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Australian Diplectroninae reviewed (Insecta: Trichoptera), with description of 21 new species, most referred to a new genus

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Abstract

The history of studies on Australian caddisflies in the hydropsychid subfamily Diplectroninae is outlined against a broader background of uncertainties in the delineation of the worldwide type genus, *Diplectrona* Westwood. For the Australian fauna, keys are given to genera of Diplectroninae that occur in Australia and to adult males of species in *Diplectrona* (including a newly synonymised genus, *Diemeniluma* Neboiss), *Austropsyche* Banks, and *Arcyphysa* **gen. nov.** Of the 32 diplectronine species recognised, six are referred to each of *Diplectrona* and *Austropsyche*, among them one and four newly described species, respectively; and four established species are transferred from *Diplectrona* to *Arcyphysa* **gen. nov.**, to join 16 newly described species. *Diplectrona cognata* Banks is synonymised with *D. spinata* Banks and *Diplectrona bispinosa* Jacquemart with *Austropsyche victoriana* Banks. Diagnoses and descriptions are accompanied by line drawings illustrating most of the diagnostic features of the genera and of most species, supplemented by photographic images. Australian species of *Diplectrona* are found from south-eastern Queensland to Tasmania, but neither *Austropsyche* nor *Arcyphysa* is known from Tasmania. *Austropsyche* extends from the Grampians in south-western Victoria to south-eastern Queensland, and the majority of species of *Arcyphysa* are recorded from north-eastern mainland Australia.

Key words: new combinations, new synonyms, distributions, species groups

Introduction

Over the years up to about 2003 when he ceased his studies on Trichoptera, Arturs Neboiss worked through available collections of Australian 'Diplectroninae' adults. He prepared careful draft figures of male and female genitalia, and, for some, wings and maxillary palpi. The group was proving intractable. In the past, Australian species had been assigned to the widespread genus *Diplectrona* Westwood 1839 and the endemic *Austropsyche* Banks 1939, and in his 2003 revision of the Tasmanian Trichoptera fauna, Neboiss erected a new endemic genus, *Diemeniluma*, for two Tasmanian species (Neboiss 2003). Although he sorted the remaining Australian 'diplectronine' species into several groups and prepared notes, he did not see the work to publication.

It is not surprising that Neboiss found it difficult to complete this project: Few published descriptions or diagnoses of the type genus, *Diplectrona*, consider the same characters and several relatively recent studies based on morphological and molecular characters suggest strongly that, as presently constituted, the hydropsychid subfamily Diplectroninae is paraphyletic (e.g., Schefter 1996; Geraci *et al*. 2005). Assignment of some species to the genus appears to be unsatisfactory (see Schefter 1996); several authors have indicated a need for revision of the genus worldwide. The breadth of this current morphology-based project on only Australian species is such that it cannot address the subfamilial problems or placement of non-Australian species. Assignment of Australian species to existing diplectronine genera and species, however, necessitates examination of diagnoses and the characters employed to distinguish genera.

The original very scant diagnosis of *Diplectrona* by Westwood (1839)[3] is totally inadequate by present standards and given current knowledge of the world Trichoptera fauna: 'Anterior tibiae 2-spurred; antennae shorter than the wings, which are broad, without any transverse subcostal nerve.' Westwood did not designate a type species, and the type was fixed subsequently by Plenary Powers of the International Commission on Zoological Nomenclature (ICZN 1966) as *Diplectrona felix* McLachlan 1878 (= *Aphelocheira flavomaculata* Stephens 1836).

In more recent diagnoses and in keys, wing features are used commonly. Wing shape and arrangement of major veins and forks appear to be consistent in diplectronine genera, but slight differences can be seen in presence or absence of cross-veins and in their positions, in curvature of Sc and R1, and in size or shape of cells. In diagnosing

3.The publication date of *Diplectrona* Westwood has been cited variously as 1839 and 1840. The publication of Westwood's *An Introduction to the Modern Classification of Insects, Founded on the Natural Habits and Corresponding Organisation of the Different Families*, occurred in two volumes in conjunction with his *Synopsis of the Genera of British Insects*. Both the *Introduction* and the *Synopsis* were published in parts from May 1838 through June 1840. The 158-page *Synopsis* was published separately from the *Introduction* on sheets B through L (except no sheet J) which were each folded and bound in 16-page sections following volume 2 of the *Introduction*. "DIPLECTRONA *Westw*." appears on page 49 of the *Synopsis*, the first page of sheet E (*Synopsis* pp. 49–64). According to Griffin (1932), sheets E and F were published in June 1839 and were received by the Entomological Society of London on 3 June 1839. Therefore, contrary to the 1840 date on bound volumes of Westwood's *Introduction* volume 2 and *Synopsis* and in the *Trichopterorum Catalogus* (Fischer 1963a), the genus-group name *Diplectrona* was actually published in 1839, the date given in the attribution by the ICZN (1966) in handing down Opinion 758 on the type species for the genus, based on Fischer's (1963b) application.

Diplectrona, Mosely & Kimmins (1953) used general body and wing features, including the strongly curved radius in both wings, but gave no mention of the shape of the anal cell of the forewing nor of warts or tubercles on the head. Neboiss' (1977) diagnosis included head warts: '… large anterolateral warts; anteromesal wart present; posterolateral warts very large; dorsal sutures present', but otherwise followed Mosely & Kimmins.

Schmid (1980, 1998) diagnosed *Diplectrona* in some detail, illustrating his diagnosis with figures of features of the Nearctic *D. modesta* Banks. Characteristics of this species conform closely to those as illustrated by McLachlan (1878) when describing *D. felix* and are confirmed in this current study in specimens of *D. felix* from the French Pyrenees. The diagnosis of *Diplectrona* given by Nimmo (1987) differs very little from that of Schmid. Stocks (2011) in his key to Hydropsychidae subfamilies and genera of the south-eastern United States separated *Diplectrona* from Hydropsychinae genera on the basis of '[f]orewing with A_{1+2+3} parallel to *av* so that *ac* approximately parallel-sided …; hind wing Sc and R with pronounced posterior curvature distally before wing margin'. In only one Australian diplectronine, species the cell *ac* approaches this shape; in all others it is more or less broadly subtriangular or lanceolate as it is in *D. felix*. In establishing *Austropsyche*, based on *Austropsyche victoriana* Banks 1939, Banks (1939) itemised wing features: '… in fore wings fork four equal to five; in hind wings the subcostal and radius run close together to near middle of discal cell, where they are connected by a very short cross-vein, and then separate, the radius bending behind but not so much as in Diplectrona so as scarcely to approach the discal cell and the space not narrowed; discal cell very elongate; costal area rather broader than in allied genera, not narrowed near middle, and with an oblique costal cross-vein before middle.' These features are all somewhat ambiguous, being rather vague degrees of difference; Banks illustrated only the dorsal head, 'clasper' and 'penis'. In Australian species the discoidal cell of a forewing varies, in some being about equal in length to the medial cell, in others considerably longer, and other slight variations can be seen in the position of cross-veins, especially in *m-r* in the hind wing.

Banks (1939, 496, fig. 6) description of the head features of *Austropsyche*: '… posterior warts … greatly enlarged so as to crowd the intermediate wart close to the anterior wart' are difficult to relate to the arrangement as he illustrated it with the intermediate wart divided almost equally into two separate sections. Nor is it as shown here in an image of the dorsal head of *A. victoriana* (Fig. 70) in which the 'intermediate wart' is unequally divided, with the posterior part of the divided wart somewhat fragmentary or at least irregular in appearance. The situation appears to be similar in all species currently assigned to *Austropsyche* (Figs 70–75). In contrast, in several of the Australian species currently assigned to *Diplectrona*, the anterolateral (= intermediate) warts are sharply divided into two warts (see Figs 146–150), the anterior one of the pair generally is slightly wider than the posterior one, and the head sutures are all strongly pronounced.

In diagnosing *Diemeniluma,* Neboiss (2003) also used a head feature, distinguishing the genus on the basis of absence of the single anteromesal wart on the vertex of the head. However, a small round setose wart is present on the head (Figs 18, 19). In fact the arrangement of the head warts in *Diemeniluma* resembles closely that of *Diplectrona felix*, and also that illustrated by Ross (1970, fig. 4B) in describing males of *D. metaqui* Ross 1970, from North America; thus it appears that based on this feature, the two species of *Diemeniluma* probably are more appropriately grouped with some of the Australian species here assigned to *Diplectrona*.

A feature of the abdomen of both male and female Diplectroninae is presence of a lateral filament on each side of sternite V. Variation can be seen in the length of the filaments (Figs 30, 31, 83)—particularly long in the type, *D. felix,* and very short in species assigned here to *Arcyphysa* **gen. nov.**; the length appears to be more or less species specific, but physiological state possibly could affect it. These filaments are connected to a glandular structure (Djaernes 2011; Fig. 31). In addition, in cleared male specimens, two pairs of reticulate-walled sacs (presumably glands) are seen within the abdominal segments VI and VII (e.g., Figs 29, 82, 183–187), varying in size and shape and sometimes extending the length of 1.5 to 2 segments; each sac has a duct at the anterolateral margin of the segment, suggesting that these structures are also glandular. Since they occur in males only, it is likely that they have a pheromone-producing function. Insufficient male abdomens have been cleared to be able to determine if the variations in size have any species or generic specificity. The Australian genus *Smicrophylax* Neboiss 1977, also has both sets of these glandular structures, and, although presently assigned to Hydropsychinae, this genus may be more appropriately grouped in Diplectroninae (*contra* Schefter 1996, who assigned the genus to a new subfamily, Smicrideinae, together with *Smicridia* McLachlan and *Asmicridea* Mosely). However, ongoing barcoding work suggests closer relationships between Australian '*Diplectrona*'+*Austropsyche* and *Asmicridea*+*Smicrophylax* (StClair *et al*., pers. com. 2016).

Genitalic characters feature in Schmid's (1980, 1996) diagnosis of *Diplectrona*: "♂ genitalia . . . segment IX without any well-defined apicolateral angle. Segment X barely distinct from segment IX and forming 2 out and 2 inner lobes. Inferior appendages with very long basal segment. Phallic apparatus fairly evenly thick, ending in 2 endothecal papillae. ♀ genitalia . . . sternites VIII completely cleft ventrally, forming 2 separate valves. Segment X without any lateral cavity, extending far down on sides and forming stout sclerotised rib that slants upward over vulvar scale. Ceiling of anovaginal cavity and vaginal tract simple."

Interpreting homologies among genitalic structures can be difficult. Nevertheless, on the basis of male genitalic features, Neboiss, in his preparatory work (ca. 2002), proposed a number of separate groups of species, tentatively genera. In males of most Australian species, abdominal tergite IX appears to be fused at least partially with tergite X (= dorsal plate or 'superior plate' of some authors). A number of species have processes that clearly arise from the lateral margins of tergite X. Banks (1939) in his description of *D. angusta* stated that '… male genitalia have a superior plate with a slender lateral process each side …' and in what is indicated in a footnote to be the description of *D. rossi* Kimmins, Kimmins (in Mosely & Kimmins 1953) described similar lateral processes on the dorsal plate. In this current study these processes are termed 'apicolateral processes of tergite X' if clearly arising from tergite X, or of 'tergites IX/X' (in situations where no clear distinction is discerned between tergites IX and X), or if associations not discerned, just 'lateral lobes'. At least some of these lateral processes are probably homologous with the broader structures illustrated by Mey (1997) in some of Banks' types of *Diplectrona* species from the Philippines and in two of Ulmer's species from Java illustrated by Malicky (1998). However, in many species in the new genus *Arcyphysa*, their relationships are uncertain.

Several of the Australian diplectronine species, in addition to lateral lobes on tergite X, have other processes that are here interpreted as developments of the apicolateral angles of sternite IX (for example, *D. hystricosa* Neboiss 1979, 832–833). In addition, some of these species have a small, sharp, curved spine mesolaterally, clearly on the distal (= apical) margin of segment IX.

A feature shared by all species currently assigned to *Austropsyche* is the mesal process on the coxopodite of each gonopod; this is interpreted here as an autapomorphy.

Females of Diplectroninae are generally slightly larger than the males, share the head, wing, and limb features of the associated males, and their genitalia are generally conservative. Variation can be seen in the shape of the pair of plates representing sternite VIII, especially of the apicolateral angle; these plates cover the small lateral clasper receptacles on segment X. Relative sizes of the cerci and two pairs of terminal protuberances on abdominal segment X vary.

While there are difficulties in diagnosing genera of Australian Diplectroninae based on adult features, larval features may eventually be found to be more informative, at least at genus level. For example, the genus *Austropsyche* appears to be distinguished clearly from other Australian 'Diplectroninae' by a strongly constricted transverse sulcus on the pronotum (Dean *et al*. 2004). This feature is seen also in the larvae of the North American '*Homopletra* sp.' and '*Homoplectra* prob. *doringa*' as illustrated by Wiggins (1996); however, adults of *Homoplectra* differ significantly from those of *Austropsyche* (see Weaver 1985 for generic diagnosis of *Homoplectra* Ross 1938).

When Dean's (1999) key to larval Hydropsychidae was published, the only Queensland diplectronines recognised from adults were 4 *Diplectrona* species; yet among larvae in collections Dean recognised 2 northern Queensland types (*Diplectrona* sp.AV7 and sp.AV8) and 4 others found in south-eastern Queensland (*Diplectrona* sp.AV1, sp.AV3, sp.AV10 and sp.AV11). In the present study among adult diplectronines from north-eastern Queensland, 6 *Diplectrona* species, 1 *Austropsyche* species, and 10 species referred to the new genus *Arcyphysa* are recognised; and, from south-eastern Queensland, 2 *Diplectrona* species, 1 *Austropsyche* species, and 7 species in *Arcyphysa* **gen. nov.** Far more work on larvae is needed.

Dean (1999) listed a single larval *Diplectrona* from south-western Western Australia. However, among the very large collection of adult Trichoptera in Museum Victoria, no diplectronines have been identified from very far west of the Great Dividing Range of eastern Australia.

Material and methods

Specimens were prepared for study and stored following the methods of Neboiss (1982). Dissected specimens are identified with Neboiss' Museum Victoria standard 'PT-numbers'. These and other preparation numbers are shown below in square brackets [ ]. The final plates were prepared by AW, mostly from Neboiss' draft figures, using the Adobe software programme Illustrator®. Sets of supporting images 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. Unless otherwise indicated, specimens are in the collection of Museum Victoria, Melbourne, Australia (NMV). For other collections, the Australian Museum, Sydney, Australia is abbreviated as AM; the Australian National Insect Collection, CSIRO, Canberra, Australia as ANIC; the Natural History Museum, London, United Kingdom as BMNH; Institut Royal des Sciences Naturalles de Belgique, Brussels, Belgium as IRSNB; the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA as MCZ; the United States National Museum of Natural History, Smithsonian Institution, Washington, DC, USA as NMNH; and the Queensland Museum as QM.

Most of the names applied to the new species are taken from Arturs Neboiss' notes. Save for those names taken from the type localities or derived from the collectors' names, derivations were not given, and can only be surmised. The new generic name is one of the three names suggested in Neboiss' notes for the 'groups'.

Taxonomy

Subfamily Diplectroninae Ulmer

Diplectroninae Ulmer 1951: 173, 175, 303.

When first established, three genera were included in the subfamily: *Diplectrona*, *Diplectronella* Ulmer 1928, and *Sciops* McLachlan 1866. Ulmer (1951, 174) also suggested that a further five genera, including *Austropsyche* probably belong in the subfamily; subsequently *Austropsyche* was referred to Diplectroninae. More recently, several diplectronine genera have been synonymised with *Diplectrona*: *Diplectronella* by Flint (2001) and *Sciops* (as well as another genus, *Diplex* Mosely 1951) by Malicky (2002); and further genera have been assigned to the subfamily: *Homoplectra* Ross 1938, *Oropsyche* Ross 1941, *Sciadorus* Barnard 1934 (see Morse 2017), and *Diemeniluma* Neboiss 2003. Since recent molecular analyses suggest that Diplectroninae genera are paraphyletic (Geraci *et al*. 2005; Stocks 2011), the diagnosis given here, based on only morphological features, must be regarded as tentative. It is adequate currently for Australian taxa and, as noted above, could also include the genus *Smicrophylax* which, *contra* Neboiss (1977), also has an anteromesal wart on the head.

Diagnosis (modified after Ulmer 1951, 167). Distinguished from other Hydropsychidae subfamilies by sternite V with a pair of filaments apicolaterally; male abdomen with two pairs of reticulate-walled, internal glandular structures; hind wings large, rounded, with Sc and R_1 more or less bowed distally; and antennae appearing to be crenate, due to median sutures and/or tufts of setae on some segments (Figs 25, 26, 80, 152).

Description (modified after Nimmo 1987). Medium to large. Wings generally large; wide basally, rounded or angular distally. Antennae equal in length to forewings, or slightly longer. Cephalic warts less prominent than in Macronematinae; posterior pair large, oval; anterolateral pair often divided; anteromesal [interantennal] wart small, round. Thorax large, robust. Male foreleg tarsal claws normal, equal, not overhung by setal tufts. Tarsi of middle leg of female rarely expanded, may be flattened (*Smicrophylax*). Spur formula 2,4,4. Forewing Sc and R1 complete, unfused, or joined distally; often robust; discoidal and median cells small, subequal, closed; forks fI–fV present; fI, fIII, and fV petiolate; thyridial cell closed, in contact with median. Hind wing often widened at midpoint; Sc and R1 distinct throughout; discoidal cell closed, elongate; fII, fIII, and fV present; median cell open.

Male. Genitalia: tergum X roof-like dorsal of aedeagus; fused entirely or partially with segment IX; with or without wart-like preanal appendages, with or without lateral processes. Sternite IX with or without processes at apicolateral angles. Aedeagus simple or complex, curved, basally expanded, with or without spines or spicules. Gonopods (claspers or inferior appendages) long, each of 2 articles, basal coxopodite, distal harpago, harpago usually shorter than coxopodite, sometimes bilobed.

Female. Terminal abdomen bluntly rounded; segment X with or without clasper receptacles, if present, not prominent; cerci prominent between two pairs of tubercles (papillae, protuberances).

Remarks. Australia has a number of species that accord with the above definition of Diplectroninae. The problems arise in deciding identity and limitations of genera that occur in Australia. The species of *Austropsyche* form a recognisable set, defined by the autapomorphic mesal process on the coxopodite of each male gonopod, and the form of the dorsal setal warts on the head. *Smicrophylax* can be defined by the fused harpago and coxopodite on each male gonopod; this genus is not dealt with here. Another set can be separated on the basis of the anterolateral warts on the head being divided to form two almost equal, laterally elongate warts separated by well-pronounced sutures; these species also share the characteristic of having one or two lateral lobes on the distal margin of abdominal segments IX/X. They are assigned here to a new genus, *Arcyphysa* **gen. nov.** Of the remainder, as noted above, *Diemeniluma* is not separable from members of another set, currently referred to *Diplectrona*. The phallic apparatus of most Australian species of *Diplectrona* bear spines or spicules of some form.

An enigmatic species from north-eastern Australia (two specimens are available, one each in NMV and ANIC) conforms to diplectronine genera in having two pairs of reticulate-walled sacs in the abdomen and paired filaments laterally on abdominal segment 5. However, unlike all other Australian diplectronines, this species has the hind wing quite narrow, the wing shape and venation resembling that of *Cheumatopsyche modica*, with the forewing vein A1 parallel to the wing margin, and the hind wing lacking fork 1 and the median cell; the head warts resemble those of *Diplectrona*. This species is not dealt with here.

For most species reviewed here, few specimens are available in collections, which suggests that they may be rare; few Australian diplectronine species have been collected in large numbers at any time. An exception is *Austropsyche acuta* **sp. nov**., adults of which were abundant at lights set beside a small permanent stream in north-eastern New South Wales in December 2006 and 2017. Some of the other hydropsychids are often abundant, for example, *Cheumatopsyche* species in parts of Australia.

Key to adult males of Diplectroninae genera in Australia

1.	Forewing fork 2 footstalk present	*Smicrophylax* Neboiss*
-.	Forewing fork 2 sessile or stalk very short (e.g., Figs 1, 23, 24, 49, 77, 102)	2
2(1)	In genitalia, coxopodite of each gonopod with mesal process (e.g., Figs 53, 59, 68)	*Austropsyche* Banks
-.	In genitalia, coxopodites of gonopods without mesal processes (e.g., Figs 3, 45, 104, 113)	3
3(2)	Dorsal head with paired anterolateral warts never more than partially and indistinctly divided (Figs 17–21); abdominal segments IX and X partially or fully fused and with or without pair of simple lateral processes; phallus with or without sclerotised spines or numerous fine spicules distally (e.g., Figs 3, 42), without parameres	*Diplectrona* Westwood
-.	Dorsal head with paired anterolateral warts clearly divided by distinct suture (Figs 146–150); abdominal segments IX/X usually with lateral processes, often 2 pairs and sometimes very elaborate; phallus without spicules or sclerotised spines (e.g., Figs 106, 136), with or without basal parameres (e.g., Figs 106, 121, 123, 160)	*Arcyphysa* **gen. nov.**

*Genus not dealt with further here; refer to Neboiss (1977, 1986).

Diplectrona Westwood

(Figs 1–48)

Diplectrona Westwood 1839, 49. Type species, *Diplectrona felix* McLachlan 1878, under Plenary Powers, ICZN Decision 758 [1966]. [See Fischer (1963a, 1972) and Morse (2017) for full taxonomic literature on *Diplectrona* and its included species.]

Diemeniluma Neboiss 2003, 71. Type species, *Diplectrona tasmanica* Jacquemart 1965, by original designation. **New synonym**.

Diagnosis. In the Australian hydropsychid fauna, *Diplectrona* resembles *Austropsyche* and *Arcyphysa* **gen. nov.** in having fork 2 in both wings usually sessile, and in the hind wing Sc and R distally curved towards the costal margin, but is distinguished from *Arcyphysa* in having on the dorsal head the anterolateral setal warts undivided or incompletely divided; and from *Austropsyche* in having the anterolateral warts at most with an incomplete, indistinct, median suture, not fragmented posteriorly; and coxopodites of male gonopods simple, without mesal processes.

Description. Medium-sized caddisflies. Head (Figs 17–21) dorsally with 5 setal warts, anterolateral warts wider than long, undivided or incompletely and indistinctly divided, crowded by pair of large posterior warts. Maxillary palpi (Figs 2, 27–28) with segments 2 and 3 equal length, 4 slightly shorter, segment 5 exceeding length of 2+3+4. Antennae with at least distal segments bearing sutures and tufts of setae, giving crenate appearance (Figs

25–26). Midtibiae and tarsi not dilated. In both pairs of wings fork 2 sessile (Figs 1, 22, 24) or very short (Fig. 23); forewings each with vein A_{1+2+3} curved, cell *ac* lanceolate to subtriangular; hind wings each with Sc and R with pronounced posterior curvature distally before wing margin. Abdomen with pair of filaments laterally on segment V (Figs 30–31), length variable; in male reticulate-walled internal sacs (Fig. 29) spherical to elongate-ovoid. Male genitalia (Figs 3–12, 14–16, 32–43, 45–46) with midapicolateral margin of segment IX often extended into paired distinct triangular lobes ('phallic guides' or 'clasper guides' of Ross & Morse, unpublished MS); phallus with or without spines or spicules distally. Female terminal abdomen (Figs 13, 44, 47–48) with sternite VIII comprising two sclerites, usually separated ventromesally, produced apicolaterally, apical tubercles on segment X small.

Remarks. Continued separation of *Diemeniluma* from *Diplectrona* is unsupported. *Diemeniluma* was erected on the basis of rather weak features. The key characteristic of absence of anteromesal wart on the vertex of the head was erroneous as there is a small round wart between the two large, undivided anterolateral warts (Figs 18, 19)—the arrangement of head warts in *Diemeniluma* closely resembles that seen in a specimen of the type species, *Diplectrona felix* (Fig. 17). The female characteristics of *Diemeniluma* as given by Neboiss (2003)—abdominal 'sternite VIII entire, not divided ventromesally; segment IX without lateral scleritic cavity, sternite three-lobed'—have not been confirmed in the genitalic preparation of the female identified, as that of *D. tasmanica* cannot be located in the NMV collection. However, a single female in ANIC, tentatively associated with a male of *D. tasmanica*, does show at least some slight midventral separation of sternite VIII (Fig. 44); the female is not known for the second species, *D. serrula* (Neboiss 2003). The nature of the triangular midapicolateral structures on segment IX of male *D. inermis* (Banks 1939), and *D. spinata* (Banks 1939) (the 'phallic guides') becomes apparent when *D. tasmanica* is viewed laterally. With greater or lesser fusion of segments IX and X these become more closely associated with tergite X as in *D. tasmanica* (compare Figs 3, 5 and 42, 43).

Key to adult males of *Diplectrona* Neboiss

1 Distal portion of phallic apparatus heavily sclerotised, ventrally presenting smoothly rounded shiny dark surface (grey area in Fig. 14; Fig. 45), produced apicodorsally into pair of spines (Figs 14–15, 46) .... *Diplectrona willandi* **sp. nov**.

-. Distal portion of phallic apparatus membranous, with or without discrete sclerotised spines and/or spicules distally (e.g., Figs 3, 6, 42) 2

2(1) Coxopodites of gonopods each at least 4x length of its harpago (Figs 32–33, 42–43, Neboiss 2003: fig. 22D) 3

-. Coxopodites of gonopods not more than 3x as long as harpagones 5

3(2) Phallic apparatus bearing complex of sclerotised rods and spines (Figs 32, 34) .... *Diplectrona castanea* Kimmins

-. Phallic apparatus without complex of sclerotised rods and spines, bearing clusters of spicules distally 4

4(3) Lobes laterally on abdominal tergites IX/X not reaching apex of tergite X (Neboiss 2003, fig. 23A)...................... .... *Diplectrona serrula* (Neboiss)

-. Lobes laterally on abdominal tergites IX/X projecting beyond apex of tergite X (Fig. 43; Neboiss 2003, fig. 22D) .... *Diplectrona tasmanica* Jacquemart

5(2) In ventral view one pair of prominent, sclerotised phallic spines dorsolaterally, small stout spines at their bases, in lateral view longer spines strongly curved dorsad .... *Diplectrona spinata* (Banks)*

-. In ventral view one small median spine and 2 pairs subequal sclerotised spines, usually directed laterad .... *Diplectrona inermis* (Banks)

*In this work, *Sciops spinata* Banks 1939 and *Diplectrona cognata* Kimmins 1953 are synonymised.

Diplectrona castanea Kimmins

(Figs 22, 27, 32–34)

Diplectrona castanea Kimmins 1953, 342.
Diplectrona lyella Neboiss 1977, 72; Neboiss 2003, 70 (synonym).

Material examined. Holotype *D. castanea*, ♂, Tasmania, National Park, 3000 ft, 26.xii.1936 (BMNH); holotype (*D. lyelli*) ♂, Tasmania, King River, 5.xi.1961, N. Dobrotworsky (NMV); paratype, 1♂, Hellyer River Gorge, 2.xii.1972, P. Zwick.

Other material: Tasmania: 1♂ 1♀, Arrowsmith Creek, 18 km SW of Derwent Bridge, 9.xii.1974, A. Neboiss [PT-1068; TRI-15009]; 1♀, Bull Creek, Cradle Mtn Road, 13.xii.1974, A. Neboiss [PT-2192; TRI-15006]; 1♂, Trib. of Darwin River, West Coast, 31.x.1976, P. Allbrook [TRI-15010, image]; 1♂, Mt Barrow, 11 km EbyN Nunamara, 41°23'S 147°25'E, 7.ii.1983, J.C. Cardale [PT-2238; TRI-15008]; 1♂, Little Florentine River, upstream of Gordon Road, 2.xii.1998, J. Jackson [PT-2135; TRI-15007]; 1♂, Nelson River, base of Nelson Falls, 3.xi.1998, J. Jackson [PT-2191; TRI-15004].

Diagnosis. *Diplectrona castanea* groups with *D. spinata* and *D. inermis* having in the male genitalia endothecal spines on the phallic apparatus, and in lateral view a spur-like apicomedial projection on the margin of abdominal segment IX. However, *D. castanea* is clearly distinguished by the very spiny, well-sclerotised complex of spines (Figs 32, 34) rather than discrete sharp spines as in the other two species, and by the harpagones of the gonopods short, less than 0.25x length of their coxopodites, and strongly hooked rather than smoothly conical as in *D. spinata* or *D. inermis*.

Description. See Neboiss (2003, 70).

Remarks. The 'diagnosis' given by Neboiss (2003) is rather more of a 'description', being quite comprehensive.

Distribution. Known only from Tasmania, from the SE, NE, SW, and NW provinces.

Diplectrona inermis (Banks)

(Figs 1–9, 13, 20, 26, 29, 31, 35–37)

Sciops inermis Banks 1939, 494.
Diplectrona inermis; Neboiss 1986, 218.

Material examined. Holotype ♂, *Diplectrona inermis*, New South Wales, Wentworth Falls, Blue Mtns, 3.i.1932 (ANIC, ex MCZ 220889); paratype ♂, data as for holotype [MCZ 22089]. Queensland: 1♂ 2♀, Branch Creek, Brisbane Riv. Catchment, 26°52'S 152°41'E, 15.xii.1992. New South Wales: 6♂ 1♀, NSW, Katoomba Falls and stream, 6.i.1955, T.E.W. [TRI-39840]; 1♂ 1♀, Cascades, Katoomba, 12.ii.1961, C.N. & A.S. Smithers; 2♂ 1♀, Minnamurra Falls, W of Kiama, 25.iii.1973, A. Neboiss; 1♂, Wentworth Falls, 23.xii.1977, A. Neboiss [TRI-39414]; 8♂ 1♀, Leura, 'Bridle Vale', 27.xii.1978, A. Wells [PT-1092, PT-1032, PT-1057 ♀; TRI-39418, TRI-39411, TRI-39397]; 1♂ [TRI-39864], Ebor Falls, 12.xi.1983, G. Theischinger; 1♂, Leura, Lyre Bird Dell, 12.xii.1984, A. Wells [TRI-39425]; 18♂ 2♀, Blue Mtns, Leura Cascades, 12.xii.1984, A. Wells [TRI-39431, TRI-39421]; 3♂ 1♀, Leura, below Falls, 13.xii.1984, A. Wells [TRI-39430]; 1♂, Royal Nat Pk 2.x.1985, A. Neboiss [TRI-39937]; 1♂, Barrington Tops, Upper Williams R., 26.01[i].1987, 550 m, D.J. Bickel; 1♂, NSW, Chichester State Forest, Jerusalem Creek, 26.xii.2000, A. Wells (ANIC). Victoria: 2♂, Wilson's Promontory, Waterloo Bay, 25.i.1958, N. Dobrotworsky [PT-1011]; 1♂, Tarra Valley Nat Park, 8.xii.1984, A. Neboiss.

Diagnosis. Distinguished from *D. tasmanica, D. serrula*, and *D. castanea* by the longer harpagones on the coxopodites of the gonopods, and the presence of discrete sclerotised spines on the phallic apparatus, and from the closely similar *D. spinata* by having 2 pairs of spines subequal and laterally directed in contrast to *D. spinata* which has a single pair of prominent, dorsally curved spines with short spines at their bases.

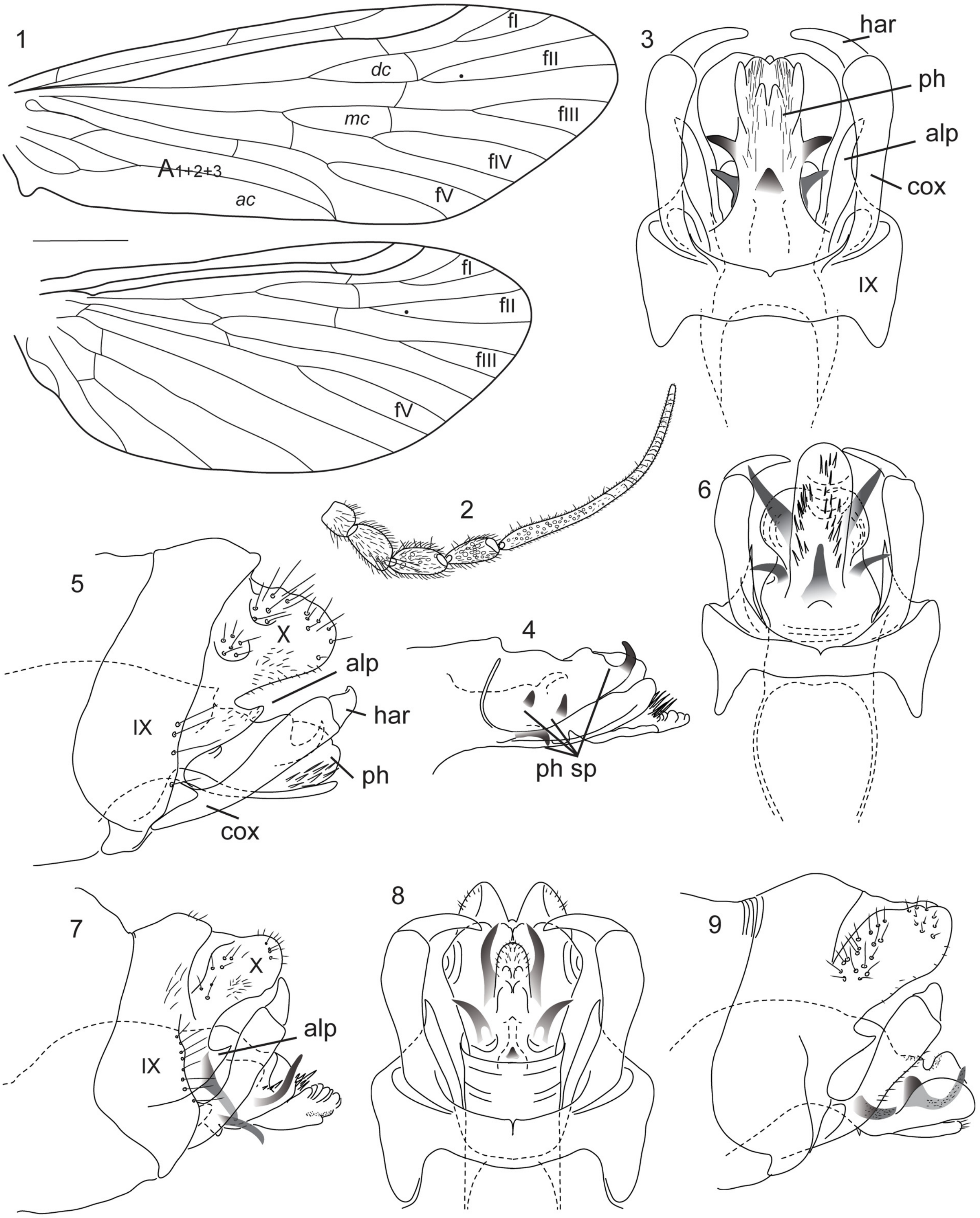
Description (revised). Length of each forewing: ♂, 6.0–7.0 mm (n = 10), ♀, 6.8–8.0 mm (n = 5).

Male. Abdominal reticulate-walled internal sacs about 1.0 to 1.5x segment length (Fig. 29); lateral filaments on sternite V almost length of segment (Fig. 31).

Genitalia (Figs 3–9, 35–37): Abdominal segment IX not deeply concave laterally, dorsally fused partially with tergite X; midlateral margin projecting posterodorsad in triangular process, in lateral view appearing as triangular 'phallic guide'; tergite X well developed, rounded apically, in dorsal view shallowly cleft apicomedially; gonopods slender, elongate, each with coxopodite swollen towards apex, length about 4x maximum width, harpago almost 1/3 length of coxopodite, simple, curved mesad, tapered toward apex; phallic apparatus stout, 2 pairs of discrete sclerotised spines laterally, single spine midventrally.

Female. Abdominal sternite VIII in form of pair of subquadrate ventral plates, mesodistal angles broadly rounded, apicolateral angles produced slightly, rounded (Fig. 13); segment IX basally with transverse opening to sclerotic cavity; on segment X cerci and apical papillae short compared to those of *Austropsyche* species.

Distribution. Found from central Victoria through eastern New South Wales to south-eastern Queensland.



FIGURES 1–9. *Diplectrona* Westwood 1839, diagnostic features. **1–5**, *D. inermis* (Banks 1939; (NSW, Leura, 'Bridle Vale' [PT-1032]), ♂: **1**, right fore- and hind wings, dorsal; **2**, maxillary palp; **3**, genitalia, ventral; **4**, apex of phallic apparatus, left lateral; **5**, genitalia, left lateral. **6–7**, *D. inermis* (NSW, Minnamurra Falls, W of Kiama [PT-1035]), ♂ genitalia: **6**, ventral; **7**, left lateral. **8–9**, *D. inermis* (Vic., Wilson's Promontory, Waterloo Bay [PT-1011]), ♂ genitalia: **8**, ventral; **9**, left lateral. Scale bar = 1 mm. Abbreviations: *ac* = anal cell; alp = apicolateral process; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; cox = coxopodite; fI, fII, fIII, fIV, fV = forks I–V; *mc* = median cell; har = harpago; ph = phallic apparatus; ph sp = spines of phallic apparatus; IX, X = abdominal segments IX, X.

Remarks. The two Banks' species, *D. inermis* and *D. spinata*, were described from intact dried specimens, the result being that the original illustrations are very deficient. In redescribing Banks' types for Philippines' species of Hydropsychinae and Diplectroninae, Mey (1997) commented that they are '… mostly … crude figures of wing venation and genitalic appendages of dry specimens'. Ross and Morse (unpublished MS, from correspondence between Morse and Ross dated in 1975), macerated Banks' Australian Trichoptera types (including *Sciops spinata* and *S. inermis*) and prepared new diagnoses (effectively descriptions) and illustrations. Once macerated, it was evident that males of both species have phallic spines (recognised by Ross and Morse as endothecal spines), the major distinguishing features being the size and arrangement in each species. In describing *D. cognata*, Kimmins (1953) commented that it may be *D. inermis*, but that Banks (1939) had not mentioned the spines. Here, however, *D. cognata* is synonymised with *D. spinata*, although, perhaps puzzlingly, the holotypes of *D. inermis* and *D. cognata* are both from the same locality.

In many of the available specimens of *D. inermis* and *D. spinata*, the phallic spines vary in length and extent of curvature and often are not clearly visible, which makes separation of the two species difficult. Mosely & Kimmins (1953) distinguished *Diplectrona spinata* and *D. inermis* by the length of the discoidal cell in each forewing, but this characteristic was not confirmed in this study (compare Figs 1 and 23). *Diplectrona inermis* appears to display considerable variability across its range.

Diplectrona serrula (Neboiss), New combination.

Diemeniluma serrula Neboiss 2003, 72, figs 23A–23E.

Material examined. Holotype ♂, M, Tasmania, Hartz Mountains, Jan. 1977, J. Sedlacek (NMV); paratype, 1♂, data as for holotype (NMV [PT-634]).

Diagnosis. Males distinguished from those of mainland Australian species by having only clusters of spicules distally on the phallus, not distinct chitinous spines, and from the closely similar *D. tasmanica* by males having the lateral lobes on segment IX/X shorter than the tip of the abdomen; otherwise *D. serrula* closely resembles *D. tasmanica*.

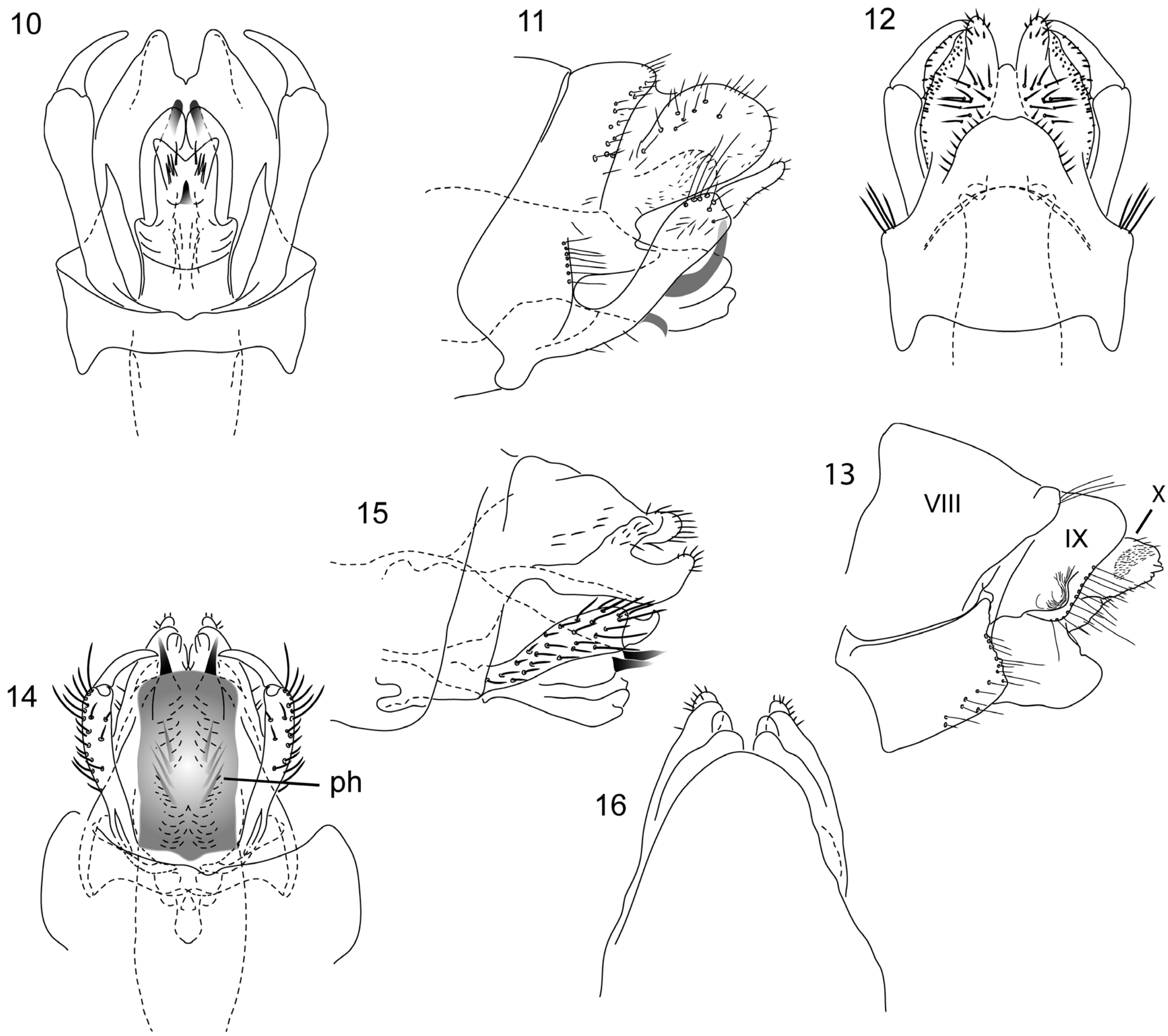
Description (see Neboiss 2003).

Distribution. Known only from the Hartz Mountains, SW Tasmania.

Diplectrona spinata (Banks)
(Figs 10–12, 21, 23, 28, 38–41, 47–48)

Sciops spinata Banks 1939, 493–494, pl. 3 fig. 31.
Diplectrona spinata; Neboiss 1986, 218.
Diplectrona bourina Mosely, in Mosely & Kimmins 1953, 345, fig. 239; Neboiss 1986, 218 (synonym).
Diplectrona cognata Kimmins, in Mosely & Kimmins 1953, 347, fig. 240. **New synonym**.

Material examined. Holotype *Sciops spinata* Banks ♂, Queensland, National Park, McPherson Range, 13.iii.1932, 3–4000 ft (ANIC ex MCZ 22088); holotype *Diplectrona bourina* Mosely ♂, SE Queensland, Tamborine Mtns, 11–18.iv.1935, R.E. Turner (BMNH); holotype ♂, *Diplectrona cognata*, New South Wales, Wentworth Falls, 24.xi.1916, R.J. Tillyard (BMNH); 1♂, Barrington Tops, Upper William River [PT-1835]. Queensland: 1♂, Springbrook, 11.iv.1955 [TRI-39496]; 1♂ 5♀, Springbrook, 31.x.1965, J. Kerr [PT-1034 ♂, PT-1059 ♀]; 1♂, Queen Mary Falls, Killarney, 12.x.1973, A. Neboiss [PT-1033]; 2♂, Conondale Range, Bundaroo Creek, rainforest [TRI-39867, TRI-39868], 1.xii.1983, G. Cassis & D. Bickel. New South Wales: 2♂, Waterfall Royal National Park, 2.x.1985, A. Neboiss [TRI-1403, TRI-39987]. Victoria: 1♂, Snobs Creek Falls, 24.i.1956, A. Neboiss [PT-1098]; 2♂, Porepunkah, 27.i.1957, A. Neboiss; 2♂, Sassafras Gap nr Carmody's, 4,600 ft, 30.i.1957, A. Neboiss; 1♂, McKay Creek, Sassafras Gap, 2.ii.1974, A. Neboiss; 7♂ 1♀, Agnes Falls, Agnes River, Toora, 2.xi.1977, A. Neboiss [PT-1094, PT-1054, PT-1055]; 4♂, Eurobin Falls, Mt Buffalo Road, 3.xii.1982, A. Neboiss; 2♂, White Bridge, Mt Buller Rd, 13.i.2016, D. Cartwright.



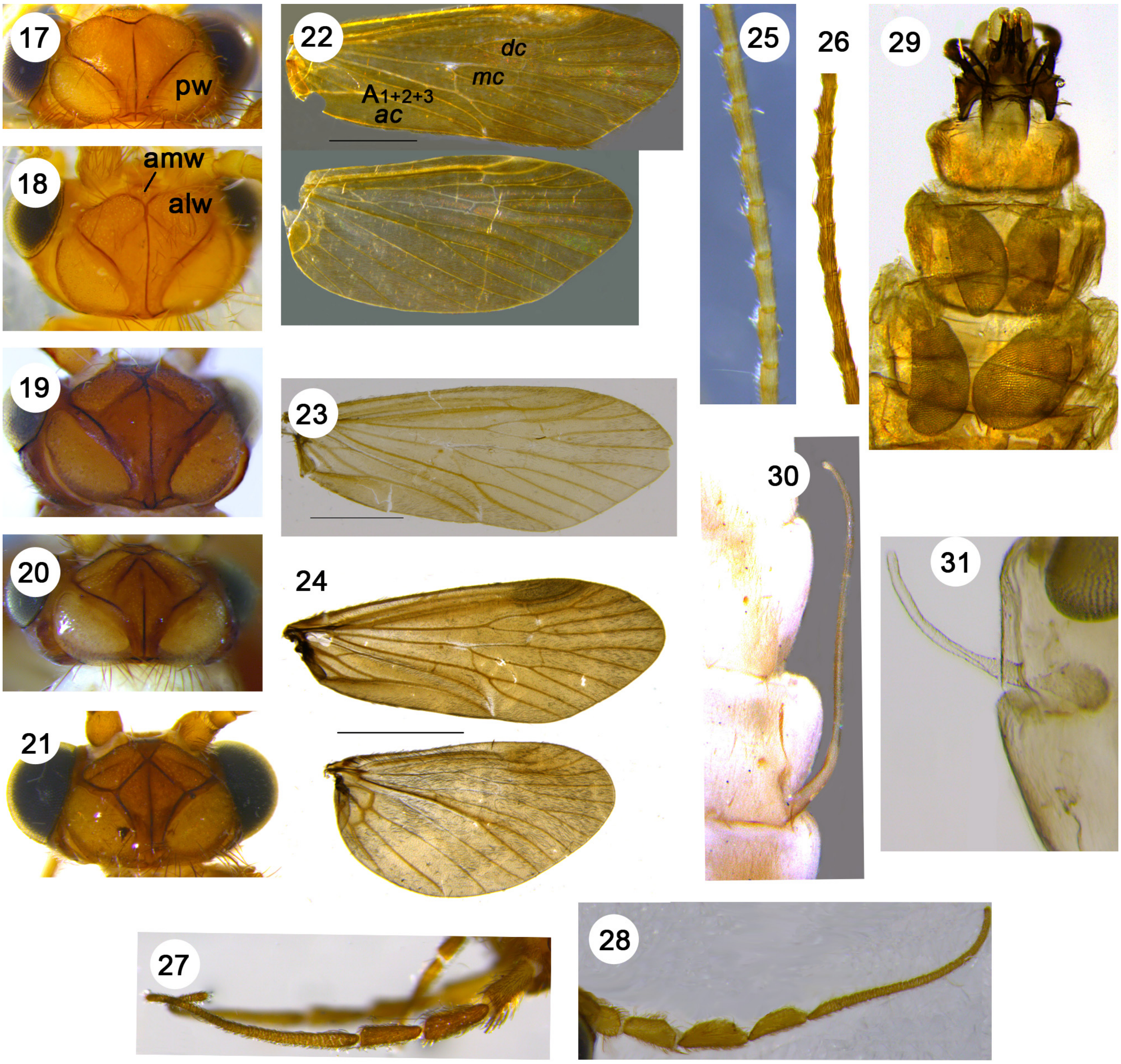
FIGURES 10–16. *Diplectrona* Westwood 1839, diagnostic features. **10–12**, *D. spinata* (Banks 1939; holotype), ♂ genitalia: **10**, ventral; **11**, left lateral; **12**, dorsal. **13**, *D. inermis* (NSW, Leura, 'Bridle Vale' [PT-1057]), ♀ terminal abdominal segments, left lateral. **14–16**, *D. willandi* **sp. nov**. (holotype), ♂ genitalia: **14**, ventral; **15**, left lateral; **16**, dorsal. Abbreviations: ph = phallic apparatus; VIII, IX, X = abdominal segments VIII, IX, X.

Diagnosis. *Diplectrona spinata* most closely resembles the New South Wales/Victorian *D. inermis* in most features of male genitalia, including spines and spicules distally on the phallic apparatus, but is distinguished from that species by having 2 very prominent dorsally curved phallic spines, in ventral view always parallel to the length of the phallic apparatus, and 2 smaller spines near the base, rather than the laterally directed spines seen in *D. inermis*.

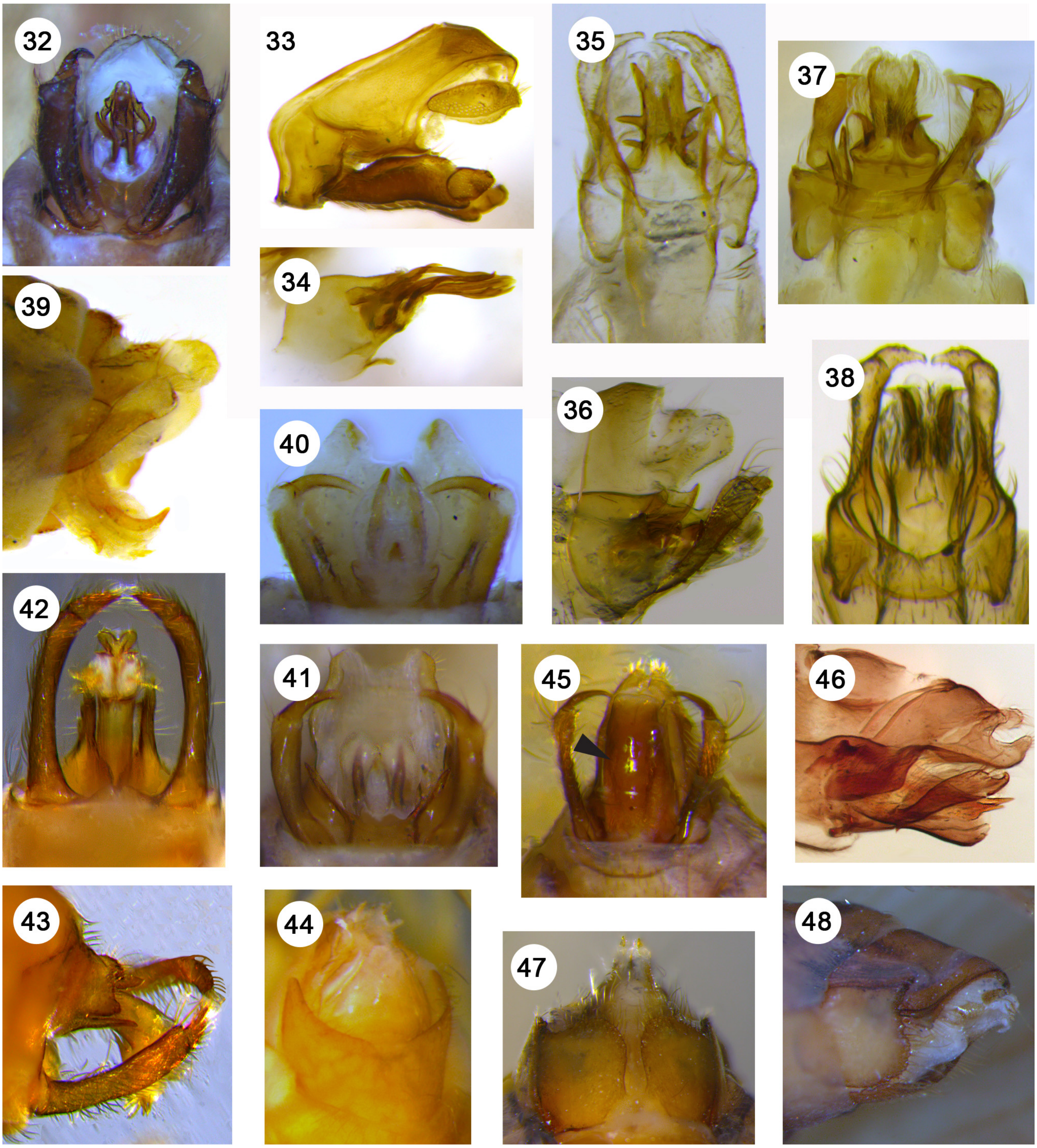
Description (revised). Length of each forewing: ♂ 5.6–8.4 mm (n = 12), ♀ 7.7–10.8 mm (n = 5).

Male. Abdominal reticulate-walled internal sacs about 0.5 to 1.5x segment length; lateral filaments on sternite V short, about 0.5x length of segment.

Genitalia (Figs 10–12, 38–41): Abdominal segment IX not deeply concave laterally, dorsally fused partially with tergite X, midlateral margin projecting posterodorsad in triangular process, in lateral view appearing as triangular 'phallic guide'; tergite X well developed, rounded apically, in dorsal view cleft apicomedially; gonopods slender, elongate, each with coxopodite swollen towards apex, length about 5x maximum width, harpago about 1/3 length of coxopodite, simple, curved mesad, tapered toward apex; phallic apparatus stout, one pair of prominent dorsolateral sclerotised spines, 2 short spines basal to larger pair, one small, short spine medially (See Fig. 40).



FIGURES 17–31. *Diplectrona* Westwood 1839 spp., diagnostic features. **17–21**, heads, dorsal: **17**, *D. felix* McLachlan 1878 (France, Pyrenees), ♂; **18–19**, *D. tasmanica* Jacquemart 1965 (Pine River, Cradle Mountain Road, Tas.): **18**, ♂, and **19**, ♀; **20**, *D. inermis* (Banks 1939; NSW, Leura, 'Bridle Vale'), ♂; **21**, *D. spinata* (Banks 1939; Qld, Springbrook), ♂. **22–24**, ♂ right wings, dorsal: **22**, *D. castanea* (Kimmins 1953; Tas., Nelson River at base of Nelson Falls [TRI-15004]), right fore- and hind wings, dorsal; **23**, *D. spinata* (Qld, Branch Creek, Brisbane Riv. Catchment [TRI-30501]), right forewing, dorsal; **24**, *D. willandi* **sp. nov.** (holotype), right fore- and hind wings, dorsal. **25–26**, sections of ♂ antennae: **25**, *D. felix*; **26**, *D. inermis*. **27–28**, ♂ maxillary palps: **27**, *D. castanea*; **28**, *D. spinata*. **29**, *D. inermis*, ♂ reticulate-walled internal sacs of abdominal segments VI and VII, ventral. **30**, *D. felix*, ♂ right lateral filament on abdominal segment V, ventral. **31**, *D. inermis*, ♂ left lateral filament on abdominal segment V, ventral. Scale bars = 2 mm. Abbreviations: *ac* = anal cell; alw = anterolateral wart; amw = anteromesal wart; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; *mc* = median cell; pw = posterior wart.



FIGURES 32–48. *Diplectrona* Westwood 1839 spp., genitalia diagnostic features. **32**, *D. castanea* (Kimmins 1953), (Tas., Nelson River at base of Nelson Falls [TRI-15004]), ♂, ventral; **33–34**, *D. lyelli* Neboiss 1977 (synonym of *D. castanea*; paratype; Tas., Hellyer River Gorge [PT-1043]), ♂ segments IX and X and gonopods: **33**, left lateral, and **34**, apex of phallic apparatus, left lateral. **35–37**, *D. inermis* (Banks 1939), ♂: **35**, holotype, ventral; **36**, holotype, left lateral; **37**, Vic., Wilson's Promontory, Waterloo Bay [PT-1011], ventral**. 38–41**, *D. spinata* (Banks 1939), ♂: **38**, NSW, Barrington Tops, Upper Williams R. [PT-1835], ventral; **39–40**, Qld, Brisbane [TRI-39514]: **39**, left lateral, and **40**, ventral; **41**, Qld, Springbrook [TRI-39496], ventral. **42–44**, *D. tasmanica* Jacquemart 1965 (Tas., Pine River, Cradle Mountain Road; ANIC): **42–43**, ♂ genitalia: **42**, ventral, and **43**, left lateral; **44**, ♀, terminal abdominal segments, ventral. **45–46**, *D. willandi* **sp. nov**. (Qld, Fishery Falls), ♂: **45**, ventral; **46**, left lateral. **47–48**, *D. spinata* (Qld, Springbrook [TRI-39426]), ♀ terminal abdominal segments: **47**, ventral; **48**, left lateral.

Female. Terminal abdomen (Figs 47–48) with sternite VIII in form of 2 discrete plates, their apicomesal angles broadly rounded, apicolateral angles sharply produced distally.

Distribution. Found in south-eastern Queensland, New South Wales, and Victoria. Improbably, the types of both *D. inermis* and *D. cognata* are from Wentworth Falls in the Blue Mountains of News South Wales, but are certainly distinct.

Remarks. As noted above, distinguishing between *D. spinata* and *D. inermis* is frequently difficult, as the critical features, the form and arrangement of phallic spines, is often difficult to discern without maceration and clearing of specimens. One specimen from the Barrington Tops in NSW [PT-1835] illustrated here (Fig. 38) and assigned tentatively to this species, could represent a separate species. In this specimen the harpagones resemble those of *D. inermis*, but the arrangement of the endothecal spines of the phallic apparatus resembles more closely that of *D. spinata*. Conceivably, it could be a hybrid.

Diplectrona tasmanica **Jacquemart, Revised status.**

(Figs 18–19, 42–44)

Diplectrona tasmanica Jacquemart 1965, 27.
Diemeniluma tasmanica; Neboiss 2003, 71, figs 22A–22G, changed combination.

Material examined. Holotype ♂, Tasmania, Cradle Mountain, 12.i.1923, A. Tonnoir (IRSNB). Tasmania: 1♂, ?1♀, Pencil Pine River, Cradle Mtn Rd, 19.i.1976, A. Wells, (ANIC).; 1♂ 10 km SW of Queenstown, 11.ii.1971, A. Neboiss; 1♂, Lake Tahume, Frenchmans Cap Nat. Pk, 20.i.1988, J. Jackson.

Diagnosis. Closely resembling *Diplectrona serrula*, males of both having numerous fine spicule-like spines apically on the phallus, and digitiform lobes laterally on tergite X, but distinguished from that species by having the midlateral lobes on segment IX extending beyond the tip of tergite X.

Description. (See Neboiss 2003).

Distribution. Found only in Tasmania, in the NW and northern SW provinces.

Remarks. Neboiss (2003) diagnosed females of *Diemeniluma* as having 'sternite VIII entire, not divided ventromesally'; however, since the specimen upon which this was based was not located in the NMV collection, this could not be confirmed. A single female specimen in the ANIC collection is associated tentatively with a male of *D. tasmanica* and appears to have the sternal plates on segment VIII partially fused (Fig. 44), however, the specimen could be teneral.

Diplectrona willandi **sp. nov.**

(Figs 14–16, 24, 45–46)

Material examined. Holotype ♂, N Queensland, Fishery Falls, 17°11'S 145°52'E, 10–11.xi.2007, A. Cairns, A. Wells, W. Cairns (NMV). Paratypes, Queensland: 2♂, collected with holotype.

Diagnosis. Resembling *D. spinata* and *D. inermis*, but lacking discrete spines associated with the phallus; however, it has the endothecal apical angles on the phallic apparatus acute rather than rounded, and sclerotised and spiny in appearance, although visible only in the macerated specimen; in ventral view the phallic apparatus is stout and heavily sclerotised; the lateral margins of tergite X are similarly heavily sclerotised.

Description. Male. Length of each forewing: 5.2–5.5 mm (n = 3); cell *ac* shallow, but not parallel-sided (Fig. 24); hind wings broadly rounded.

Genitalia (Figs 14–16, 45–46): Sternite IX shallowly concave, tergites IX and X partially fused, lateral margins darkly sclerotised; gonopods slender, elongate, length of coxopodite about 7x maximum width, harpago about 0.3x length of coxopodite, strongly curved mesally, a small mesal spur at base; phallic apparatus stout, heavily sclerotised ventrally (indicated by shaded area in Fig. 14), endotheca apical angles acute, sclerotised.

Female. Unknown.

Distribution. Known only from the type locality in a water catchment reserve just south of Tully in the wet tropics of north-eastern Queensland.

Remarks. The head warts of this species differ from those of others in the genus, being wide and shallow.

Austropsyche Banks

(Figs 49–101)

Austropsyche Banks 1939, 496. Type species *Austropsyche victoriana* Banks 1939, by monotypy.

Diagnosis. *Austropsyche* is distinguished from *Diplectrona* and *Arcyphysa* **gen. nov.** mainly by the mesal processes on the coxopodites. As on the head of *Diplectrona*, the anterolateral warts, if divided at all, are divided by only a poorly defined suture; in *Austropsyche* the posterior portion is usually more or less fragmented. The forewings (Figs 49, 50, 76–79) resemble those of *Diplectrona* and *Arcyphysa* in each having cell *ac* lanceolate and hind wings each with Sc and R1 curved towards the leading margin, but only slightly; the median cell length is equal to or about 2/3 that of the discoidal cell. In male genitalia, *Austropsyche*, in common with *Diplectrona*, may have sclerotised spines associated with the phallus; these are absent in *Arcyphysa*.

Description. Head (Figs 70–75) dorsally with 5 setal warts, anterolateral pair often incompletely divided, posterior part fragmented or at least irregular in appearance. Antennae with median suture on segments (Fig. 80). Maxillary palpi (Figs 51, 81) with segment 5 very long, equal to length of rest of palp, segment 3 about twice length of 4, but scarcely longer than 2, segments 2, 3 and 4 flattened, expanded and rounded distally (Fig. 81). Forewing (Figs 49, 50, 76–79) fork 4 equal to 5, A_{1+2+3} curving proximally so cell *ac* is lanceolate, not parallel-sided, discoidal cell length equal to or about 2/3 length of median cell; hind wing median cell open, subcosta and radius running parallel to near middle of discoidal cell where they are connected by short cross-vein, and then separating, radius bending behind, but not so much as in *Diplectrona* so as scarcely to approach discal cell and space not narrowed, costal area rather broader than in allied genera, not narrowed near middle, and with an oblique costal cross-vein before middle. Abdomen with lateral filaments (Fig. 83) on segment V about length of segment or 0.75x length; paired reticulate-walled internal sacs (Fig. 82) within abdominal segments VI and VII generally 1.5–2x length of segments. Male genitalia characterised by mesal process on coxopodite of gonopods (e.g., Figs 52–53, 59–60, 62, 66, 68–69).

Remarks. In their unpublished MS redescribing Banks' types, Ross and Morse (personal communication 1975) commented on the 'unusual extensile slender apical portion' of the phallus of *Austropsyche victoriana*, on how in this respect *Austropsyche* differs from any other Diplectroninae genera. This structure is apparent in some of the museum specimens of *Au. victoriana*, but not in all, and is not seen in any other species in the genus; possibly it depends on state at time of preservation, or method of preservation. On the basis of other character states, two distinct groups are recognised, referred to here as the *Au. victoriana* Group, including *Au. victoriana*, *Au. bifurcata* (Kimmins, in Mosely & Kimmins 1953), and *Au. kaputar* **sp. nov**.; and the *Au. acuta* Group, comprising *Au. acuta* **sp. nov**. and *Au. ambigua* **sp. nov**. Placement of a 6th species, *Au. morana* **sp. nov**., is enigmatic; it appears to combine some male genitalic features of both groups, but in other features is highly autapomorphic.

Distribution. Found from the Grampians of south-western Victoria to south-eastern Queensland; no species of *Austropsyche* is known to occur in Tasmania.

Key to adult males of *Austropsyche* Banks

1. Phallus bulbous distally, narrowly truncate and sclerotised apically; sharp, sclerotised, ventrally curving spine arising apicolaterally on abdominal segments IX/X, and second thread-like sclerotised process arising from internal apodeme (Fig. 67); mesal process on coxopodite of each gonopod about half length of its harpago (Figs 66–67, 94). . . . . . *Austropsyche morana* **sp. nov**.

-. Phallus not bulbous distally, without sclerotised apex; abdominal segments IX/X with or without membranous plate or lobe apicolaterally, but without apicolateral sclerotised spine; mesal process on each coxopodite variable in length (e.g., Figs 52, 59, 63) 2

2(1) Gonopods each with mesal process stout, apically roughly truncate, basal on coxopodite (Figs 68–69, 90–91) . . . . *Austropsyche kaputar* **sp. nov**.

-. Gonopods each with mesal process narrow, conical or slender, curving to acute or irregular apex, apical or sub-apical on coxopodite (e.g., Figs 52, 59, 63) 3

3(2) Forewings each with median cell equal in length to discoidal cell (Figs 50, 78); gonopods each with mesal process apical on coxopodite (Figs 59, 61, 92, 93); with pair of slender sclerotised spines projecting distally (Figs 59–60, 61–62, 92–93), without short sclerotised spines subapically on phallus 4

-. Forewings each with median cell about 1.3x length of discoidal cell (e.g., Figs 49, 77); gonopods each with mesal process subapical on coxopodite; without pair of slender, elongate, sclerotised spines as above (e.g., Figs 52, 63–65), but with short sclerotised spines on phallus (e.g., Figs 53, 56, 63–64, 87–88) 5

4(3) Gonopods each with mesal process about 3/4 length of harpagone, slender, acute apically; small conical tubercle between mesal process and harpago (Figs 59, 92) . . . . *Austropsyche acuta* **sp. nov**.

-. Gonopods each with mesal process no more than half length of harpagone, variably blunt or pointed apically; without small conical tubercle between mesal process and harpago (Figs 61–62, 93) . . . . *Austropsyche ambigua* **sp. nov**.

5(3) Gonopods each with mesal process on coxopodite short, irregular in shape; sclerotised spines on phallus in ventral view straight; in ventral view, small rounded plate visible dorsal to gonopods, in lateral view apicomedial margin slightly produced (Figs 63–65, 88–89) . . . . *Austropsyche bifurcata* (Kimmins)

-. Gonopods each with mesal process on coxopodite short, conical and apically acute in ventral view; sclerotised spines on phallus in ventral view curved; apex of phallus membranous, sometimes protruded; in ventral view membranous plates lateral to gonopods mesally produced posterad, in lateral view forming irregular midapicolateral lobe (Figs 53–55, 84–87) . . . . *Austropsyche victoriana* Banks

Austropsyche acuta sp. nov.

(Figs 59–60, 73, 78, 80–81, 83, 92, 100–101)

Material examined. Holotype ♂, New South Wales, Crystal Creek Rainforest Resort, Upper Crystal Creek, 26–27.xii.2016, A. Wells (ANIC).

Paratypes, Queensland**:** 45♂ 13♀, Crystal Creek Rainforest Resort, Upper Crystal Creek, 28°15'S 153°15'E, 26–27.xii.2016, A. Wells; data as for holotype (ANIC); 4♂ 3♀, same locality, 26.xii.2006, A. Wells (NMV).

Other material examined. New South Wales: 1♂, Korumbyn Creek, 28°24'S 153°19'E, eastern slope of Mt Warning, 29.vi.1988, A. Neboiss; 2♂ 5♀, Orara West State Forest, Tucker's Knob, 29°41'S 152°48'E, 22.xi.1990, G. Theischinger; 13♂ 3♀, Upper Crystal Creek at Crystal Creek Rainforest Retreat, 28°15'S 153°15'E, 24.xii.2006, A. Wells; 18♂ 13♀, same locality, 25.xii.2006, A. Wells; 1♀, same locality, 22.xii.2016, A. Wells; 4♂ 3♀, same locality, 22.xii.2016, A. Wells; 42♂ 6♀, ♀, same locality, 25–26.xii.2016, A. Wells. SE Queensland: 1♂, Coomera Creek, Lamington NP, 8.ii.1961, F.A. Perkins [TRI-13850]; 1♂, Queen Mary Falls, Killarney, 12.x.1973, A. Neboiss; 1♂, Teviot Brook nr Wilson's Peak, 18.xi.1980, M. Schneider; 1♂ Conondale Range, Bundaroo Creek, rainforest, 1.xii.1983, G. Cassis & D. Bickel [TRI-39868]; 8♂, same data [TRI-39499].

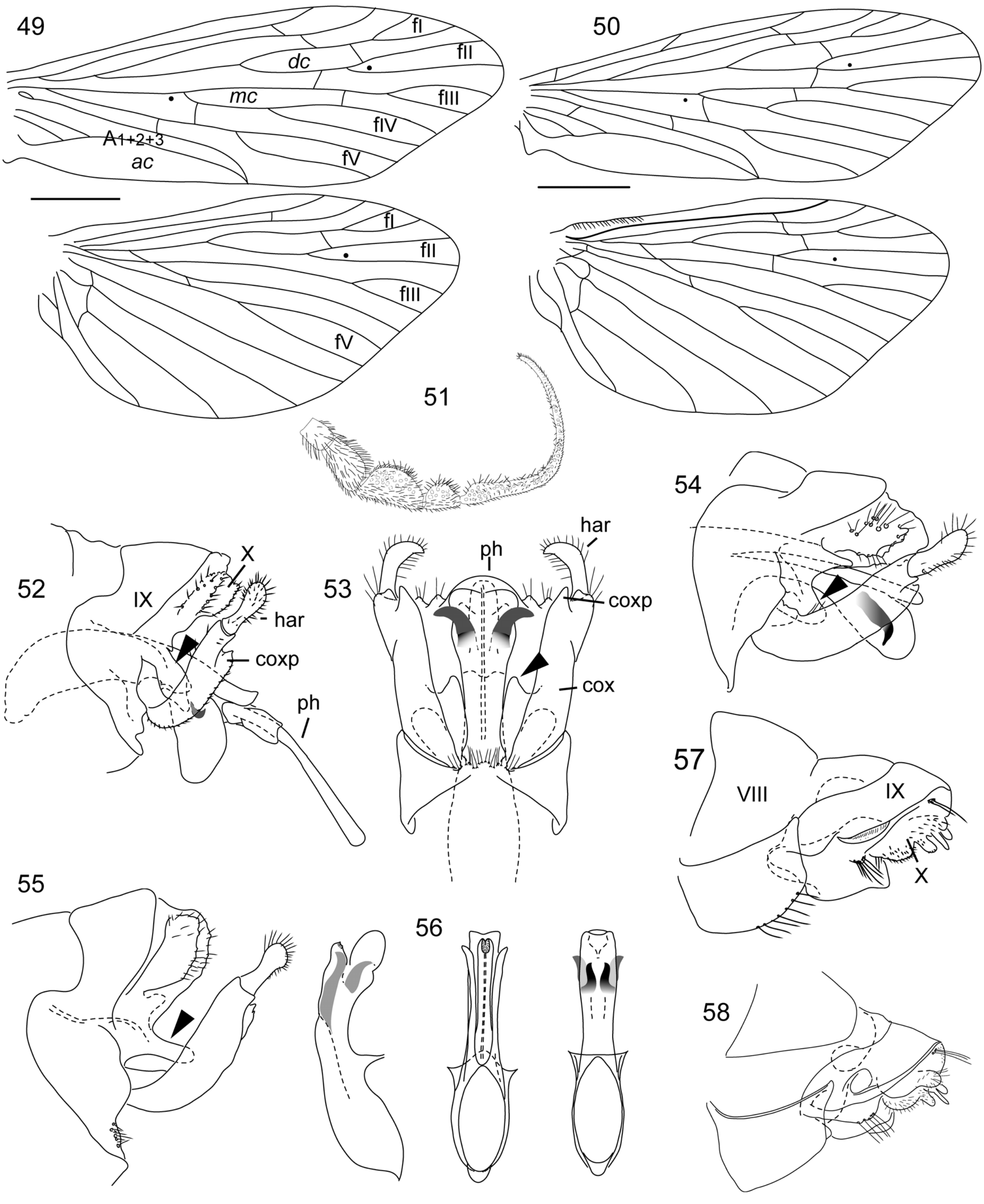
Diagnosis. This species forms a set with *Austropsyche ambigua*, here termed the *Au. acuta* Group, characterised by having the forewing median cell short, about equal in length to the discoidal cell; in the male genitalia, paired elongate sclerotised spines arise internally at the base of the deep apodeme connected to the gonopods and the mesal processes on the coxopodites arise apically, not subapically or basally. It is distinguished from *Au. ambigua* by having the apicomesal process on the coxopodite at least half length of harpago, needle-like, and subtended dorsally by a small conical lobe.

Description. Length of each forewing: ♂ 9.2–11.1 mm (n = 10), ♀ 11.4–12.2 mm (n = 9); cross-vein *r-m* anterad of cross-vein closing median cell.

Male. Abdomen swollen, internal sacs all elongate, each sack extending length of two segments; on segment V lateral filament length slightly less than length of segment (Fig. 83). Genitalia (Figs 59–60): Segment IX subquadrate, tergites IX and X partly fused; gonopods each with coxopodite almost equal width throughout length, narrow sharp process apicomesally, small conical dorsal lobe at base, harpago about length of coxopodite, elongate digitiform; phallic apparatus cylindrical, dilated apically, without endothecal spines; pair of elongate slender spines lateral to phallus, arising at base of apodemes connected to gonopods, converging apically.

Female. Abdominal segment VIII (Figs 100–101) with sternal plates separated, but indistinctly, tapered distally with apicolateral angles triangular; cerci and apical papillae on segment X relatively large, as for *Au. victoriana*.

Distribution. Found in north-eastern New South Wales and south-eastern Queensland. A single specimen in the NMV collection, PT-1041, labelled "NT, Alligator River", is almost certainly mislabelled as no other specimens of any diplectronine species have been taken from very far west of the Great Dividing Range, and no *Austropsyche* further north of south-eastern Queensland. The locality may have been Alligator Creek near Mackay, in central eastern Queensland; but even that is well north of any other collections of *Austropsyche*.



FIGURES 49–58. *Austropsyche* Banks 1939 spp., diagnostic features. **49–50**, ♂ right fore- and hind wings, dorsal: **49**, *Au. bifurcata* (Kimmins 1953; holotype); **50**, *Au. ambigua* **sp. nov**. (NSW, Upper Manning River, 20 km NNW Rawdon Vale [PT-1019]). **51**, *Au. ambigua* **sp. nov**. [PT-1019], ♂ maxillary palp. **52–56**, *Au. victoriana* Banks 1939, ♂ genitalia: **52**, (holotype), left lateral; **53–54**, (Vic., Kalymna Falls, Williams Range, Grampians [PT-1009]): **53**, ventral, and **54**, left lateral; **55–56**, (Vic., Cement Creek [PT-1100]): **55**, left lateral, and **56**, phallic apparatus, left lateral and ventral and dorsal, respectively, left to right. **57–58**, ♀ terminal abdominal segments, left lateral: **57**, *Au. victoriana* (Vic, Cumberland Falls, SE Marysville [PT-1046]); **58**, *Au. ambigua* **sp. nov**. (NSW, Upper Manning River, 20 km NNW Rawdon Vale [PT-1058]). Scale bars = 2 mm. Abbreviations: *ac* = anal cell; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; cox = coxopodite; coxp = mesal process on coxopodite; fI, fII, fIII, fIV, fV = forks I–V; *mc* = median cell; har = harpago; ph = phallic apparatus; VIII, IX, X = abdominal segments VIII, IX, X.

Remarks. Unlike males of most caddisfly species, males of *Au. acuta* are as large as, or larger than the associated females, and have sizeable, swollen abdomens. On dissection one finds that much of the abdominal cavity is occupied by the 2 pairs of reticulate-walled sacs. That, coupled with the fact that most of the light trap specimens collected in 2017 were male, leads to speculation that the sacs, which appear to be glands, may be involved in male-male attraction, in lekking behaviour.

Austropsyche ambigua **sp. nov.**
(Figs 50–51, 58, 61–62, 74, 93)

Material examined. Holotype 1♂, Upper Manning River, 20 km NNW Rawdon Vale, 19.ii.1980, A.A. Calder [PT-1093 (ANIC)]

Paratypes. Victoria: 2♂ 1♀, Noorinbee, 23.xi.1965, A. Neboiss; New South Wales: 1♂, Barrington House via Salisbury, 27.v.1963, G. Monteith [PT-1093]; 20♂ 1♀, Upper Manning River, 20 km NNW Rawdon Vale, 19.ii.1980, A.A. Calder [♂ PT-1019, ♀ PT-1058]; 2♂, NSW, Styx River, Hyatts Flat, 8.xii.1998, G. Theischinger (ANIC); 3♂ 1♀, NSW, Nungatta Creek, Yambula State Forest, 16–17.ii.2000, J. Miller (ANIC).

Other material. New South Wales: 3♂ 1♀ (dry), Barrington Tops, 15.xi.1953; 2♂, Brown Mountain, 18.i.1961, E.F. Riek (ANIC); 2♂ 2♀, Kangaroo Valley, 22.iii.1961, E.F. Riek (ANIC); 1♂ (dry, dissected), Little Styx River, New England NP, 11.ix.1972, O.S. Flint (USNM); 7♂, Styx River, 2 km S of Ebor, 17.x.1973, A. Neboiss; 3♂, Kanangra-Boyd NP, Budthingaroo Creek, 24–26. xii.1977, G. Daniels; 1♂, Mumbulla Creek nr Bega, 20.xi.1978, I. Campbell [PT-635]; 1♂, Mumbulla Creek, 15 km NE Bega, 29.iii.1979; 11♂, Dilgry River 19 km NW of Rawdon Vale, 18.ii.1980, A.A. Calder; 1♂, Allyn River, Chichester SF, 32°08'S 151°27'E, 10–11.xi.1981, T. Weir; 1♂, Dilgry River, Barrington Tops SF, 31°53'S 151°32'E, 15–16xi.1981, T. Weir; 1♂, Tennyson Creek, 5 km NW of Buldah, 1–7.i.1982, ANZSES exped; 1♂, between Ebor and Dorrigo, 12.xi.1983, G. Theischinger; 2♂ ♀, Qld, Binna Burra, Lamington NP, 2–10.xi.1984, E.D. Edwards [TRI-39507]; 9♂, Errinundra River, 3 km below E warm junction, 14.iii.1982, J. Blyth; 1♂, Nadgee S. F., Maxwell's Creek, 13–19.ii.1987, 400 m, D. Bickel; 1♂, Wilson River, nr Belangry, 5.xii.1988, G. Theischinger; 1♂, Gloucester Tops at 1200 m, 19.xi–4.xii.1988, D. Bickel, Malaise trap; 14♂ 1♀, Gloucester Tops, 32°04'S 151°34'E at 1300m, 2–3.xii.1988, Theischinger & Mueller; 3♂ 1♀, Gloucester Tops at 1200 m, 4–30.xii.1988, D. Bickel, Malaise trap; 2♂ 1♀, Barrington Tops, Polblue, 1500 m, 11.xii.1992, G. Theischinger. Victoria: 1♂, Noorinbee, 23.xi.1965, A Neboiss [PT-1097]; 5♂, Noorinbee, 12.xi.1969, A. Neboiss; 1♂, Errinundra River, 17 km N of Club Terrace, 11.xi.1975, J. Blyth; 4♂, Noorinbee North nr Cann River, 30.xii.1975, M.S. Moulds; 4♂ 1♀, Noorinbee North, 20.iii.1977, A. Neboiss; 3♂, Beehive Creek, 30 km N of Cann River, 21.iii.1977, A. Neboiss; 2♂, Back Creek above Cann River, 9.ii.1980, A. Wells.

Diagnosis. Resembling *Au. acuta* in having the forewing discoidal and median cells equal in length, males with a pair of slender elongate sclerotised spines that arise deep within abdominal segment IX from the base of the apodeme that connects to the gonopods, and the mesal process apical on the coxopodite. It is distinguished from *Au. acuta* by the shorter mesal process, which is irregular or acute apically, and lacks a small, conical dorsal process at its base.

Description. Length of each forewing: ♂ 9.7–11.1 mm (n = 10), ♀ 11.5–12.4 mm (n = 4); forewings (Fig. 50) with cross-vein *r-m* distad of cross-vein closing median cell; forks 4 and 5 long, about equal in length; discoidal and median cells about same length. On segment V lateral filaments about 2/3 length of sternite.

Male. Internal sacs small, in VI and VII, less than one segment in length. Genitalia (Figs 61–62, 93): abdominal sternite IX deeply concave proximally; tergites IX and X more or less fused; gonopods each with coxopodite almost equal width throughout length, narrow process apicomesally, without small conical dorsal process at base between process and harpago, harpago about half length of coxopodite, digitiform; phallic apparatus slender medially, dilated apically, without endothecal spines; pair of slender spines arising deep within segment IX, converging apically close to apex of phallus.

Female. Terminal abdomen with sternite VIII divided, forming two valves, separated medially, apicolaterally tapered to narrow angle; sternite IX in form of small paired lobes separated by membranous area.

Distribution. Found from central-eastern New South Wales, south to East Gippsland in eastern Victoria.

Remarks. In *Austropsyche ambigua* males, the apicomesal process on each coxopodite varies in shape, in some males being acute apically, in others irregular to almost narrowly truncate.

***Austropsyche bifurcata* (Kimmins)**
(Figs 49, 63–65, 71, 88–89, 96–97)

Diplectrona bifurcata Kimmins, in Mosely & Kimmins 1953, 344.
Austropsyche bifurcata; Neboiss 1986, 219.

Material examined. Holotype ♂, Mt Kosciusko, 5,000 ft, NSW (BMNH); paratype 1♂, same data as for holotype (ANIC). ACT: 1♂, Bendora, 14.xii.1960, D. Colless [PT-1015]; 3♂ 2 larvae, Mt Gingera, 11.i.1967, E.F. Riek (ANIC). New South Wales: 2♂ 4♀, Dead Horse Gap, 5.i.1984, G. Theischinger [TRI-13803]. Victoria: 1♂, Kanuka Creek, Helmers Road, 420 m, East Gippsland, 11.iii.1982, J. Blyth [PT-1008].

Diagnosis. Males of *Austropsyche bifurcata* belong in the *Au. victoriana* Group; *Au. bifurcata* is distinguished from *Au. victoriana* by the absence in male genitalia, in ventral view, of the ventrolateral plates at the base of the gonopods and differs from *Au. kaputar* in having the mesal process on each coxopodite subapical, and short, not basal, elongate, and stout.

Description. Length of each forewing: ♂ 9.0–10.0 mm (n = 3), ♀ 11.5–12.8 mm (n = 3); median cell length about 1.3x length discoidal cell.

Male. Genitalia (Figs 63–65, 88–89): Tergite IX reduced to narrow bridge midventrally, in lateral view partly delineated from tergite X, with small convexity below phallic apparatus midapicolaterally, rounded in ventral view; abdominal tergite X apically with deep V-shaped excision; gonopods each with coxopodite about 1.5–2.0x length of harpago and well-developed irregular-shaped mesal lobe subapically; phallic apparatus with two pairs of sharply pointed, straight endothecal spines subapically.

Female (association tentative, Figs 96, 97). Resembling *Au. victoriana*: Terminal abdomen with sternite VIII divided to form 2 plates, in ventral view broad based, tapered distally to truncate apices, in lateral view, apicolateral angles slightly produced, triangular.

Distribution. Collected at higher altitudes of south-eastern Australia from East Gippsland, Victoria to the Blue Mountains, west of Sydney, New South Wales.

***Austropsyche kaputar* sp. nov.**
(Figs 68–69, 72, 77, 90–91)

Material examined. Holotype ♂, New South Wales, Mt Kaputar NP, Bullawa Cr., 24.xi.1984, G. Hangay (NMV [PT-1714]).

Paratypes, New South Wales: 2♂ 7♀, data as for holotype [PT-1713].

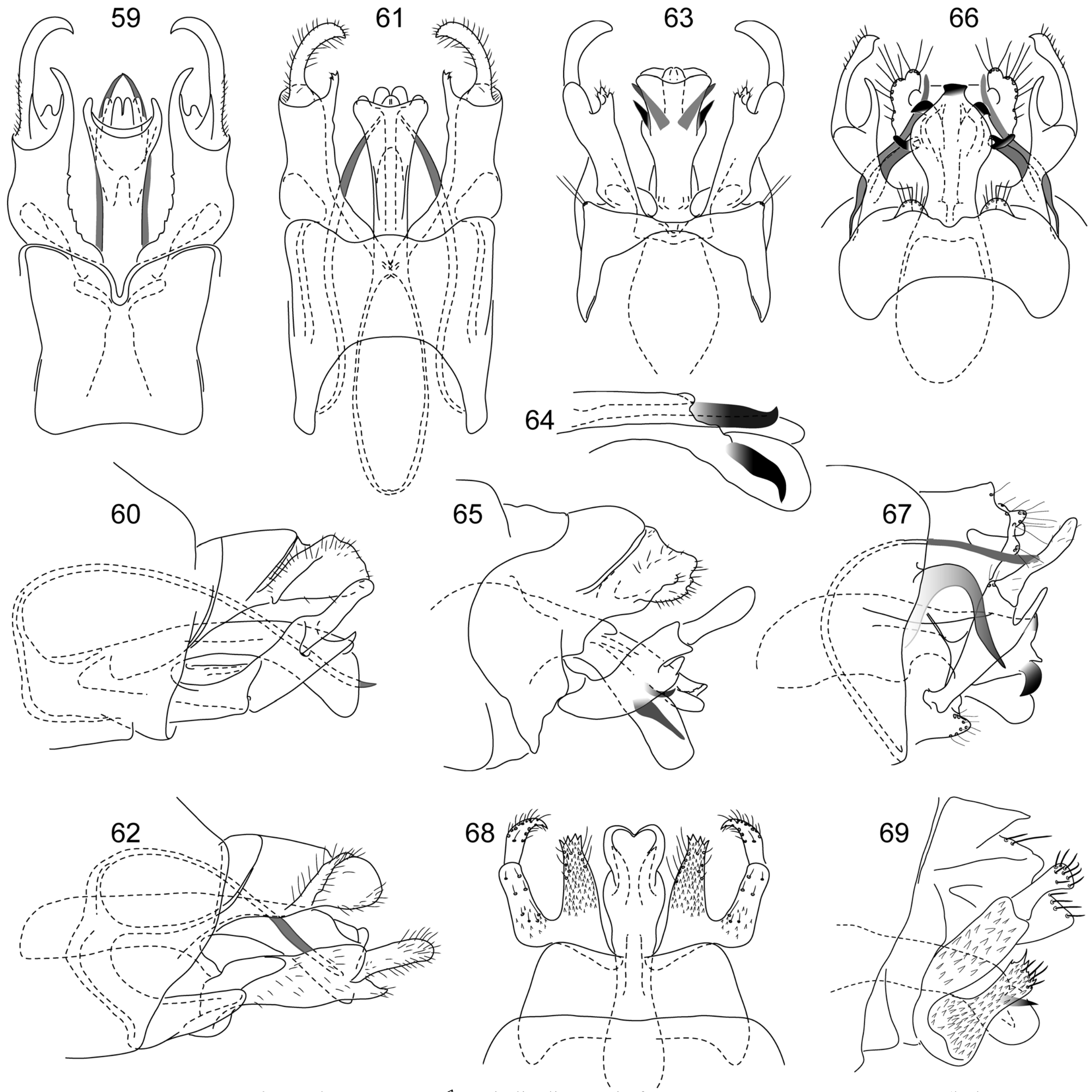
Diagnosis. *Austropsyche kaputar* shares with *Au. bifurcata* and *Au. victoriana* the form of wing venation, with the forewing median cell exceeding by about 1/3 the length of the discoidal cell and in male genitalia having endothecal spines subapically on the phallic apparatus; but uniquely, this species has the mesal process on the coxopodite of each gonopod stout, elongate, and arising within a 'collar' near the base of the coxopodite.

Description. Length of each forewing: ♂ 9.4–10.8 mm (n = 3), ♀ 11.5–12.2 mm (n = 7); wing venation (Fig. 77) as in *Au. bifurcata*, forewing median cell elongate, length about 5x maximum width; filaments on abdominal segment V about length of segment.

Male. Abdominal reticulate-walled internal sacs elongate, greater than one segment length. Genitalia (Figs 68–69, 90–91): Tergites IX and X partially fused, tergite X in dorsal view shallowly cleft at apex; gonopods each with coxopodite bearing relatively large, densely setose mesal process arising near base and extending almost to apex of coxopodite, in lateral view arising ventrally near base of coxopodite, apically acute; phallic apparatus with 2 pairs of sclerotised spines subapically.

Female. Terminal abdomen with sternite VIII divided to form 2 plates, plates broad based in ventral view, broadly rounded apicomesally, apicolateral angles sharply triangular.

Distribution. Known only from the type locality, approximately 50 km east of Narrabri, on the western side of the Great Dividing Range in north-eastern New South Wales.



FIGURES 59–69. *Austropsyche* Banks 1939 spp., ♂ genitalia diagnostic features. **59–60**, *Au. acuta* **sp. nov**. (holotype, NSW, Crystal Creek Rainforest Resort, Upper Crystal Creek; ANIC): **59**, ventral; **60**, left lateral. **61–62**, *Au. ambigua* **sp. nov**. (NSW, Upper Manning River, 20 km NNW Rawdon Vale [PT-1019]): **61**, ventral; **62**, left lateral. **63–65**, *Au. bifurcata* (Kimmins 1953; ACT, Bendora ([PT-1015]), ♂ genitalia: **63**, ventral; **64**, apex of phallic apparatus, left lateral; **65**, left lateral. **66–67**, *Au. morana* **sp. nov**. (Qld, trickle on Moran's Falls track, Lamington NP [TRI-54706-1]): **66**, ventral; **67**, left lateral. **68–69***, Au. kaputar* **sp. nov**. (NSW, Mt Kaputar NP, Bullawa Creek [PT-1714]): **68**, ventral; **69**, left lateral.

Austropsyche morana sp. nov.

(Figs 66–67, 75, 79, 94–95, 99)

Material examined. Holotype ♂, Queensland, trickle on Moran's Falls track, Lamington NP, xi.2011, J. Mynott & M. Shackleton (NMV [TRI-54706-1]).

Paratypes. Queensland: 5♂ 1♀, data as for holotype [TRI-54706]. New South Wales: 1♂ 1♀, Chichester State Forest, Jerusalem Creek, 26.xii.2000, A. Wells (ANIC).

Diagnosis. Distinctive among congeners, *Au. morana* shares the wing venation pattern and form of female genitalia of the *Au. victoriana* Group, but has highly distinctive male genitalia that differ, too, from those of *Au.*

acuta and *Au. ambigua* and other members of the genus in having a pair of slender curved, sclerotised spines that arise on the distal margin of tergite IX, and another pair that arise from the distal margin of segment IX; alone among congeners it has the apex of the phallus truncate and sclerotised.

Description. Length of each forewing: ♂ 7.6 mm (n = 5), ♀ 8.4 mm (n = 1). Forewing (Fig. 79) discoidal cell length 6x maximum width, median cell length approximately 1.3x length of discoidal cell.

Male. Reticulate-walled internal sacs in abdomen with pair in segment VI length of 2 segments, those in segment VII about 1.5x length of segment; lateral filaments on segment V elongate, almost length of segment. Genitalia (Figs 66–67, 94–95): In lateral view abdominal sternite IX with sclerotised spur protruding distally at each apicolateral angle; tergite X in ventral view with paired rounded setose lobes laterally, paired sclerotised spines arising from lateral margins; inferior appendages each with coxopodite expanded towards apex, subapicomesally with elongate apically acute process, harpago about length of coxopodite, narrow in proximal 2/3, swollen distally, apically with mesally directed spur; phallic apparatus laterally with pair of short stout sclerotised spines subapically, directed anterad, dorsally apex sclerotised, narrowly truncate.

Female. Abdominal sternite VIII (Fig. 99) in form of pair of almond-shaped ventral plates, their apicolateral angles slightly produced, triangular.

Distribution. Known only from the type locality on the ranges between SE Queensland and NE New South Wales.

Remarks. In some superficial respects, *A. morana* appears to combine aspects of the *Au. victoriana* Group and *Au. acuta* and *Au. ambigua*, in having sclerotised endothecal spines embedded in the phallus, as well as other elongate spines arising from apodemes in segment IX, free from the phallic apparatus. The overall form of the male genitalia, however, is quite distinct.

Austropsyche victoriana Banks

(Figs 52–57, 70, 76, 82, 84–87, 98)

Austropsyche victoriana Banks 1939, 496.

Diplectrona bispinosa Jacquemart 1965; Neboiss 1986, 218, as *Au. bispinosa*; Neboiss 2003, 70, as *Au. bispinosa.* **New synonym**.

Material examined. Holotype *Au. victoriana,* ♂, Mt Donna Buang, Victoria, Harvard Australian Expedition, P.J. Darlington (ANIC, ex MCZ 22086). Holotype *D. spinosa* ♂, Sassafras (without indication of State; confirmed as Victoria, not in Tasmania according to Neboiss 2003, 70) (IRSNB).

Other material, Victoria: 2♂ (1 dry) 1♀, Masons Falls, Kinglake, 15.ii.1953, A. Neboiss; 1♂, Tarra Valley NP, 19.ii.1953, GW Douglas; 2♂, Cement Creek, nr Warburton, 22.ii.1953, A. Neboiss; 10♂ 2♀, Tarra Valley NP, 5.iii.1953, A Neboiss; 1♂ 1♀, Vic, Tarra Valley Nat. Pk, Gippsland, 5.iii.1953, A. Neboiss [PT-1010 ♂, PT-1064 ♀]; 1♂, Cement Creek, 13.ii.1954, A. Neboiss; 1♂ (dry), Masons Falls, Kinglake, 13.xii.1953, A. Neboiss; 1♂ (dry), Cement Creek, 13.ii.1954, A. Neboiss; 5♂ (dry), Millgrove, 27.iii.1954, A. Neboiss; 2♂ (dry), Millgrove, 27.iii.1954, A. Neboiss; 5♂, Mt Buffalo, 4,500ft, 13.i.1955, A. Neboiss; 8♂, Cement Creek, nr Warburton, 5.ii.1955, A. Neboiss; 1♂, Ladies Bath Falls, Porepunkah, 25.ii.1955, A. Neboiss; 3♂ 1♀, Kinglake, 29.xi.1955. A. Neboiss; 1♂, Cement Creek, 1.i.1957, A. Neboiss; 2♂ Acheron Gap, 9.i.1957, A. Neboiss; 3♂, Cement Creek, nr Warburton, 9.i.1957, A. Neboiss; 1♂, Millgrove, 9.i.1957, A. Neboiss; 6♂ 2♀, Porepunkah, 27.i.1957; 1♀, Porepunkah, 27.i.1957, A. Neboiss [PT-1065 ♀]; 1♂, Millgrove, 16.iii.1958, A. Neboiss; 3♂ 1♀, Falls Creek, Bogong High Plains, 26.i.1960, A. Neboiss; 1♂, Mt Mackey, 26.i.1960, A. Neboiss; 1♂, Cumberland Falls, SE Marysville, 16.xii.1960, A. Neboiss; 1♂, Cement Creek, nr Warburton, 14.i.1961, A. Neboiss; 1♂ 1♀, Cumberland Falls, SE Marysville, 17.i.1961, A. Neboiss; 5♂, White Bridge, Mt Buller Road, 10.xii.1962, A. Neboiss; 1♂, Kalymna Falls, Williams Range, Grampians, 15.xii.1966, A Neboiss [PT-1009]; 2♂, Kalymna Falls, Williams Range, Grampians, 14.iii.1974, A Neboiss; 16♂, Cement Creek. 8.xii.1970, A. Neboiss [PT-1100]; 46♂ 20♀ Cumberland Falls, SE Marysville, 7.i.1971, A. Neboiss [PT-1018, PT-1046]; 1♂ 17 km SE Merrijig, 8 Mile Creek off Howqua River, 1.xii.1971, A. Neboiss; 1♂, Cement Creek, nr Warburton, 27.iii.1972, A. Neboiss; 4♂, Dandenong Mtns, Sassafras Creek, 18.xi.1972, P. Zwick; 12♂, Yea River, 4 km NE of Toolangi, 17.xi.1973, A. Neboiss; 11♂ 4♀, Sassafras Creek, 1 km N of Kallista, 30.x.1974, A. Neboiss [PT-1044]; 1♂, Dee River, 2 km NW of Millgrove, 24.ii.1976, A. Neboiss; 10♂, Dee River, 2 km NW of Millgrove, 24.ii.1976, A. Neboiss; 1♂ 1♀, Yarra River, Millgrove, 24.ii.1976, A. Neboiss; 1♂, Cement Creek, Mt Donna Buang, 12.i.1978, Cartwright & Dean; 3♂ 1♀, Wilhelmina Falls, Falls Creek, trib. Murrindindi River, 12 km E of Glenburn, 6.xi.1979, A. Neboiss; 2♂, Cement Creek, 7.xii.1979, Cartwright & Dean; 11♂ 3♀, Cement Creek, Mt Donna Buang Rd, 7.xii.1979 [TRI-16898]; 3♂, Tooronga Falls, 7 km NE of Noojee, 27.xi.1981, Morse & Neboiss; 13♂, Rum Creek, Erica-Thomson Road, 9.i.1985.

Diagnosis. Male similar to that of *Austropsyche bifurcata* in having 2 pairs of endothecal spines associated with the phallic apparatus, and only a very short sub-apical mesal spur on the coxopodite, but distinguished by the strongly ventrally directed spines subapically on the phallus; conical subapicomesal process on the coxopodite; in ventral view by the variably shaped basomesal lobes ventral to the phallic apparatus and dorsal to the gonopods (phallic guides of Ross & Morse unpublished MS), in lateral view visible as rather stout, tapered or rounded apicomesal lobes on abdominal sternite IX; without deep, elongate, sclerotised spines as seen in *Au. ambigua* and *Au. acuta*.

Description. Length of each forewing: ♂ 9.4–10.8 mm (n = 15), ♀ 13.1–14.1 mm (n = 7); venation as for *Au. bifurcata* (Fig. 49).

Male. Abdomen (Fig. 82) reticulate-walled internal sacs with pair on segment VI length of 2 segments, those on segment VII about 1.5x length of segment; lateral filaments on segment V elongate, almost length of segment. Genitalia (Figs 52–56, 84–87): In lateral view abdominal sternite IX with stout lobe protruding distally at each apicolateral angle, lobe conical, projected ventrad; tergite X short; gonopods each with coxopodite expanded towards apex, subapicomesally short conical process, harpago about half length of coxopodite, constricted in proximal third and distally curved mesad; phallic apparatus laterally with pair of short sclerotised spines subapically, without upper internal rods, phallotrema elongate, sclerotised dorsally.

Female (Fig. 98). Abdominal sternite VIII in form of pair of subtriangular ventral plates, apicolateral angles very slightly produced distally; segment IX basally with transverse opening to sclerotic cavity.

Distribution. Widespread and quite commonly collected in Victoria from the Grampians to the central ranges.

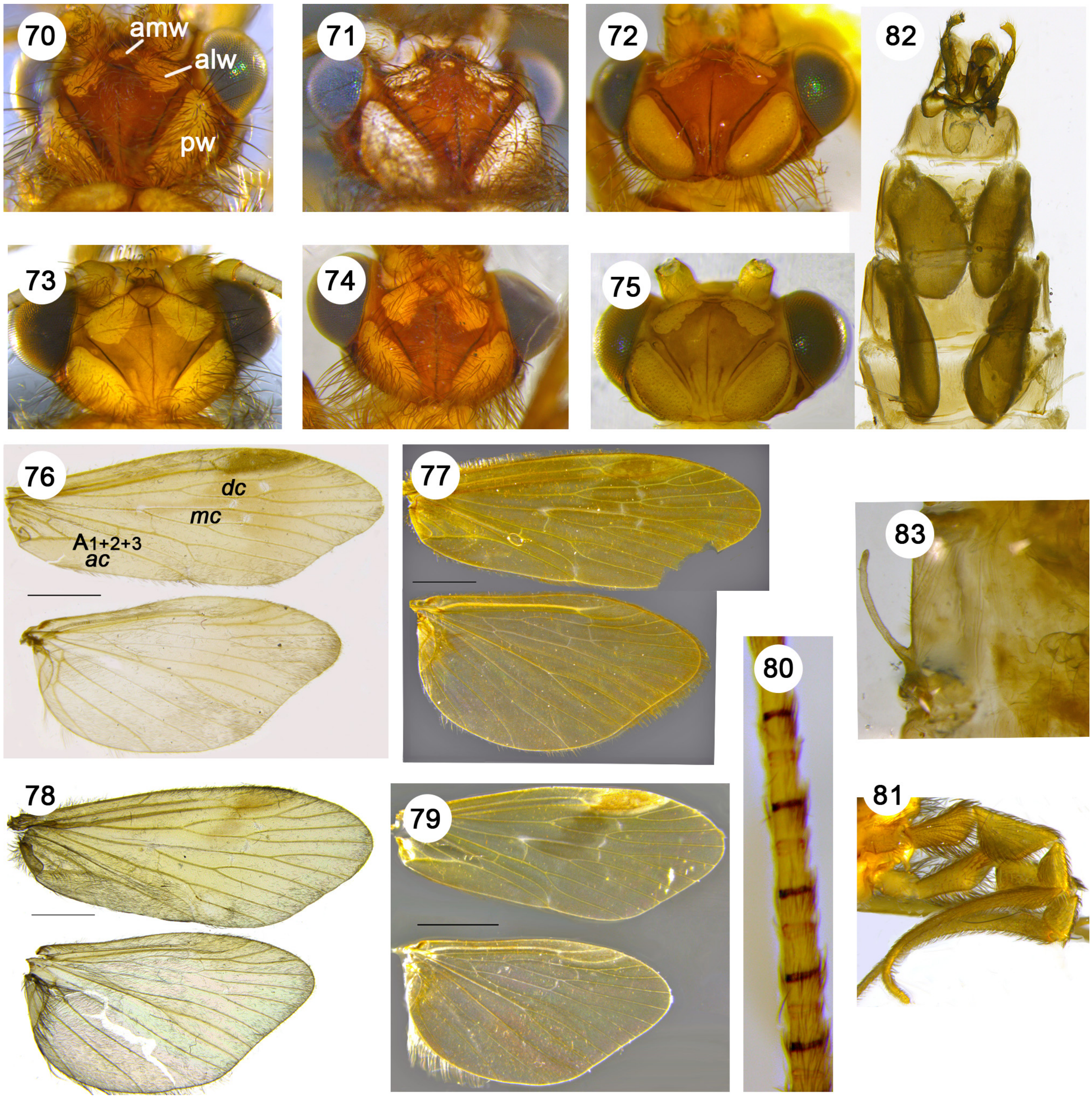
Remarks. Considerable variation is seen in the male genitalia of this species. The apicolateral lobes on abdominal segment IX are variable in shape and length (Figs 52, 55, 84, 86), some in ventral view being almost truncate apically, some with a concavity on the apex, and some with the mesal margin extended, digitiform; the mesal lobe on each coxopodite sometimes is scarcely developed; and in preserved specimens the phallotrema may or may not be extended. The form appears to be consistent in samples, but much more study is needed to evaluate the extent of separation of populations. For the present, all are assigned to *Au. victoriana*.

Arcyphysa gen. nov.
(Figs 102–187)

Type species: *Diplectrona angusta* Banks 1939, by present designation.

Diagnosis. This genus is distinguished from other Australian Diplectroninae genera by the sharply and almost evenly divided anterolateral dorsal head warts, divided at right angles to the length of the body by a distinct suture, and in male genitalia abdominal sternite IX has one or more elongate, often elaborate, processes apicomedially, and a short, sometimes divided, harpago on each gonopod.

Description. Head (Figs 146–150) dorsally with anterolateral warts divided obliquely, both parts similar in size, posterior parts not reaching midline; sutures pronounced. Antennae slender, about as long as forewings, segments cylindrical, with median suture and setae giving crenate appearance (Fig. 152). Maxillary palps (Fig. 103) with segments 2 and 3 about equal length, almost 2x length of segment 1, and about 1.3x length of segment 4, segment 5 exceeding length of all other segments together. Wing venation (Figs 102, 151) as in *Arc. diamontona* **sp. nov**.: Forewing fork 2 sessile; median cell length about 1.2x length of discoidal cell. Hind wing f1, f2, f3, and f5 present, median cell open; R_1 curving strongly towards margin, as in *Diplectrona*. Lateral filaments on sternite V present in both sexes, no more than half length of segment, often very short.



FIGURES 70–83. *Austropsyche* Banks 1939 spp., ♂ diagnostic features. **70–75**, heads, dorsal: **70**, *Au. victoriana* Banks 1939; **71**, *Au.bifurcata* (Kimmins 1953); **72**, *Au. kaputar* **sp. nov**.; **73**, *Au. acuta* **sp. nov**.; 74, *Au. ambigua* **sp. nov**.; **75**, *Au. morana* **sp. nov**. **76–79**, right fore- and hind wings, dorsal: **76**, *Au. victoriana*; **77**, *Au. kaputar* **sp. nov**.; **78**, *Au. acuta* **sp. nov**.; **79,** *Au. morana* **sp. nov**. **80**, *Au. acuta* **sp. nov.**, antennal segments. **81**, *Au. acuta* **sp. nov.**, maxillary palp. **82**, *Au. victoriana*, reticulate-walled internal sacs of abdominal segments VI and VII, ventral. **83**, *Au. acuta* **sp. nov.**, left lateral filament on segment V, ventral. Scale bars = 2 mm. Abbreviations: *ac* = anal cell; alw = anterolateral wart; amw = anteromesal wart; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; *mc* = median cell; pw = posterior wart.

Male. Abdomen with paired reticulate-walled internal sacs in segments VI and VII (Figs 183–187) about equal length, rarely longer than length of respective segment. Genitalia (Figs 104–115, 117–131, 154–178): Tergites IX and X fused, membranous, somewhat rounded apically with small median incision; sternite IX with upper lateral angle extended posteriorly into processes of various shapes; inferior appendages short, robust, harpago undivided or bifid; phallic apparatus in lateral view gradually curved downward, in ventral view with base abruptly widened, without spines.

Female (Figs 116, 179–182). Abdominal sternite VIII well divided mesoventrally and produced posterad, laterodistal angle produced slightly, rounded; segment IX with large dorsoventrally elongate sclerotic cavity, inner surface of which with granular appearance.

Distribution. Most species are from north-eastern Australia, but one species is found in central and eastern Victoria.

Etymology. *Arcyphysa*, the name derived from Greek, *arkys* being descriptive of bubble- or bellows-like appearance of lateral lobes in ventral view of male genitalia, and *physa*, net or mesh, for the appearance of the internal reticulate-walled sacs of the male. The gender is feminine.

Remarks. Relationships of the pair of male genitalic processes above the phallic apparatus and gonopods are often unclear. They are referred to by Mosely (in Mosely & Kimmins 1953) in the description of *Diplectrona satana* as an 'upper penis-cover forming a pair of processes' and by Neboiss (1979), in *D. hystricosa*, as a 'pointed process' arising from each lower margin of tergite X. In some species the one or two processes appear clearly to be lobes on the lateral margins of tergite X, in others to be individual structures arising from the apicolateral margins of segment IX. Tergite X is sometimes more or less fused with tergite IX. These variously expressed structures may not be homologues, but to avoid confusion, they are simply referred to as 'apicolateral processes' in the descriptions and key.

Neboiss in his draft notes on Australian diplectronines, recognised three separate sets among species that here are assigned to this new genus, *Arcyphysa*. One set, here termed the *Arc. angusta* Group, included *Diplectrona angusta*, *Diplectrona hystricosa*, *Arc. fraserensis* **sp. nov.**, and *Arc. diamontona* **sp. nov**. Five further species are added now to this group: *Arc. candela* **sp. nov.**, *Arc. lovedayi* **sp. nov.**, *Arc. naumanni* **sp. nov.**, *Arc. rossi*, and *Arc. satana*. Neboiss in his preliminary work did not assign *Arc. rossi* or *Arc. satana* to any of his groups; however, on the basis of head and general genitalic features they cluster with members of the *Arc. angusta* Group. The second set, here the *Arc. hugginsi* Group, included *Arc. hugginsi* **sp. nov.**, *Arc. sybillae* **sp. nov.**, *Arc. crescentina* **sp. nov.**, and *Arc. caldera* **sp. nov.**; a fifth species is now added, *Arc. carnarvona* **sp. nov**. The third group, here called the *Arc. acmea* Group, comprised *Arc. acmea* **sp. nov.**, *Arc. anaplasis* **sp. nov.**, *Arc. tortula* **sp. nov.**, *Arc. flinti* **sp. nov.**, *Arc. volsella* **sp. nov.**, and *Arc. nebo* **sp. nov**. Neboiss proposed, tentatively, that these be recognised as separate new genera. However, features of head, antennae, maxillary palpi, and wings unite all species here assigned to *Arcyphysa*. They differ in aspects of male genitalia, but, except for the *Arc. hugginsi* Group (all of which have a pair of parameres basally on the phallic apparatus), no clear synapomorphies can be recognised to unite members. For the present, a single new genus is recognised. The order of treatments here is alphabetic within each of the 3 loose species groups.

Key to males of species of Arcyphysa

1 Apicolateral processes length at least 4x length of coxopodites of gonopods (Figs 144–145) .... *Arcyphysa nebo* **sp. nov**.

-. Apicolateral processes length less than 4x length of coxopodites 2

2(1) Gonopods with coxopodites in lateral view subquadrate to irregularly stout, with length equal to or less than 2x width (e.g., Figs 133, 137, 139) 3

-. Gonopods with coxopodites in lateral view more or less rectangular or rod-shaped, with length exceeding 2x maximum width (e.g., 105, 118, 129) 7

3 (2) In ventral view, apicolateral processes on segment IX strongly curved, distally club-shaped (Fig. 134), coxopodites triangular; in lateral view, coxopodites sub-quadrilateral (Fig. 135) .... *Arcyphysa anaplasis* **sp. nov**.

-. In ventral view, apicolateral processes tapered to acute apices or narrowly rounded apically, shape of coxopodites varied, not triangular in ventral view and sub-quadrangular in lateral view.......... 3

4(3) Harpagones each single, tapered (Fig. 141) .... *Arcyphysa volsella* **sp. nov**.

-. Harpagones each distinctly bilobed (e.g., Figs 132, 136).......... 5

5(4) Coxopodites of gonopods sub-rectangular in ventral and lateral views (Figs 132–133) ....*Arcyphysa acmea* **sp. nov**.

-. Coxopodites of gonopods triangular in ventral view (Figs 136, 138).......... 6

6(5) Apicolateral processes on segment IX twisted, sinuous (Figs 136–137) ....*Arcyphysa tortula* **sp. nov**.

-. Apicolateral processes on segment IX not as above (Figs 138–139) .... *Arcyphysa flinti* **sp. nov**.

7(2) Phallic apparatus with parameres visible towards base; harpagones usually sharply and shallowly bifid apically (e.g., Figs 117, 122) 8

-. Phallic apparatus without parameres; harpagones never bifid apically, sometimes cup- or spatula-shaped (e.g., Figs 104, 110) 12

8(7) Ventral lobe of each apicolateral process on segment IX elaborately crescent-shaped in lateral view, with curves lined with specialised setae (Figs 118, 120) 9

-. Ventral lobe of each apicolateral process not as above 10

9(8) Apicolateral processes in lateral view bilobed, each with ventralmost lobe loosely crescent-shaped; tergite X covered with dense microtrichia (Fig. 118) .... *Arcyphysa caldera* **sp. nov**.

-. Apicolateral processes in lateral view bilobed, each with ventralmost lobe tightly and more coarsely crescent-shaped than in *Arc. caldera* **sp. nov**.; tergite X without dense microtrichia (Fig. 120) .... *Arcyphysa crescentina* **sp. nov**.

10(8) Ventral lobes of apicolateral processes in ventral view sharply angled and overlapping each other distally, apical margins serrate (Fig. 126) .... *Arcyphysa carnarvona* **sp. nov**.

-. Ventral lobes of apicolateral processes in ventral view, if overlapping distally, then tapered to sharp apices, distal margins not serrate 11

11(10) Phallic apparatus with parameres elongate, reaching to tip of phallus (Fig. 123, 124); apicolateral processes in ventral view angled mesad, overlapping (Fig. 123)........................ *Arcyphysa sybillae* **sp. nov**.

-. Phallic apparatus with paramere very short, length about 2x maximum width; apicolateral processes in ventral view broadly lanceolate, neither angled mesad nor overlapping (Fig. 121)........................ *Arcyphysa hugginsi* **sp. nov**.

12(7) Paired sharp ventrolateral or lateral spurs present on distal margin of segment IX, directed caudad (Figs 107, 109) or ventrad in lateral view (Figs 111, 129, 131, 165) 13

-. Without paired sharp ventrolateral or lateral spurs on distal margin of segment IX 18

13(12) In lateral view apicolateral processes appearing to arise from lateral margins of tergite IX, slender and almost uniform width throughout length, with apices rounded or tapered, or lanceolate (e.g., Figs 129, 131)........................ 14

-. In lateral view apicolateral processes appearing to arise from lateral margins of tergite X, irregular in shape 15

14(13) Apicolateral processes elongate, tapered distally to acute apex; harpagones each with dorsal hook subapically (Figs 128–129) .... *Arcyphysa naumanni* **sp. nov**.

-. Apicolateral processes elongate, rounded apically; harpagones without hooks (Figs 130–131) . . . *Arcyphysa lovedayi* **sp. nov**.

15(13) Gonopods with harpagones tapered, spur-shaped; in lateral view apicolateral processes club-shaped (Figs 106–107) .... *Arcyphysa diamontona* **sp. nov**.

-. Gonopods with harpagones cup-shaped or with width no more than 2x length (Figs 108– 112); in lateral view apicolateral processes irregular in shape (Figs 109, 111) or tapered to acute apices........................ 16

16(15) Apicolateral processes in lateral view elongate, slightly sinuous, tapered to acute apices (Mosely & Kimmins 1953, fig. 233a) .... *Arcyphysa rossi* (Kimmins)

-. Apicolateral processes in lateral view irregular in shape, in ventral view strongly curved (Figs 108, 110), sometimes elaborately setose........................ 17

17(16) Apicolateral processes on segment X in ventral view elaborately setose (Fig. 108), in lateral view processes extending beyond apex of segment X, apically stoutly rounded (Fig. 109) .... *Arcyphysa fraserensis* **sp. nov**.

-. Apicolateral processes on segment X in ventral view without dense setae (Fig. 110), in lateral view processes short, not extending beyond apex of segment X, apically digitiform (Fig. 111) .... *Arcyphysa hystricosa* (Neboiss)

18(12) Gonopods in ventral view stout, pillar-like (Figs 112, 156); apicolateral processes in lateral view stout, sharply tapered distally to acute apices (Fig. 157) .... *Arcyphysa satana* (Mosely)

Gonopods in ventral view widely divergent (Figs 104, 113); apicolateral processes digitiform or lanceolate (Figs 105, 114–115) 19

19(18) Apicolateral processes in lateral view elongate lanceolate (Fig. 105) .... *Arcyphysa angusta* Banks

-. Apicolateral processes in lateral view digitiform, tipped by single seta (Figs 114–115) .... *Arcyphysa candela* **sp. nov**.

Arcyphysa angusta Group
(Figs 104–105, 146, 158–159, 179–180)

Arcyphysa angusta (Banks)
Diplectrona angusta Banks 1939, 495; Mosely & Kimmins 1953, 337.

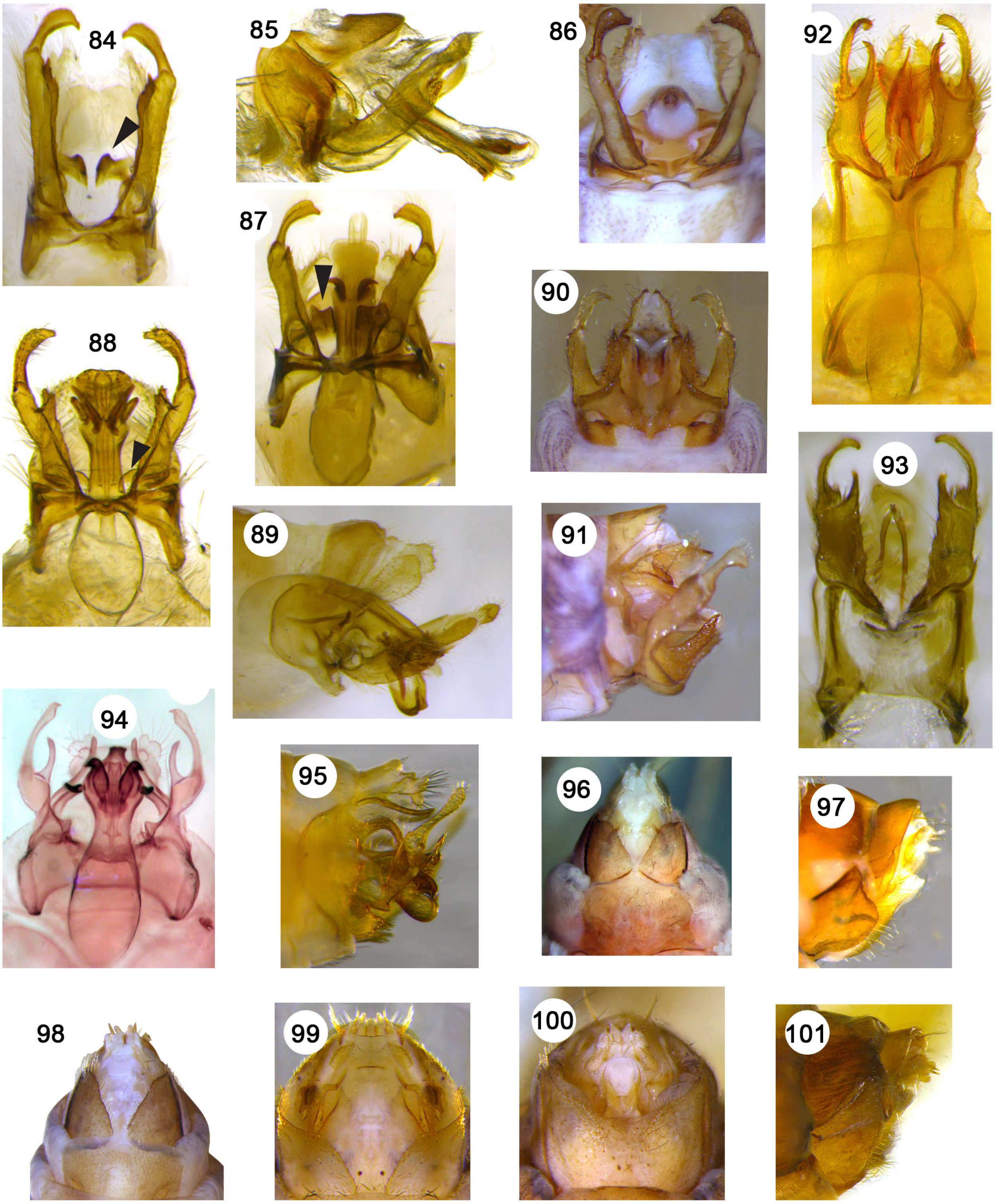
Material examined. Holotype ♂, Dorrigo, NSW (ANIC, ex MCZ 22087); 1♂, 2♀, NSW, Styx River, 12 km S of Ebor, 17.x.1973, A. Neboiss (NMV [PT-1005]).

Diagnosis. This species resembles *Arcyphysa diamontona* **sp. nov**. in having the gonopods in ventral view widely bowed, but is distinguished from *Arc. diamontona* by having dorsal processes clearly arising on abdominal tergite IX and lanceolate, not club shaped, and by lacking sharp spines apicolaterally on sternite IX; harpagones are leaf-like, rounded apically, not acute as in *Arc. diamontona*.

Description. Length of each forewing: ♂ 10.0 mm (n = 2), ♀ 10.4 mm (n = 2); forewing median cell length about 5x maximum width.

Male. Abdomen with internal reticulate-walled internal sacs all elongate oval, about length of segments.

Male genitalia (Figs 104–105, 158–159): Segment IX short, apicolaterally expanded distally to form subtriangular lobe; apicolateral processes elongate, lanceolate, about twice length of tergite X, in ventral view with convergent club-shaped lobes densely clothed in short setae; tergite X compressed, taller than long; phallic apparatus without parameres, in ventral view wide at base, in lateral view with apex curved downward; gonopods each with coxopodite stout, strongly curved in ventral view, width almost equal throughout length, harpagones leaf-shaped, about 1/3 length of coxopodites, curved gently, tapered to rounded apices.



FIGURES 84–101. *Austropsyche* Banks 1939 spp., genitalia diagnostic features. **84–95**, ♂ genitalia: **84–87**, *Au. victoriana* Banks 1939: **84–85**, (typical form): **84**, ventral, and **85**, left lateral; **86**, (Vic., Wilhelmina Falls [TRI-12958]), ventral, showing variation in development of the ventrolateral 'plates' at the bases of the gonopods; **87**, (Vic., Cumberland Falls, SE Marysville [PT-1018]), ventral, showing variation in development of the ventrolateral 'plates' at the bases of the gonopods. **88–89**, *Au. bifurcata* (Kimmins 1953; (ACT, Bendora [1015]): **88**, ventral, and **89**, left lateral. **90–91**, *Au. kaputar* **sp. nov.** (holotype): **90**, ventral, and **91**, left lateral. **92**, *Au. acuta* **sp. nov.** (NSW, Upper Crystal Creek), ventral. **93**, *Au. ambigua* **sp. nov.** (Vic. Noorinbee [1097]), ventral. **94–95**, *Au. morana* **sp. nov.** (holotype): **94**, ventral; **95**, left lateral. **96–101**, ♀ terminal abdominal segments. **96–97**, *Au. bifurcata* (NSW, New South Wales, Dead Horse Gap): **96**, ventral, and **97**, left lateral; **98**, *Au. victoriana,* ventral. **99**, *Au. morana* **sp. nov.** (Qld, trickle on Moran's Falls track, Lamington NP), ventral. **100–101**, *Au. acuta* **sp. nov.** (NSW, Upper Crystal Creek): **100**, ventral, and **101**, left lateral.

Female (Figs 179–180). Abdomen terminating bluntly; distally with pair of cerci and 2 pairs of small terminal protuberances; sternite VIII formed by 2 ventrolateral plates (valves) covering inferior appendage receptacle grooves, fully divided mesally, apicolateral angles produced, broadly rounded; segment IX with rounded sclerotic cavity, its inner surface granular.

Distribution. Collected only from north-eastern New South Wales.

Remarks. Banks (1939, 495) interpreted the paired apicolateral structures in *Arc. angusta* as part of the 'superior plate'. Here these structures are interpreted as apicolateral processes on abdominal tergite IX. The arrangement in *Arcyphysa angusta* contrasts with the arrangement in *Arc. diamontona*, *Arc. hystricosa*, and *Arc. fraserensis* in which abdominal segment IX and tergite X appear to be fused, with the result that the apicolateral lobes appear to arise from the fused structure.

Arcyphysa diamontona sp. nov.

(Figs 102–103, 106–107, 116, 149, 151, 162–163, 181–182)

Material examined. Holotype ♂, Victoria, Diamond Creek, 7 km SE of Gembrook, 31.i. 1979, Wells & Neboiss (NMV [PT-1006]).

Paratypes. Victoria: 14♂ 10♀, data as for holotype; 1♂ Noorinbee, 12.xi.1969, A. Neboiss; 2♂ 2♀, 8 km NE Toolangi, 2.xii.1970, A. Neboiss; 1♂ 1♀, Ada River, on Ada River road, 19.i.1979, NMV Survey Department '54'; 1♂ 2♀, LaTrobe River, 9.8 km W of Noojee, 21.i.1979, NMV Survey Department '55'; 2♂, Watts River, Fernshaw, 12 km NE of Healsville, 11.ii.1982; A. Neboiss & K. Walker (NMV).

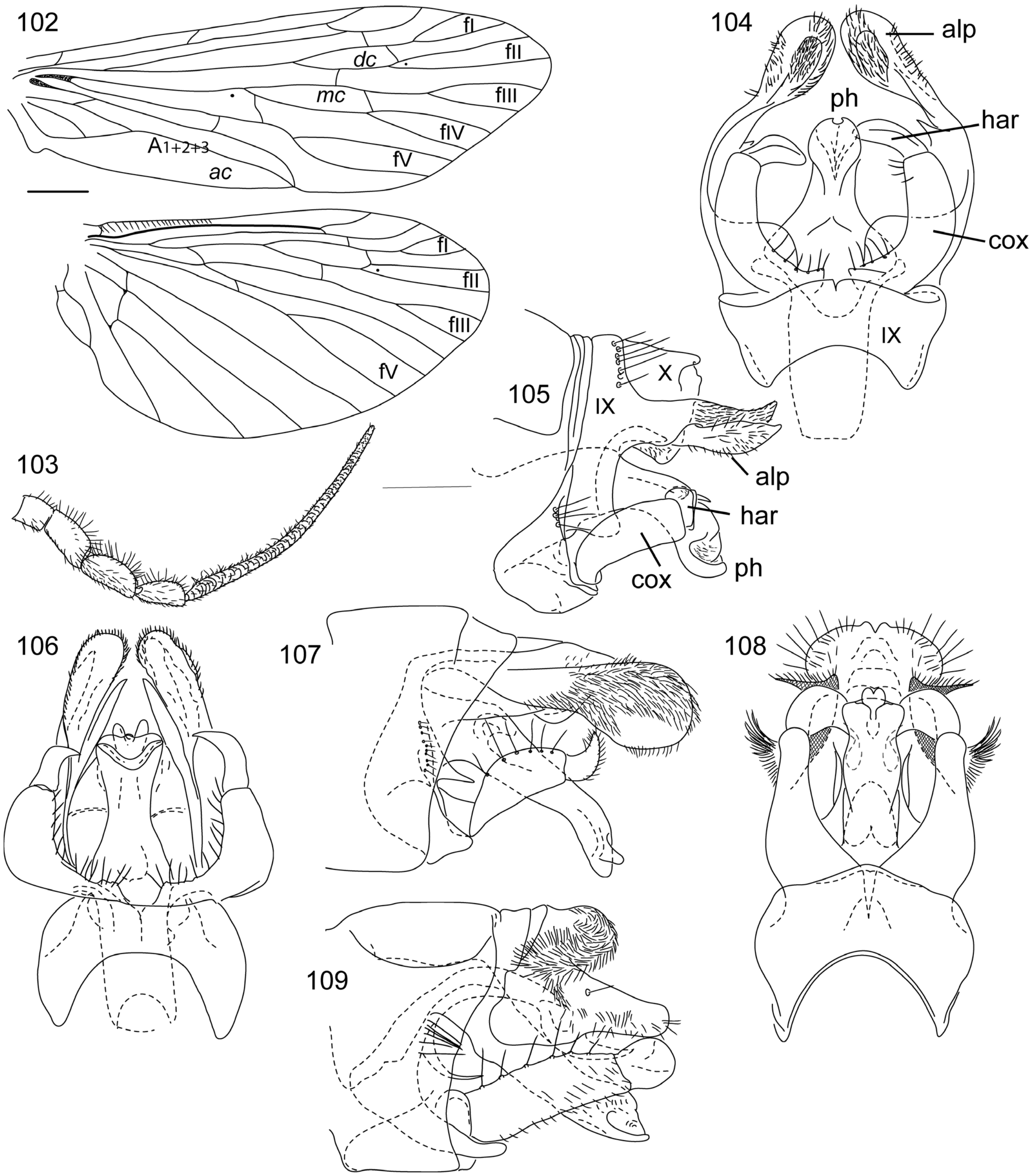
Other material, Victoria: 2♂, Gordon's Bridge, Yea River, 6.i.1954, A. Neboiss; 1♂, Healsville, 7.ii.1954, A. Neboiss; 1♂, Noojee, 14.xi.1957, A. Neboiss; 1♂, Merrijig, Vic, 30.xi.1957, J. Landy; 2♂ 2♀, 7.xii.1957, J. Landy; 1♂, Merrijig, 15.i.1958, Edwards [PT-1095]; 1♂, Glenelg River, Chimney Pot Gap, Grampians, 16.xii.1966, A. Neboiss; 1♂, Glenelg River, Headwaters, 16.xii.1966, E.F. Riek (ANIC, badly bleached specimen); 2♂ (?38♀), Tooronga Falls, NE Noojee, 17.xii.1970, A. Neboiss; 4♂ 13♀, 3 km SE Taggerty, Little River, 6.i.1972, A. Neboiss; 1♂ 7♀, 3 km W Beenak, 7.i.1972, A. Neboiss; 31♀, Yea River, 7 km S of Glenburn, 1.xii.1972, A. Neboiss; 1♀, Aire River, 4 km ? Beech Forest, 4.xii.1972, A. Neboiss & Malcolm; 1♀, Taggerty River, 4 km E of Marysville, 26.xii.1974, A. Neboiss; 2♀, Wingan River, 8 km S of Princes Hwy, 30.i.1975, A. Neboiss; 1♂, Jordan River at Jericho, 28.xi.1976, A.A. Calder; 2♂ 7♀, Matlock Creek off Thomson Portal Road, 14 km W of Aberfeldy, 10.ii.1977, A. Calder; 6♀, Tooronga River, 1 km S of Tooronga Rd, 28.xi.1978, NMV Survey Dept; 6♀, Tooronga Falls, 7 km NE of Noojee, 27.xi.1981, J. Morse & A. Neboiss; 1♂, Acheron River, 3.5 km ESE Narbethong, 14.i.1982, R. StClair; 2♂, Watts River, Fernshaw, 12 km NE of Healsville, 11.ii.1982, A. Neboiss & K. Walker; 8♀, O'Shannassy River, 20.i.1983, A. Neboiss; 2♂ 7♀, Vic, Matlock River off Thomson Portal Road, 14 km W of Aberfeldy, 10.ii.1977, A. Calder [TRI-39989].

Diagnosis. In general form, the male genitalia of this species are similar to those of *Arc. angusta* with strongly bowed gonopods, but with lateral extensions on fused abdominal tergites IX/X, in lateral view, broadly rounded and club-shaped, not narrowly lanceolate; a small down-curved spine is present medially on the apicolateral margins of abdominal segment IX; and on each gonopod, the harpago is acute apically, not rounded. The female terminal abdomen has apicolateral angles of sternite VIII narrowly digitiform.

Description. Length of each forewing (Fig. 102): ♂ 9.0–10.9 mm (n = 3), ♀ 10.3–11.8 mm (n = 7); forewing median cell length about 5x maximum width. Maxillary palps (Fig. 103) with segments 2 and 3 about equal length, 1 and 4 shorter, 5 slightly longer than other four together.

Male (Figs 106–107, 162–163). Reticulate-walled internal sacs rounded, about 2/3 length of segments; lateral filaments short, about half length of segment. Genitalia: In lateral view with segment IX broadly concave apically; slender, spiny down-curved process on each lateral margin situated below level of phallus; tergites IX and X fused, in ventral view each side with elongate lateral extension of about equal width throughout length, on mesal margins slender process to about 2/3 length, in lateral view broadly rounded distally; gonopods in ventral view each with coxopodite stout, strongly curved, harpago short, narrow, in ventral view curved, tapered to acute apices directed mesad; phallic apparatus without parameres, stout basally, in lateral view tapered distally, down-turned.

Female. Abdomen (Figs 181–182) terminating bluntly; pair of cerci and both pairs of terminal protuberances small; sternite VIII formed by 2 ventrolateral plates that cover inferior appendage receptacle grooves fully divided mesally, apicolateral angles extending dorsad in finger-like lobes, in lateral view rounded ventrally.



FIGURES 102–109. *Arcyphysa* **gen. nov.** spp., diagnostic features. **102–103**, *Arc. diamontona* **sp. nov**., Vic., Diamond Creek, 7 km SE of Gembrook [PT-1006], ♂: **102**, right fore- and hind wings, dorsal, **103**, maxillary palp. **104–109**, ♂ genitalia. **104–105**, *Arc. angusta* (Banks 1939; NSW, Styx R. [PT-1005]): **104**, ventral, and **105**, left lateral. **106–107**, *Arc. diamontona* **sp. nov**. [PT-1006]: **106**, ventral, and **107**, left lateral. **108–109**, *Arc. fraserensis* **sp. nov**. (Qld, Fraser Island, Pile Valley, nr Central Station [PT-1125]): **108**, ventral, and **109**, left lateral. Scale bars: Fig. 102 = 1 mm; Fig. 103 = 0.5 mm. Abbreviations: *ac* = anal cell; alp = apicolateral process; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; cox = coxopodite; fI, fII, fIII, fIV, fV = forks I–V; *mc* = median cell; har = harpago; ph = phallic apparatus; IX, X = abdominal segments IX, X

Distribution. *Arcyphysa diamontona* has been collected in areas immediately to the east and north-east of Melbourne, Victoria.

***Arcyphysa fraserensis* sp. nov.**
(Figs 108–109)

Material examined. Holotype ♂, Queensland, Fraser Island, 3 km W Central Station, 20.xii.1979, K.J. Lambkin (QM [TRI-39436]).

Paratypes. Queensland: 2♂, Camp Mile, Cooloola, *Banksia*-dominated open forest, 28.viii.1970, E. Dahms [PT-1014]; 2♀, Fraser Island, Lake Wabby, 10–18.xii.1975, Bensink & Burton (QM); 1♀, same loc., 19.xi.1976, Thompson & Rice (QM); 1♀, Fraser Island, Coomboo Lake, south bank, 31.viii.1979, K.J. Lambkin (QM); 1♂ 1♀, Fraser Island, Pile Valley, nr Central Station, at light, 18.xii.1979, K.J. Lambkin (QM [PT-1125, PT-1050; TRI-39403]).

Other material examined. Queensland: 2♂, Upper Logan, Feb. 1963, K. Korboot, emerged in captivity (UQ); 2♂ 1♀, Tamborine Mtns, Mar. 1963, MV lt, K. Korboot; 3♂ 4♀, Seary's Creek, Cooloola NP, Rainbow Beach, 15°58'S 153°04'E, 9.ii.1987, G. Theischinger; 1♂, Camp Milo Cooloola, at light, *Banksia* dom. open forest, 28.viii.1970, E. Dahms (QM).

Diagnosis. This species is similar to *D. hystricosa* in having each harpago sickle-shaped in ventral view, but differs by having extensions on the anterolateral margins of tergite X in ventral view truncate apically, appearing somewhat 'winged'; and in lateral view having a spine on each mesolateral margin of segment IX directed downward, not upward. The female is indistinguishable from that of *D. hystricosa*.

Description. Length of each forewing: ♂ 6.7–6.9 mm (n = 2), ♀ 7.7.mm (n = 1).

Male (Figs 108–109). Genitalia: In lateral view, abdominal segment IX with wide, U-shaped median excision, anterolateral angles bluntly rounded and densely covered with short, stout spicules, truncate in ventral view; group of bristles located on outer margin on each side, and down-turned spiny process on mesolateral margin situated just below phallic apparatus; tergite IX/X hood-shaped medially, lateral margins covered with scattered groups of short peg-like spines, apicolateral processes in ventral view apically truncate, projecting laterad; in lateral view terminating in finger-like lobe; gonopods in ventral view each with coxopodite stout, broadest at base, slightly curved, harpago short, broadly sickle-shaped in ventral view; phallic apparatus without parameres, almost straight.

Female. Abdomen terminating bluntly; pair of cerci and both pairs of terminal protuberances small; sternite VIII formed by 2 ventrolateral plates fully divided mesally, covering inferior appendage receptacle grooves, distal margins deeply and widely excised; apicolateral angles produced distally in wide setose lobes.

Distribution. Known from several sites on Fraser Island off the coast of south-eastern Queensland and also from several other south-eastern Queensland localities.

***Arcyphysa hystricosa* (Neboiss)**
(Figs 110–111, 150, 152–155)

Diplectrona hystricosa Neboiss 1979 [1978], 832, figs 14–19.

Material examined. Holotype ♂, Queensland, North Stradbroke Island, Myora Springs, 28.xii.1977, A. Arthington (QM [T-5785]). Paratypes, Queensland: 1♂ 1♀, Nth Stradbroke Island, Myora Springs, 3.ix.1974, A. Bensink [PT-512]; 1♀, North Stradbroke Island, Myora Springs, 28.xii.1977, A. Arthington [T-5786]; 1♀ [T-5788 PT-558] (QM, NMV). Queensland: 1♂, Blue Lake, Nth Stradbroke Island, 27.v.1973, H. Burton; 2♂ 2♀, same locality and collector, 11.xi.1973; 1♂ 2♀, same locality and collector, 17.ix.1973; 1♂, Brown Lake, Stradbroke Island, 16.vi.1975, H. Burton.

Diagnosis. In the genitalia of males of *Arc. hystricosa* and *Arc. fraserensis*, abdominal segment IX and tergite X appear to be fused completely, each having, in lateral view, well-developed apicolateral processes that in *Arc. hystricosa* form an upper broad lobe and, below the level of the phallic apparatus, a short up-turned spine. In *Arc. fraserensis* the apicolateral processes each terminates in a shorter finger-like upwardly directed lobe, and the spine below the phallic apparatus is directed downward. In *Arc. hystricosa* the harpagones, in ventral view, are almost cup-shaped, rather than tapered as in *Arc. diamontona* and *Arc. angusta*. The females of *Arc. hystricosa* and *Arc. fraserensis* are closely similar.

Description (modified from Neboiss 1979, 832, figs 14–19). Length of each forewing: ♂ 6.8–8.2 mm (n = 7),

♀ 8.0–9.9 mm (n = 6); forewing median cell only slightly longer than discoidal cell; fork 2 barely sessile, or sometimes with very short footstalk; cross-vein *r-m* at about middle of discoidal cell. Lateral filaments on segment V short.

Male (110–111, 153–154). In abdomen, reticulate-walled sacs in segments VI and VII large, ovoid, each extending about 3/4 distance into preceding segment. Genitalia: Segment IX broad, robust, with wide U-shaped lateral excision; in lateral view, anterolateral angles bluntly rounded and densely covered with short, stout spicules; group of bristles located on outer margin on either side, up-turned spine on each mesolateral margin, situated just below phallus; tergite X hood-shaped, lateral margins each covered with scattered group of short peg-like spines; pointed processes arising from lower apical margins of tergite; gonopods each with coxopodite stout, slightly curved, broadest at base, length about 2.5x maximum width; harpago short, broad, almost cup-shaped in ventral view; phallic apparatus without parameres, straight, with apex obliquely truncate.

Female. Abdomen terminating bluntly; pair of cerci and both pairs of terminal protuberances small. Sternite VIII formed by 2 ventrolateral plates covering inferior appendage receptacle grooves, fully divided mesally, distal margin deeply and widely excised; apicolateral angles broadly rounded.

Distribution. Recorded only from Stradbroke Island.

Remarks. Neboiss (1979) noted that this species 'appears to be related to' *Arc. rossi*, but that the genitalia of the two species differ. In the same work, among 'Other material examined' Neboiss listed one male and two females from Fraser Island. These are assigned here to *Arc. fraserensis* **sp. nov**.

Arcyphysa lovedayi sp. nov.

(Figs 130–131, 164–165)

Material examined. Holotype ♂, Queensland, Killarney District, 3.iv.1955, Loveday (NMV).

Other material examined. 1♂, Papua New Guinea, Port Moresby, Feb 1963, coll. A. Flynn, reared K. Koorboot [TRI-54708].

Diagnosis. This species superficially resembles *Arc. flinti* in having a simple curved process lateromesally on the distal margin of segment IX. However, it is more closely similar to *Arc. naumanni*, in that both species have in lateral view a ventrally directed spine apicomedially on the lateral margin of abdominal segment IX. *Arcyphysa lovedayi* is distinguished from *Arc. naumanni* by the rounded apices on the apicolateral processes and by the absence of a dorsal 'horn' subapically on each harpago.

Description. *Male*. Length of each forewing: 8.2 mm (n = 1). Reticulate-walled internal sacs elongate ovoid, almost length of 2 segments. Genitalia (Figs 130–131, 164–165): Tergites IX and X fused; apicolateral processes of even width throughout length, in ventral view curved outwards and in lateral view curved upward subapically, sternite IX with paired acute spines below phallus on apicolateral margins; gonopods in ventral view each with coxopodite arched widely, slightly tapered distally, harpago about 1/4 length of coxopodite, beak-like apically; phallic apparatus without parameres, broad-based, strongly arched ventrad at about midlength.

Distribution. Known from only 2 specimens: The type specimen collected in the Killarney District on the border of SE Queensland and New South Wales, to the west of the Border Ranges and the other from southern Papua New Guinea.

Arcyphysa naumanni sp. nov.

(Figs 128–129)

Material examined. Holotype ♂, Queensland, 13°44'S 143°20'E, 11 km W by N Bald Hill, McIlwraith Range, 500 m, 26.vi.1989, I.D. Naumann (NMV [PT-2042]).

Paratype 1 ♂, Queensland, Mt Tozer, Iron Range, 300 m, 30.iv.1973, S.R. Monteith (NMV [TRI-39432]).

Diagnosis. The ventral view of the male genitalia superficially resembles that of *Arc. flinti*, but *Arc. naumanni* differs from that species in having in lateral view a ventrally directed spine apicomedially on each lateral margin of abdominal segment IX and a dorsally directed subapical process on the harpago of each gonopod. *Arcyphysa lovedayi* also exhibits this feature but differs from *Arc. naumanni* in having the apicolateral processes on abdominal segment IX rod-shaped and rounded apically, not lanceolate with acute apices, and in lacking any modification of the harpagones.

Description. Male. Length of each forewing: 5.1 mm (n = 1). In abdomen, reticulate-walled glands ovoid, about one segment long; lateral filaments on segment V almost length of segment. Genitalia (Figs 128–129): Tergite IX partially fused with tergite X; down-turned sclerotised spine apicomedially on each lateral margin of sternite IX; single pair of lanceolate apicolateral processes extending posterad well past apex of tergite X and tip of gonopods; gonopods stout, widely separated, each with harpago having 'beak-like' dorsal expansion; phallic apparatus stout, without parameres.

Distribution. Known only from northern Cape York in far north Queensland.

Arcyphysa rossi (Kimmins)

Diplectrona rossi Kimmins, in Mosely & Kimmins 1953, 338, 340, fig. 233.

Material examined. Holotype ♂, Queensland, National Park [= Lamington National Park], 1500–2000 ft, 28.ii.1921, R.J. Tillyard (BMNH).

Diagnosis. When viewed in lateral aspect this species resembles *Arc. angusta*. The apicolateral processes on tergite X and the gonopods and the phallus show some similarity to those structures in that species, but in ventral and dorsal views the genitalia of *Arc. rossi* are distinctive: the apicolateral processes are convergent and tapered to acute apices, not club shaped as in *Arc. angusta*. In common with *Arc. hystricosa*, *Arc. fraserensis*, and *Arc. diamontona*, *Arc. rossi* has a sharp spine midapicolaterally on abdominal segment IX, but those species all have more elaborate lateral extensions on tergite IX/X.

Description. See Mosely & Kimmins (1953, 338, 340, fig. 233).

Distribution. Known only from the type locality in south-eastern Queensland.

Remarks. Unfortunately, no further specimens of this species have been recognised, despite examination of a considerable collection of specimens from southern Queensland, including from Lamington National Park. It is understandable that originally this species was confused with *Arc. angusta* since, in lateral view, the two species show close similarity. However, the two are quite dissimilar in other respects (see Fig. 105, but compare Figs 104, 158, and Mosely & Kimmins 1953, fig. 223c). Given how few specimens of any *Arcyphysa* species are available in collections, it is perhaps not surprising that no further specimens of *Arc. rossi* have been collected.

Arcyphysa satana (Mosely)
(Figs 112, 148, 156–157)

Diplectrona satana Mosely, in Mosely & Kimmins 1953, 342, fig. 236.

Material examined. Holotype ♂, Queensland, F.P. Dodd (BMNH 1907-129); ♂, Queensland, Crystal Cascades, Trib. Crystal Creek, 5.ix.2008, A. Wells (ANIC).

Diagnosis. This species shares with other species in the genus *Arcyphysa* the presence of elongate apicolateral processes on abdominal segment IX, their distally globular and apically sharply pointed shape most closely resembling processes seen in lateral view in *Arcyphysa hugginsi.* Unlike *Arc. hugginsi*, this species lacks parameres on the phallus and the gonopods in ventral view are stout and slightly sinuous basally, the harpagones are narrowly digitate, acute apically. The form of tergite X in dorsal view is truncate and cleft medially at the apex, more closely resembling *Arc. sybillae*. Only two specimens are available at present, the type from ‘Queensland’ and a specimen from Crystal Cascades near Cairns in north-eastern Queensland.

Description (modified after Mosely, in Mosely & Kimmins 1953). Male. Small, length of each forewing: 6–7 mm (n = 2). In abdomen, glandular sacs large, distal pair rounded, proximal pair elongate. Genitalia (Figs 112, 156–157): Tergite X in dorsal view subquadrate, cleft midapically; abdominal segment IX with apicolateral processes swollen, globose distally, narrowed abruptly to sharply pointed apices; gonopods with coxopodites stout and slightly sinuous in basal twothirds, harpagones elongate, length about 6 times width; phallic apparatus stoutest in middle region, narrowed towards apex, in lateral view strongly curved downwards, without spines or parameres.

Female. Unknown.

Distribution. Known only from Queensland, including the unspecified type locality 'Queensland' that is probably in far north-eastern Queensland as for the more recently collected specimen.

Arcyphysa hugginsi Group

Arcyphysa caldera sp. nov.

(Figs 117–118)

Material examined. Holotype ♂, NE Queensland, The Crater, Atherton Tableland, 25.iv.1979, S.R. Curtis (NMV [PT-1040; TRI-39415; WTH-0327]).

Paratypes, NE Queensland: 1♂ (dry), 17 mls S of Atherton, 3000 ft, 19.iii.1964, I.F.B. Common & M.S. Upton (ANIC); 1♂ (dry), Wright Creek, Lake Eacham N.P., 5.ix.1972, O.S. & C.M. Flint (NMNH); 1♂, Tinaroo Creek road, 21.ii.1982, M.S. Moulds (NMV [WTH 0313]); 1♂, Mt Lewis Road, Julatten, 2500 ft, rainforest, 10.xii.1986, A. Walford-Huggins (NMV [WTH 0311]).

Diagnosis. This species groups with *Arc. sybillae*, *Arc. crescentina*, *Arc. hugginsi*, and *Arc. carnarvona*, all of which share the male genitalic feature of a basal paramere on the phallus. Like *Arc. crescentina*, *Arc. hugginsi,* and *Arc. carnarvona*, *Arc. caldera* has 2 sets of paired processes on medially on apicolateral margins of abdominal segment IX, and in common with *Arc. crescentina*, one pair are crescent-shaped, but more openly curved and densely setose than in *Arc. crescentina* and the dorsal pair are not flattened distally; the coxopodites of the gonopods are more slender, being about 5x as long as wide.

Description. Male. Length of each forewing: 8.8–10.5 mm (n = 2). Abdomen with internal membranous sacs elongate-oval, extending for about 1.5x segment length; lateral filaments on segment V short.

Genitalia (Figs 117–118): Tergite IX slightly sclerotised, covered with minute spicules, row of bristles along distal margin, fused with membranous tergite X; sternite IX lying partly within segment VIII; upper apical angle extended to slender, curved, outer apicolateral process, inner apicolateral process arising ventromesally, openly curved, covered with row of spicules; gonopods rather slender, each with coxopodite in ventral view length about 5x maximum width, in lateral view slightly expanded distally, harpago short, curved mesad, shallowly bifid apically; phallic apparatus slender, downturned slightly, expanded apically, small membranous tapered paramere on each side of base.

Female. Unknown.

Distribution. Known only from North-east Queensland.

Remarks. An adult female was taken with the Tinaroo Creek specimen, but since several species have been taken in the same general area, any association can only be tentative.

Arcyphysa candela sp. nov.

(Figs 113–115, 160, 161, 187)

Material examined. Holotype ♂, New South Wales, Brown Mountain, 18.i.1961, E.F. Riek (NMV [PT-1017]).

Diagnosis. Alone among Australian species of Diplectroninae, *Arcyphysa candela* has a pair of small digitiform lobes dorsolaterally on the apical margin of abdominal segment IX, here suggested to be homologous with the elongate apicolateral processes of other species in the genus. This feature distinguishes *Arcyphysa candela* from *Arc. angusta* and *Arc. diamontona*, with which it shares the characteristic of strongly bowed coxopodites.

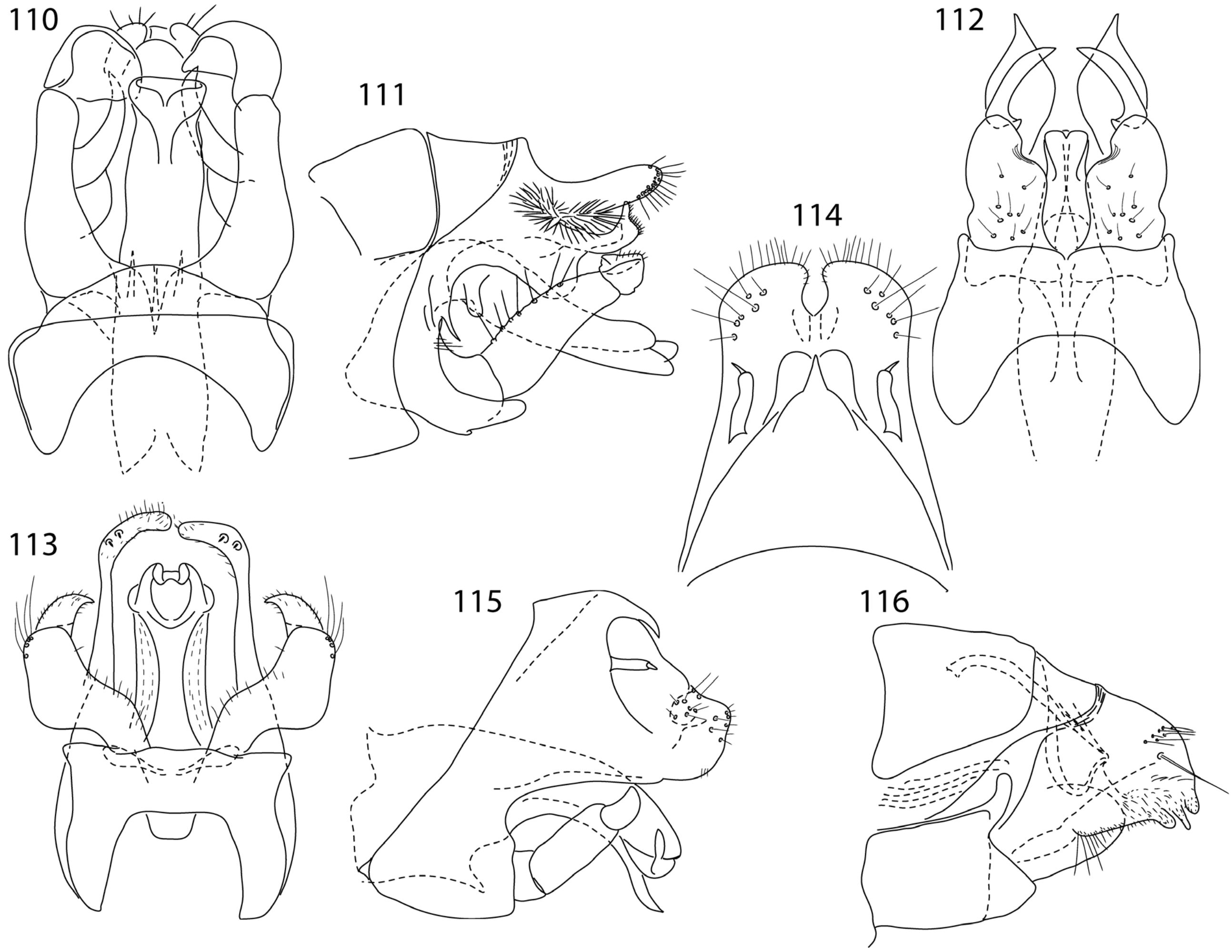
Description. Male. Length of each forewing: 9.8 mm (n = 1). Lateral filaments short, internal sacs small, ovoid, less than 0.5x length of segment. On head, anterolateral warts distinctly divided.

Male. Genitalia (Figs 113–115, 160–161): Abdominal segment IX laterally partially fused with tergite X, sharp triangular projection middorsally, lateral extensions of apicolateral margins absent, dorsally with pair of digitiform or candle-like processes tipped with seta apicolaterally; gonopods sinuous in ventral view and broadly curved, each with coxopodite rod-like in lateral view, harpago almost 1/4 length of coxopodite, length about 2x width, tapered, directed mesad; phallic apparatus stout basally, narrower in distal half, without chitinised spines, with slender upturned lip apically.

Female. Unknown.

Distribution. Known only from the type locality in SE New South Wales.

Remarks. Unfortunately, the body of the holotype is badly bleached, making it very difficult to be sure of some features.



FIGURES 110–116. *Arcyphysa* **gen. nov.** spp., diagnostic features. **110–111**, *Arc. hystricosa* (Neboiss 1979) (Qld, North Stradbroke Island [PT-512]): **110**, ventral; **111**, left lateral. **112**, *Arc. satana* (Mosely 1953; N Qld, Crystal Cascades, Trib. Crystal Creek), ventral. **113–115**, *Arc. candela* **sp. nov**. (NSW, Brown Mountain [PT-1017]): **113**, left lateral; **114**, ventral; **115**, dorsal. **116**, *Arc. diamontona* **sp. nov**. (Vic., Diamond Creek, 7 km SE of Gembrook [PT-1047]), ♀ terminal abdominal segments, left lateral.

Arcyphysa carnarvona sp. nov.

(Figs 126–127, 147, 171–173)

Material examined. Holotype ♂, Queensland, Carnarvon Gorge National Park, 25°15'S 148°24'E, 12.xi.1990, G. Theischinger (NMV [TRI-39506]).

Paratypes, Queensland: 2♂ 3♀, collected with holotype [TRI-39506].

Diagnosis. This species groups with *Arc. crescentina*, *Arc*. *sybillae*, *Arc. caldera*, and *Arc. hugginsi*, having, in the males, parameres on the phallus. Among these species, males most closely resemble those of *Arc. hugginsi* and *Arc. caldera* in having two pairs of long apicolateral processes on segment IX. *Arcyphysa carnarvona* most closely resembles *Arc. hugginsi* in having the outermost pair heavily sclerotised, but in *Arc. carnarvona* the processes are sinuous, crossed medially, crenate, and slightly truncate apically, while in *Arc. hugginsi* the processes curve gently, swell distally to be bulbous and then converge without crossing toward pointed, beak-like apices.

Description. Length of each forewing: ♂ 8.7 mm (n = 3), ♀ 9.6 mm (n = 3).

Male. In abdomen, glandular sacs ovoid, about one segment long; filaments on segment V short, about 1/4 length of segment. Genitalia (Figs 126–127, 171–173): Abdominal segment IX apicolaterally with 2 processes on each side, outermost heavily sclerotised, sinuous, apically crenate, and innermost, more dorsal process pale and terminating in dense spines; tergite IX slightly sclerotised, evenly rounded distally, fused with membranous segment X; segment X in dorsal view rounded distally, shallowly cleft medially; gonopods each with coxopodite in ventral view about 5x maximum width, harpago short, curved inward, apically abruptly reduced to acute spur, in lateral view bifid apically; phallic apparatus expanded basally with very short, conical, apically sclerotised paramere on each side, shorter than in *D. sybillae*.

Female. Terminalia almost 'lotus-like' in ventral view, with sternite VIII in form of 2 well-separated valves, slightly divided distally and laterally produced in narrow distal lobes; sternite IX with paired leaf-like sclerotisations laterally; segment X with cerci and paired apical papillae well developed.

Distribution. Known only from Carnarvon Gorge in the Brigalow country of southern Queensland.

Arcyphysa crescentina sp. nov.

(Figs 119–120, 166–167)

Material examined. Holotype ♂, NE Queensland, Tully Falls, S of Ravenshoe, 11.i.1977, M.S. & B.J. Moulds (NMV [PT-1002; TRI-39438; WTH-0316]).

Paratypes, NE Queensland: 1♂, data as for holotype (NMV [PT-1002]; 2♂, Kirrama State Forest, 24 km WNW of Kennedy, 28.i.1981, M.S. & B.J. Moulds (NMV); 1♂, Bellenden Ker Range, 0.5 km S Cable Tower No. 7, 500 m, 25–31.x.1981, Earthwatch (QM [WTH 0460]); 1♂, Goodard Creek, Kirrama State Forest, 18°06'S 145°41'E, iv.1993, G. Theischinger [TRI-39453, WTH-1037]; 1♂, Canon Creek, Kirrama State For., 17°50'S 145°35'E, iv.1993, G. Theischinger [TRI-39452; WTH-1160]; 1♂, Hutts Brook, 19.v.1010, M. Shackleton, MS 364; 1♂, Tully Gorge Rd, 2.9 km u/s power station 28.v 2011, J. Mynott & M. Shackleton [TRI-54710].

Other material examined. 1♂, Queensland, Tamborine [as Tamb], Mar. 1963, K. Korboot (QM).

Diagnosis. This species groups with *Arcyphysa sybillae*, *Arc. caldera*, *Arc. hugginsi*, and *Arc. carnarvona*, all of which share the male genitalic feature of a pair of basal parameres on the phallus. Among these species it is most similar to *Arc. caldera* in having the apicolateral angles of abdominal segment IX produced into a divided process; in *Arc. crescentina* the longer dorsal process is heavily sclerotised and slightly flattened distally, the inner process is tightly crescent-shaped, in *Arc. caldera* the dorsal process is not flattened and the ventral process is more openly curved.

Description. Male. Length of each forewing: 8.5–9.0 mm (n = 7). Abdomen with internal membranous sacs about as long as one segment, slightly elongate.

Genitalia (Figs 119–120, 166–167): Segment IX partly retracted into segment VIII; tergite IX slightly sclerotised, evenly rounded distally, fused dorsally with membranous segment X; sternite IX apicodorsal angle extended into black, somewhat twisted and flattened elongate dorsal process, also ventral crescentic process bearing band of dense setae; gonopods each with coxopodite rod-shaped, length almost 4x greatest width, harpago short, shallowly bifid to truncate apically; phallic apparatus slender, downturned apically, expanded basally with tiny acute paramere on each side.

Female. Unknown.

Distribution. Found in the Wet Tropics of north-eastern Queensland.

Remarks. Dean's (1999) larva, *Diplectrona* sp. 7 (collected from Kirrama State Forest, 31 May 1971) is possibly this species, recognised by the upright black bristles covering the abdomen, narrow anterior margin of the frontoclypeus, the lateral extremities of which align closely with the inner mesal margins of the eyes.

Arcyphysa hugginsi sp. nov.

(Figs 121–122, 168–169)

Material examined. Holotype ♂, North-east Queensland, Julatten, Mt Lewis Road, 3,700 ft, 25.i.1976, A. Walford-Huggins (NMV [PT-1001; WTH 0320]).

Paratypes. North-east Queensland: 2♂ (NMV [WTH 0322–0323], 1♀ [PT-1051; WTH 0321]), data as for holotype; 1♂, Bellenden Ker Range, Cable Tower No. 3, 1054 m, 25–31.x.1981,Earthwatch (QM [WTH 0462]); 1♂, Bellenden Ker Range, Summit, TV Station, 1560 ft, 1–7.xi.1981, Earthwatch (QM [WTH 0324]); 1♂, Mt Bartle Frere, 0.5 km N of South Peak, 1500 ft, 6–8.xi.1981, Earthwatch (QM [WTH 0461]); 1♂, Julatten, Mt Lewis Road, 2,500 ft, 10.xii.1986, A. Walford-Huggins (NMV [PT-1040; TRI-38720]).

Diagnosis. As with *Arc. sybillae*, *Arc. caldera*, Arc. *crescentina*, and *Arc. carnarvona* this species has a pair of parameres on the phallus and distinctive, complex male genitalia with the apicolateral angles of abdominal segment IX produced to form one or two pairs of elongate processes. *Arcyphysa hugginsi*, *Arc. caldera*, and *Arc. carnarvona* have two pairs of apicolateral processes of tergite X and in *Arc. hugginsi* the outermost pair are heavily sclerotised, flattened distally and each terminates in a bulbous swelling that narrows abruptly to a sharp point, in contrast to *Arc. carnarvona* which has these processes only slightly expanded subapically and terminating in a crenate club and *Arc. caldera* in which they are of even width throughout and rounded apically.

Description. Length of each forewing: ♂ 9.5–11.0 mm (n = 5); ♀ 12 mm (n = 1).

Male. Abdomen with internal glandular sacs about as long as one segment, slightly elongate; lateral filaments on segment V short.

Genitalia (Figs 121–122, 168–169): Segment IX partly retracted into abdominal segment VIII; sternite IX lying inside segment VIII, apicolateral angles each extended into heavily sclerotised, somewhat twisted, apically pointed process and also mesal pale curved process; tergite IX slightly sclerotised, evenly rounded distally, fused with membranous segment X; gonopods each with coxopodite in ventral view about 3.5x maximum width, slightly tapered distally, harpago short, curved inward, abruptly reduced and slightly bifid apically; phallic apparatus expanded basally with flexible, membranous, apically sclerotised paramere on each side, shorter than in *D. sybillae*.

Female. Abdominal sternite VIII in form of pair of sub-quadrate ventral plates, distal mesal angles slightly produced into short rounded lobes; segment IX basally with transverse opening to sclerotic cavity.

Distribution. North-east Queensland wet tropics.

Arcyphysa sybillae sp. nov.

(Figs 123–125, 170)

Material examined. Holotype ♂, North-east Queensland, 5 mls (8 km) N Bloomfield River, 7–9.v.1970, S.R. Curtis (ANIC [WTH-0326; PT 1016; TRI-39435]).

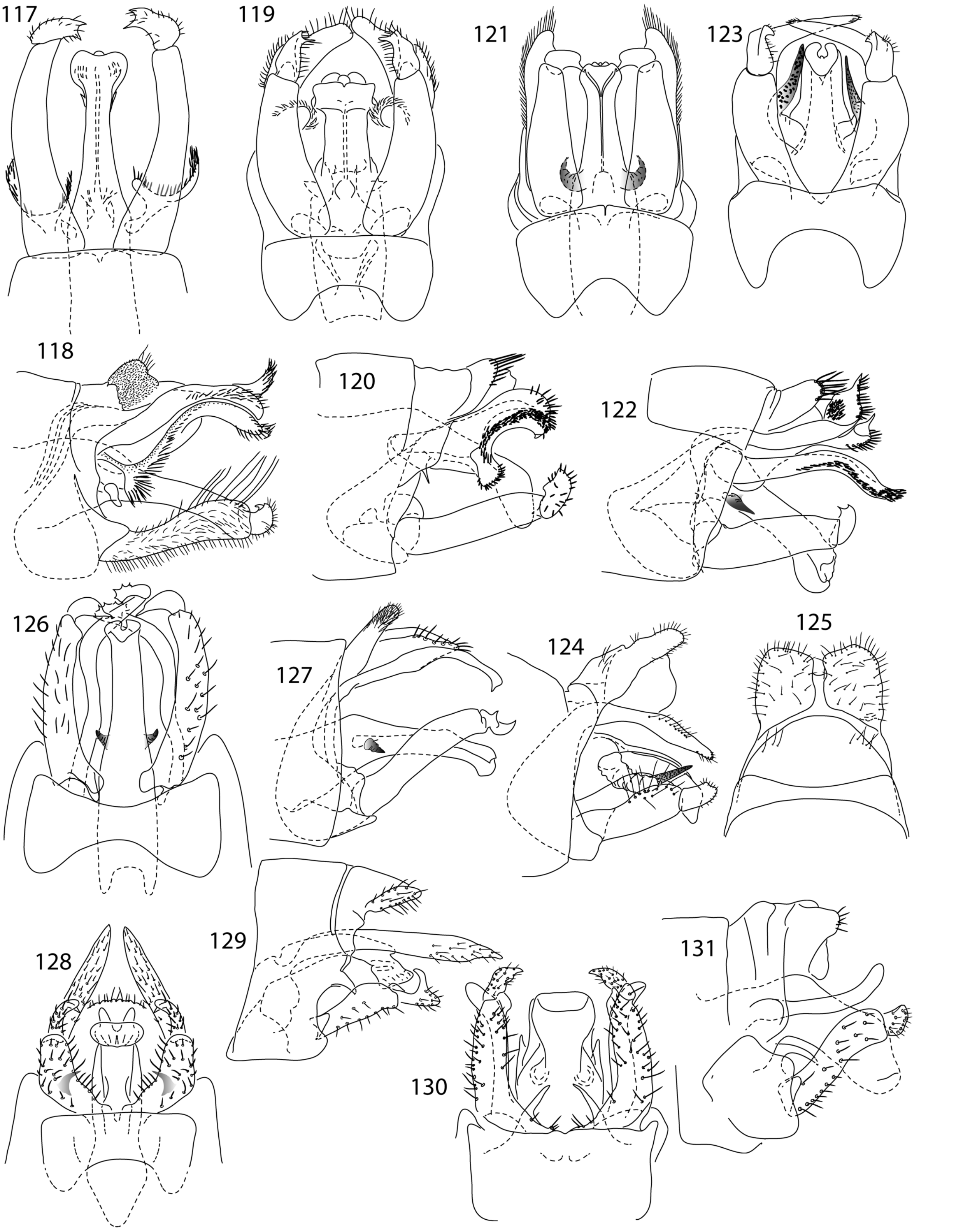
Diagnosis. With parameres at the base of the phallic apparatus, this species groups with *Arc. crescentina*, *Arc. hugginsi*, and *Arc. caldera* but the parameres are more strongly developed, forming long acute spines, and the apicolateral angles of abdominal sternite IX are produced as simple, elongate, distally convergent processes, whereas in these three other species they can be seen in lateral view to be elaborately bilobed and, at least in part, sinuous.

Description. Male. Length of each forewing, 9 mm (n = 1). Head with anterolateral warts divided clearly; maxillary palps each with segment 5 longer than length of 1-2-3-4 together. In abdomen, membranous sacs somewhat compressed, elongate oval, with total length about as long as 1.5 segments; lateral filaments on segment V short.

Genitalia (Figs 123–125, 170): Tergite IX in dorsal view divided, comprising 2 large areas of short setae, membranous medially, fused with tergite X; sternite IX sclerotised, apical angles extended, forming acute, convergent process on each side, overlapping medially; gonopods in ventral view each with coxopodite length approximately 3x width, harpago somewhat flattened, twisted, apex bluntly pointed mesally; phallic apparatus broad at base, tapered and downturned apically, flexible, basally membranous and apically chitinised paramere arising on each side of base.

Female. Unknown.

Distribution. Known only from the type locality in the Wet Tropics of NE Queensland, between Cape Tribulation and Cooktown.



FIGURES 117–131. *Arcyphysa* **gen. nov.** spp., ♂ genitalia diagnostic features. **117–118**, *Arc. caldera* **sp. nov**. (Qld, The Crater, Atherton [PT-1040]): **117**, ventral; **118**, left lateral. **119–120**, *Arc. crescentina* **sp. nov**. (Qld, Tully Falls [PT-1002]): **119**, ventral; **120**, left lateral. **121–122**, *Arc. hugginsi* **sp. nov**. (Qld, Bellenden Ker Range [PT-1000]): **121**, ventral; **122**, left lateral. **123–125**, *Arc. sybillae* **sp. nov**. (Qld, Bloomfield River [PT-1016]): **123**, ventral; **124**, left lateral; **125**, dorsal. **126–127**, *Arc. carnarvona* **sp. nov**. (holotype; Qld, Carnarvon Gorge National Park): **126**, ventral; **127**, left lateral. **128–129**, *Arc. naumanni* **sp. nov**. (holotype; Qld, 11 km W by N Bald Hill, McIllraith Range): **128**, ventral; **129**, left lateral. **130–131**, *Arc. lovedayi* **sp. nov**. (holotype): **130**, ventral; **131**, left lateral.

Archyphysa acmea Group

Arcyphysa acmea **sp. nov.**
(Figs 132–133, 176, 184–185)

Material examined. Holotype ♂, Qld, Mt Bartle Frere, 0.5 km N of South Peak, 6–8.xi.1981, 1500 m, Earthwatch (QM [WTH-0459]).

Paratypes 3♂ (1 dissected), data as for holotype (NMV [PT-999; WTH 0315]).

Diagnosis. This species resembles *D. tortula* and *D. anaplasis* in general arrangement of male genitalic structures but is distinguished by the shorter, regularly curved apicolateral processes on abdominal segment IX, and, in ventral view, the stoutly pillar-shaped coxopodites of the gonopods.

Description. Male. Length of each forewing: 8–8.5 mm (n = 4); maxillary palpi with segments 2, 3, and 4 equal in length.

Genitalia (Figs 132–133, 176): Abdominal segment IX clearly differentiated from tergite X, reduced to very narrow strip laterally, and with apicolateral process on each side evenly curved mesad, brush of setae on ventral margin of distal 1/3; in ventral view terminating in acute, setose apex; tergite X in dorsal view shallowly cleft apically; gonopods each with coxopodite stoutly pillar-like, subrectangular in ventral and lateral views, harpago bifid, lobes tapered distally; phallic apparatus without parameres, slender in distal half, stout medially, slightly narrower in proximal half.

Distribution. Known only from the type locality in north-eastern Queensland.

Arcyphysa anaplasis **sp. nov.**
(Figs 134, 135, 174, 175, 186)

Material examined. Holotype ♂, North Queensland, 25 km along Mt Lewis Road, SW of Mossman, 16.i.1977, M.S & B.J. Moulds, NMV.

Diagnosis. This species is grouped with *Arc. tortula, Arc. flinti*, *and Arc. acmea* in having the harpagones bifid, and sharing with *Arc. acmea*, *Arc. tortula*, *Arc. volsella*, and *Arc. nebo* the elongate, often sinuous apicolateral extensions on segment IX that extend beyond tergite X. It differs from *Arc. acmea* and *Arc. tortula* by the less robust genitalic structures and in ventral view the apicolateral processes club-shaped distally, rather than narrowly rounded or tapered to acute apices.

Description. Male. Length of each forewing: 8 mm (n = 1).

Genitalia (Figs 134–135, 174–175): Abdominal tergites IX and X fused, processes arising from lateromedial margins of segment IX elongate, bifid, reaching well beyond apex of tergite X, sharply curved upwards at about 1/5 length, in ventral view dilated distally, densely setose; tergite X broadly rounded, scarcely cleft midapically; gonopods each with coxopodite triangular to subrectangular in ventral view, in lateral view trapezoidal, harpago bifid; phallus without parameres, slender distally, widest medially.

Distribution. Known only from the type specimen from the Wet Tropics of north-eastern Queensland.

Arcyphysa flinti **sp. nov.**
(Figs 138–140)

Material examined. Holotype ♂ (dry mounted), North-east Queensland, Palmerston National Park, Tchooratippa Creek, 5.ix.1972, O.S. & C.M. Flint (NMV [PT-2007]).

Paratype 1♂, data as for holotype.

Diagnosis. In general body features this species groups with other species of *Arcyphysa*, and in lateral view of male genitalia resembles *Arc. sybillae*. However, unlike *Arc. sybillae,* it shares with *Arc. acmea*, *Arc. anaplasis*, and *Arc. tortula* phallic appatatus without parameres and harpagones bifid, and it differs from *Arc. acmea*, *Arc. anaplasis* and *Arc. tortula* in having the apicolateral processes on segment IX about as long as the gonopods, and not twisted and densely setose. In having the coxopodites of the gonopods, in ventral view, elongate triangular, *Arc. flinti* resembles *Arc. tortula*. *Arcyphysa flinti* is distinguished from that species by having the lateral extensions of segment IX in length not exceeding tergite X and only gently curved, not twisted.

Description. Male. Length of each forewing: 7.6 mm (n = 1).

Genitalia (Figs 138–140): Abdominal segment IX in lateral view with elongate slightly curved process medially, arising apicolaterally, of equal width throughout length, extended to slightly less than apex of tergite X; tergite X (Fig. 140) cleft apically in dorsal view; gonopods each with coxopodite stout, triangular, harpago divided, apices of lobes acute in lateral view; phallic apparatus without parameres, slender.

Female. Unknown.

Distribution. Known only from the type locality in north-eastern Queensland.

Arcyphysa nebo **sp. nov.**
(Figs 143–145)

Material examined. Holotype ♂, Queensland, Mt Nebo, 13.xii.1959, J Kerr (NMV [TRI-39427]).

Paratypes, Queensland: 1♂, data as for holotype (NMV [PT-1096; TRI-39433]); 3♂, Branch Creek, Brisbane River, catchment, 26°52'S 152°41'E, 25.x.1993 (NMV [TRI-39424]); 2♂, Branch Creek, Brisbane River, catchment, 26°52'S 152°41'E, 20.xii.1993 (NMV [TRI-39420]).

Other material examined. 1♂, Papua New Guinea, Port Moresby, Feb. 1963, K. Korboot [TRI-54709].

Diagnosis. Most closely similar to *D. volsella* with which it shares the feature on abdominal segment IX of long lateral extensions that are gradually tapered to acute apices and of undivided harpagones, but in this species the processes are irregularly curved, not sharply twisted, each has a band of dense setae along its length, not just on the terminal 1/3, and the harpagones and coxopodites are approximately equal in length, whereas in *D. volsella*, the harpagones are about 1/3 length of the coxopodites.

Description. Male. Length of each forewing: 6.3–6.5 mm (n = 2).

Genitalia (Figs 143–145): Abdominal segment IX in lateral view not clearly demarcated from tergite X, midlaterally with long slender irregularly curved process extending on each side well beyond apex of tergite X, densely setose along ridge extending almost full length of process; gonopods with coxopodites and harpagones approximately equal in length, in lateral view coxopodites subrectangular, harpagones undivided, slightly tapered distally to rounded apices; phallic apparatus without parameres, stoutest in midregion, narrowed towards apex, in lateral view strongly curved downwards.

Female. Unknown.

Distribution. In Australia, collected only at Mt Nebo, some 30 to 40 km north-west of Brisbane; also collected from SE Papua New Guinea.

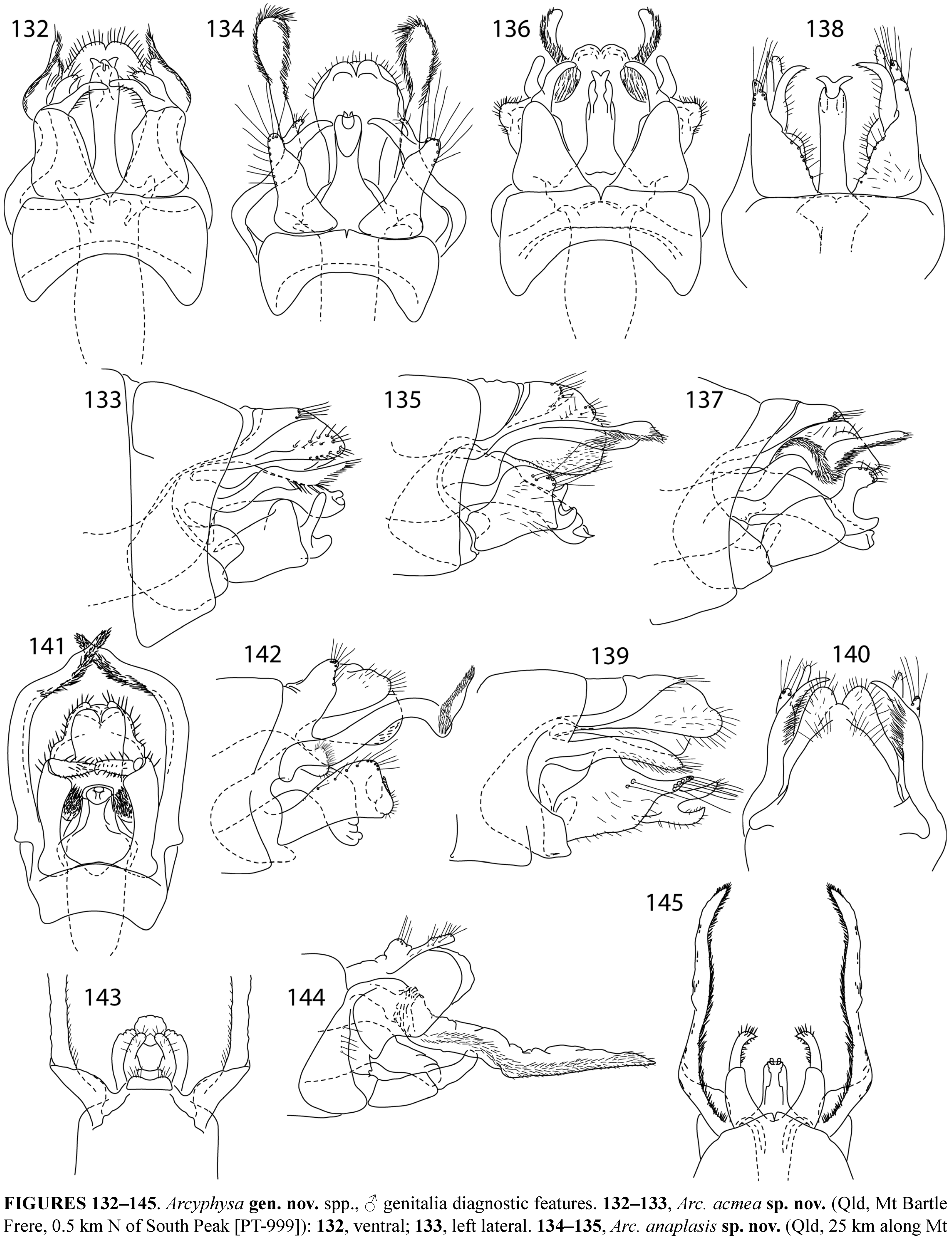
Arcyphysa tortula **sp. nov**
(Figs 136–137, 177–178, 183)

Material examined. Holotype ♂, North Queensland, Bellenden Ker Range, Cable Tower No. 3, 1054 m, 25–31.x.1981, Earthwatch (QM [PT-1031; WTH-0458]).

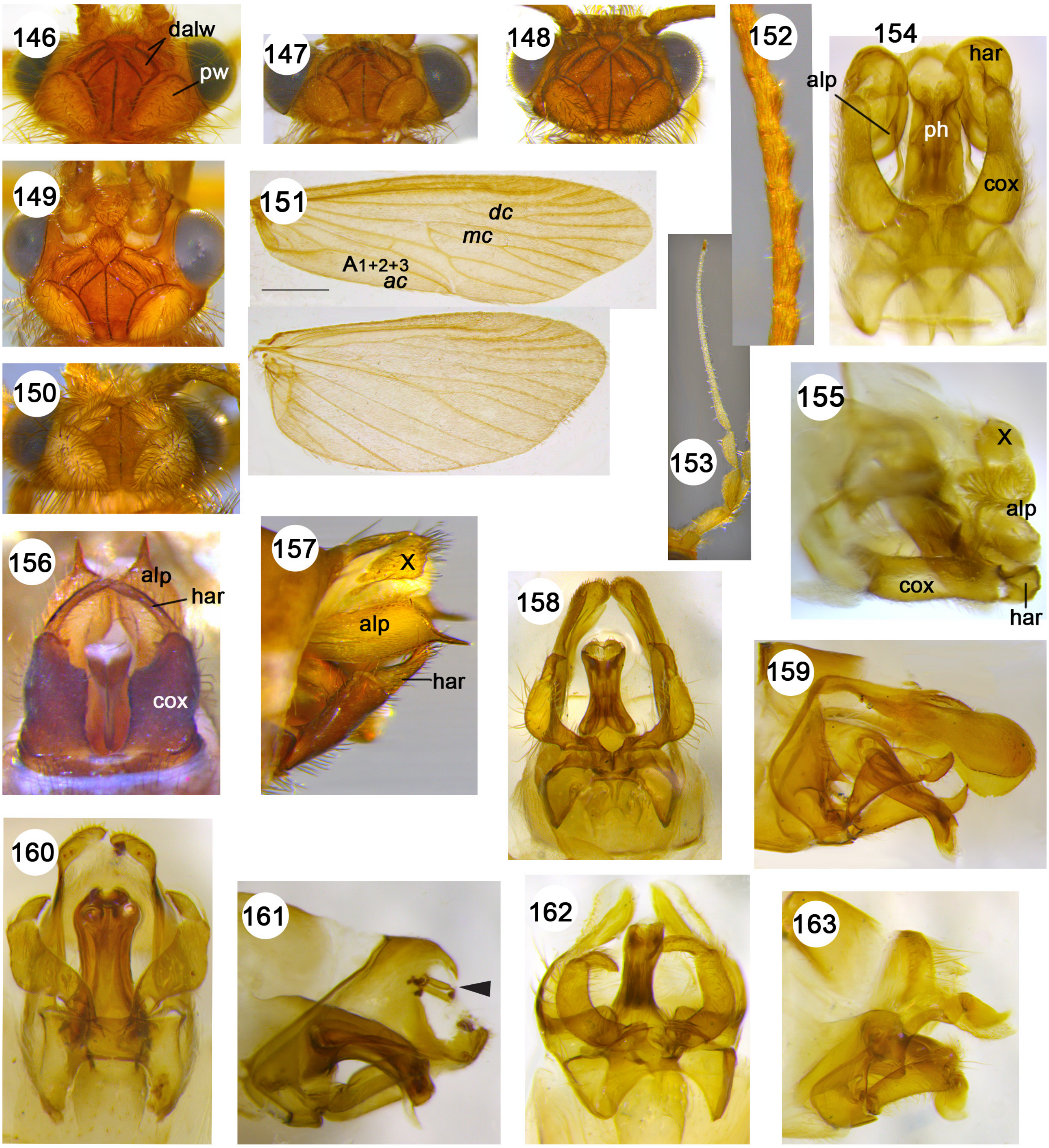
Diagnosis. In having the apicolateral processes on abdominal segment IX strongly sinuous, extended well beyond the apex of tergite X and the coxopodites broadly triangular in ventral view, subrectangular in lateral view, this species can be distinguished from other similar species such as *Arc. acmea*, *Arc. flinti*, *Arc. anaplasis*, and *Arc. nebo*. In ventral view, *Arc. tortula* is clearly distinguished by the strongly twisted apicolateral processes on segment IX and the digitate lobes of the harpagones.

Description. Male. Length of each forewing: 7.5 mm (n = 1); maxillary palpi segments 2, 3, and 4 of equal length. In abdomen (Fig. 183), reticulate-walled internal sacs in segment VI broadly rounded, sacs in segment VII ovoid, both sets slightly exceeding lengths of respective segments.

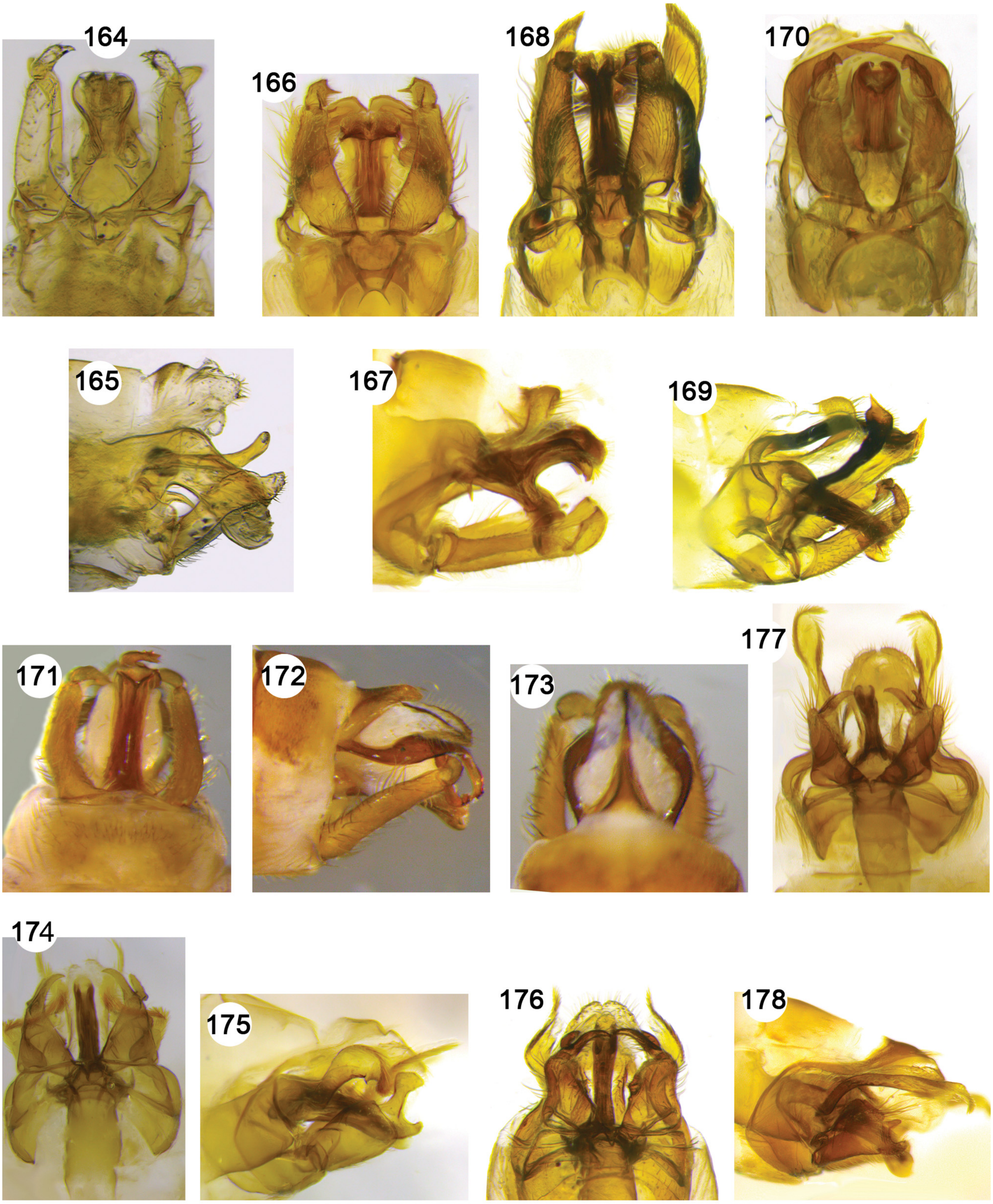
Genitalia (Figs 136–137, 177–178): Abdominal segment IX clearly delineated dorsally from tergite X, narrow midlaterally, strongly twisted apicolateral processes extend well beyond tergite X, bordered by dense setae; tergite X shallowly cleft apically; gonopods with coxopodite stoutly triangular in ventral view, subrectangular in lateral view, harpago bifid, lobes digitate; phallic apparatus without parameres, slender distally, stout medially and towards base.



FIGURES 132–145. *Arcyphysa* **gen. nov.** spp., ♂ genitalia diagnostic features. **132–133**, *Arc. acmea* **sp. nov.** (Qld, Mt Bartle Frere, 0.5 km N of South Peak [PT-999]): **132**, ventral; **133**, left lateral. **134–135**, *Arc. anaplasis* **sp. nov.** (Qld, 25 km along Mt Lewis Road, SW of Mossman [PT-1003]): **134**, ventral; **135**, left lateral. **136–137**, *Arc. tortula* **sp. nov.** (Qld, Bellenden Ker Range, Cable Tower No. 3 [PT-1031]): **136**, ventral; **137**, left lateral. **138–140**, *Arc. flinti* **sp. nov.** (Qld, Palmerston National Park, Tchooratippa Creek [PT-2007]): **138**, ventral; **139**, left lateral; **140**, dorsal. **141–142**, *Arc. volsella* **sp. nov.** (Qld, Queensland, Lamington National Park, Coomera Creek [PT-1013]): **141**, ventral; **142**, left lateral. **143–145**, *Arc. nebo* **sp. nov.** (Qld, Mt Nebo [PT-1096]): **143**, dorsal; **144**, left lateral; **145**, ventral.



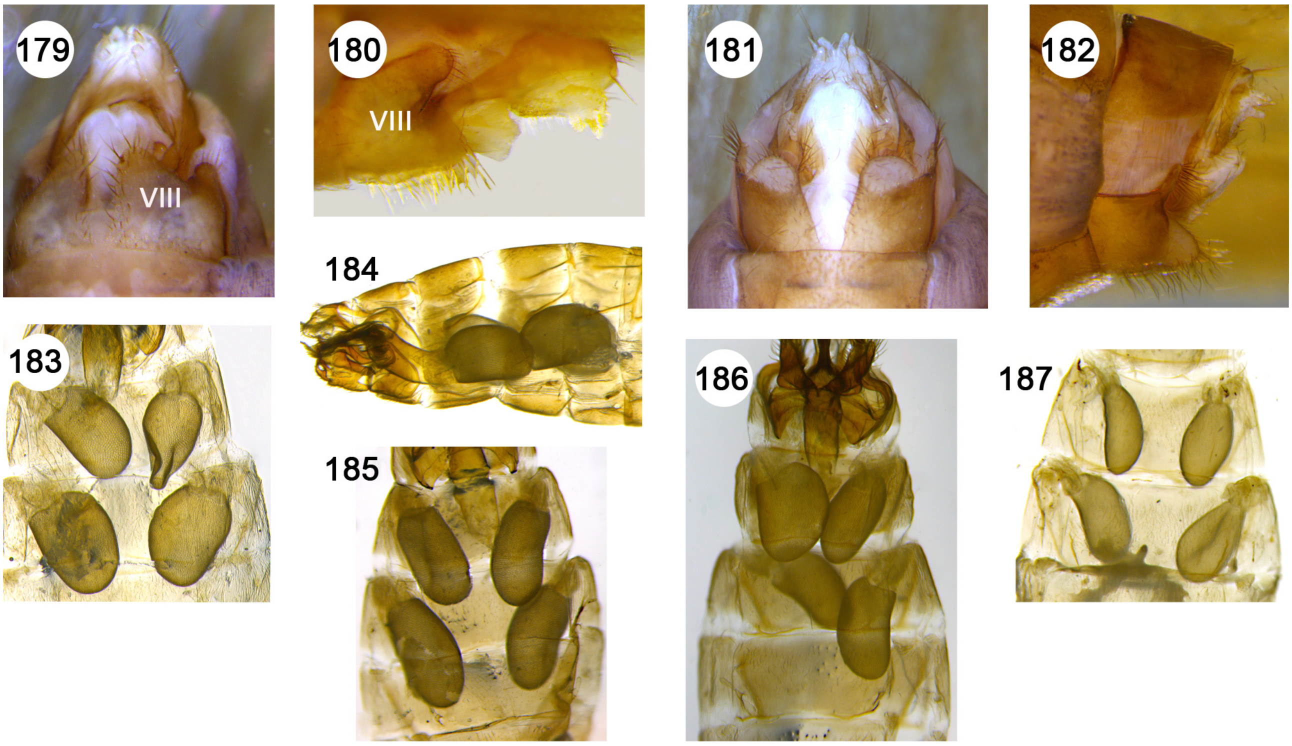
FIGURES 146–163. *Arcyphysa* **gen. nov.** spp., ♂ diagnostic features. **146–150**, heads, dorsal: **146**, *Arc. angusta* (Banks 1939; [PT-1005]); **147**, *Arc. carnarvona* **sp. nov.** (Qld, Carnarvon Gorge); **148**, *Arc. satana* (Mosely 1953; N Qld, Crystal Cascades, Trib. Crystal Creek); **149**, *Arc. diamontona* **sp. nov.** [PT-1047]; **150**, *Arc. hystricosa* (Neboiss 1979; Qld, North Stradbroke Island [PT-512]). **151**, *Arc. diamontana* (Vic., Diamond Creek, 7 km SE of Gembrook), ♂ right fore- and hind wings, dorsal. **152–153**, *Arc. hystricosa* [PT-512]: **152**, antennal segments; **153**, maxillary palp. **154–163**, ♂ genitalia. **154–155**, *Arc. hystricosa* [PT-512]: **154**, ventral, and **155**, left lateral; **156–157**, *Arc. satana* (N Qld, Crystal Cascades, Trib. Crystal Creek): **156**, ventral, and **157**, left lateral; **158–159**, *Arc. angusta* (NSW, Styx R. [PT-1005]): **158**, ventral, and **159**, left lateral; **160–161**, *Arc. candela* **sp. nov.** (NSW, Brown Mountain [PT-1017]): **160**, ventral, and **161**, left lateral; **162–163**, *Arc. diamontona* [PT-1047]: **162**, ventral, and **163**, left lateral. Scale bar = 2 mm. Abbreviations: *ac* = anal cell; alp = apicolateral process; A_{1+2+3} = fused anal veins A_1, A_2, A_3; *dc* = discoidal cell; dalw = divided anterolateral wart; cox = coxopodite; *mc* = median cell; har = harpago; ph = phallic apparatus; pw = posterior wart; X = abdominal segment X.



FIGURES 164–178. *Arcyphysa* **gen. nov.** spp., ♂ genitalia diagnostic features. **164–165**, *Arc. lovedayi* **sp. nov.** (holotype): **164**, ventral; **165**, left lateral. **166–167**, *Arc. crescentina* **sp. nov.** (Qld, Tully Falls [PT-1002]): **166**, ventral; **167**, left lateral. **168–169**, *Arc. hugginsi* **sp. nov.** (Qld, Bellenden Ker Range [PT-1000]): **168**, ventral; **169**, left lateral. **170**, *Arc. sybillae* **sp. nov.** (Qld, Bloomfield River [PT-1016]), ventral. **171–173**, *Arc. carnarvona* **sp. nov.** (Qld, Carnarvon Gorge): **171**, ventral; **172**, left lateral; **173**, dorsal. **174–175**, *Arc. anaplasis* **sp. nov.** (Qld, 25 km along Mt Lewis Road, SW of Mossman [PT-1003]): **174**, ventral; **175**, left lateral. **176**, *Arc. acmea* **sp. nov.** (Qld, Mt Bartle Frere, 0.5 km N of South Peak [PT-999]), ventral. **177–178**, *Arc. tortula* **sp. nov.** (Qld, Bellenden Ker Range, Cable Tower No. 3 [PT-1031]): **177**, ventral; **178**, left lateral.

Female. Unknown.

Distribution. Another apparently rare species, being known only from the type specimen from the Wet Tropics of north-eastern Queensland.



FIGURES 179–187. *Arcyphysa* **gen. nov.** spp., diagnostic features. **179–182**, ♀ terminal abdominal segments: **179–180**, *Arc. angusta* (NSW, Styx R. [PT-1005]): **179**, ventral, and **180**, left lateral; **181–182**, *Arc. diamontona* **sp. nov.** [PT-1006]: **181**, ventral, and **182**, left lateral. **183–187**, ♂ reticulate-walled internal sacs of abdominal segments VI and VII: **183**, *Arc. tortula* **sp. nov.** (Qld, Bellenden Ker Range, Cable Tower No. 3 [PT-1031]), ventral; **184–185**, *Arc. acmea* **sp. nov.** (Qld, Mt Bartle Frere, 0.5 km N of South Peak [PT-999]): **184**, right lateral, and **185**, ventral; **186**, *Arc. anaplasis* **sp. nov.** (Qld, 25 km along Mt Lewis Road, SW of Mossman [PT-1003]), ventral; **187**, *Arc. candela* **sp. nov.** (NSW, Brown Mountain [PT-1017]), ventral. Abbreviation: VIII = abdominal segment VIII.

Arcyphysa volsella sp. nov.

(Figs 141, 142)

Material examined. Holotype ♂, Queensland, Lamington National Park, Coomera Creek, 8.ii.1961, F.A. Perkins (NMV [PT-1013; TRI-13820]).

Paratypes, Queensland: 2♂, data as for holotype NMV [TRI-13820]; ♂, Lamington National Park, 25.1.1963, A. Masters (AM, poorly preserved [PT-1004]).

Diagnosis. In the form of the apicolateral processes, the clear separation of abdominal segments IX and X, and general features of wings and head, *Arc. volsella* resembles *Arc. flinti*, *Arc. tortula*, and *Arc. anaplasis*, but unlike the arrangement in those species, in *Arc. volsella* the harpago is not divided into two separate lobes; in this respect, *Arc. volsella* most closely resembles *Arc. nebo*. Both *Arc. volsella* and *Arc. nebo* share the feature of tapered apices on the apicolateral processes of segment IX, rather than rounded apices as in *Arc. angusta*, and *Arc. volsella* has stout coxopodites that in lateral view are distally about 1.5x as thick as their basal width, not of even width along their lengths as in the other two species.

Description. Male. Genitalia (Figs 141, 142): Abdominal segment IX in lateral view clearly demarcated from tergite X, midlaterally with long slender twisted apicolateral processes extending well beyond apex of tergite X, densely setose on mesal margins of distal 1/3; tergite X shallowly cleft apically; gonopods in lateral view each with coxopodite expanded towards truncate apex such that apical margin almost 1.5x width at proximal margin, harpago undivided, tapered distally, with small spur on apicomesal margin; phallic apparatus without parameres, stoutest in middle region, narrowed towards apex, in lateral view strongly curved downwards.

Distribution. Collected only from south-eastern Queensland, from Lamington National Park.

Remarks. Neboiss' male genitalic preparations of specimens of this species have been found, but despite several careful searches of the NMV collection, and enquiries to QM and AM, the relevant bodies have not been located. Since in general features the species referred to *Arcyphysa* are relatively constant, and the genitalia of *A. volsella* are distinctive, this newly described species is included, based solely on the genitalic preparations.

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