: 483, type species: *Barynema costatum* Banks, 1939 by monotypy.

In their treatment of the Australian endemic genus *Barynema*, Mosely and Kimmins (1953) discussed its early placement in the family Calamoceratidae and their rationale for transferring the genus to the family Odontoceridae on the grounds that *Barynema* lacks the median cell in the forewing. Adults of *Barynema* species are distinguished from Australian representatives of *Marilia* by having a pair of setose warts on the mesoscutum, whereas *Marilia* has two rows of setae; males of many specimens of *Marilia* have holoptic compound eyes, not seen in any *Barynema*. Two species of *Barynema* – *B. australicum* Mosely, 1953, and *B. goomburra* sp. nov. – also have a pair of setate warts posteriorly on the mesoscutellum, a characteristic that appears to be absent in all other Odontoceridae. This could be considered a distinguishing feature at the genus level but given the very close similarity of other male and female features of species assigned to *Barynema*, we believe all eight species are appropriately referred to a single genus. Similar variation in presence and absence of mesoscutal and mesoscutellar setal warts and their arrangement is seen in the closely related Philorheithridae (Neboiss, 1977).

In the inferior appendages of the males of some species of *Barynema* (e.g. *B. costatum* and *B. australicum*), the harpago appears to be fused with the coxopodite (or lost?). In other species, a rather similar structure (when viewed laterally) appears to be simply an extension of the coxopodite that is probably homologous with the structure termed “subapicodorsal lobe of an inferior appendage” by Yang et al. (2017, p. 88). The socketed harpago forms a smaller, but morphologically similar, structure (e.g. *B. lobatum* sp. nov.) or is reduced to a small triangular (*B. dilatatum* sp. nov.) or subquadrate (*B. dolabratum* sp. nov.) lobe laterad of the extended coxopodite; it usually bears an area of short peg-like black setae. A similar situation appears to occur in the east Asian species *Psilotreta malickyi* Oláh and Johanson, 2010, although in that species the reduced harpago is a mesal structure. In females of *Barynema*, the apical lobes are stout structures on abdominal segment X, while in *Marilia* they are absent or fused with tergite X.

Here, new records and images are given for each of the two established species of *Barynema*: *B. costatum* from Victoria and *B. australicum* from north-eastern New South Wales. Thoracic and female genitalic features are described and illustrated for these species. In addition, six new species are described, based on male and female thoracic and genitalic features, and a key is provided for the genus. The genus has been collected along the Great Dividing Range of eastern Australia but has not been recorded further west; in the south, the genus is not recorded from west of the central ranges of Victoria or from Tasmania. Genetic data from BOLD suggest that additional species are present in Australia.

Larvae of a few species can be associated with the adult

using the CO1 barcode. The larvae show subtle differences that may enable species separation, but this is best left until more species are associated. The larval and pupal descriptions of *Barynema costatum* by Cartwright and Dean (1987) may not be that species and may not be adequate to separate larvae of related species.

Key to males of *Barynema* Banks.

1. Mesoscutellum subcircular to rectangular, bearing small paired setate warts separate from each other and close to posterior margin (figs 29, 33) 2
 - Mesoscutellum ovoid, with large paired setate warts fused and covering most of mesoscutellum (fig. 5) 3
2. Inferior appendages, each with harpago in ventral view bearing abbreviated area of short stout black peg-like setae subapicomesally; coxopodite with short mesal lobe bearing similar, but tapered, setae (fig. 32)
 - *B. australicum* Mosely
 - Inferior appendages, each with harpago in ventral view bearing elongate area of short stout black peg-like setae subapicomesally; coxopodite without mesal lobe (fig. 35)
 - *B. goomburra* sp. nov.
3. Inferior appendages, each with brush of short, stout black setae on harpago subapicomesal, elongate, extending along distal half of mesal margin (figs 3, 6)
 - *B. costatum* Banks
 - Inferior appendages, each with brush of short stout black setae on harpago apical and rounded, not elongate (figs 9, 13, 18, 21, 25) 4
4. Lobes of upper penis cover in ventral view expanded apicolaterally (figs 21, 25) 5
 - Lobes of upper penis cover in ventral view tapered, acuminate to rounded apically, but not expanded apicolaterally (figs 9, 13, 15, 18) 6
5. Apicolateral lobes of upper penis cover in ventral view rounded (fig. 21) *B. dilatatum* sp. nov.
 - Apicolateral lobes of upper penis cover in ventral view sharply triangular, pick-shaped (fig. 25)
 - *B. dolabratum* sp. nov.
6. Inferior appendages, each with coxopodite in ventral view about 2 times as long as wide (figs 13, 15)
 - *B. lorien* sp. nov.
 - Inferior appendages each with coxopodite in ventral view subquadrate (figs 9, 18) 7
7. Coxopodites in ventral view, each with mesal margin rounded (fig. 18) *B. lobatum* sp. nov.
 - Coxopodites in ventral view, each with mesal margin angled obliquely from base (fig. 9) . *B. paradoxum* sp. nov.

***Barynema costatum* Banks**

Figures 1, 3–8

Barynema costatum Banks, 1939: 484, figs 43, 51, 54.

Material examined. *Holotype*. male, Victoria, Mount Donna Buang, 6–7 December, Darlington (ANIC, ex CZM, dry on a pin). Victoria: 1 male (dissected), Cement Creek near Warburton, 4.xi.1972, P. Zwick (NMV Tri-26514, PT-1389). Victoria: 1 adult female, same data (NMV Tri-26517, PT 1890); 1 male (pharate adult, dissected), small trib. Snobs Creek, Snobs Road crossing bridge, 11.6 km u/s Eildon Road, 31.x.1981, J. Dean (NMV Tri-26506); 1 female (reared), Back Creek, 1 km NE of Noorinbee, 13.x.1982, A. Bolton, reared (NMV Tri-26518).

Diagnosis. Males, when freshly caught or dried, have on the black forewing a band of white and golden hairs angled across the wing at about 3/5 length and a streak of golden scales and hairs between A1 and Cu2; on the inferior appendages, a rather elongate hairbrush-like cluster of short and blunt black setae line the inner subapical or apical region of the harpago, features that distinguish them from *B. paradoxum* sp. nov. with similar black wings, but with the distal band of hair on the forewing only slightly curved and the harpago with a rounded cluster of short black setae apically; in ventral view, the basal section of the coxopodite is broadly subrectangular in *B. costatum*, but more rounded in *B. paradoxum*, and the upper penis cover with each lobe expanded laterally toward the apex, rather than tapered or rounded.

Description (revised after Mosely and Kimmins, 1953).

Mesothorax with scutellum subquadrate, without mesoscutellar setate warts.

Male. Body and wings (figs 1, 3, 4) black, forewings each with gold band along proximal section of A1 and white band across vein anastomoses at about 3/5 wing length; length of each forewing 9.5 mm (n = 1). Mesoscutellum ovoid, without setate warts. Abdominal sternite VII bearing median subquadrate lobe. Genitalia: Pre-anal appendages in dorsal view stoutly conical, about length of inferior appendages; upper penis cover elongate, wrapped lateroventrad of phallus, flared and widest towards apex; inferior appendages in ventral view with coxopodite stout, subquadrate basally; harpago in ventral view slender, with elongate apicomesal brush of sharp, stout black setae lining distal half, giving hairbrush-like appearance.

Female. Terminalia: Distal abdomen bearing pair of short, stout, apically truncate apical lobes; striated plates ventrally on segment IX.

Distribution. Found in central and eastern Victoria.

Remarks. Very few specimens of *B. costatum* have been collected – many of the specimens previously identified as *B. costatum* are assigned here to the new species *Barynema paradoxum* sp. nov. BOLD data groups the two, with only a short distance between them. One of the few confirmed *B. costatum* specimens is a pharate pupa from a tributary of Snobs Creek on the north-western edge of the Great Dividing Range in central Victoria, images of which are included here (figs 5–8), particularly to show the form of the mesoscutellum that is obscured by the pin on the dried type.

***Barynema paradoxum* sp. nov.**

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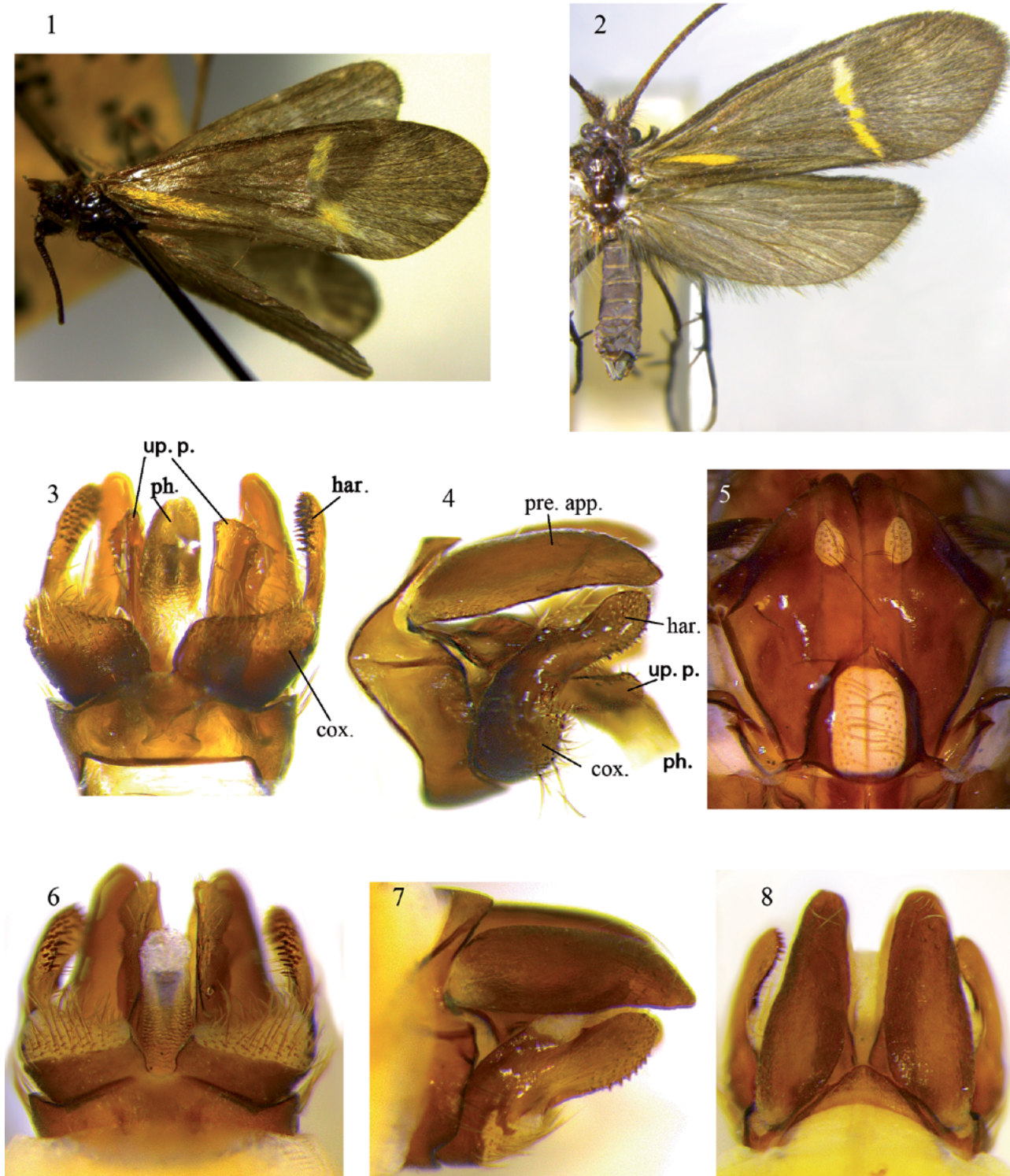
Figures 2, 9–12

Material examined. *Holotype*. male, New South Wales, 8 km N of Nowra, 21.x.1966, N.D. (NMV Tri-27118, PT-1646).

Paratypes. New South Wales: 2 males, data as for holotype, 21.x.1966, N.D. (NMV Tri-27113); 4 males, data as for holotype, 21.x.1966, N.D. (NMV Tri-27115); 1 male, Minnamurra Falls, N of Kiama, 25.iii.1973, A. Neboiss (NMV Tri-27114); 2 males, Mumbulla Creek, near Bega, 20.xi.1978, I. Campbell (NMV Tri-27110); 3 males, 1 female, Minnamurra Falls, 22.x.1982, G. Theischinger (NMV Tri-27139); 2 males, Bundanoon, 34° 39' S 150° 18' E, ix.1983, G. Theischinger (NMV Tri-27137).

Other material. New South Wales: 1 male [pinned], Brown Mountain, 2.xii.1956, E.F. Riek (ANIC); 2 males [pinned], Macquarie Falls, 14.ix.1960, D.H. Colless (ANIC); 3 males [pinned], upper Kangaroo Valley, 24.ix.1960, E.F. Riek (ANIC); 1 male, eastern Fall, Clyde Mountain, 26.x.1960, E.F. Riek (ANIC); 2 males, 1 female, Minnamurra Falls, 23.x.1962, D.K. McAlpine (NMV Tri-27062); 2 males, 1 female, Minnamurra Falls (NMV TRI-27062); 1 male, 1 female, New South Wales, Macquarie Pass, 13x.1986, "G. Thei. & L. Mu." [G. Theischinger and L. Muller] (NMV Tri-27133); 1 male, New South Wales, Macquarie Rivulet, W of Shell Harbour, 34° 34' S 150° 41' E, 4.i.1990, G. Theischinger (NMV Tri-27134); 1 male, same data (NMV Tri-27070); 1 male, Bundanoon, Fairy Bower, 35° 39' S 150° 18' E, ix.1991, G. Theischinger (NMV Tri-27135); 2 male, same data (NMV TRI-27137); 1 male, same data (NMV TRI-27138); 1 female, New South Wales, Yadboro Creek, Budawang Range, 40 km SW of Nowra, 35° 22' S 150° 03' E, xi.1991, G. Theischinger (NMV Tri-27136); 1 female, Yadboro Creek, Budawang Range, 40 km SW of Nowra, xi.1991, G. Theischinger, 35° 22' S 150° 03' E (NMV TRI-27136); 1 male, South East Forests National Park, trail near Monaro Highway, malaise in Hopping Joe Creek, 37° 12' 58" S 149° 18' 37" E, 5.xii.2004–12.i.2005, C. Lambkin, N. Starick (ANIC); 16 males 1 female, East Boyd State Forest, Anteaters Road, 55 km SE Bombala Forest, 37° 12' 18" S 149° 42' 24" E, 6.xii.2004–12.i.2005, C. Lambkin, N. Starick (ANIC); 1 male, New South Wales, Polblue Creek, Barrington Tops Forest Road, 31° 57' S 151° 26' E, 2.xii.2007, A. Glaister, J. Dean and R. St Clair (NMV Tri-54560); 1 male, tributary of Macquarie Rivulet off Clover Hill Road, 29.ix.2017, Z. Billingham (NMV Ento 2018-246, JOS-424); 1 male, Minnamurra Creek, off Minnamurra Rainforest Walk, 3.x.2017, Z. Billingham (NMV Ento 2018-246, JOS-423); 13 males, 1 female, Budawang National Park, Mount Budawang Road, 35.4563 S 149.4455 E, 16.i.2019, K.M. Bayliss, J. Lumbers and D.K. Yeates (ANIC). Victoria: Coopracambra National Park, malaise trap over Beeline Creek, 27 km NNE of Cann River, 5.xii.2004–12.i.2005, C. Lambkin, N. Starick (ANIC).

Diagnosis. Males of *Barynema paradoxum* resemble those of *B. costatum* in having distinctive black wings with a median white band across the area of vein anastomoses and a band of bright yellow hairs between veins Cu2 and A1. But in *B. paradoxum*, the white band is slightly curved, not angled, and the area of golden setae is smaller. Like *B. costatum*, *B. paradoxum* shares with *B. dilatatum* sp. nov., *B. lorien* sp. nov. and *B. dolabratum* sp. nov. the absence of setate warts on the mesoscutellum and, as with those three species, the male of this new species has a rounded club of short, stout black setae apically on the distal extremity of each inferior appendage, not an elongate brush as in *B. costatum*. Together with *B. lorien*

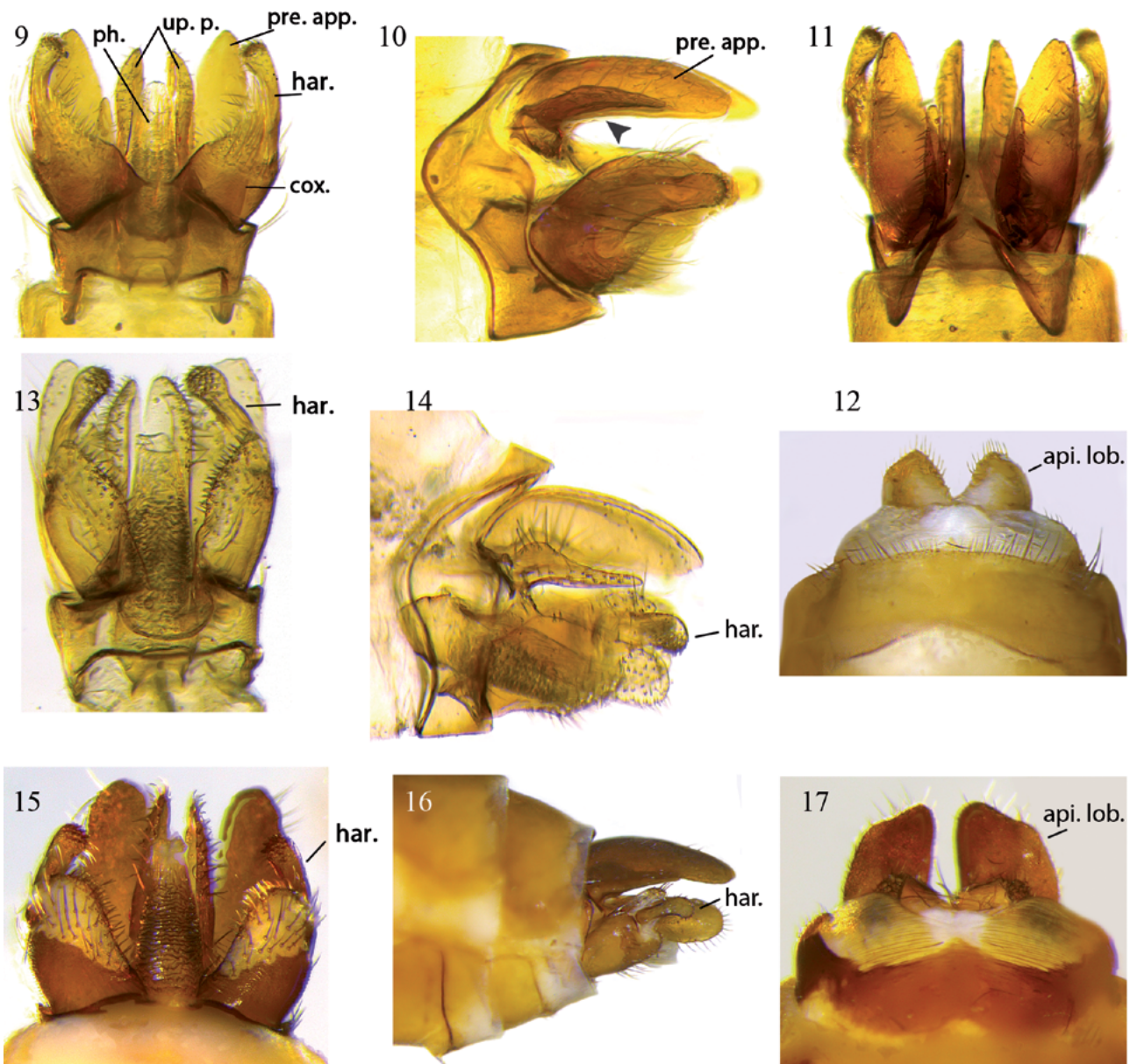


Figures 1–8, *Barynema* species. 1, 3, 4, *Barynema costatum* Banks holotype male: 1, body and wings, dorsal; 3, 4, genitalia, ventral and lateral, respectively. 2, *B. paradoxum* sp. nov., New South Wales, Upper Kangaroo Valley, body and wings, dorsal; 5–8, *B. costatum*, male, Victoria, tributary of Snobs Creek (NMV TRI-27406): 5, mesothorax, dorsal; 6–8, genitalia, ventral, lateral, and dorsal, respectively. Abbreviations: cox. = coxopodite; har. = harpago; ph. = phallus; pre. app. = pre-anal appendages; up. p. = upper penis cover.

and *B. lobatum* sp. nov., *B. paradoxum* has the ventrolateral lobes of the upper penis cover tapered apically, rather than expanded. *Barynema paradoxum* is characterised by the coxopodite of each male inferior appendage subquadrate, not longer than wide in ventral view and not produced to form a rounded lobe at its apicomeseal angle.

Description. Mesothorax without mesoscutellar setate warts. Body and wings black, each forewing with slightly curved band of white setae across vein anastomoses.

Male. Length of each forewing 6.2–9.7 mm (n = 10). Abdominal segment VII bearing small, sharp, sclerotised median spur. Genitalia: Pre-anal appendages stout, apices



Figures 9–17, *Barynema* species. 9–12, *B. paradoxum* sp. nov., holotype, New South Wales, Nowra (NMV TRI 27118, PT-1646): 9–11, male genitalia, ventral, lateral, and dorsal, respectively; 12, female, New South Wales, Yadboro Creek, Budawang Range, 40 km SW of Nowra (NMV TRI-27136) terminalia, ventral. 13–17, *B. lorien* sp. nov.: 13, 14, holotype male, New South Wales, Lansdowne via Taree (NMV TRI-27061, PT-1564), genitalia ventral and lateral, respectively; 15, 16, paratype male, Queensland, Lamington National Park (NMV TRI-27061), genitalia, ventral and lateral, respectively; 17, paratype female (NMV TRI-27061), terminalia, ventral. Abbreviations: api. lob. = apical lobe; cox. = coxopodite; har. = harpago; ph., phallus; pre. app. = pre-anal appendages; up. p. = upper penis cover.

narrowly rounded in dorsal view; lobes of upper penis cover in ventral view tapered to acuminate apices; inferior appendages, each with coxopodite in ventral view stout, subquadrate basally, harpago about length of coxopodite, slender with a cluster of short, bristle-like dark setae on rounded club-shaped apex.

Female. Length of each forewing 9.0 mm ($n = 1$). Terminalia: Distal abdomen bearing pair of short apical lobes, stout basally, rounded laterally and tapered to rounded apices; striated plates ventrally on segment IX.

Distribution. Widespread in eastern New South Wales, extending into far eastern Victoria, possibly overlapping with *B. costatum*.

Etymology. Named for the past confusion over this species, and the paradox presented by the variability in male genitalic structures. Most specimens were identified previously as *B. costatum*.

***Barynema lorien* sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:E8CB61B0-BA99-4CC9-8A92-E94F3037E18D>

Figures 13–17

Material examined. Holotype. male, New South Wales, Lansdowne via Taree, 29.ix.1985, G.W. Williams (NMV TRI-27071, PT-1564)

Paratypes. Queensland: 2 males, 1 female, [Lamington] National Park, 1.xi.1954, T.E. Woodward (NMV TRI-27060); 1 male, Lamington National Park, 15.xi.1955, Yeo (NMV TRI-27069); 1 male (reared from pupa), Tamborine Mountain, iii.1962, K. Korboot (NMV TRI-27068); 1 female (reared from pupa), same data (NMV TRI-27067); 3 males, 1 female, Lamington National Park, xi.1982, T. Hinger (NMV TRI-27061); 1 male, Lamington National Park, xi.1982, G. Theischinger (NMV TRI-27065).

Other material. New South Wales: 1 male 1 female, Wentworth Falls, 22.xi.1960, C.N. Smithers (NMV TRI-27059); 1 male, same data (NMV TRI-27070); 1 male, [Barrington Tops State Forest], Manning River, Pheasant Creek Road, 3.xii.2007, A. Glaister, J. Dean and R. St Clair (NMV TRI-54568, JOS-237).

Diagnosis. Resembling *B. paradoxum*, *B. costatum*, and *B. lobatum* sp. nov. in having males with the pre-anal appendages stout, apically rounded. The male differs from that of *B. costatum* in having each inferior appendage terminating in a small rounded area of short black setae, not an elongate brush. It is distinguished from *B. costatum* by having the lobes of the upper penis cover in ventral view acute apically, not flared distally as in *B. costatum*, and is distinguished from *B. paradoxum* by having the basal region of each inferior appendage subrectangular, not subquadrate, and from *B. lobatum* sp. nov. which has the mesal angle more strongly produced, rounded. Females resemble those of *B. lobatum*, having the apical lobes short, stout, and stepped (obliquely truncate).

Description. Mesothorax without mesoscutellar setate warts.

Male. Length of each forewing 6.8–7.5 mm ($n = 4$). Abdomen with small sharply pointed spur medially on sternite VII. Genitalia: Pre-anal appendages stout, rounded apically. Upper penis cover forming pair of elongate lobes of

more or less uniform width for most of length, tapered slightly to apex. Inferior appendages each with coxopodite basally long, subrectangular to ovoid in ventral view, without any tufts of setae or mesal lobes, harpago slender at base, slightly dilated distally, with round pad of short, stout black setae apically.

Female. Length of each forewing 8.3–9.6 mm ($n = 3$). Terminalia: Apical lobes, slightly stepped toward rounded apices.

Distribution. Found from eastern New South Wales, from the Blue Mountains to the west of Sydney to south-eastern Queensland.

Etymology. Named after the Lorien Wildlife Refuge and Conservation Area near Lansdowne, New South Wales.

***Barynema lobatum* sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:5985E223-FC68-48B4-A1C4-19D51BD5E0C2>

Figures 18–20

Material examined. Holotype. male, Queensland, Montville, Bon Accord Falls, 27.ix.1955, A.N. Burns (NMV Tri-27064).

Paratypes. Queensland: 3 male, 1 female, Montville, Bon Accord Falls, 29.ix.1955 A. N. Burns (NMV TRI-27063); 1 male, same data (NMV Tri-27066); 1 male, south-east Queensland, Stony Creek, Conondale Range, 10.viii.1988, S. Bunn (NMV Tri-27120).

Diagnosis. In most features, *B. lobatum* sp. nov. resembles *B. lorien* sp. nov. but alone among congeners, this species has the apicomeral angle of the otherwise subquadrate coxopodite of the inferior appendages produced and rounded distally; the pre-anal appendages are tapered distally, and a small rounded mesal process occurs on sternite VII. The female is indistinguishable from those of *B. lorien*, both having stepped (obliquely truncate) apical lobes.

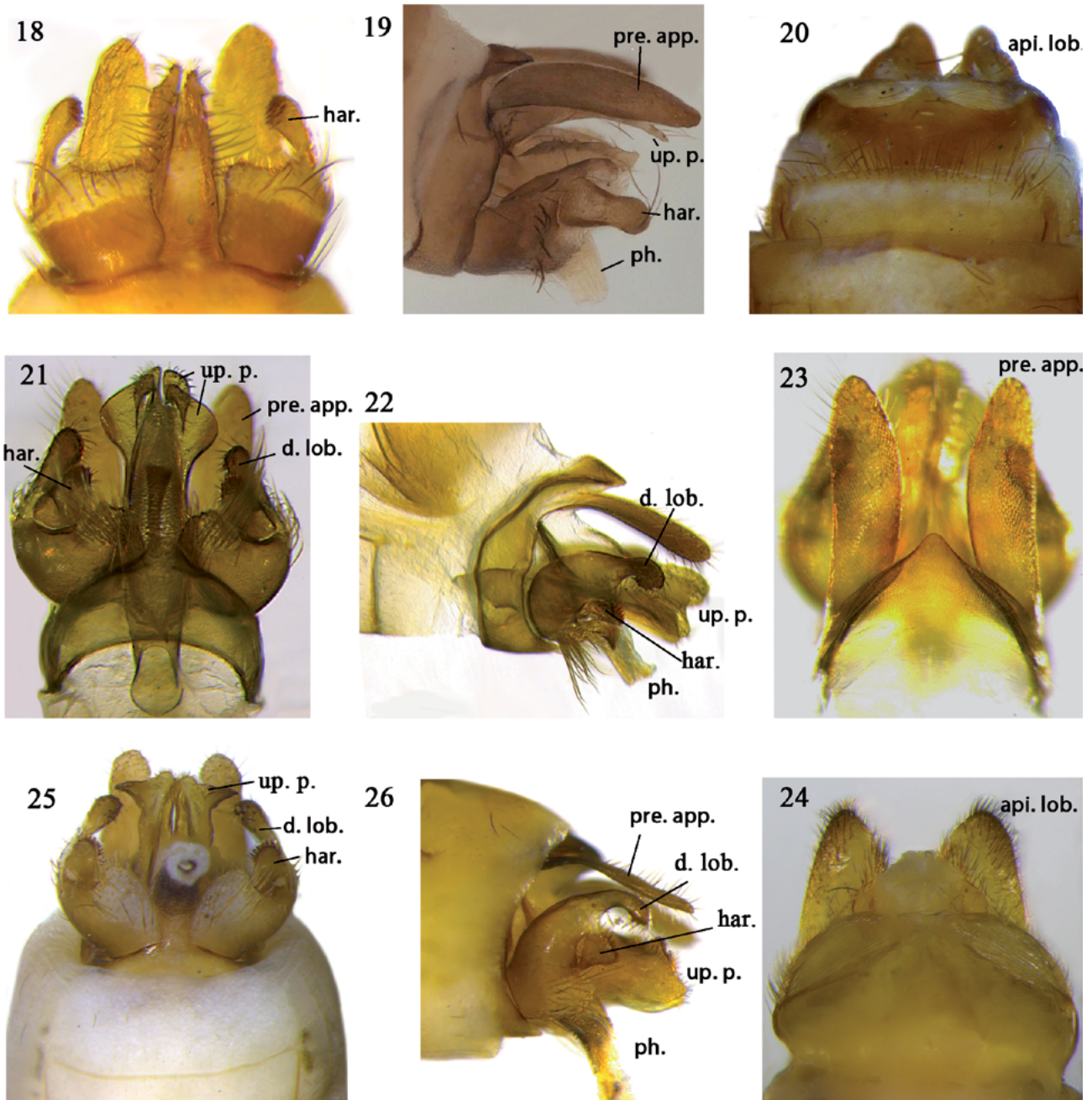
Description. Thorax with mesoscutellum almost subquadrate, pale, margin dark, lacking setate warts.

Male. Length of each forewing 5.2–7.2 mm ($n = 5$). Sternite VII with small, apically rounded median tab. Genitalia: Pre-anal appendages stout in dorsal view, tapered to rounded apices, in lateral view almost same width throughout, apically rounded. Lobes of upper penis cover in ventral view constricted distally to form sharp tips, in lateral view stout, rounded apically. Inferior appendages each with coxopodite in ventral view stout, apicomeral angle slightly produced, rounded; harpago narrow near base, cluster of short, dark, bristle-like setae apically.

Female. Length of each forewing 8.6 mm ($n = 1$). Terminalia: Distal abdomen bearing pair of apical lobes, stout basally, narrowed laterally, and produced to rounded apex.

Distribution. Known only from north of Brisbane in the Sunshine Coast region of south-eastern Queensland.

Etymology. Named for the expanded apicomeral angles of the inferior appendages.



Figures 18–26, *Barynema* species. 18–20, *B. lobatum* sp. nov.: 18, holotype male, Queensland, Montville, 27.ix.1955, (NMV Tri-27064), genitalia ventral; 19, paratype male (NMV 27120), lateral; 20, paratype female (NMV TRI-27063) terminalia, ventral. 21–24, *B. dilatatum* sp. nov.: 21–23, holotype, male (NMV WTH-2966, PT-2033) genitalia ventral, lateral, and dorsal, respectively; 24, paratype female (Python Creek NMV), terminalia, ventral. 25, 26, *B. dolabratum* sp. nov. holotype male, (Oliver Creek NMV), genitalia, ventral and lateral, respectively. Abbreviations: api. lob. = apical lobe; d. lob. = dorsal lobe of inferior appendages; har. = harpago; ph. = phallus; pre. app. = pre-anal appendages; up. p. = upper penis cover.

***Barynema dilatatum* sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:26539E9C-AFA3-4F1B-BD16-B4C2F76A38E8>

Figures 21–24

Material examined. Holotype. male, north Queensland, Carron Creek, Kirrama State Forest, April 1993, G. Theischinger, 18° 06' S 145° 41' E (NMV WTH-2966 PT-2033).

Paratypes. North Queensland: 5 males, Carron Creek, Kirrama State For., 17° 50' S 145° 35' E, April 1993 (NMV WTH-1171); 5 males, same data (NMV WTH-1174); 5 males, same data (NMV WTH-1172); 5 males, same data (NMV WTH-1173); 5 males, same data (NMV WTH-1174); 5 males, same data (NMV WTH-1175); 5 males, same data (NMV WTH-1176); 3 males, same data (NMV WTH-1345); 7 males, north Queensland, Goodard Creek, Kirrama State Forest, April 1993, G. Theischinger, 18° 06' S 145° 41' E (NMV WTH-1040); 7 males, same data (NMV WTH-1041); 17 males, 6 females, stream on Tully Gorge Road, 6.7 km d's of power station, M. Shackleton and J. Mynott, 8.v.2011 (NMV Tri-54556).

Other material. North Queensland: 3 females, upper Mulgrave River via Gordonvale, 29–30 April 1970, S.R. Curtis (NMV WTH-0786); 5 male, same data (WTH-2654); 1 female, Lock-Davies Creek Road, Lamb Range, Mareeba District, 10 November 1974, M.S. Moulds (WTH-0437 PT-2028); 1 female, upper Freshwater Creek, Whitfield Range, Cairns, 24 August 1974, MV-light, MS Moulds (WTH-0615); 1 male, same data (NMV WTH-0603); 1 male, same data (NMV WTH-0604); 1 male, upper Freshwater Creek, Whitfield Range, near Cairns, 15 December 1974, MS Moulds (NMV WTH-0606); 1 male, 1 male, same data (NMV WTH-0605); 1 male, same data (NMV WTH-0607); 2 females, same data (NMV WTH-0614); 1 male, the Crater, near Herberton, 18 December 1974, M.S. Moulds (NMV WTH-0602); 1 female, Mareeba, Davies Creek Road, 21 January 1976, Walford-Huggins (NMV WTH-0616); 1 male, State Forest, 24 km along Goldsborough Road near Gordonvale, 27.xii.1980, M.S. and B.J. Moulds (NMV WTH-1350); 1 male, Behana Gorge, Cairns, 16 November 1982, T. Hinger, 17° 11' S 145° 50' E (NMV WTH-0608); 2 females, same data (NMV WTH-0609); 1 male, Mossman Gorge, Daintree National Park, 17 November 1988, MV It, K. Walker (NMV WTH-0598); 1 male, river on Lake Morris Road, Cairns, 3.v.2011, 16.9412 145.71762 (NMV EPAVT122); 2 males, 5 females, river on Lake Morris Road, Cairns, 16.9412 145.71762, 3.v.2011, J. Mynott and M. Shackleton (NMV Tri-54557); 1 male, small creek beside Josephine Falls, M. Shackleton and J. Mynott, 6.v.2011 (NMV Tri-54559); 1 male, 1 female, Josephine Falls, 17.4338 145.8630, Shackleton and Mynott 110506-7, 6.v.2011 (NMV Tri-54558); 3 males, Dunn? Creek at Bridge 11, Kirrama Range Rd, ~14 km from national park sign, -18.2138 S 145.7982 E, 24.x.2017, D. Cartwright and R. St Clair; 1 male, Mulgrave Road, Goldsborough Valley Campsite, Wooroonoonan National Park, 17.2374 S 145.7733 E, 26.x.2017 (NMV JOS 451); 1 male, Python Creek in Tully Gorge Road, ~52 km NW of Tully, 17.7662S 145.5895E, 2 November 2017, D. Cartwright and R. St Clair (QM JOS-448).

Diagnosis. The male of *Barynema dilatatum* closely resembles that of *B. dolabratum* sp. nov. in having the inferior appendages each with the harpago reduced to a small apically setose ventral lobe and the coxopodite in lateral view produced and curved ventrad distally. In *B. dolabratum*, the upper penis cover in ventral view appears to form two lobes apically, with the ventral lobe expanded and rounded laterally, in contrast with *B. dolabratum*, which has the upper penis cover in ventral view pick-shaped apically.

Description. Mesothorax with mesoscutellum shield-shaped, without setate warts; fresh adult males with body and wings dark except white area at anastomosis on wings.

Male. Length of each forewing 9.3–10.3 mm (n = 10). Sternite VII without median tab or spur. Genitalia: Pre-anal appendages in dorsal view broadest at about midpoint, constricted towards base. Upper penis cover distally bilobed, dorsal lobe tapered apically in ventral view, rounded in lateral view, ventral lobe expanded and rounded laterally towards apex. Inferior appendages each with coxopodite base short, stout, produced to form a dorsal lobe with slender neck before slightly dilated apex bearing short stubby black setae, harpago short, rod-shaped, bearing dense brush of short black setae apically.

Female. Length of each forewing 11.8–17.7 mm (n = 10). Terminalia: Apical lobes conical, tapered to darkly sclerotised apices.

Distribution. From north-eastern Queensland, west of Tully to the Cairns district.

Etymology. The name is derived from the Latin *dilato*, to extend, for the lateral swellings on the upper penis cover lobes.

***Barynema dolabratum* sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:70CBA5A9-B547-4657-9FF7-F5D89AABE20E>

Figures 25, 26

Material examined. Holotype. male, north Queensland, Gap Creek, 10.ii.1982, M.S. Moulds (NMV WTH-0599, PT-1176).

Paratypes. North Queensland: 1 male, Gap Creek, Mount Finlayson Range, S of Cooktown, 25 November 1974, M.S. Moulds (NMV WTH-0601); 1 male, Gap Creek, 10 February 1982, M.S. Moulds (NMV WTH-0600); 1 male, Oliver Creek on Bloomfield Road, 8 km S of Cape Tribulation, 16.1377 S 145.4408 E, 29.x.2017, D. Cartwright and R. St Clair (QM); 1 male, data as above, D. Cartwright and R. St Clair, NMV (JOS-452).

Diagnosis. This species, known only from males, closely resembles that of *B. dilatatum*, but is distinguished by the slightly smaller body, darker body, mesoscutal setate warts elongate-ovoid, and the sharp, pick-shaped form of the upper penis cover lobes in ventral view.

Description. Mesothorax with mesoscutellum shield shaped, without setate warts.

Male. Length of each forewing 9.0–10.6 mm (n = 5). Small white area around lower part of wing at anastomosis. Sternite VII without median spur or tab. Genitalia: Pre-anal appendages stout, apically rounded in ventral view. Upper penis cover lobes produced distally, pick-shaped apicolaterally in ventral view, in lateral view triangular apico-dorsally. Inferior appendages each with coxopodite broad at base, in lateral view produced in slender, curved dorsal lobe bearing cluster of stubby black setae apically; harpago forming short apically truncate lobe bearing stout peg-like black setae at tip.

Female. Unknown.

Distribution. Collected from Cape York, Queensland, from the two sites to the north of Cairns and south of Cooktown.

Etymology. From the Latin *dolabratus*, meaning pick-shaped for the appearance of the upper penis cover lobes.

***Barynema australicum* Mosely**

Barynema australicum Mosely, in Mosely and Kimmins, 1953: 162, figs 108, 109.

Figures 27–32

Material examined. Holotype. male, New South Wales, Ebor, 5.i.1916, R.J. Tillyard, (BMNH) [head and abdomen mounted in balsam, images courtesy B. Price, BMNH]

New South Wales: 1 female, Wilson River Reserve near Bellangry, 5.xii.1986, G. Theischinger (NMV TRI-26493); 1 male, Coomboodja Creek, Washford National Park, 29° 16' S 152° 22' E, 5.i.1986, Theischinger (NMV Tri-27119, PT-1655); 2 females, same data (NMV Tri- 27116); 1 male, 1 female, "Cockerawo... Creek", 23 km WNN Bellangry, 8.xii.1986, 730 m, G. Theischinger (NMV TRI-26505); 19 males 1 female, Orara West State Forest, Tuckers Knob, 29° 41' S 152° 48' E, 27.xi.1990, G. Theischinger (NMV TRI-27117); 1 male, Manning River, Pheasant Creek Road, A. Glaister, J. Dean and R. St Clair, 3.xii.2007, 31° 53' S 151° 29' E (NMV TRI-54569, JOS-238); 1 male, Never Never River, Whitneys Road, -30.33001S 152.86222E, 10. xi.2010, 10110-5, MS 747 [M. Shackleton] (NMV TRI-54570, JOS-108).

Diagnosis. Distinguished from most other species of *Barynema* by having a pair of setate warts on the mesoscutellum, a feature shared with *B. goomburra* sp. nov., from which it differs by having male genitalia in ventral view with the coxopodite of each inferior appendage subquadrate, and in both ventral and lateral views the harpago with a short, slender basal portion before the swollen terminal section that bears a broader hairbrush-shaped area of short blunt black setae, rather than an elongate toothbrush-shaped region as in *B. goomburra* sp. nov.

Description. Male. Length of each forewing 6.4–7.8 mm (n = 10). Sternite VII bearing apically rounded median tab. Genitalia: see Mosely and Kimmins, 1953: 162).

Female. Length of each forewing 8.4–10 mm (n = 3). Terminalia: Apical lobes on abdominal segment X short, broad, almost quadrate.

Distribution. Found in north-east New South Wales, in the Barrington Tops-Wauchope and mid north coast regions.

Remarks. Two specimens among those that have been sequenced for the BOLD project can be referred to *B. australicum*. Each appears in a different cluster on the current BOLD Taxon Identification Tree. This is due to either contamination of the COI gene or the presence of sibling species. Several more specimens are required before this can be resolved. This species, together with specimens here referred to *B. dilatatum* sp. nov., show no presently resolvable relationships.

***Barynema goomburra* sp. nov.**

<http://zoobank.org/urn:lsid:zoobank.org:act:3B854EDD-8AEB-4E71-903C-DEE0AEEF26EE>

Figures 33–35

Material examined. Holotype. male, Queensland, Goomburra State Forest, NE of Warwick, 28° 03' S 152° 07' E, 20.i.1986, G. Theischinger (NMV TRI- 27112).

Paratypes. New South Wales: 1 male, 4 females, Styx River, Hyatt Flat, 8.xii.1998, G. Theischinger (ANIC).

Diagnosis. Adults of this species closely resemble those of *B. australicum* in having a pair of setose warts on the mesoscutellum; the males of both species have a brush of short, blunt black setae terminally on each harpago and, in lateral view, the pre-anal appendages are broad-based and gradually tapered distally. The male of *B. goomburra* is characterised by having the inferior appendages narrower than those of *B. australicum* and the coxopodites lacking apicomesal clusters of setae that are present in *B. australicum*. The male of *B. goomburra* resembles that of *B. costatum* with the harpago bearing an elongate and narrow brush of stout black setae occupying almost its entire inner distal margin, but differs from *B. costatum* in that *B. goomburra* has a subcircular to rectangular mesoscutellum bearing small paired setate warts separate from each other and close to the posterior margin, whereas the mesoscutellum of *B. costatum* is ovoid and with large paired setate warts fused and covering most of the mesoscutellum.

Description. Mesothorax with mesoscutellum bearing pair of setate warts close to distal margin.

Male. Length of each forewing 6.5–7.2 mm (n = 2). Abdominal segment VII bearing stoutly rounded midventral tab. Genitalia: Pre-anal appendages in lateral view elongate triangular; upper penis cover in ventral view forming pair of short, stout, apically expanded structures; inferior appendages in ventral view each with coxopodite about equal width throughout length, without apicomesal brush of setae, harpago not clearly delineated, with somewhat stout, short, blunt black setae lining entire mesal side, giving toothbrush-like appearance.

Female. Length of each forewing 8.0–9.6 mm (n = 4). Terminalia: Apical lobes broad-based, arising close to each other, then tapered to narrowly rounded apices.

Distribution. Collected from just north of the New South Wales–Queensland border, and from the Styx River in the Northern Tablelands area of New South Wales.

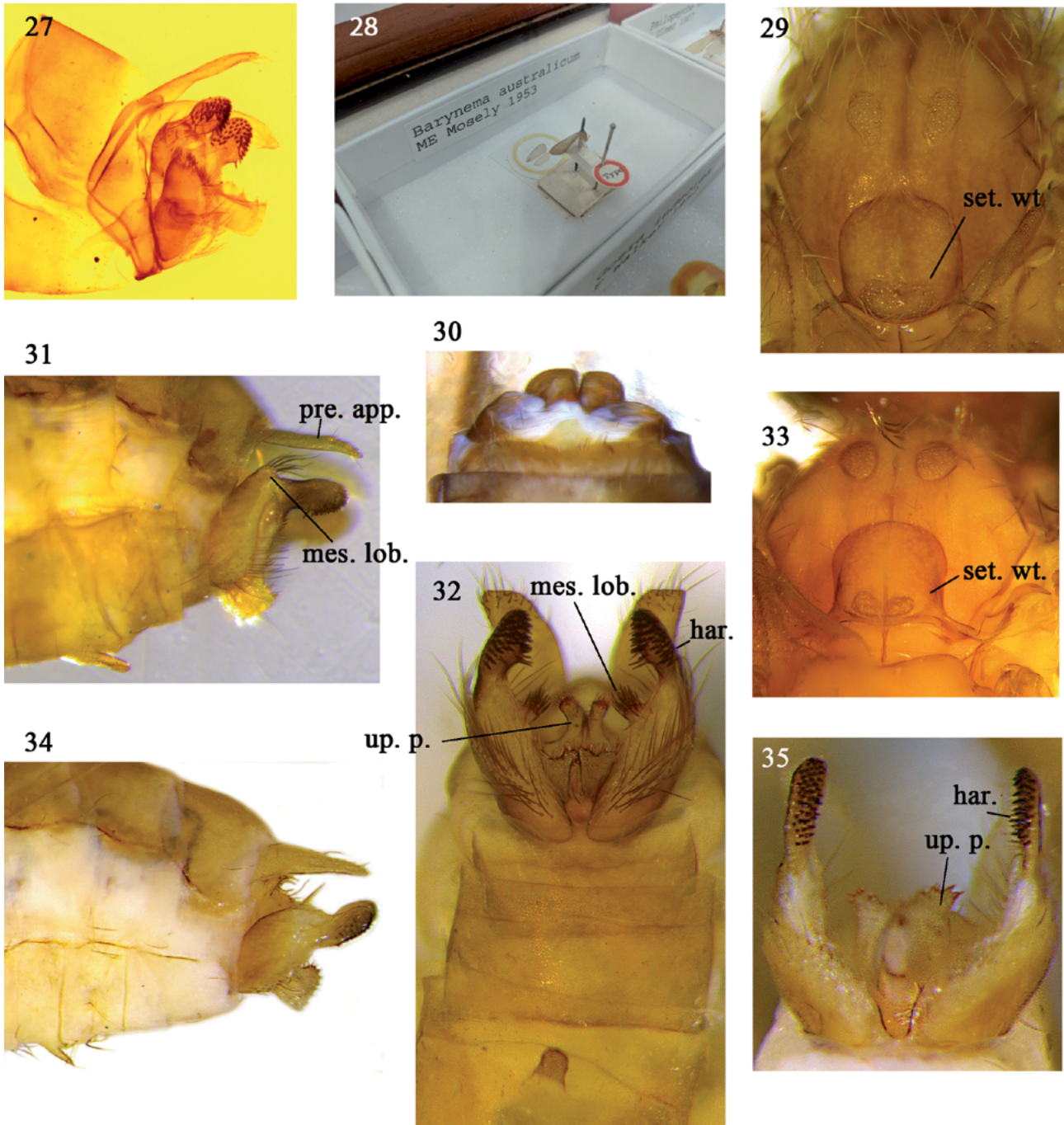
Remarks. No specimens recognisable as *B. goomburra* are among material for which molecular (COI) data are available at present.

Etymology. Named for the holotype locality.

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Material from Queensland collected by Michael Shackleton was taken under collecting permits WITK1027111 and that collected by David Cartwright and Ros St Clair under the Entomological Society of Queensland collecting permits WITK15549915 and TWB/02/2015. Material from New South



Figures 27–35, *Barynema* species. 27, 28, *B. australicum* Mosely, holotype male (BMNH): 27, genitalia, lateral (on microscope slide); 28, part of body and wings of holotype (images, courtesy B. Price, BMNH). 29–32, *B. australicum*, New South Wales, Orara West State Forest (NMV-27117): 29, male mesothorax dorsal; 30, female, terminalia ventral; 31, 32, male, genitalia, lateral and ventral, respectively. 33–35, *B. goomburra* sp. nov., holotype male, Queensland, Goomburra State Forest, NE of Warwick (NMV TRI-27112): 33, mesothorax dorsal; 34, 35, genitalia lateral and ventral, respectively.

Abbreviations: har. = harpago; mes. lob. = mesal lobe of coxopodite; pre. app. = pre-anal appendages; set. wt. = setate warts on mesoscutellum; up. p. = upper penis cover.

Wales was collected by Michael Shackleton under Scientific Research Permit P07/0095 and National Parks Service Scientific License S12404; by Alena Glaister, Ros St Clair, and John Dean under Scientific Research Permit P07/0095-1.0, and National Parks Service Scientific License S12404; and by Zac Billingham as bycatch under National Parks Service Scientific License SL101930.

Material from Queensland was collected under Scientific Research Permit numbers WITK06190909 (May 2010) and WITK10277111 (8 Nov 2011–7 Nov 2013). Material from Victoria was collected under Scientific Research Permits 10005961 (19 Aug 2012–31 Aug 2013).

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