



***Cryptophlebia* Walsingham, 1900, *Thaumatotibia* Zacher, 1915, and *Archiphlebia* Komai & Horak, 2006, in Australia (Lepidoptera: Tortricidae: Olethreutinae: Grapholitini)**

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Abstract

The Australian species of the grapholitine genera *Cryptophlebia* Walsingham, 1900, *Thaumatotibia* Zacher, 1915 and *Archiphlebia* Komai & Horak, 2006, are revised, described and illustrated. A key to species is provided. Five named species of *Cryptophlebia*, *C. ombrodelta* (Lower), *C. iridosoma* (Meyrick), *C. rhynchias* (Meyrick) and *C. pallifimbriana* Bradley, are redescribed and three new species, *C. wraggae*, **sp. nov.**, *C. stigmata*, **sp. nov.**, and *C. caulicola*, **sp. nov.**, are described. *Cryptophlebia amblyopa* Clarke, described from Micronesia, is synonymised with *C. iridosoma*. *Cryptophlebia caulicola*, **sp. nov.**, is a borer in twigs of *Acacia mangium* Willd. in northern Queensland. *Thaumatotibia aclyta* (Turner) and *T. zophophanes* (Turner) are redescribed and the new species *T. maculata*, **sp. nov.**, is described. Fruit of *Acronychia* spp. (Rutaceae) have been identified as native hosts of *T. zophophanes*, a pest species which damages macadamia (Proteaceae) and avocado (Lauraceae) on the Atherton Tableland. *Archiphlebia endophaga* (Meyrick) and *A. rutilescens* (Turner) are redescribed, and the new species *A. gilva*, **sp. nov.**, is described.

Key words: Macadamia nut borer, twig borer, *Acacia mangium*, avocado, taxonomy, new species

Introduction

The taxonomy of the *Ecdytopha* group of genera (Adamski & Brown 2001), which includes *Cryptophlebia* Walsingham and *Thaumatotibia* Zacher, has been assessed three times in recent years. Komai (1999) dealt with the group in a review of *Grapholita* Treitschke and allied genera in the Palaearctic region, and Adamski & Brown (2001) provided a comprehensive revision of the New World species of *Ecdytopha* Zeller, *Gymnandrosoma* Dyar and *Pseudogalleria* Ragonot. More recently, Komai & Horak (2006) reviewed the group at the generic level for the Australian fauna, describing the new genus *Archiphlebia* Komai & Horak and reporting *Gymnandrosoma* from Australia. However, the bulk of *Cryptophlebia* and *Thaumatotibia* species occur in the Oriental/Australian region and to a lesser extent in tropical Africa, and they have not been examined at the species level since a very early study of economically important species by Bradley (1953). In this paper we revise *Archiphlebia* and the Australian species of the closely related *Cryptophlebia* and *Thaumatotibia*, describing new species in all three genera. The character combination for one of the new species necessitated a re-evaluation of *Cryptophlebia* and its relationship with *Pseudogalleria*. *Gymnandrosoma* was not considered in this context as only the male is known of the Australian *G. gonomela* (Lower).

The larvae of the *Ecdytopha* group are all borers, either in seeds, pods or fruit or in galls, twigs, stems and rarely roots. Many species are polyphagous, often across a range of families, and several are serious horticultural pests. The widely distributed *Cryptophlebia ombrodelta* (Lower), known as the macadamia nutborer in Australia, is an important pest of macadamia, litchi, orange and tamarind (Bradley 1953), and Ironside (1974) provided a long list of host plants from six families. Recently, a small unidentified native species, initially referred to *Cryptophlebia* and later found to belong to *Thaumatotibia*, was found attacking macadamia and avocado on the Atherton

Tableland in northern Queensland. An unnamed species of *Cryptophlebia* was also recently discovered with larvae boring in twigs of *Acacia mangium* Willd. Furthermore, several other unnamed Australian species in this group were known to be present in the Australian National Insect Collection. Given the economic importance of the group and the resulting quarantine implications, financial support from the former Horticultural Research and Development Corporation (HRDC) was a welcome incentive for a comprehensive revision of Australian *Cryptophlebia* and *Thaumatotibia* to provide a realistic inventory of Australian species and genera as well as reliable means for their identification. Strong sexual dimorphism in wing pattern in many *Cryptophlebia* species and the inherently large range in size of borers make species recognition difficult unless adequate documentation is available.

The dorsal portion of the male genitalia of *Cryptophlebia*, *Thaumatotibia* and *Archiphlebia* is strongly simplified, a trend consistent with their taxonomic position in the tribe Grapholitini. This reduces the number of taxonomically informative genitalia characters, even more so in groups with a simplified valva with only a few large spines of sometimes huge size, and has resulted in very distinctive species having nearly identical male genitalia. Details of the secondary sexual scale structures on the 8th segment in some cases provide the diagnostic features lacking in the genitalia. The female genitalia of both genera have retained several plesiomorphic character states and, with some exceptions, provide rather few taxonomic characters, again leaving some distinct species with identical genitalia.

Generic delineation for the Australian fauna in this group was far from clear, and an unnamed Australian species with characters intermediate between the established genera further obscured the picture. Since extensive generic descriptions are given in Komai & Horak (2006) and reliable generic differential diagnoses are impossible in this group, only brief diagnostic generic descriptions are provided. To allow for reliable identification of the known Australian species, we have endeavoured to provide a user-friendly key, with several species keyed out repeatedly to account for sexual and intraspecific pattern variation. Any identification obtained using the key should be confirmed by comparison with the diagnosis and illustrations of the relevant species, and genitalia dissection if there is any doubt.

Material and methods

This study is based largely on the holdings of the Australian National Insect Collection, CSIRO NRCA, Canberra, and the type material of the species concerned. For non-type material, only the sex, general locality and consolidated collection dates are given. The complete data for the Material Examined is accessible by searching for *Cryptophlebia* in the Atlas Of Living Australia at: <http://bie.ala.org.au/search?q=>. The distribution maps were made with BioLink. Collectors and collections are abbreviated as follows:

E.D.E. = E. D. Edwards;

I.F.B.C. = I. F. B. Common;

ANIC, Australian National Insect Collection, CSIRO NRCA, Canberra, Australia;

BMNH, The Natural History Museum, London, U.K.;

QFRI, Queensland Forestry Research Institute, Dutton Park, Qld, Australia;

SAMA, South Australian Museum, Adelaide, Australia.

For wingspan measurements, the size of specimens distinctly outside a cohesive size range are given in parentheses. The illustrations were made from standard genitalia slides using a Zeiss ProgRes 3012 high-resolution digital camera on a compound microscope and the software Automontage (Synoptics Ltd., Cambridge, UK) to compile a series of focus levels into a single image. The BOLD TaxonID Tree based on barcodes obtained from ANIC material is generated using the neighbour-joining algorithm, with detailed information available on http://www.boldsystems.org/index.php/resources/handbook?chapter=4_analysis.html§ion=taxon_id_tree.

Results

The *Ecdytolopha* group of genera

The genera of the *Ecdytolopha* group have long puzzled taxonomists. The strongly reduced tegumen in the male and the very plesiomorphic female genitalia have caused difficulties assigning the genera to the appropriate olethreutine tribe ever since Heinrich (1923, 1926) included *Pseudogalleria* at the base of the Eucosminae and *Gymnandrosoma* and *Ecdytolopha* at the base of the Laspeyresiinae (now Grapholitini), though he was well aware of similarities between the three genera. Bradley (1953) restricted himself to a revision at the species level without addressing the position of *Cryptophlebia* within the Olethreutinae. Diakonoff (1953) first recognised the relationship between the New and Old World genera of the group and initially synonymised *Cryptophlebia* with *Pseudogalleria*, but later (Diakonoff 1957) reinstated *Cryptophlebia* on the basis of the very derived wing shape of *Pseudogalleria*. Diakonoff (1957) also realised that *Ecdytolopha* belongs to the same group, with the position of M_2 and M_3 in the hindwing variable even within the genus and not taxonomically significant. He referred all three genera to the Laspeyresiini (Diakonoff 1957), an assignment upheld by Obraztsov (1961). Horak & Brown (1991) tentatively transferred *Cryptophlebia* to the Eucosmini. However, Komai's (1999) phylogenetic analysis of the Grapholitini demonstrated that the *Ecdytolopha* group is monophyletic, and he finally provided convincing apomorphies placing *Cryptophlebia* and related genera within this tribe.

Characters defining the *Ecdytolopha* group include a usually small or obsolete accessory cell, and, according to Adamski & Brown (2001), a spinulose patch at the junction of ductus and corpus bursae and an anterolateral notch to the D1 pinacula on the larval abdomen. In the Australian fauna, the spinulose patch is usually present but absent in *C. stigmata*, whilst the larvae have not been studied. Komai (1999) identified five further apomorphies, in addition to a small or obsolete accessory cell, which unite *Thaumatotibia* and *Cryptophlebia*: 1) forewing with a blackish triangular pretornal patch; 2) hindwing with a short discal cell, especially in male; 3) T8 and sometimes also preceding tergites in male with a patch of long, easily removable mane-like scales; 4) valva with a patch of very long, curled scales on the outer surface of the cucullus; and 5) pupa with A10 having a pair of strong spines along anal rise. Long, curled scales on the outer surface of the valva are present in all Australian *Thaumatotibia*, *Cryptophlebia* and *Archiphlebia* species, as well as in *P. inimicella*. A pretornal patch is absent in several Australian species and weak in *P. inimicella*, but a patch of long mane-like scales is present at least on T8 in all Australian species, including *A. rutescens* and *A. endophaga*, and also in *P. inimicella*. The length of the hindwing discal cell and pupal morphology were not assessed in the present study.

Definition of genera within the *Ecdytolopha* group is equally impeded by the paucity of genitalia characters and the variable hindwing venation. Though Adamski & Brown (2001) included a phylogenetic analysis and cladogram in their revision of *Ecdytolopha*, *Gymnandrosoma* and *Pseudogalleria* they refrained from providing generic diagnoses and a key to genera. Wing pattern and genitalia structures strongly suggest three separate genera, but it is difficult to translate these differences in 'Gestalt' into unequivocal, diagnostic characters. Some of the crucial traits show considerable homoplasy, such as position of M_2 and M_3 in the hindwing and valva shape, or are rather tenuous, such as the broad, pale terminal and subterminal forewing area defining *Ecdytolopha*. Komai (1999) provided diagnoses for both *Thaumatotibia* and *Cryptophlebia*, but again, many characters are homoplasious, especially the coremata, though they are highly informative if present. In the Australian context, *Thaumatotibia* is clearly defined, as is the core of *Archiphlebia*. *Archiphlebia rutescens*, however, has only tentatively been included in *Archiphlebia*. *Cryptophlebia* is a highly diverse taxon, and the present revision has aggravated rather than diminished the problem as it has revealed a *Cryptophlebia* species that lacks some of the 'typical' *Cryptophlebia* characters, e.g., a sexually dimorphic forewing pattern and coremata.

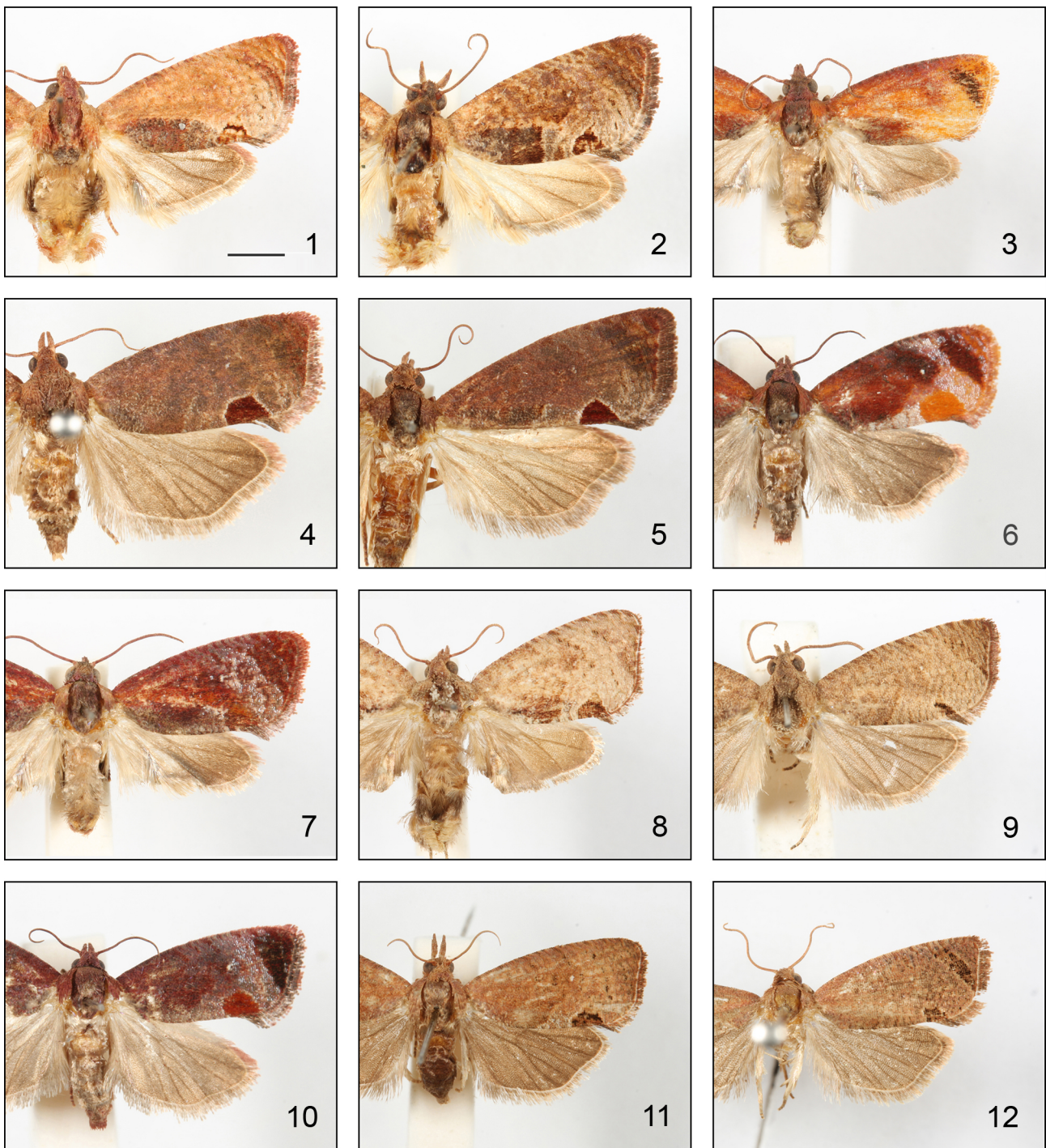
Whilst the BOLD TaxonID Tree based on ANIC material does recover *Thaumatographa*, *Cryptophlebia*, and *Archiphlebia* each as a cluster, the three genera are separated by other grapholitine genera (*Microsarotis* Diakonoff, *Pammenemima* Diakonoff, *Apocydia* Komai & Horak, *Notocydia* Komai & Horak, *Grapholita* Treitschke, *Acanthoclita* Diakonoff) and by the eucosmine genus *Coenobiodes* Kuznetsov. If the barcodes of *Pseudogalleria* are added to this tree it appears separate from but next to *Cryptophlebia*.

Key to Australian species of *Cryptophlebia*, *Thaumatotibia* and *Archiphlebia*

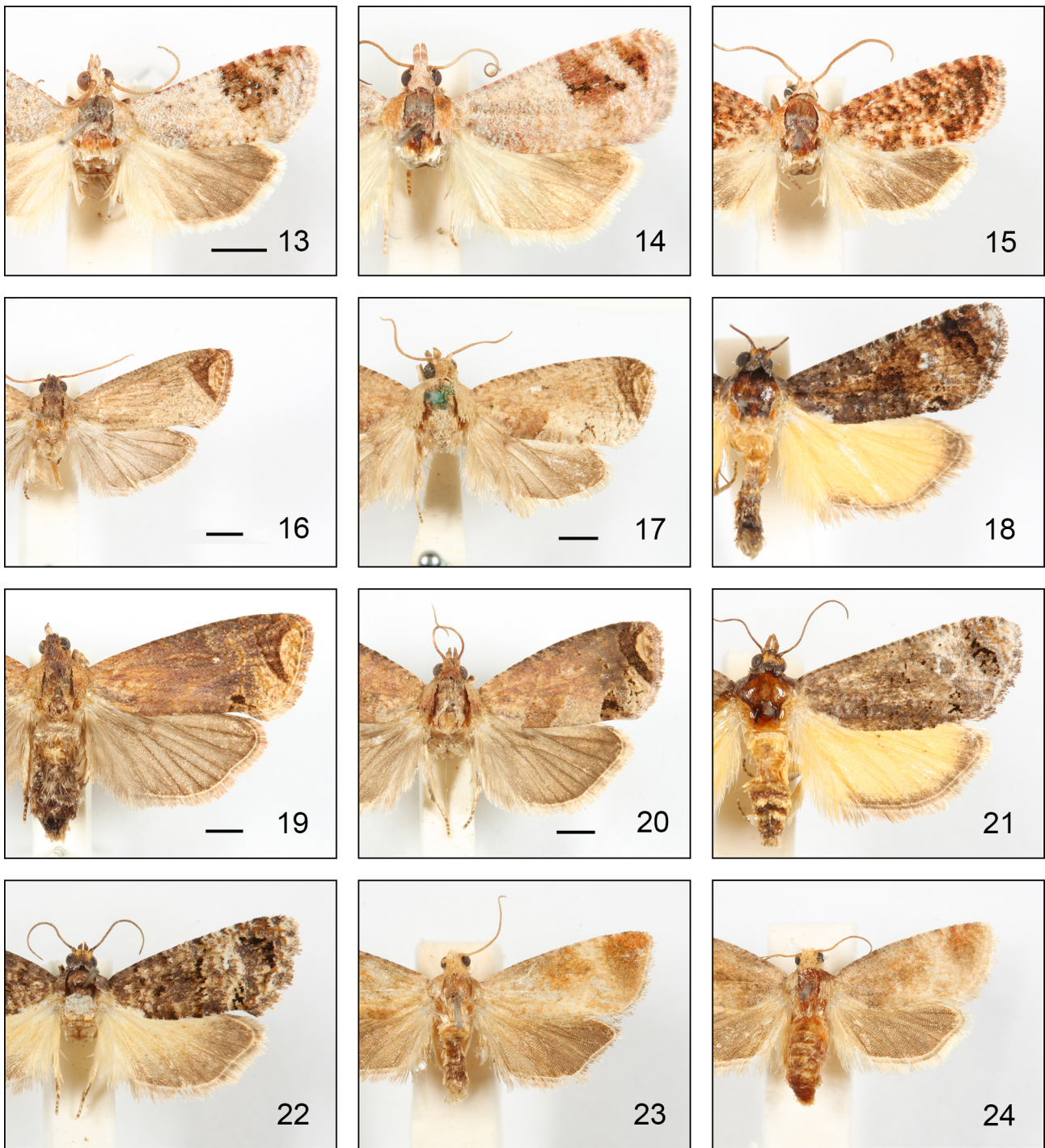
Unless otherwise stated, the key applies to both sexes. However, for strongly sexually dimorphic species the sexes are keyed out separately, and species with variable wing pattern are keyed out repeatedly.

- 1 Forewing with pale elliptic mark on termen delineated by comma-shaped dark mark (Figs. 16, 17, 19, 20) 2
 - Forewing without pale elliptic mark on termen 3
- 2(1) Forewing dorsum with outwardly oblique dark band below middle with well-defined oblique distal margin (Figs. 17, 20); male with modified hind tibia and hindwing *C. pallifimbriana*
 - Forewing dorsum without dark band below middle (Figs. 16, 19); male hind tibia and hindwing not modified . *C. rhynchias*
- 3(1) Hindwing yellowish orange with a grey band along margin, forewing mottled dark grey and black (*Archiphlebia*) 4
 - Hindwing greyish, if yellowish orange in basal half then forewing not mottled dark grey and black. 5
- 4(3) Narrow, well-defined, dark grey band along hindwing margin only (Figs. 18, 21) *A. endophaga*
 - Broad, ill-defined, grey band with scattered scales extending towards centre of hindwing (Fig. 22) *A. gilva*
- 5(3) Forewing with small dark pretornal mark at end of dorsum (beware of rubbed specimens) (Figs. 1, 4, 8, 9) 6
 - Forewing without dark pretornal mark at end of dorsum, or pretornal mark obscured by surrounding pattern (Figs. 3, 13, 23, 25, 26, 27) 13
- 6(5) Pretornal mark conspicuous though often small, darker than surrounding area or etched by paler scales (Figs. 4, 9) 7
 - Pretornal mark inconspicuous, not much darker than surrounding area, semicircular, orange to red-brown (Figs. 6, 10); wing reddish with leaden or metallic blue iridescence; male with modified hindwing and hind tibia *C. wraggae*
- 7(6) Forewing varying from light greyish to brown, sometimes with a reddish or burgundy tinge, pretornal mark much darker than surrounding area 8
 - Forewing mottled blackish grey, pretornal mark not much darker though etched by paler scales (*Thaumatotibia*) 17
- 8(7) Males (one frenulum bristle from base of hindwing) 9
 - Females (several frenulum bristles from base of hindwing) 11
- 9(8) Hind tibia enlarged and hindwing with scale-filled ventral pocket distally along CuA₂ 10
 - Hind tibia and hindwing not modified; pretornal mark slender, an inwardly oblique dark brown bar, forewing apex either darker or with a transverse, well-defined darker preapical band (Fig. 9) *C. caulicola*
- 10(9) Forewing pale greyish ochreous, very wide; hindwing darker, grey (Fig. 8) *C. iridosoma*
 - Forewing reddish ochreous to reddish brown, moderately wide; hindwing paler, greyish ochreous (Figs. 1, 2) *C. ombrodelta*
- 11(8) Pretornal mark elongate, slender, inwardly oblique; forewing apex either darker or with a transverse, well-defined darker preapical band (Fig. 12) *C. caulicola*
 - Pretornal mark subtriangular; dark apical mark ill-defined or absent 12
- 12(11) Forewing apex pointed, termen oblique; apex gradually darker or with darker transverse shade; pretornal mark high, subtriangular (Figs. 4, 5) *C. ombrodelta*
 - Forewing apex rather square, termen only slightly oblique; apex not darker; pretornal mark a low semicircle (Fig. 11). *C. iridosoma*
- 13(5) Forewing pale grey with brownish maculations or marks, or at least partly orange or reddish brown 14
 - Forewing mottled blackish grey, if any reddish brown only on dorsum (*Thaumatotibia*) 17
- 14(13) Forewing pale grey except for a large bipartite brown mark in distal half of wing; hindwing yellowish white at base, dark grey distally (Figs. 13, 14) *C. stigmata*
 - Forewing not so 15
- 15(14) Forewing marbled throughout with light reddish brown on whitish background; hindwing distally grey (Fig. 15) *C. stigmata* (speckled form)
 - Forewing not so 16
- 16(15) Forewing with an orange to reddish brown blotch in apex delineated by a pale greyish band from tornus to 1/3 costa; hindwing grey with yellowish orange base (Figs. 23, 24) *A. rutilescens*
 - Forewing red-brown or reddish throughout, usually with a band of scattered leaden or metallic blue iridescent scales from 1/3 costa to tornus; male with modified hindwing and hind tibia, female with inconspicuous orange or red-brown semicircular pretornal mark (Figs. 3, 6, 7, 10). *C. wraggae*
- 17(7,13) Distal half of forewing at least in parts paler beyond a clearly defined outwardly curved line from beyond middle of costa to before tornus (Figs. 26, 27, 29, 30) 18
 - Usually entire forewing dark, if some paler areas then ill-defined and not delineated by a clearly defined curved line from beyond middle of costa to before tornus (Figs. 25, 28); male genitalia with bipartite uncus (Figs. 60, 61), female genitalia with a large projecting ring around ostium (Fig. 79). *T. zophophanes*
- 18(17) Males (one frenulum bristle from base of hindwing) 19
 - Females (two or more frenulum bristles from base of hindwing) 20
- 19(18) Hindwing nearly white with modified, black scales near centre on upper side (Fig. 27) *T. maculata*
 - Hindwing very pale grey, without any modified black scales (Fig. 26). *T. aclyta*
- 20(18) Distal half of wing only in parts much paler than base, with an indistinct vertical subtriangular dark mark from before apex towards tornus (Fig. 29); female genitalia with scale bands of sterigma short, wide and strongly diverging (Fig. 80) *T. aclyta*

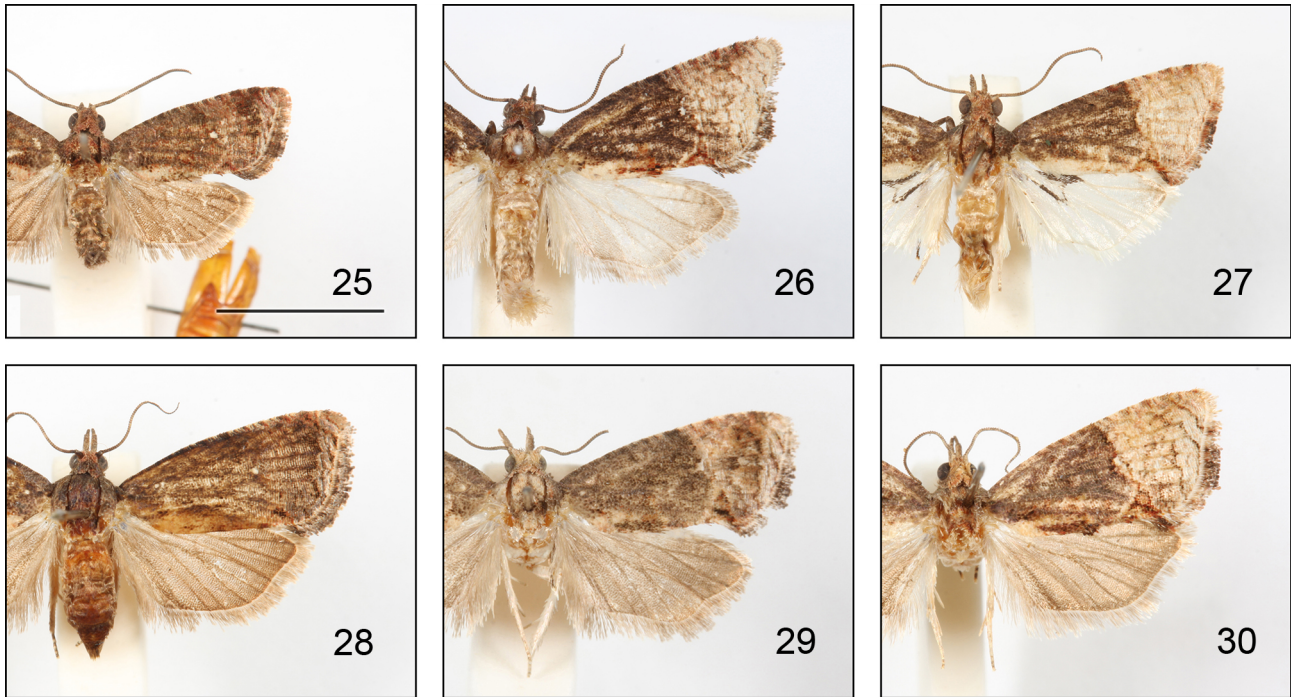
- Distal half of wing throughout much paler than base, even if somewhat mottled (Fig. 30); female genitalia with scale bands of sterigma long, slender and only distally diverging (Fig. 81) *T. maculata*



FIGURES 1–12. Adults of *Cryptophlebia*. 1, *C. ombrodelta*, male, Daintree, Qld. 2, *C. ombrodelta*, male, nr Bindoon, WA. 3, *C. wraggae*, paratype male, Yeppoon, Qld. 4, *C. ombrodelta*, female, Wingham, NSW. 5, *C. ombrodelta*, female, nr Geraldton, WA [image reversed]. 6, *C. wraggae*, paratype male, Yeppoon, Qld. 7, *C. wraggae*, paratype female, Bucasia, Qld. 8, *C. iridosoma*, male, nr Yeppoon, Qld. 9, *C. caulicola*, paratype male, nr Mt Tozer, Qld. 10, *C. wraggae*, paratype female, Bucasia, Qld. 11, *C. iridosoma*, female, Base of Bellenden-Ker, Qld. 12, *C. caulicola*, paratype female, Atherton, Qld. Scale bar = 2 mm.



FIGURES 13–24. Adults of *Cryptophlebia* and *Archiphlebia*. 13, *C. stigmata*, holotype male. 14, *C. stigmata*, paratype female, Mootwingee NP, Qld. 15, *C. stigmata*, male of speckled morph, nr Charleville, Qld. 16, *C. rhynchias*, male, nr Cooktown, Qld. 17, *C. pallifimbriana*, male, Brisbane, Qld. 18, *A. endophaga*, male, nr Carnarvon, WA. 19, *C. rhynchias*, female, nr Hope Vale Mission, Qld. 20, *C. pallifimbriana*, female, Byfield, Qld. 21, *A. endophaga*, female, nr Carnarvon, WA. 22, *A. gilva*, holotype female. 23, *A. rutilescens*, male, Carnarvon NP, Qld. 24, *C. rutilescens*, female, nr Musselbrook, NT. Scale bar = 2 mm (all same magnification as Fig. 13 except for Figs. 16, 17, 19, 20).



FIGURES 25–30. Adults of *Thaumatogetra*. 25, *T. zophophanes*, male, Malanda, Qld. 26, *C. aclyta*, male, Tooloom, NSW. 27, *T. maculata*, paratype male, nr Hope Vale Mission, Qld. 28, *T. zophophanes*, female, Base Mt Bellenden Ker, Qld. 29, *T. aclyta*, female, Toowoomba, Qld [image reversed]. 30, *T. maculata*, paratype female, Tip Tree, Qld [image reversed]. Scale bar = 5 mm.

Taxonomy

Genus *Cryptophlebia* Walsingham, 1900

Cryptophlebia Walsingham, 1900: 105. Bradley, 1953: 682; Diakonoff, 1957: 129; Obraztsov, 1961: 64; Razowski, 1977: 232; Zimmerman, 1978: 560; Razowski, 1989: 221; Horak *et al.*, 1996: 135; Komai, 1999: 56, figs. 40, 45–50, 52, 69–82, 375, 387–389; Komai & Horak, 2006: 435, figs. 108, 110, 915–926. Type species: *Cryptophlebia carpophaga* Walsingham, 1899 [= *Arotrophora* (?) *ombrodelta* Lower, 1898], by original designation.

Pogonozada Hampson, 1905: 586 (in the Noctuidae). Fletcher, 1929: 23, 181 (as synonym of *Argyroploce*); Bradley, 1953: 682 (synonymised with *Cryptophlebia*). Type species: *Pogonozada distorta* Hampson, 1905, by original designation.

Phanerophlebia Diakonoff, 1957: 142 (as subgenus of *Cryptophlebia*). Type species: *Cryptophlebia perfracta* Diakonoff, 1957, by original designation.

Diagnosis. Medium to large moths with broad forewings, often with a darker subtriangular pretornal mark, with sinuate, medially widened labial palpi with short scales. Thorax with a more or less developed dense posterior tuft of usually short, hardly raised scales, sometimes curled and very rarely loosely raised. Males with upcurved anal tuft, and often with a dorsal mane on abdomen, hind tibia and first tarsal segment broadly fringed, and a large ventral pocket in hindwing along distal half of CuA_2 filled with scent scales. Forewing (Figs. 31–33) with small to very small accessory cell with chorda from between R_2 and R_3 to between R_4 and R_5 , in some specimens chorda entirely absent. R_4 and R_5 in forewing sometimes approximated, hindwing (Figs. 31–33) with M_2 usually moderately close to short stalk of M_3 and CuA_1 , rarely distant. T8 in male usually with a triangular to Y-shaped plate with long scales and with a pair of sometimes bifid tufts arising from shallow pockets on each side, and S8 with coremata consisting of a two bundles of inflated scales (sometimes reduced or lacking) connected by a pair of levers consisting of an intersegmental ventral sclerite and the semicircular or crescentic S8 with small apodemal lateral projections. The greatly inflated, clavate valva with isolated strong spines on the inner surface of the cucullus is a synapomorphy for *Cryptophlebia* + *Pseudogalleria*, its domed outer surface carries a patch of long scales which are shared with *Thaumatotibia*. Female genitalia without generically diagnostic traits, sharing paired

horn-shaped signa in anterior half of corpus bursae with *Thaumatotibia* and other related genera; sterigma often with a pair of parallel sclerotised bands posterior to ostium; ductus bursae varying from membranous to variably sclerotised, but unless entirely sclerotised always with a bipartite small sclerite between ostium and origin of ductus seminalis; corpus bursae usually spinulose at least in anterior half.

Distribution and biology. *Cryptophlebia* is present in all faunal regions except the Nearctic, but it has a strong Indo-Pacific concentration. In Australia it occurs throughout the mainland except in the arid areas (Figs. 82–84), and it is absent from Tasmania. As detailed by Komai (1999) in a table of host plants of the *Grapholita* group, *Cryptophlebia* feeds on taxonomically diverse plant families and has been reported from Anacardiaceae, Hippocastanaceae, Fabaceae, Palmae, Polygonaceae, Rhizophoraceae, Rutaceae, Sapindaceae, but with a heavy emphasis on Fabaceae with some species probably restricted to this plant family. The larvae are borers of either seeds, nuts, pods, fruit, galls or twigs, and the larva pupates at the feeding site.

Comments. The taxonomic position of *Cryptophlebia* and allied genera has been convincingly established by Komai (1999) in his revision of the 11 genera of the *Grapholita* genus group of the tribe Grapholitini. One of the autapomorphies of the *Grapholita* group is the presence of coremata consisting of the following three elements: 1) semicircular or crescent-shaped 8th sternite; 2) intersegmental ventral sclerite usually with pair of levers; 3) a pair of scale-tufts situated on the pleural area near the distal ends of the levers of the intersegmental sclerite (Komai 1999: fig. 14). The scale tufts of the coremata may be reduced or lost in some species. Coremata are present in *Cryptophlebia* except in *C. stigmata*.

Cryptophlebia has variously been treated either as one genus divided into two subgenera (*Cryptophlebia* and *Phanerophlebia* Diakonoff) (Diakonoff 1957), with *Thaumatotibia* (or *Metriophlebia*) as a separate genus (Diakonoff 1969, Komai 1999), or as a single large inclusive taxon (Clarke 1986). Komai (1999) presented a comprehensive revision of *Cryptophlebia* as distinct from *Thaumatotibia*, including a detailed, well-illustrated description of the genus, a review of all Palaearctic species and of immature stages, and tables with host plant and pheromone information. He based the monophyly of the genus on four apomorphies: 1) T8 in male with long scale tufts from lateral shallow pockets, 2) S8 (part of coremata) in male with a pair of short projections laterally, 3) a thick, swollen, clavate valva with sparse strong spines on inner surface, and 4) corpus bursae aciculate at least in anterior half (Komai 1999). Of these, only the scale tufts on T8 and the swollen valva are shared by all Australian species belonging to *Cryptophlebia*. *Cryptophlebia stigmata* lacks the lateral projections on S8, has lost the scale tufts of the coremata and has a smooth corpus bursae, but its sterigma with two longitudinal parallel sclerotised bands provides an additional synapomorphy with *C. ombrodelta*, leaving no doubt about its generic position. Diakonoff's (1957) subgenus *Phanerophlebia* denotes merely a subordinate group within *Cryptophlebia* characterised by a projecting tooth on the ventral valva margin, represented by *C. rhynchias* and *C. pallifimbriana* in the Australian fauna.

Diakonoff (1953) initially synonymised *Cryptophlebia* with *Pseudogalleria* on the basis of genitalia similarities but later (Diakonoff 1957) reverted to treating them as separate genera based on the modified forewing shape of *Pseudogalleria*. The approximated bases of M_2 and M_3 in the hindwing of *Cryptophlebia*, in contrast to the more distant ones in *Pseudogalleria*, is one of the characters separating the two genera in the revision by Adamski & Brown (2001), but in *C. distorta* from China and Japan M_2 and M_3 are as distant as in *Pseudogalleria* (Komai 1999: fig. 48). Nearly all other diagnostic features that separate the two genera in the cladistic analysis by Adamski & Brown (2001) are untenable once the newly described Australian *C. stigmata* is considered. It has the same forewing pattern without a pretornal patch in both sexes, it lacks hair scales dorsally on the base of the male abdomen and the lateral tufts of the coremata, and, together with *C. caulicola* and *C. rhynchias*, has an unmodified male hind tibia. This only leaves the wing shape and possibly the larval character mentioned by Adamski & Brown (2001) to characterise *Pseudogalleria*, without any apomorphy to define *Cryptophlebia*. In the BOLD TaxonID Tree *Pseudogalleria* is distinct from *Cryptophlebia*. Given the economic importance of *Cryptophlebia* on several continents and the vast literature associated with it, it would be highly disruptive to replace it with *Pseudogalleria* as the senior synonym. Any such decision will have to be contingent on a comprehensive molecular phylogeny.

***Cryptophlebia ombrodelta* (Lower, 1898)**

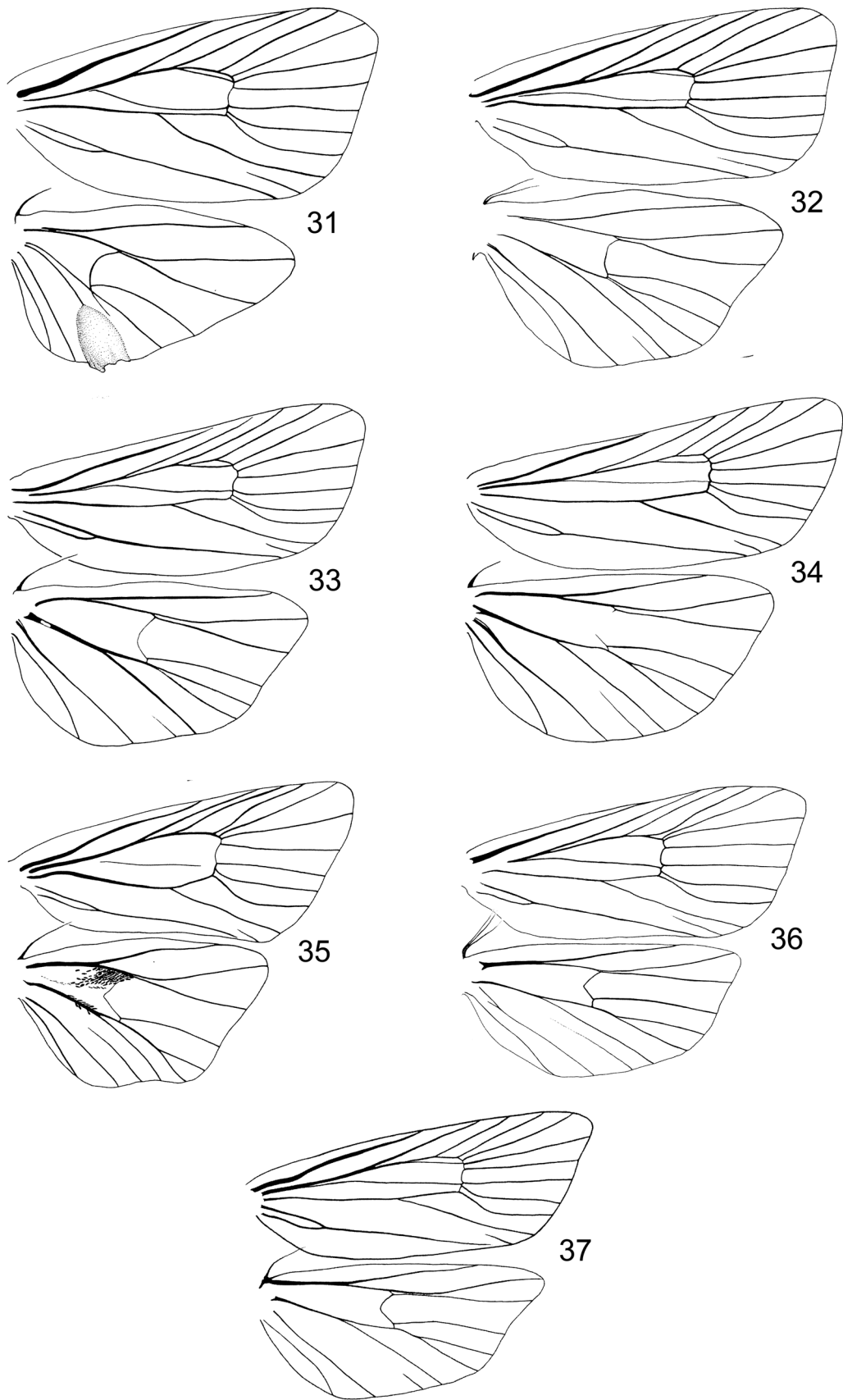
(Figs. 1, 2, 4, 5, 31, 32, 38, 42, 43, 50, 51, 69, 82)

Arotrophora (?) *ombrodelta* Lower, 1898: 48. Bradley 1953: 682, fig. 1, pl. xxiv fig. 1, pl. xxv fig. 1, 1a (*Cryptophlebia*); Clarke, 1976: 109, fig. 47, pl. 10, figs. c, d (comprehensive bibliography); Horak *et al.*, 1996: 135; Komai, 1999: 63, figs. 69, 70, 75, 77, 80, 81; Komai & Horak, 2006: 439, figs. 917, 918, 920, 922–925.
Cryptophlebia carpophaga Walsingham, 1899: 106. Bradley 1953: 682 (as synonym of *C. ombrodelta*).

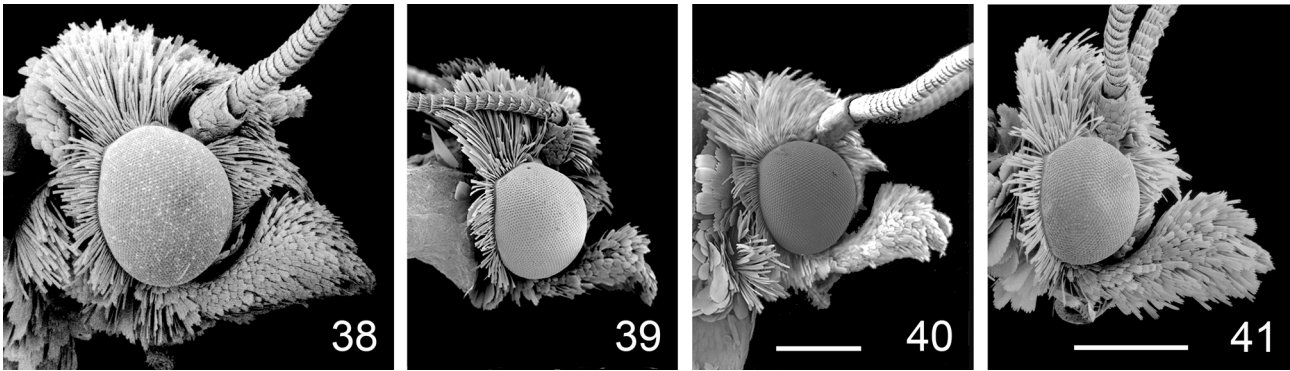
Material examined. *Type.* Holotype of *Arotrophora* (?) *ombrodelta* Lower: ♀, Sydney, L 2857, Australia Lower Coll. (SAMA).

Other material. Western Australia: 1 ♂, Harvey River nr Waroo, 30.iv.1983; 1 ♂, Yalgorup Nat. Park, 1.v.1983; 1 ♂, Kondinin, 6.x.1963; 1 ♂, nr Hyden, 29.i.1993; 1 ♀, nr Quairading, i.xi.1992; 1 ♂, Nedlands, 25.ix.1951; 3 ♂, 3 ♀, Perth, 24.iii.1971, 20.iv.1998, 5.viii.1925; 5 ♂, nr Bindoon, 25.ix.1981; 8 ♂, 2 ♀, Gingin, 27.iii.1990, 3.iv.1986; 3 ♂, Burra Rock nr Coolgardie, 17.iii.1996; 1 ♀, Jurien, 7.x.1975; 1 ♂, Leeman, 29.x.1992; 1 ♀, Dongara, 15.x.1970; 16 ♂, 1 ♀, nr Geraldton, 30.vi.1973, 11.x.1992, 3.xi.1958; 2 ♂, Coronation Beach Road, 13.x.1992; 2 ♂, Howatharra Hill Res. nr Geraldton, 12&28.x.1992; 2 ♂, nr Northampton, 30.ix.1981; 1 ♂, nr Kalbarri, 25.x.1992; 12 ♂, 1 ♀, Kalbarri, 15&24.x.1992; 1 ♂, 1 ♀, nr Millstream, 28.x.1970, 4.xi.1970; 3 ♀, 50 km W Marble Bar, 26/27.iv.1995; 1 ♀, Point Samson, 1.v.1995; 1 ♂, 1 ♀, nr Kununurra, 13.v.1995; 2 ♂, Drysdale River, 308.viii.1975. **Northern Territory:** 3 ♂, 4 ♀, Darwin (East Point, Holmes Jungle), 2.iv.1959, 4.vi.1973, 15.v.1995; 1 ♂, Howard Springs, 4.iii.1967; 1 ♂, 2 ♀, Solar Village, Humpty Doo, 15–17.v.1995; 2 ♂, nr Hayes Creek Roadhouse, 10.v.1993; 3 ♂, 1 ♀, Cobourg Peninsula (Smith Point, Black Point), 23/24.i.1977, 4.ii.1985; 1 ♂, nr Mt Cahill, 20.v.1973; 1 ♀, Baroalba Creek Springs, 28.x.1972; 3 ♂, nr Mudginbarry H. S., 26.v.1973; 1 ♂, Cooper Creek, nr Mt Borradaile, 2.xi.1972; 3 ♂, 2 ♀, 12 km S Mataranka, 31.iii.1995; 1 ♂, Cooper Creek, nr Nimbuwah Rock, 3.vi.1973. **Queensland:** 1 ♂, 1 ♀, Cape York (Lockerbie, Bamaga), 27&31.iii.1964; 7 ♂ 2 ♀, nr Heathlands, 21.iii.1992, 20.v.1994, 17–19.ix.1992, 21.x.1993, 11/12.xi.1993; 1 ♂, 1 ♀, Moreton, 20.x.1993, 10.xi.1993; 2 ♂, Pappan Creek, 18.ii.1994; 1 ♀, Batavia Downs, 13–19.i.1993; 1 ♂, Claudie River, 16.ii.1985; 1 ♂, Edward River, 14.ix.1993; 1 ♂, nr Mt Webb, Cooktown, 1.x.1980; 1 ♂, 1 ♀, nr Hope Vale Mission, 8/9.x.1980; 5 ♂, 1 ♀, Cooktown (Rounded Hill, Isabella Falls, Keatings Gap), 18.i.1994, 21.v.1977, 21–25.v.1995, 6.x.1980; 5 ♂, 31 km NW by W Cooktown, 20–23.v.1977; 1 ♂, 37 km W Cooktown, 7.i.1976; 5 ♂, Laura Gorge, 24.v.1977; 1 ♂, Jowabinnia, 17.i.1994; 1 ♂, Shiptons Flat, 17.x.1980; 6 ♂, 16 km S Daintree, 29.iv.1955; 1 ♂ Kuranda, 16/17.v.1980; 1 ♂, 1 ♀, Cairns, 7.ii.1980, 24.xii.1924; 2 ♂, Mareeba, 31.i.1963, 9.xii.1962; 1 ♂, Edmonton, 8.ix.1971; 1 ♀, Yungaburra 26.viii.1929; 1 ♂, Base Cableway Mt Bellenden-Ker, 24.x.1981; 2 ♂, Mingela, 21.iv.1955; 1 ♂, Merinda, 2.xii.1987; 1 ♂, Bucasia; 1 ♂, nr Marlborough, 9.v.1955; 1 ♀, Yeppoon, 17.x.1924; 2 ♂, nr Yeppoon, 7.ix.1980; 21.x.1975; 1 ♂, 1 ♀, nr Emerald, 20.iv.1955; 2 ♂, 1 ♀, Rockhampton, 12.ii.1947, 17.viii.1952; 1 ♂, nr Gogango, 6.iv.1957; 1 ♂, nr Miles, 19.ix.1990; 1 ♂, Tewantin, 19.v.1966; 8 ♂, 2 ♀, Nambour, 13&31.i.1986, 25.ii.1986, 1–6.xi.1985; 1 ♂, 1 ♀, Buderim, 14.viii.1973; 2 ♂, 4 ♀, Beerwah, 14.i.1972, 22.xii.1971; 1 ♂, Burpengary; 3 ♂, 1 ♀, Aspley, 18.i.1972; 22 ♂, 13 ♀, Brisbane, 12.i.1972, 14–30.i.1968, 26.i.1969, 28.i.1988, 2.ii.1969, 14.ii.1949, 15.ii.1913, 18.v.1966, 11.vi.1906, 2&9.vii.1966, 20.ix.1916, 6.xi.1920, 5–19.xi.1921, 6.xi.1922, 15.xii.1910, 15.xii.1971; 1 ♀, Gatton, 30.iv.1972; 6 ♂, 3 ♀, Toowoomba, 11.i.1969, 26&28.iii.1984, iii.1944, 19.iv.84, 30.iv.1972, 20.vii.1998, 1.ix.1988, 6.xii.1986; 1 ♂, Mt Mistake, 11.ii.1973; 1 ♀, Boonah, 30.iv.1972; 1 ♀, Warwick, 2.xii.1930. **New South Wales:** 1 ♂, Bilambil, 23.iv.1972; 1 ♂, 1 ♀, Terranora, 23.iv.1972; 1 ♂, Burringbar, 13.i.1958; 1 ♂, Big Scrub Flora Res. nr Lismore, 3.x.1978; 1 ♂, nr Rosebank, 11.i.1958; 1 ♀, Broken Head Nature Res., 23.xi.1976; 1 ♂, 1 ♀, Alstonville, 10.vii.1990; 1 ♂, Bellingen, 21.iv.1966; 2 ♂, 1 ♀, Port Macquarie, 15.i.1958; 1 ♂, 113 km WbyS Cobar, 10.xii.1982; 1 ♀, Mt Keira, 9.i.1964.

Diagnosis. *Cryptophlebia ombrodelta* is strongly sexually dimorphic. The male is easily recognised by the combination of its forewing pattern and the narrow, modified hindwing with a scale-filled elongate pocket along CuA₂. The females of *C. ombrodelta* and *C. iridosoma* are superficially very alike and large *C. iridosoma* are easily confused with small *C. ombrodelta*. However, in *C. ombrodelta* the forewing apex is more pointed and has at least an indication of the dark preapical band, and the pretornal mark in *C. iridosoma* is lower and less triangular (Figs. 4, 5, 11). In the male genitalia the scale tufts on T8 are bipartite each with a slender medially oriented pencil and there are three huge spines on each valva. The genitalia of *C. wraggae* and the South American *Cryptophlebia carpophagoides* Clarke are very similar to those of *C. ombrodelta*, but whilst *C. ombrodelta* has an indication of a keel on the outer valva surface, this is lacking in *C. carpophagoides* and more strongly developed in *C. wraggae*. The female genitalia are characterised by the sterigma shape, a sclerotised ring below the ostium, a constriction in the ductus bursae at its junction with the corpus bursae, and large, curved, flattened signa. They are easily differentiated from those of *C. iridosoma* with a short ductus bursae narrowed to form a broad, sclerotised ring below ostium and very large signa strongly tapering from a wide base.



FIGURES 31–37. Wing venation of *Cryptophlebia*, *Archiphlebia* and *Thaumato-grapha*. 31, *C. ombrodelta* male. 32, *C. ombrodelta* female. 33, *C. stigmata*, male. 34, *A. endophaga*, male. 35, *T. maculata*, male. 36, *T. zophophanes*, female. 37, *A. rutilescens*, male.



FIGURES 38–41. Heads of *Cryptophlebia*, *Thaumatotibia* and *Archiphlebia*, male.: 38, *C. ombrodelta*. 39, *T. zophophanes*. 40, *A. endophaga*. 41, *A. rutilescens*. Scale bars = 0.5 mm.

Description. Male (Figs. 1, 2). Wingspan: (12) 15–21 mm. Head (Fig. 38), palpi, antennae and tegulae light pinkish brown, thorax and tips of tegulae often darker greyish. Fore and mid leg reddish brown, hind leg whitish ochreous with greatly modified tibia and first tarsal segment. Inner surface of hind tibia partly naked, with a large cream scale tuft from its base and broad lateral fringes, posteriorly widened with dark grey tips. Abdomen with long mane-like scales dorsally. Forewing (Fig. 31) moderately wide with oblique termen; accessory cell narrow with chorda from between R_2 and R_3 to between R_4 and R_5 ; colouring from very light pinkish brown to dark reddish brown with a burgundy hue, with a parallel series of outwardly curved banding starting with a pale area from beyond middle of costa to tornus and darkening towards apex, with a particularly dark preapical shade or band from 3/4 costa to middle of termen; palest area near tornus light pink with an interrupted line of black scales to tornus and basally delineated by a triangular pretornal mark partly edged with blackish or burgundy scales; dorsum frequently shaded to fold by grey or blackish scales. Hindwing (Fig. 31) small, narrowly triangular, whitish near base and along basal 2/3 costa, otherwise greyish brown, ventral side with elongate pocket along distal half of CuA_2 containing creamy and grey modified scales, covered with a tuft of long scales on upper surface.

Male genitalia (Figs. 42, 43, 50, 51). T8 Y-shaped, wide but short, with a bipartite scale tuft on each side consisting of the normal tuft of very long scales and with a very small pencil-shaped tuft pointing inwardly along base of T8. Coremata consisting of two bundles of inflated scales, connected by well-defined, wide, strongly sclerotised levers of intersegmental ventral sclerite and sclerotised arms with subtriangular S8 with strong apodemal projections. Tegumen a broad, dorsally rounded band. Gnathos indicated by two small, hook-shaped, sclerotised lateral processes from tegumen. Valva greatly inflated, narrow at base and strongly widening to round swollen cucullus with a dome-shaped outer surface ending in a small triangular keel halfway to base; inner surface slightly concave and naked except for a few thin long bristles and three huge marginal spines, with the distal one closer to the ventral one. Phallus long, curved, tapering from bulbous base to narrow distal half; vesica with a dense band of small, diagonally arranged cornuti.

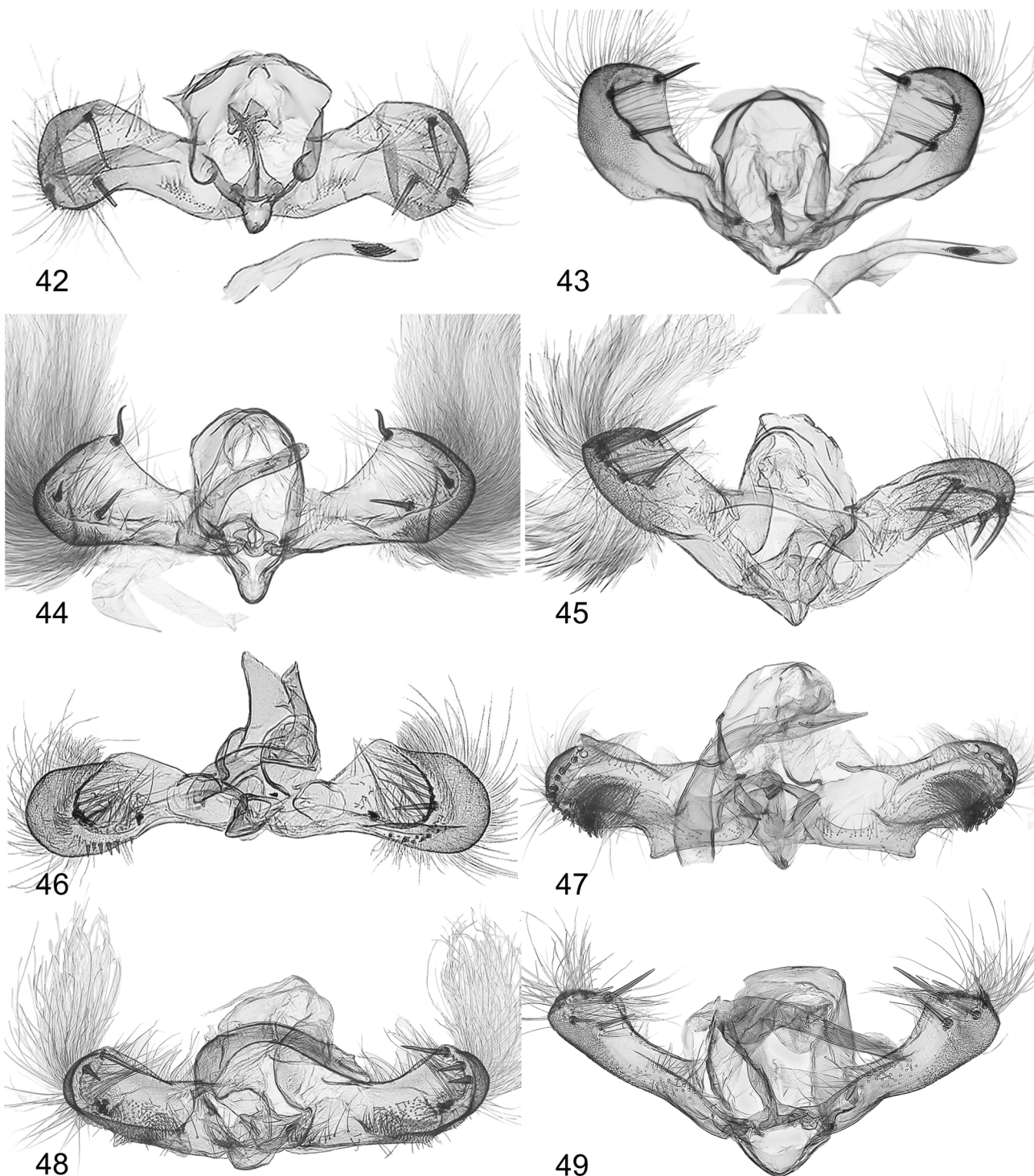
Female (Figs. 4, 5). Wingspan: 15–23 (27) mm. Head, palpi, antennae and thorax reddish brown, posterior half of thorax sometimes grey. Fore and mid legs red-brown, hind legs silver grey, with some red-brown. Forewing (Fig. 32) moderately wide with oblique termen, colouring from light pinkish grey to brown with a burgundy hue, with a broad, ill-defined paler band from 2/3 costa to termen distally followed by a parallel, dark, subapical streak; pretornal mark a white-edged, burgundy to dark brown triangle with a well-defined point. Hindwing (Fig. 32) grey-brown with coppery gloss.

Female genitalia (Fig. 69). Ostium in narrow V-shaped excavation not reaching middle of S7, surrounded by a strongly melanised patch on S7. Sterigma a broad, sclerotised band ventrally around end of ductus bursae with its two upcurved, parallel, elongate-elliptical ends forming lamella postvaginalis, not extending beyond hind margin of S7. Ductus bursae narrow to a wide, usually complete sclerotised ring at 1/3 below ostium, then wider in anterior 2/3 but constricted again at entrance to corpus bursae, with a hint of sclerotisation in middle; inception of ductus seminalis in anterior 1/5. Signa large, curved, tapering to rounded points; anterior 2/3 of bursa strongly spinulose.

Distribution and biology. *Cryptophlebia ombrodelta* is widely distributed from Sri Lanka, India, Thailand, China, Indonesia, Philippines and Taiwan to southern Japan, Micronesia, Hawaii and Australia (Bradley 1953, Clarke 1976, Zimmerman 1978, Komai 1999). In Australia, it occurs around the fringes of the entire continent

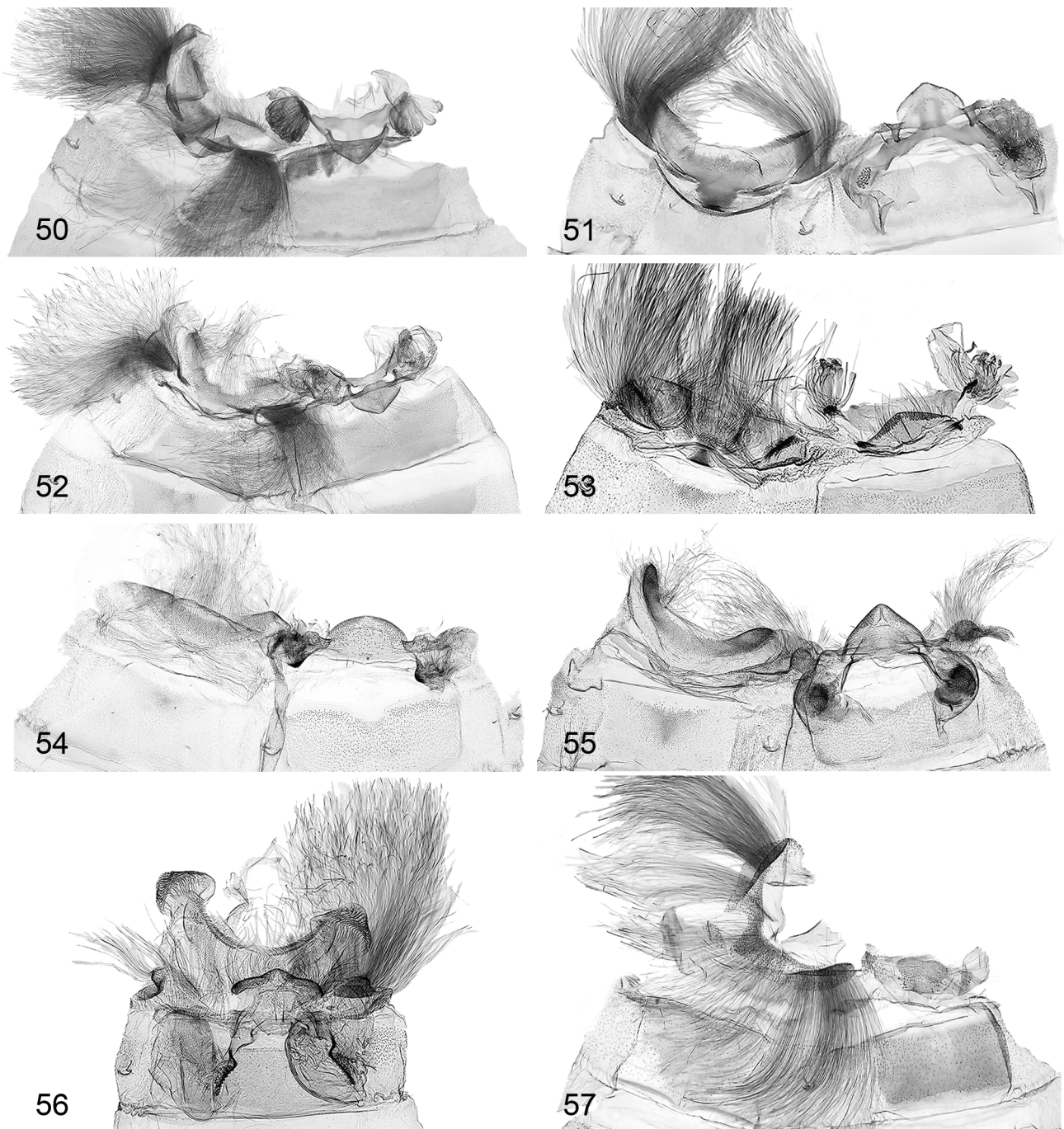
except for the dry regions and the southernmost part south of Geographe Bay in Western Australia and south of Wollongong in New South Wales (Fig. 82, based on material in the ANIC). The Western Australian distribution suggests much drier habitats lacking trees with the soft fruit usually host to *C. ombrodelta*, and there are additional indications that the Western Australian population is a different biological race. Numerous specimens at Gingin were reared from heavily infested woody galls on *Acacia saligna* along a creek on the edge of a macadamia plantation. Though this large population has lived in close proximity to the macadamia trees for years there were only very few incidents where the species was found in the husk of macadamia nuts. No consistent morphological or molecular differences could be found to separate this Western Australian population from eastern *C. ombrodelta* regularly attacking macadamia, as discussed below in the *Comments*. There is copious information about host plants of *C. ombrodelta*, with some records possibly dubious as either unidentified or similar-looking *Cryptophlebia* species may have been involved. Ironside (1974), in a study of the biology of *C. ombrodelta* in Queensland, gives a referenced host list for its distribution beyond Australia as well as listing its Australian hosts, and Komai (1999) summarises host records, including Japanese data. Fabaceae are the most frequent hosts, usually pods and seeds, including *Acacia* spp. (pods and seeds), *Adenanthera pavonina* L. (seeds), *Bauhinia* spp. (seeds and/or pods), *Caesalpinia decapetala* (Roth) Alston, *Cassia* spp. (pods and shoots), *Delonix regia* (Bojer ex Hook.) Raf. (pods, seeds and shoots), *Indigofera suffruticosa* Mill. (terminal stems and seed pods), *Parkinsonia aculeata* L. (pods and leaves), *Phaseolus* spp., *Pithecellobium dulce* Benth. (seeds), *Poinciana pulcherrima* L. (pods and seeds), *Prosopis pallida* H. B. K. (pods and seeds), *Schotia brachypetala* Sond. (pods and seeds), *Sesbania* spp. (pods or seeds), *Tamarindus indica* L. (fruit). Other reported hosts are: Palmae: *Cocos nucifera* L. (immature fruit); Polygonaceae: *Coccoloba uvifera* L.; Proteaceae: *Macadamia* spp. (fruit); Rutaceae: *Aegle marmelos* (L.) Corr. (fallen fruit), *Citrus* spp. (fruit), *Feronia* sp. (fruit); Sapindaceae: *Cupaniopsis anacardioides* (A. Rich.) Radlk (fruit), *Euphoria longan* Steud., *Filicium decipiens* Thw. (young terminal growth), *Litchi chinensis* Sonn. (fruit and seeds), *Sapindus saponaria* L. (terminal branches).

Comments. As mentioned in Distribution and Host Records, a population of *C. ombrodelta* is found in much drier habitats in Western Australia, with hardly any records from macadamia, which normally is a preferred host of *C. ombrodelta*. A few specimens found tunnelling in the husks but not the kernel of near-ripe macadamia nuts in 1986 at a plantation in Gingin, were reared to adults with slightly paler hindwings than normal *C. ombrodelta* and with some apparent slight differences in male secondary sexual scaling on the 8th segment. During a visit to Gingin in March 1990 to investigate this taxon, not a single infested macadamia nut was found in three hours of examination of nearly ripe nuts on numerous trees, but a large population of *C. ombrodelta* was discovered inhabiting woody galls on *Acacia saligna* growing along a creek on one of the plantation boundaries. These specimens also seem to have paler hindwings and a smaller medial pencil on T8, but a comprehensive comparison with other Western Australian and Northern Territory *C. ombrodelta* material did not find consistent differences. The sex pheromone of female moths reared from larvae from acacia galls at Gingin could not be distinguished from that of moths reared from macadamia nuts from various locations in eastern Australia (C. P. Whittle and T. E. Bellas, pers. comm.) Electrophoretic comparison of one specimen each from Gingin and Queensland showed that their allozymes were identical for one or both alleles for all but 2 of the 30 loci observed (J. Fisk, pers. comm.), a very low level of differentiation even if it was confirmed for further material. Sequencing of the D2 region of 28S rDNA and of cytochrome c oxidases I and II of Western Australian and eastern Australian *C. ombrodelta* also did not reveal any consistent differences. Yet the presence of an obviously long-established, large population of *C. ombrodelta* on *Acacia saligna* galls next to a macadamia plantation at Gingin with only one single reported attack of macadamia nuts strongly suggests that this Western Australian population shows different behaviour from its eastern counterparts. It is found in much drier localities than the eastern population, in places such as Burra Rock near Coolgardie where *Acacia* galls in the run-off zone around the rock would be the only possible host. Furthermore, whilst there are several rearing reports for *C. ombrodelta* from *Acacia* pods in eastern Australia, there is no report from *Acacia* galls except from galled pods of *Acacia podalyriifolia* (E. Sinclair, pers. comm.), though *Acacia* galls are known to be productive hosts for microlepidoptera and have been frequently reared. Given that no consistent morphological and molecular differences can be found between the two populations there is no choice but to treat the Western Australian population as *C. ombrodelta*, though the behavioural differences indicate a different biological race. However, the fact that this native Western Australian *C. ombrodelta* population until now has not become a pest of macadamia should be sufficient reason to ensure that the eastern population, which does attack macadamia, is kept out of Western Australia.



FIGURES 42–49. Male genitalia of *Cryptophlebia*. 42, *C. ombrodelta*, Qld, GP T 2109. 43, *C. ombrodelta*, WA, GP ANIC 3129. 44, *C. wraggae*, GP ANIC 17008. 45, *C. caulicola*, GP ANIC 8632. 46, *C. iridosoma*, GP ANIC 2451. 47, *C. rhynchias*, GP ANIC 2461. 48, *C. pallifimbriana*, GP ANIC 16960. 49, *C. stigmata*, GP ANIC 16789.

Cryptophlebia lasiandra (Meyrick) has been treated as a synonym of *C. ombrodelta* (Clarke 1976), but Komai (1999) reinstated the taxon as a separate species. Consequently, the so-called *C. ombrodelta* figured by Clarke (1958), the holotype of *lasiandra*, is a misidentification.



FIGURES 50–57. Last abdominal segments of male *Cryptophlebia*. 50, *C. ombrodelta*, NT, GP ANIC 16732. 51, *C. ombrodelta*, WA, GP ANIC 3129. 52, *C. wraggae*, GP ANIC 17008. 53, *C. caulicola*, GP ANIC 8632. 54, *C. rhynchias*, GP ANIC 2461. 55, *C. pallifimbriana*, GP ANIC 16960. 56, *C. iridosoma*, GP ANIC 2451 [abdominal pelt not opened]. 57, *C. stigmata*, GP ANIC 16789.

***Cryptophlebia wraggae*, sp. nov.**

(Figs. 3, 6, 7, 10, 44, 52, 70, 83)

Material examined. Types. Queensland: holotype ♂, 23.12S 150.46E, 10 km SSE of Yeppoon, 8.ix.1981, I. F. B. Common, ANIC genitalia slide No. 17008 (ANIC); paratypes: 1 ♀, Cardwell, 24.viii.1977, I. F. B. C.; 12 ♂, 6 ♀, Bucasia, 25.iv.1996, 8.ii. & 4.iii.1998, 15.xi.1999, 16.xi.2000, 3.ii. & 12. & 13.x.2001, 22. & 28.ii. & 7.iii. & 28.ix. & 24.x. & 25.xi.2002, 10.iii.2003, 1. & 4.vii. & 18.ix.2004, K. J. Sandery; 3 ♀, Yeppoon, 18.i.1949, 29.iii.1950,

14.xii.1964, I. F. B. C.; 12 ♂, 2 ♀, 23.12S 150.46E, 9 or 10 km [or 6 miles] SSE of Yeppoon, 30.i.1970, 18. & 21.x.1975, 7. & 8.ix.1980, 3.ix.1981, 20.viii.1984, I.F.B.C.; 1 ♂, 25.22S 152.54E, 12 km SSE of Pinalba, 5.ii.1991, I. F. B. C.; 1 ♂, Tewantin, 19.v.1966, V. J. Robinson.

Diagnosis. The sexually dimorphic *C. wraggae* is unlike any other *Cryptophlebia* species. The reddish forewings are scattered with blue iridescent scales, in the female often darkened to bluish red and with a reddish pretornal mark. The genitalia in both sexes of *C. wraggae* are very similar to those of *C. ombrodelta*, but in the male of *C. wraggae* the outer surface of the cucullus has a distinct keel, rather than only an indication thereof, and the transverse portion of the scale tuft on T8 is very short. In the female, the ovipositor has a broader posterior lobe and the ductus seminalis originates from closer to the middle of the ductus bursae than in *C. ombrodelta*.

Description. Male (Figs. 3, 7). Wingspan: (12.5) 14–17 mm. Head, palpi, antennae and thorax with often dark-tipped dark red-brown scales with silvery to metallic blue iridescence, tegulae paler, often bright orange. Fore leg red-brown, middle leg grey or touched with red-brown, hind leg silver grey on outside, with greatly modified tibia and first tarsal segment. Inner surface of hind tibia partly naked, with a large cream scale tuft from its base and with broad lateral fringes having widened dark grey tips posteriorly. Abdomen with long mane-like scales dorsally. Forewing broadly subtriangular with oblique termen; accessory cell narrow with chorda from between R₂ and R₃ to between R₄ and R₅; ground colour variable from orange brown to dark brownish burgundy with iridescent, silvery to metallic blue costal strigulae and a wide outwardly curved band of parallel lines of silvery to metallic blue iridescent dots often intermixed with white scales across distal half of wing, with lines of dots more widely spaced towards apex, and usually with dorsal region sprinkled to fold with grey or blackish scales and often some pale and dark striae along middle of dorsum; if ground colour orange brown then with dark red-brown transverse preapical band and dark red-brown suffusions in centre of wing and near base of dorsum. Underside uniformly pale brownish grey except for costal strigulae and pale dorsal margin. Hindwing smallish, narrowly triangular, from very whitish base darkening to grey apex, ventral side with an elongate pocket along distal half of CuA₂ containing creamy and grey modified scales, covered with a tuft of long scales on upper surface.

Male genitalia (Figs. 44, 52). T8 narrowly triangular with a bipartite scale tuft on each side consisting of a tuft of very large, long scales and a very small transverse one of short scales with their tips far from reaching to middle of tergite. Coremata two bundles of pigmented inflated scales, connected by wide, strongly sclerotised levers of intersegmental ventral sclerite and large subtriangular S8 with strong apodemal projections. Tegumen a very wide band, especially dorsally, apex narrowly rounded. Gnathos two small, hook-shaped lateral projections. Valva greatly inflated, strongly widening from narrow base to broadly rounded cucullus with dome-shaped outer surface ending in a large, longitudinal, triangular keel in centre of valva, and with slightly concave inner surface naked except for 3 huge spines and a few slender bristles along margin. Phallus moderately long, bent in middle, tapering from slightly bulbous base to parallel-sided distal half; vesica with a large oblique bundle of moderately long cornuti.

Female (Figs. 6, 10). Wingspan: (11.5) 13–19 (21) mm. Head, palpi, antennae and thorax dark red-brown. Legs silver grey, the two anterior pairs touched with red-brown on ventral surfaces. Forewing reddish brown to brownish burgundy, variably sprinkled with blackish scales across centre of wing from near base to termen, with a large semicircular orange to red-brown pretornal mark and a wide outwardly curved band of parallel lines of iridescent indistinct leaden spots across distal half of wing, with lines more widely spaced towards apex, and often with some whitish and pale grey scales along middle of dorsum. Underside evenly grey. Hindwing grey with coppery gloss.

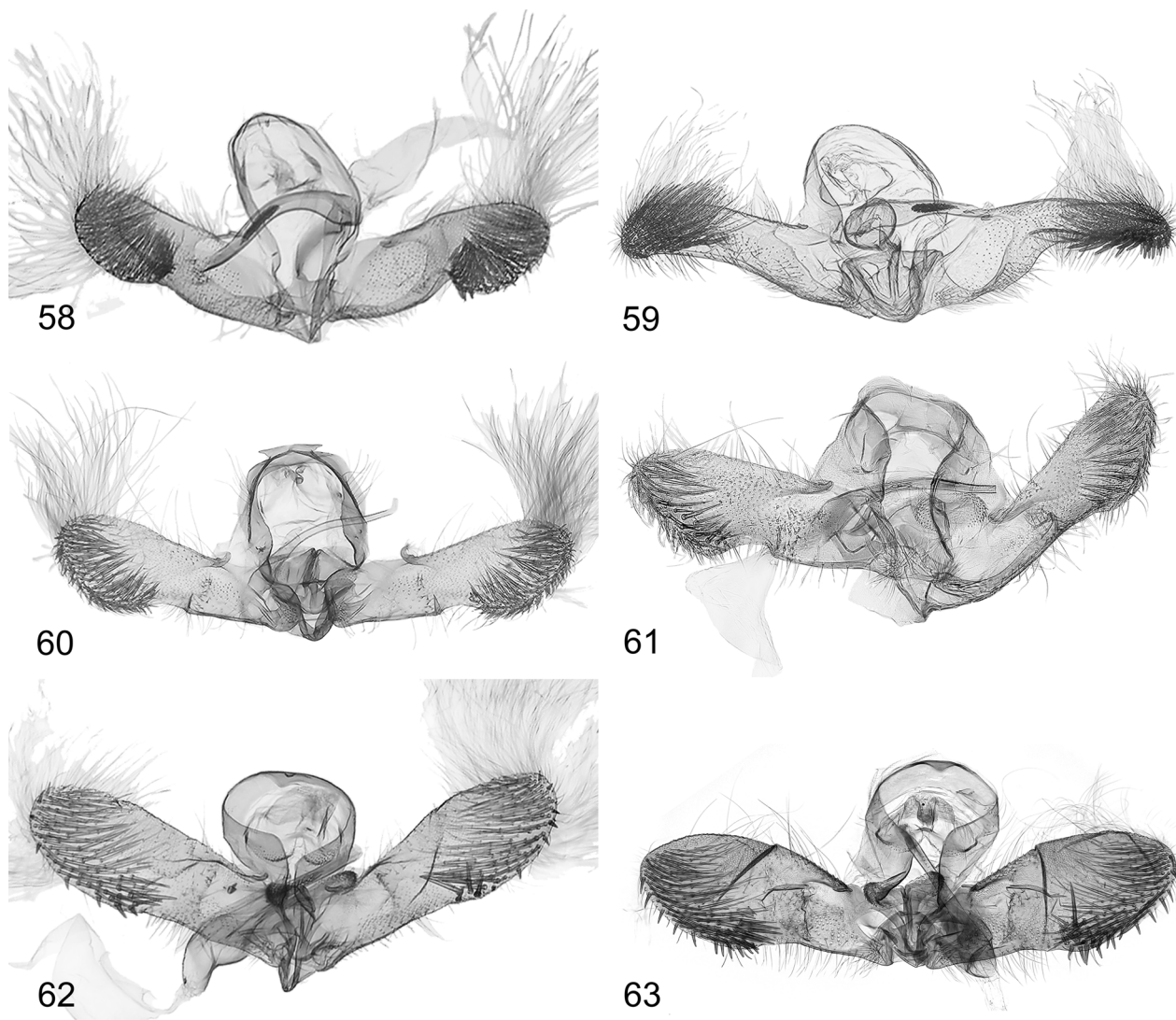
Female genitalia (Fig. 70). Ovipositor lobes distinctly broad posteriorly. Ostium in V-shaped excavation not reaching to middle of S7, surrounded by a weakly melanised patch or band on S7. Sterigma a broad, sclerotised band ventrally around ostium with its two upcurved, parallel, tapering ends forming lamella postvaginalis, not extending beyond hind margin of S7. Ductus bursae narrow to a sclerotised ring close to its middle, then gradually widening to corpus bursae; inception of ductus seminalis in anterior 1/5. Signa long, slender, curved, with rounded points; anterior 2/3 of bursa finely spinulose.

Distribution and Biology. *Cryptophlebia wraggae* is known only from the central Queensland coast from Cardwell south to Tewantin north of Brisbane (Fig. 83), with most material collected at Yeppoon. No host records are available.

Comments. There are two specimens, a male and a female, of either *C. wraggae* or a closely related species from Berry Springs and near Nimbuwah Rock in the Northern Territory in the ANIC. Superficially the two specimens are indistinguishable from *C. wraggae* though they have hardly any iridescent metallic scales, but the

single female has much narrower and pointed signa. However, more material is required to decide whether the material is conspecific with *C. wraggae* or a distinct species, and the two specimens are not included in the type series.

Etymology. This species is named for Sharyn Wragg who perfected the methods to photograph and enhance adult and genitalia images and provided all the illustrations. *Cryptophlebia wraggae* is the closest relative of *C. ombrodelta* in the Australian fauna.



FIGURES 58–63. Male genitalia of *Archiphlebia* and *Thaumatotibia*. 58, *A. endophaga*, GP ANIC 16910. 59, *A. rutilescens*, GP ANIC 17006. 60, *T. zophophanes*, GP ANIC 16995. 61, *T. zophophanes* GP ANIC 16931. 62, *T. aclyta*, GP ANIC 16999. 63, *T. maculata*, GP ANIC 16873.

***Cryptophlebia caulicola*, sp. nov.**

(Figs. 9, 12, 45, 53, 71, 84)

Material examined. *Types.* **Queensland:** holotype ♂, Atherton, em. 28.iv.1988, D. Nicholson, Dept. Forest. Qld, Acc. 6430, stem boring in *Acacia mangium*, ANIC genitalia slide no. 8632 (ANIC); paratypes: 1♂, 1♀, 12.43S 143.18E, Cooks Hut, Iron Range, 13 & 15.vii.1998, J.C.Cardale, E.D.E.; 1♂, 12.44S 143.17E, 8 km EbyN Mt Tozer, 7.vii.1986, J. C. Cardale (ANIC); 1♂, 5♀, same label data as holotype (QFRI, ANIC); 3♂, 2♀, Cardwell, coll. 15.iv.1997, em. [3] May 1997, P. Pomroy, M. De Baar, stemlet borer of *Acacia mangium* (QFRI, ANIC); 2♂, 1♀, Lannercost W. of Ingham, [coll.] 18–20.iv.1989, em. 20. & 26.iv.1989, F. R. Wylie, on *A. mangium*, Exp. 374 Pl. 45 (QFRI).

Diagnosis. There is no secondary sexual dimorphism in either hindwing or leg structure nor wing pattern. The male is unmistakable with its simple wing pattern. The female shows similarities with that of *C. iridosoma*, however, the female of *C. caulicola* is characterised by a straight termen, a darkened apex or a dark preapical streak, and an asymmetrical, inwardly oblique pretornal mark, whereas *C. iridosoma* often has an indistinct inverted Y-shaped paler fascia surrounding the erect pretornal mark and running towards costa and a weakly sinuate termen. In the male genitalia the combination of well-developed coremata, a valva with 5–6 large spines, and only few small cornuti is diagnostic for *C. caulicola*. The female genitalia with a modified S7 and slender, horn-shaped signa with a round diameter from a triangular base are unique and diagnostic.

Description. Male (Fig. 9). Wingspan: 13–16 mm. Head, palpi, antennae and thorax grey-brown to brown, tips of frontal scales and thorax sometimes blackish grey. Fore and mid tibia grey-brown, hind leg greyish white with loose tibial scaling but not modified. Abdomen with long scattered scales dorsally. Forewing subtriangular with weakly oblique termen; accessory cell very small, triangular with chorda from between R_2 and R_3 to between R_4 and R_5 ; ground colour grey brown to brown, finely speckled with pale-tipped scales and especially below costa and across apex often with oblique, parallel, short, interrupted rows of black scales, with only few pattern elements consisting of darker brown spots between costal strigulae, a narrow, oblique, wedge-shaped pretornal mark of black and brown scales continued and elongated by dark cilia, a variably developed darker transverse band across apex from 3/4 costa to middle of termen, often well-defined and etched with black scales on both sides but sometimes entire apex including band slightly darker than rest of wing, and often a variably developed darker shade over basal half of dorsum; cilia concolorous with adjacent wing. Underside grey-brown except for ochreous costa with brown striae and whitish dorsum. Hindwing broad, not modified, dark brownish grey, cilia concolorous with adjacent wing.

Male genitalia (Figs. 45, 53). T8 T-shaped but very weakly sclerotised except for short anterior arm, transverse portion covered with long scales that are in dense patches on depressed lateral areas. Coremata consisting of smallish tufts of lightly pigmented band-shaped scales, connected by very short levers of an elliptical, lightly sclerotised intersegmental ventral sclerite and weakly sclerotised, short, wide triangular S8 with small apodemal projections. Tegumen a wide band with posterior half dorsally abruptly recessed, lower than anterior portion. Gnathos two triangular lateral processes. Valva inflated but of roughly even width throughout with distally rounded cucullus; outer side of cucullus strongly rounded, inner surface slightly concave, with 5–6 large spines of variable length arranged in a half ellipse around margin and few slender bristles in between. Phallus long, slightly but evenly curved, with bulbous base and roughly parallel-sided distal half; vesica with a sheaf of 5–6 very small cornuti.

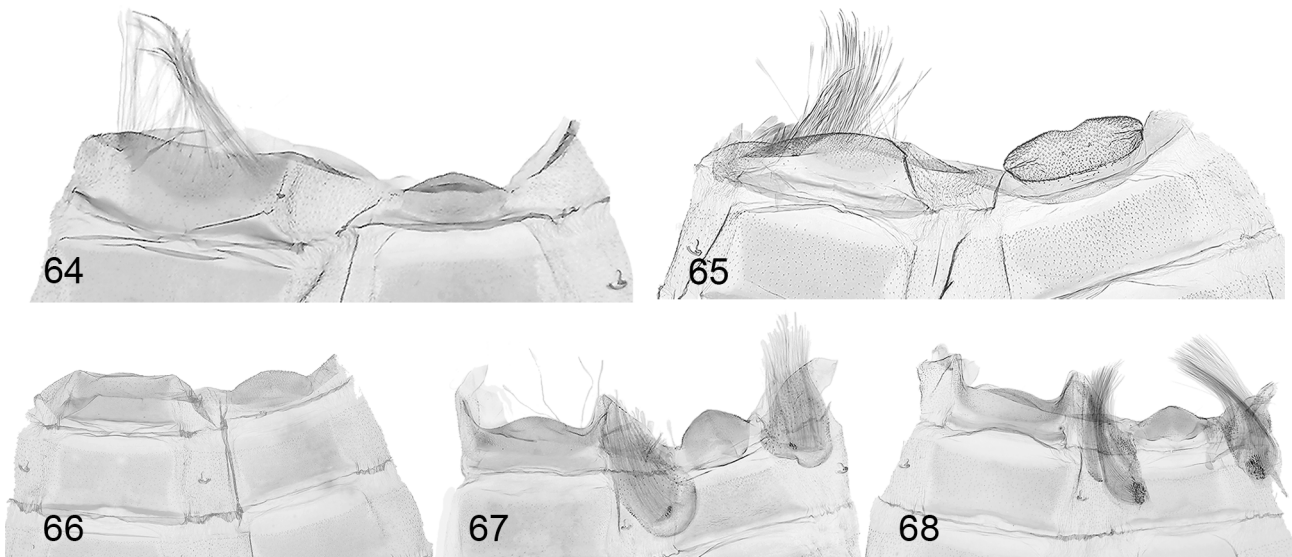
Female (Fig. 12). Wingspan: 13–16.5 mm. As male, but ground colour sometimes reddish brown and pretornal mark less narrow, more triangular.

Female genitalia (Fig. 71). Ovipositor lobes slender. Ostium in small, broadly V-shaped excavation of hind margin of strongly modified, subtriangular S7 with posterior half consisting of two paired, round, concave sclerotised patches recessed from raised anterior portion along two sharply angled lines converging towards ostium. Sterigma a ventral band around ostium, lamella postvaginalis faintly sclerotised. Ductus bursae posteriorly narrow to a bipartite sclerotised ring near middle, then wider and partially sclerotised but constricted again at entrance of corpus bursae; inception of ductus seminalis very close to corpus bursae, and a small but distinct round appendix from neck of corpus bursae. Corpus bursae round, signa slender, curved, tapering horns with round diameter and triangular base plates.

Distribution and Biology. *Cryptophlebia caulicola* occurs only in northern Queensland. Most of the specimens have been reared from larvae boring in minor branches of *Acacia mangium* Willd. in the Cairns region, with adults emerged in April or early May. The material was reared at the Queensland Forestry Research Institute, Dutton Park (QFRI) from *A. mangium* at three different localities, at Cardwell by B. Pomroy and M. de Baar, at Atherton by D. Nicholson and M. de Baar from naturally occurring trees, and at Lannercost near Ingham by R. Wylie from planted *A. mangium*. Three adults have been collected at light, two at Iron Range and one nr Mt Tozer (Fig. 84).

Comments. In wing pattern *C. caulicola* is similar to *C. cartarica* Diakonoff from Sumba (Diakonoff 1984), but the female genitalia are different.

Etymology. The species name has been chosen to denote that the larva is a stem-borer and not a fruit-borer like most other *Cryptophlebia* species.



FIGURES 64–68. Last abdominal segments of male *Archiphlebia* and *Thaumatotibia*. 64, *A. endophaga*, GP ANIC 16910. 65, *A. rutilescens*, GP ANIC 17006. 66, *T. zophophanes*, GP ANIC 16882. 67, *T. aclyta*, GP ANIC 16884. 68, *T. maculata*, GP ANIC 17018.

***Cryptophlebia iridosoma* (Meyrick, 1911)**

(Figs. 8, 11, 46, 56, 72, 83)

Argyroploce iridosoma Meyrick, 1911: 264. Bradley, 1953: 684, (*Cryptophlebia*); Horak *et al.*, 1996: 135; Komai, 1999: 62; Komai & Horak, 2006: 439.

Eucosma ceratodes Turner, 1946: 209. Horak *et al.* 1996: 135 (synonymised with *iridosoma*).

Cryptophlebia amblyopa Clarke, 1976: 106, fig. 46, pl. 10, fig. a, b. **Syn. nov.**

Material examined. *Types.* Lectotype of *Argyroploce iridosoma* Meyrick (designated by Bradley 1953): ♂, Brisbane, Queensland, AJT [A. J. Turner], xii.08, BM ♂ genitalia slide No. 2453 (BMNH). Holotype of *Eucosma ceratodes* Turner: ♀, North Queensland, Cape York, 15.x.1927, W. B. Barnard (ANIC).

Other material. **Northern Territory:** 3 ♂, 5 ♀, Darwin (Dripstone Park, East Point, Holmes Jungle), 2/3.iv.1959, 6–12.iv.1991, 4.vi.1973; 6 ♂, Cobourg Peninsula (Smith Point, Black Point), 8–23.i.1977; 1 ♂, Rimbija Is., Wessel Islands, 12.i.1977. **Queensland:** 1 ♂, 1 ♀, Bamaga, Cape York, 4.iv.1964, 16.x.1927; 1 ♀, Upper Jardine River, 25.x.1979; 1 ♀, Heathlands, 10.iii.1992; 2 ♂, nr Mt Tozer, 11.vii.1986; 4 ♂, 2 ♀, McIlwraith Range, 14/15.i.1988, 2–8.vii.1989; 4 ♂, 4 ♀, Mt Webb Nat. Park, 28.ix.–3.x.1980; 1 ♂, Pilgrim Sands, 27.i.–9.ii.1988; 1 ♂, nr Daintree, 29.iv.1955; 1 ♂, nr Julatten, 26.ix.1980; 1 ♂, 1 ♀, Kuranda, 11.iii.1964, 11–13.x.1993; 1 ♂, nr Mt Tip Tree, 20.x.1980; 4 ♂, 8 ♀, Base Cableway, Mt Bellenden-Ker, 23–31.x.1981; 1 ♂, east base Mt Bartle Frere, 26.iv.1955; 2 ♂, 1 ♀, Bucasia, 15.ii.2000; 3 ♂, 2 ♀, Yeppoon, 22.i.1948, 14–18.xii.1964; 9 ♂, 2 ♀, 10 km SSE Yeppoon, 25–29.iv.1986, 18.v.1985, 22.x.1975; 1 ♂, Oasis Lodge, Carnarvon Nat. Park, 1–8.v.1994; 1 ♀, Palmwoods, 30.i.1968; 1 ♂, Burpengary; 1 ♂, Gwinganna nr Tallebudgera, 18.iv.1994. **New South Wales:** 1 ♀, Burringbar, 13.i.1958; 1 ♂, Rous, Richmond River, 22.ii.1967; 4 ♀, Broken Head Nat. Res. nr Byron Bay, 23.xi.1976; 1 ♀, Port Macquarie, 11.iii.1958; 1 ♀, Niagara Park, 8.xii.1949; 5 ♂, 3 ♀, Mt Keira, 4.ii.1973, 14–19.ii.1978, 22.ii.1964, 14.iii.1978, 18.iii.1971, 29.xi.1976; 1 ♂, Wollongong, 5.xi.1976; 1 ♂, Minnamurra Falls, 20.ii.1973.

Diagnosis. The male of *C. iridosoma* is easily recognised by the combination of broad, grey forewings with a triangular pretornal mark and modified hindwings with a scale-filled pocket along Cu₂ and greatly enlarged hind tibiae with sex scales. The female is similar to those of *C. ombrodelta* and *C. caulicola*, but differs from both species in a having a forewing with a more squarish and undarkened apex without dark preapical band and a flattened semicircular rather than subtriangular or oblique pretornal mark. The male genitalia with their complex valva are diagnostic for *C. iridosoma* and the female genitalia with the ostium in the middle of S7, a long slender sclerotised ring below the ostium, and large, curved and sharply tapered signa, are unlike those of any other *Cryptophlebia* species.

Redescription. Male (Fig. 8). Wingspan: 11.5–15.0 mm. Head, palpi, antennae and thorax greyish ochreous to pale grey mixed with reddish brown. Legs silver grey, hind tibia and first tarsal segment greatly modified, with a large creamy ochreous scale tuft from inner base of tibia and lateral fringes of long spreading scales with widened dark grey tips. Abdomen with long mane-like scales dorsally. Forewing very wide, termen weakly oblique, ground colour very pale iridescent ochreous grey with sparse red-brown marks and variably sprinkled with blackish brown scales throughout. The red-brown marks include spaces between costal strigulae that continue along termen, a low rounded pretornal spot etched with few black scales, and an ill-defined subtriangular mark near middle of dorsum, and dark brown scales that can be completely absent or present throughout the wing, entirely changing the appearance from a very pale grey moth with typical *Cryptophlebia* markings to a much darker one without recognisable wing pattern. Hindwing small, narrowly subtriangular, pale to dark grey, ventral side with a spindle-shaped pocket along distal half of CuA₂, containing ochreous and grey modified scales, posteriorly cream on upper side.

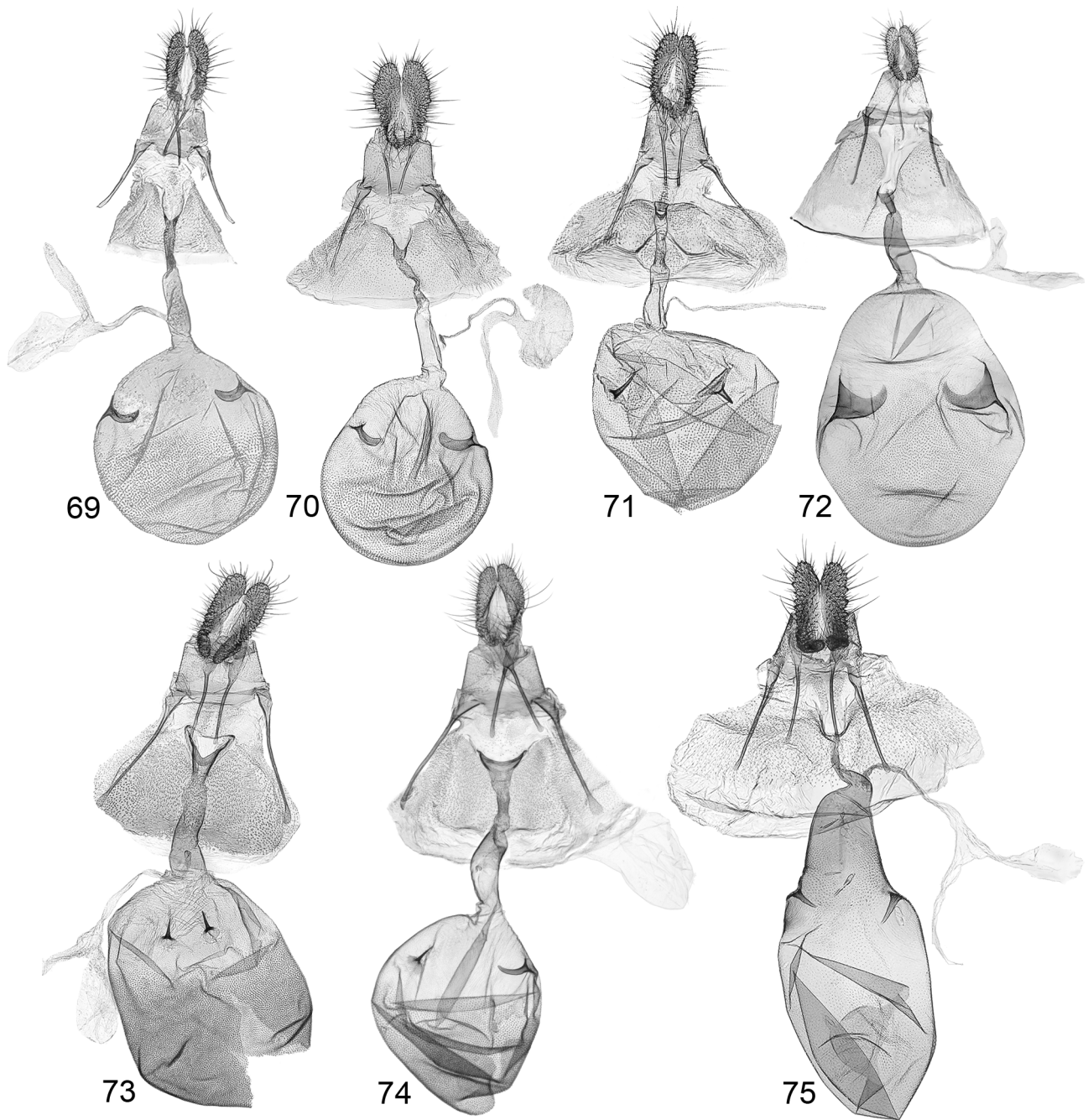
Male genitalia (Figs. 46, 56). T8 Y-shaped with on each side a posterolateral ribbed pouch and a bipartite basal scale tuft consisting of the normal tuft of very long scales and a smaller transverse tuft. Coremata consisting of tufts of short inflated scales, connected by wide levers of weakly sclerotised intersegmental ventral sclerite and short, subtriangular S8 with strong apodemal projections. Tegumen modified, dorsally strongly widened and anteriorly projecting in a tongue-shaped, medially excavated process (with anterior edge usually at the top in slide preparation). Gnathos two hook-shaped lateral tegumen processes medially connected by a slender, partly sclerotised band. Valva strongly inflated, slender at base and strongly widening to middle, cucullus roughly parallel-sided and distally rounded, outer surface dome-shaped with a large, triangular longitudinal keel; inner surface with a depressed central portion recessed along a curved line subparallel to cucullus edge from projecting angle in middle of costa to just beyond basal excavation, with two huge spines and several large bristles from margin of recessed portion, and a parallel curved row or band of short, sharp, scattered thorns ventrally on raised portion of inner surface, ending in a band of dense hair running to costa. Phallus rather short, gradually narrowing towards apex; vesica with a large longitudinal bundle of moderately long cornuti.

Female (Fig. 11). Wingspan: 11.5–16.0 mm. Head, palpi, antennae and thorax reddish brown. Fore and mid legs mixed silver grey and red-brown, hind leg silver grey sprinkled with some red-brown scales. Forewing wide with weakly oblique termen, grey-brown with a pinkish to burgundy tinge with little pattern except darker spots between costal strigulae, a rounded low pretornal mark of red-brown and black scales, several irregular curved lines of minute scattered blackish dots across distal half of wing, and often some whitish scales on middle of dorsum, sometimes in three short parallel lines; very rarely nearly entire forewing sprinkled with blackish scales. Hindwing grey-brown with coppery gloss.

Female genitalia (Fig. 72). Ovipositor lobes slender throughout. Ostium in narrow V-shaped excavation of S7 reaching to middle, with a round sclerotised patch laterally on each side of S7. Sterigma an inconspicuous band anteriorly around ostium with its ends as two slender, faintly sclerotised parallel bands forming lamella postvaginalis, not reaching hind margin of S7. Ductus bursae short and membranous, sclerotised and narrowed as a broad ring just below ostium and slightly constricted again at entrance to corpus bursae; inception of ductus seminalis in anterior 1/4. Signa close to middle of corpus bursae, conspicuously wide and large, strongly curved, gradually tapering to sharp points; anterior 2/3 of bursa strongly spinulose.

Distribution and Biology. In Australia, *C. iridosoma* has been collected mainly along the east coast from Wollongong in New South Wales to the tip of Cape York in Queensland, but there are also records from the coast and off-shore islands of the Northern Territory, around Arnhem Land to the Darwin region (Fig. 83, based on material in the ANIC). This species is also found on New Guinea and adjoining islands where it occurs inland in the mountains, and it extends into Micronesia (Clarke 1976, as *C. amblyopa*) and to Mindoro, the Philippines (Komai unpublished data). All of the Australian localities are coastal, apart from one specimen caught at Oasis Lodge, Carnarvon National Park, which is probably outside the natural distribution range of this species. No host records are available for Australia, but the larvae were found by F.K. boring into fruit of *Glochidion littorale* Blume (Phyllanthaceae) in the Philippines.

Comments. There is little doubt that *C. amblyopa*, described from the Palau Islands, Micronesia (Clarke 1976), is a junior synonym of *C. iridosoma*. Given the unmistakable features of *C. iridosoma* and the excellent illustrations of *C. amblyopa*, and the fact that New Guinea specimens were examined, it was not considered necessary to examine the type of *C. amblyopa*. *Cryptophlebia sigerui* Kawabe (Kawabe 1995) from Thailand is very close to *C. iridosoma*, but the phallus is narrower and the signa in the female are shorter and less curved. *Cryptophlebia iridosoma* is also close to *Cryptophlebia distorta* (Hampson) from China and southern Japan, based on external appearance as well as genitalia structure.



FIGURES 69–75. Female genitalia of *Cryptophlebia*. 69, *C. ombrodelta*, GP ANIC 16731. 70, *C. wraggae*, GP ANIC 16918. 71, *C. caulicola*, GP ANIC 12938. 72, *C. iridosoma*, GP ANIC 16803. 73, *C. rhynchias*, GP ANIC 2456. 74, *C. pallifimbriana*, GP ANIC 16973. 75, *C. stigmata*, GP ANIC 17005.

***Cryptophlebia rhynchias* (Meyrick, 1905)**

(Figs. 16, 19, 47, 54, 73, 84)

Platypeplus rhynchias Meyrick 1905: 586. Bradley, 1953: 687, fig. 6, pl. xxiv fig. 6, pl. xxv figs. 6, 6a (*Cryptophlebia*); Clarke, 1958: 327, pl. 162, Figs. 3, 3a; Clarke, 1976: 110, fig. 48, pl. 10 fig. e (comprehensive bibliography); Horak *et al.* 1996: 135; Komai, 1999: 63; Komai & Horak, 2006: 439, figs. 919, 921, 926.

Material examined. *Types.* Lectotype *Platypeplus rhynchias* Meyrick (designated by Clarke 1958): ♂, Yatiyantota, Ceylon [Sri Lanka], E E G., iii.1902, ♂ genitalia slide JFGC No. 7210 (BMNH).

Other material. AUSTRALIA: **Queensland:** 2 ♀, 14 km W by N of Hope Vale Mission, 8 & 10.x.1980, E.D.E.; 1 ♂, 5 km S by W of Rounded Hill, Cooktown, 7.x.1980, E.D.E.; 1 ♀, Pilgrim Sands, 2 km NW by N of Cape Tribulation, 20.ii.1998, E.D.E.; 1 ♀, Base Cableway Mt Bellenden-Ker, 25.x.1981, E.D.E. PAPUA NEW GUINEA: 1 ♀, Rossel Island, Abaleti, 2.x.–2.xi.1963, Brandt; 1 ♀, Bougainville Island, Kukugai Village, 17.x.1960–22.i.1961, Brandt. VANUATU: 2 ♂, 7 ♀, Espiritu Santo Island, Narango. South Coast, 24.v.–25.vii.1960, Brandt.

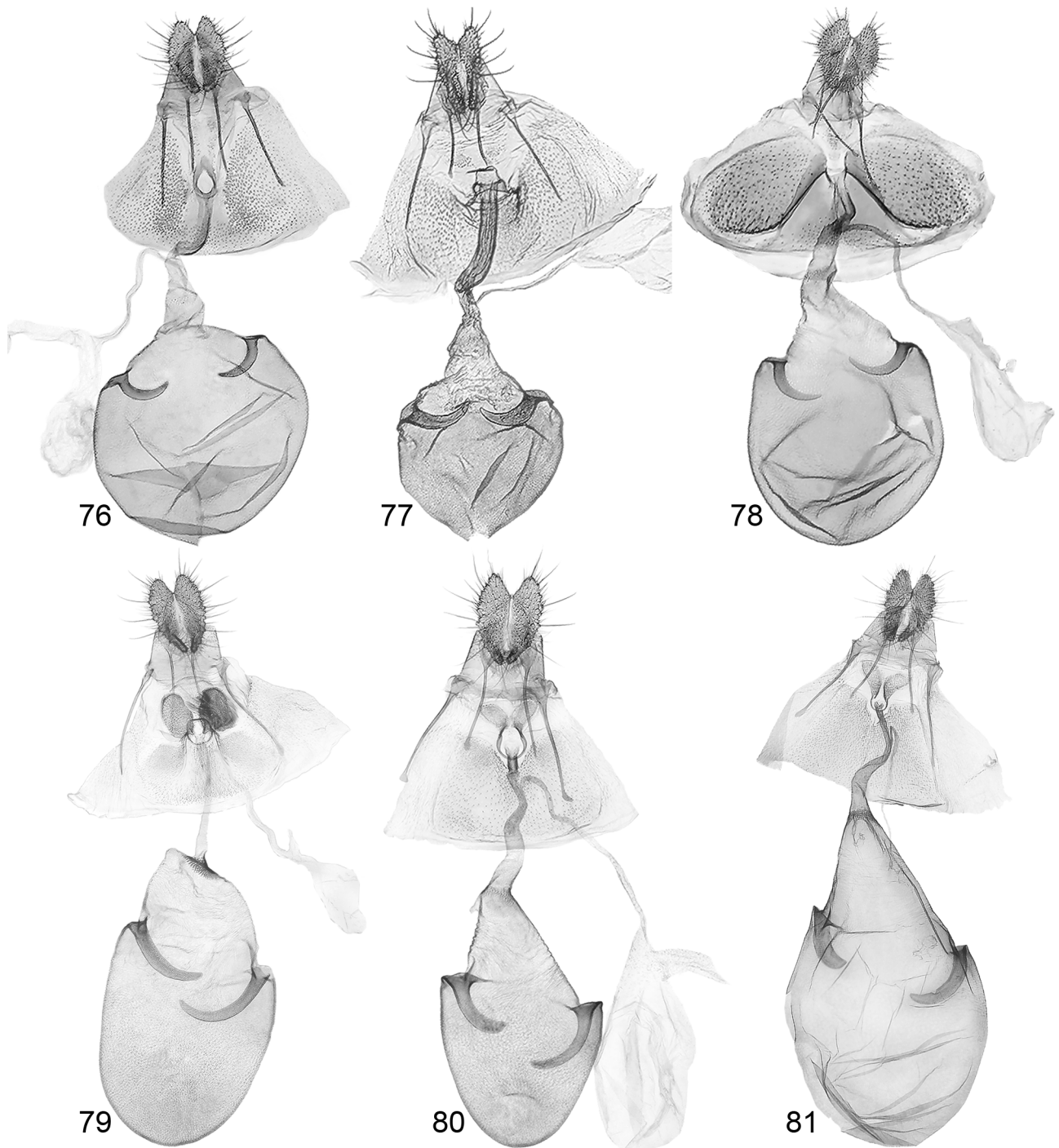
Diagnosis. *Cryptophlebia rhynchias* is similar to *C. pallifimbriana*. Both are large brownish species with a pale elliptic mark on termen delineated by a comma-shaped dark brown mark before apex, but *C. rhynchias* lacks the outwardly erect dark band below middle of dorsum and the modified male hindwings and hind legs of *C. pallifimbriana*. The male genitalia differ from those of *C. pallifimbriana* by the presence of coremata, and a marginal semicircle of large spines and a central area of dense bristles on the valva. The female genitalia of both species have sharp, curved signa but the sterigma is a large funnel in *C. rhynchias* rather than shallow cup-shaped as in *C. pallifimbriana*.

Redescription. Male (Fig. 16). Wingspan: 19–24 mm. Head, palpi and antennae with red-brown scales with leaden tips, particularly on head and laterally on palpi. Thorax pale grey-brown, medially touched with leaden grey, tegulae slightly paler. Legs light greyish red-brown, tips of tarsal segments and hind tibia pale silvery grey, hind tibia loosely scaled but unmodified. Abdomen with long scattered scales dorsally. Forewing subtriangular with oblique termen; accessory cell narrow, chorda from between R_2 and R_3 to between R_4 and R_5 , which are closely approximated at base; ground colour pale greyish ochreous suffused with white on dorsal half, indistinctly longitudinally striate with red-brown and very few blackish scales; with inconspicuous costal strigulae and a variably expressed large comma-shaped dark preapical mark with a broad ill-defined base extending from 4/5 length of costa to apex and curved and narrow from costa to termen below middle, its inner and outer edges well-defined and always dark burgundy brown with blackish scales but centre sometimes paler pinkish brown; with pale greyish ochreous elliptic to semicircular terminal area delineated by dark mark, with curved rows of light red-brown scales parallel to outer edge of dark mark; with an inconspicuous small whitish dot in middle of wing over crossvein; tornal region pale greyish ochreous, without red-brown longitudinal striae, sometimes with a few black scales. Cilia red-brown from apex to end of dark mark at about 2/3 termen, greyish ochreous in termen, scattered with some blackish scales throughout. Underside brownish grey, costa and terminal region including tornus paler greyish ochreous strigulated with brownish grey or with wavy transverse brownish grey lines. Hindwing unmodified, brownish grey, cilia concolorous.

Male genitalia (Figs. 47, 54). T8 a narrow boomerang-shaped band set with long scales with a dense scale patch in shallow membranous pocket anterolaterally on each side. Coremata consisting of tufts of band-shaped scales, connected by levers of moderately sclerotised intersegmental sclerite and subrectangular S8 with very short apodemal projections. Tegumen a rather narrow band with a lateral, raised, ear-shaped lobe on each side on anterior margin. Gnathos two small lateral processes; subscaphium partly sclerotised. Valva greatly inflated, widest in basal half, with ventro-basal margin straight, strongly sclerotised and with only very few hairs near margin, ending in a large, projecting, roughly rectangular corner; cucullus ovate with strongly rounded outer surface without a keel, inner surface lightly concave with a semicircular row of roughly evenly spaced large spines along its margin and an inner subconcentric circle of dense bristles culminating in a patch of large spines on ventral margin adjacent to the most ventral of the marginal spines. Phallus bent at nearly a right angle in middle, base bulbous, remainder roughly parallel-sided with bevelled apex; vesica with two large, curved cornuti.

Female (Fig. 19). Wingspan: 21.5–29.0 mm. As male, but thorax and ground colour of forewing much darker, dark reddish brown variably mixed and overlaid with leaden grey, sometimes nearly as dark as blackish brown comma-shaped subapical mark, and with a small irregular squarish to subtriangular blackish brown pretornal spot on dorsum, outlined by light red-brown scales; pale elliptic mark along anterior part of termen and tornal region light reddish ochreous with some transverse red-brown rows of scales, with a minute whitish dot in middle of wing above crossvein, and with some transverse rows of red-brown scales between white dot and comma-shaped dark mark; costal strigulae not conspicuous. Cilia banded reddish ochreous and dark red-brown, paler in tornus. Hindwing dark grey-brown.

Female genitalia (Fig. 73). S7 subtriangular with V-shaped hind margin. Sterigma large, funnel-shaped, with a wide sclerotised V-shaped anterior rim. Ductus bursae slightly widening from a constriction below ostium, lightly sclerotised in middle; inception of ductus seminalis from anterior 1/4. Distal 2/3 of corpus bursae with spinules; signa two curved, sharp, laterally compressed horns with a rounded base.



FIGURES 76–81. Female genitalia of *Archiphlebia* and *Thaumatotibia*. 76, *A. endophaga*, GP ANIC 2453. 77, *A. gilva*, GP ANIC 16972. 78, *A. rutilescens*, GP T 2235. 79, *T. zophophanes*, holotype. 80, *T. aclyta*, GP ANIC 16996. 81, *T. maculata*, GP ANIC 17002.

Distribution and biology. *Cryptophlebia rhynchias* is widely distributed and reported from Mauritius, Sri Lanka, India, Papua New Guinea, Australia, Micronesia, Vanuatu and Samoa (Clarke 1976). In Australia only a few specimens have been collected in northern Queensland, from the Cooktown area and from the base of Mt Bellenden-Ker in the Cairns region (Fig. 84, based on material in the ANIC). No hosts are known from Australia, but Clarke's (1976) statement 'Food plants: *Canavalia* (fruits); *Erythrina*; *Cajanus cajan* (L.) Millp. (pigeon pea stem borer)' suggests that *C. rhynchias* is a fruit as well as a stem borer in Fabaceae.

Comments. Meyrick's (1905) original description combines both male and female forewing pattern elements.

As the only male from Australia has malformed genitalia those of a specimen from the Espiritu Santo Island in Vanuatu have been figured.

***Cryptophlebia pallifimbriana* Bradley, 1953**

(Figs. 17, 20, 48, 55, 74, 83)

Cryptophlebia pallifimbriana Bradley 1953: 688, fig. 5, pl. xxiv fig. 5, pl. xxv fig. 5, 5a. Clarke, 1986: 162, figs. 113, 292f; Komai, 1999: 63; Komai & Horak, 2006: 439.

Material examined. *Types.* Holotype *Cryptophlebia pallifimbriana* Bradley, ♂, Fiji, Natoon, iv.1918, R. Veitch, BM ♂ genitalia slide 2545 (BMNH).

Other material. AUSTRALIA: **Queensland:** 1 ♀, Byfield, 29.ii.1964, Common & Upton; 1 ♂, Brisbane, Jan., [Turner]. PAPUA NEW GUINEA: 1 ♂, Amazon Bay area, Doveta, 2400ft, 24.vii.–11.ix.1962, Brandt. VANUATU: 1 ♀, Espiritu Santo Island, Narango. south coast, 24.v.–15.vii.1960, Brandt.

Diagnosis. *Cryptophlebia pallifimbriana* is superficially like *C. rhynchias*, but it has an outwardly oblique dark band below middle of forewing dorsum, and the male has modified hind legs and a narrow fold ending in a corkscrew-like scale tuft on the hindwing underside. The antennal cilia in *C. pallifimbriana* are longer than in other *Cryptophlebia* species. The male genitalia differ from those of *C. rhynchias* with the ventrally projecting angle of the valva covered with bristles, with large spines on the cucullus and its outer surface with a strong keel. The female genitalia of *C. pallifimbriana* have a cup-shaped sterigma rather than a funnel as in *C. rhynchias*.

Redescription. Male (Fig. 17). Wingspan: 22–25 mm (n=2). Head, palpi and antennae with red-brown scales with leaden tips, particularly on head and laterally on palpi. Antennal ciliae small but distinct, ca 1/4 diameter of flagellum. Thorax pale grey-brown, medially touched with leaden grey, tegulae slightly paler. Abdomen with long scattered scales dorsally. Legs pale greyish ochreous, undersurface of fore and mid legs touched and tarsi ringed with greyish red-brown, hind tibia modified, inner surface partly naked, with a large tuft of pale ochreous scales from base and long lateral fringes, grey posterodorsally. Forewing subtriangular with oblique termen; accessory cell narrow, chorda from between R₂ and R₃ to between R₄ and R₅ which are closely approximated at base; ground colour pale greyish ochreous suffused with white on dorsal half, indistinctly longitudinally striate with reddish ochreous, especially in distal third of wing, and with scattered transverse blackish striae across wing; with brownish spots between costal strigulae and a large comma-shaped dark preapical mark running from a broad ill-defined base from apex to below 4/5 costa as a curved narrowing point to termen below middle, its inner and outer edges etched with blackish scales, separated by paler, reddish-brown scales from a third dark central line running between the first two; with pale ochreous elliptic to semicircular area on termen delineated by dark mark, with some parallel brown striae; tornal region and distal 3/5 dorsum pale greyish ochreous with some blackish transverse striae and lines, pretornal mark at most a few dark scales indicating its apex; basal 2/3 of dorsum darker, touched with reddish-brown, set off against distal paler part of dorsum by a clear-cut outwardly oblique line marked by some brown or blackish scales extending to fold. Cilia red-brown from apex to end of dark mark at about 2/3 termen, greyish ochreous in termen, scattered with some blackish scales throughout. Underside brownish grey, costa and terminal region including tornus paler greyish ochreous strigulated with brownish grey or with wavy transverse brownish grey lines. Hindwing slightly modified, ventral surface with an inconspicuous narrow pocket distally along CuA₂ ending in a cork-screw-shaped bundle of modified scales, covered above by a large scale tuft; brownish grey, cilia paler.

Male genitalia (Figs. 48, 55). T8 a narrow curved band set with long scales with a dense scale patch in shallow membranous pocket anterolaterally on each side. Coremata consisting of tufts of band-shaped scales, connected by levers of moderately sclerotised ventral intersegmental sclerite and semicircular S8 with very short apodemal projections. Tegumen a rather narrow band with a lateral, raised, ear-shaped lobe on each side on anterior margin. Gnathos two small lateral processes; subscaphium partly sclerotised. Valva greatly inflated, widest in basal half, with ventro-basal margin of sacculus lightly sinuate ending in a sharply projecting, nearly rectangular projection covered to margin with dense short bristles; cucullus ovate with strongly rounded outer surface with a very wide, longitudinal keel ending in a rectangular corner below middle of valva, inner surface with several lightly concave areas, with an interrupted row of several irregularly spaced large spines just inside its projecting margin, 2–4 longer

ones along dorsal half of apex and a group of 2–4 shorter ones ventrally beyond end of sacculus, and a few large bristles in between. Phallus bent at nearly right angle in middle, base only slightly wider than parallel-sided apical half with bevelled apex; vesica with two large, curved cornuti.

Female (Fig. 20). Wingspan: 22–30 mm (n=2). As male, but thorax and ground colour of forewing much darker, dark reddish brown variably mixed and overlaid with leaden grey, sometimes nearly as dark as black-edged comma-shaped subapical mark, and with a subtriangular blackish and brown pretornal spot on dorsum, surrounded with pale basally and apically; pale elliptic mark along anterior part of termen and tornal region light reddish ochreous with transverse red-brown rows of scales, an interrupted row of black scales from tornus to middle of wing, basal 2/3 length of dorsum darker, red-brown but covered by pale scale-tuft at base of dorsum, and this darker dorsum base separated along a distinct, outwardly oblique line from paler more distal portion reaching to pretornal mark, with an indistinct whitish dot in middle of wing above crossvein; costal strigulae pale, not conspicuous. Cilia banded reddish ochreous and dark red-brown, paler in tornus. Hindwing dark grey-brown.

Female genitalia (Fig. 74). S7 subrectangular with lightly concave hind margin. Sterigma large, cup-shaped, anterior portion strongly sclerotised. Ductus bursae narrow in posterior half with a bipartite sclerotised ring below ostium, wider, curved and lightly sclerotised anteriorly; inception of ductus seminalis from anterior 1/4. Distal 2/3 of corpus bursae with spinules; signa two long, curved, sharp, laterally compressed horns with a rounded base.

Distribution and Biology. Bradley's (1953) description of *C. pallifimbriana* is based on Fijian material, but he reported the species also from the Austral Islands, the Society Islands, Vanuatu, Tahiti, Vulcan Island and New Guinea. Clarke (1986) added the Marquesas Archipelago, and *C. pallifimbriana* is here reported for the first time for Australia from two Queensland specimens, one from Brisbane and one from Byfield north of Rockhampton (Fig. 83, based on material in the ANIC). No host records are available from Australia, but some of the type material was reared from 'larva on Ivi fruit [*Inocarpus edulis*]' (Bradley 1953), recorded as *Inocarpus fagifer* (Parkinson) Fosberg (Fabaceae) by Clarke (1986).

Comments. Bradley (1953) gives a wingspan range 19–33 mm for both sexes of *C. pallifimbriana*, and figures adult and genitalia of both sexes. Clarke (1986) reports *C. pallifimbriana* from the Marquesas Archipelago and figures a female and its genitalia.

***Cryptophlebia stigmata*, sp. nov.**

(Figs. 13–15, 33, 49, 57, 75, 82)

Material examined. *Types:* Holotype ♂: New South Wales, 31.17S 142.18E, Homestead Gorge, Mootwingee Nat. Park, 7.ix.1988, E.D.Edwards. *Paratypes:* **Northern Territory:** 2 ♂, 24.03S 133.59E, 41 km SbyE of Alice Springs, 4.x.1978, E.D.E. **Queensland:** 2 ♂, 1 ♀, 26.24S 146.16E, 3 km E of Charleville, 15.iii.1990, E.D.E. & J. H. Fisk; 3 ♂, 5 ♀, 26.35S 146.11E, 16 km SSW of Charleville, 18.iii.1990, E.D.E. & J. H. Fisk; 1 ♂, 1 ♀, 26.29S 146.11E, Angellala Ck, 29 km SSW of Charleville, 19.iii.1990, E.D.E. & J. H. Fisk; 1 ♂, 26.43S 146.08E, 35 km SSW of Charleville, 13.iii.1990, E.D.E. & J. H. Fisk. **New South Wales:** 1 ♂, 3 ♀, same label data as holotype. **Western Australia:** 1 ♀, 31.07S 121.24E, 29 km SEbyE of Coolgardie, 5.v.1983, E. S. Nielsen & E.D.E.

Diagnosis. *Cryptophlebia stigmata* lacks sexual dimorphism, and the species is easily recognised by its unique wing pattern. Unlike all other *Cryptophlebia* species, the male genitalia have a slender, nearly parallel-sided valva with usually 4–5 large spines and no coremata. The female genitalia of *C. stigmata* are unique for the genus with their short and curved ductus bursae gradually merging into a pear-shaped corpus bursae.

Description. Male (Fig. 13). Wingspan: 12–16 mm. Head, palpi, antennae and thorax usually greyish white, reddish ochreous on outer surface of palpi and laterally on frons and antennal scape and on tegulae, more rarely entire head and thorax with mixed greyish white and reddish ochreous scales. Legs greyish white, tarsi and tibia at least with reddish ochreous bands. Forewing (Fig. 33) subtriangular with oblique termen; accessory cell narrow with chorda from R_2 to between R_4 and R_5 ; ground colour whitish grey, of mixed pale beige and white-tipped pale grey scales, scattered with few red-brown scales, with red-brown spots between costal strigulae forming confluent pairs in distal half, some indistinct reddish ochreous vertical striae along middle of dorsum and with a large, conspicuous, bipartite mark centred on distal half of costa with a roughly semicircular outline partly etched with blackish scales and curving from middle of costa to before apex, containing a distal spot of pale ground colour surrounded by red-brown scales sprinkled with some black. Cilia whitish grey. Underside dark grey except for a

white dorsum and along costa a red-brown streak and a series of 4 white strigulae towards apex. Hindwing (Fig. 33) broad, not modified, increasingly darker grey from pale base to dark grey margin; cilia very pale grey.

Male genitalia (Figs. 49, 57). T8 a narrow, weakly sclerotised, subtriangular band set with long scales throughout but in particular laterally in a shallow pouch. Coremata lacking scale tufts, only indicated by elliptic intersegmental ventral sclerite and subrectangular S8 without apodemal projections. Tegumen a moderately wide band, dorsally broadly rounded with hindmargin somewhat excavated. Gnathos at most two indistinct lateral projections. Valva inflated, but relatively narrow throughout, roughly parallel-sided, distally obliquely rounded; outer surface of cucullus strongly rounded, inner surface flat with 5, rarely 4 large spines of variable length arranged in a semi-ellipse along its margin, the two largest at each end dorsally and ventrally, with some thinner bristles in between. Phallus moderately long and weakly bent in middle, with a bulbous base gradually tapering to middle, distal half roughly parallel-sided with bevelled apex; vesica with a sheaf of moderately long longitudinal cornuti.

Female (Fig. 14). Wingspan: 13–18 mm. As male.

Female genitalia (Fig. 75). Ovipositor lobes slender. Ostium in a small U-shaped excavation of hind margin of S7. Sterigma two subparallel weakly sclerotised longitudinal bands in lamella postvaginalis reaching well beyond hind margin of S7 and diverging above ostium to form a key-hole shape. Ductus bursae short and gradually merging into pear-shaped corpus bursae; with weakly sclerotised narrow ring near ostium, then gradually widening in a short curved, partially sclerotised portion to just beyond inception of ductus seminalis at about 1/3 from corpus bursae, there widening again into narrower posterior portion of corpus bursae; corpus bursae not spinulose. Signa two short, sharp, lightly curved horns at end of narrow part of corpus bursae.

Distribution and Biology. *Cryptophlebia stigmata* is known only from five widely separated localities throughout the southern half of drier inland Australia (Fig. 82), and further collecting will probably reveal an even wider distribution. No host records are available.

Comments. Sympatric with *C. stigmata* in three of the five localities is a superficially very different-looking taxon of *Cryptophlebia* with entirely speckled forewings (Fig. 15) that has the same genitalia as *C. stigmata* in both sexes. There are no specimens with an intermediate forewing pattern, and in the barcode tree the two morphs are mixed. A more detailed molecular analysis will be required to establish whether the two taxa are indeed two pattern morphs or two separate taxa. Based on the present information we assume the former, but are not including the speckled morph in the type series.

Material examined (speckled morph). **Northern Territory:** 1 ♂, 27 km N of Alice Springs, 14.ii.1966, Britton, Upton & McInnes; 1 ♂, 23.32S 133.38E, 30 km NWbyN of Alice Springs, 7.x.1978, E.D.E.; 2 ♂, 24.03S 133.59E, 41 km SbyE of Alice Springs, 4.x.1978, E.D.E. **Queensland:** 2 ♂, 3 ♀, 26.24S 146.16E, 3 km E of Charleville, 15.iii.1990, E. D. E. & J. H. Fisk; 1 ♂, 26.27S 146.08E, 12 km SW of Charleville, 17.iii.1990, E.D.E. & J. H. Fisk; 3 ♂, 1 ♀, 26.35S 146.11E, 16 km SSW of Charleville, 18.iii.1990, E.D.E. & J. H. Fisk; 1 ♂, 1 ♀, 26.29S 146.11E, Angellala Ck, 29 km SSW of Charleville, 19.iii.1990, E.D.E. & J. H. Fisk; 1 ♀, 26.43S 146.08E, 35 km SSW of Charleville, 13.iii.1990, E.D.E. & J. H. Fisk. **New South Wales:** 2 ♂, 31.17S 142.18E, Homestead Gorge, Mootwingee Nat. Park, 7.ix.1988, E.D.E.

Genus *Archiphlebia* Komai & Horak, 2006

Archiphlebia Komai & Horak 2006: 433, figs. 909–914. Type species: *Argyroploce endophaga* Meyrick, 1911: 278.

Diagnosis. Medium-sized moths with forewing either leaden grey with short transverse blackish lines across basal 2/3 of wing, as rows of raised scales on dorsum, with indication of a blackish pretornal mark and with a blackish subapical blotch, both proximally delineated with sprinkled white scales, and with a minute white dot above closing vein, or pale ochreous with a pale grey, ill-defined band from 2/3 costa to tornus and a large subtriangular blotch of orange or reddish ochreous scales in apical area (*A. rutilescens*). Forewing (Figs. 34, 37) with a moderately large accessory cell with chorda from between R_1 and R_2 to between R_4 and R_5 . Hindwing yellow at least in basal half, with grey margin, or yellowish at base only and otherwise grey (*A. rutilescens*); with M_2 at base bent moderately close to short stalk of M_3 and CuA_1 (Figs. 34, 37). Sinuate, medially widened labial palpi with short scales. Thorax with a large posterior crest, male with a dorsal fringe of long scales on hind tibia, but otherwise

unmodified. T8 in male a semicircular or subrectangular, lightly sclerotised plate with scattered long scales but not with lateral scale tufts; S8 unmodified, a small semicircular plate; male genitalia without uncus and socii, gnathos arms two lightly sclerotised lateral arms; valva with a large flat cucullus, either wide, transversely ovate and delineated by deep excavation in ventral valva margin or slender (*A. rutilescens*), with dense long bristles on inner surface and a row of marginal spines and with a tuft of long scales on outer surface; phallus long, vesica with a large patch of small, transverse cornuti. Female genitalia with S7 with an unscaled medioanterior portion; sterigma a strongly sclerotised ring or collar and posterior part of ductus bursae bent and sclerotised, or sterigma a simple opening between two posteriorly converging keels on S7; corpus bursae not spinulose, signa two large, distally flattened and pointed, sharply curved horns.

Distribution and biology. *Archiphlebia* is endemic to Australia and occurs throughout the continent except in its southeastern corner (Fig. 85). Meyrick (1911) recorded the holotype of *A. endophaga* being bred from a larvae feeding 'on pods of *Acacia* sp., eating the seeds and ejecting refuse through a hole, in October'. Turner (1946) stated that *A. rutilescens* (the holotype of *Eucosma diaema*) was reared from fruit, without further details.

Comments. *Archiphlebia* comprises two closely related, similar-looking species, *A. endophaga* and *A. gilva*, and the more loosely associated *A. rutilescens*. The first two species share numerous synapomorphies whilst the link with *A. rutilescens* consists mainly of generalised characters apart from a posteriorly sclerotised ductus bursa with scattered spinules near the corpus bursae and a medially sparsely scaled S7 in the female. Hence, *A. rutilescens* was tentatively included in *Archiphlebia* (Komai & Horak 2006) until a revision of the little known and diverse Papuan fauna can shed more light on its relationships. This assignment is upheld here as the species lacks the apomorphies of either *Cryptophlebia* or *Thaumatotibia*. The BOLD TaxonID Tree clusters *A. rutilescens* with *A. endophaga* and *A. gilva*.

***Archiphlebia endophaga* (Meyrick)**

(Figs. 18, 21, 34, 40, 58, 64, 76, 85)

Argyroproce endophaga Meyrick, 1911: 278. Horak *et al.*, 1996: 135 (*Cryptophlebia*); Komai & Horak, 2006: 435, figs. 909–914 (*Archiphlebia*).

Material examined. *Types.* Holotype *Argyroproce endophaga* Meyrick, ♂, Western Australia, Carnarvon, bred, 21.xi.1886, [E. Meyrick], BM ♂ genitalia slide No. 3545 (BMNH).

Other material. Western Australia: 3 ♂, 5 ♀, nr Carnarvon, 28.viii.1963, 17–23.x.1992; 1 ♀, nr Mt Singleton, 28.ix.1981; 1 ♂, 1 ♀, 29 km S Billabong Roadhouse, 8.viii.1984, 26.x.1992; 1 ♂, 163 km SE by E Broome, 3.viii.1976; 1 ♀, Madura, 30.iv.1984. **Northern Territory:** 1 ♂, 2 ♀, 39 km E Alice Springs, 25.ix.1978. **South Australia:** 4 ♂, 5 ♀, Brookfield Conservation Park, Blanchetown, 29.x.–4.xi.1991.

Diagnosis. *Archiphlebia endophaga* and *A. gilva* are both easily recognised by the combination of mottled dark grey forewings, yellowish hindwings with a marginal grey band and a conspicuously large, white posterior crest on the thorax. Reliably separating the two species without dissection is difficult, but *A. endophaga* has deeper yellow hindwings with the dark marginal band narrower and better defined. The male genitalia of *A. endophaga* are characterised by a strongly sclerotised but not inflated, medially constricted valva with an ovate cucullus, but the male of *A. gilva* is not known. The female genitalia share a posteriorly sclerotised curved ductus bursae but the sterigma in *A. endophaga* is a flat margin surrounding a teardrop-shaped opening rather than a protruding collar as in *A. gilva*.

Redescription. Male (Fig. 18). Wingspan: 15–19 mm. Head (Fig. 40), palpi, antennae and thorax with dark brownish grey usually pale-tipped scales, with red-brown scales laterally on palpi and in two large tufts behind antennae; posterior crest very large, with raised, distally enlarged, white scales. Fore and mid leg grey-brown, ringed with yellowish ochreous; hind leg yellowish ochreous, touched with brownish grey; hind tibia with long dorsal scaling, but not modified. Abdomen with a tuft of long curved scales rising from valvae, but not dorsally from abdomen. Forewing (Fig. 34) subtriangular with costa straight nearly to apex and with oblique termen; with several parallel transverse interrupted rows of raised blackish scales on dorsum to fold; accessory cell moderately large, chorda from between R₁ and R₂ to between R₄ and R₅; ground colour leaden grey, mixed with few transversely arranged blackish and red-brown scales in basal 2/3 of wing and sprinkled with white, little red-brown

and some black lines in distal 1/3; costal strigulae pale separated by dark grey spots in basal half, white separated by black more distally; transverse blackish striae across basal 2/3 of wing as rows of raised scales in dorsal region; pretornal spot indicated by some short lines of black scales above end of dorsum, usually comprising a small inverted V-shaped mark; with a preapical band of partly connected short blackish lines and spots running from 3/4 costa towards middle of termen; distal third of wing densely sprinkled with white scales except for a grey patch on tornus and the preapical transverse band with black scales, and with some interrupted transverse lines of red-brown scales especially in apical region; cilia of mixed leaden grey and few white scales. Hindwing (Fig. 34) with M_2 bent quite close to short stalk of M_3 and CuA_1 at base; yellow to yellow-ochreous with a well-defined, narrow, dark grey band around termen and apex; cilia light grey, yellow on dorsum.

Male genitalia (Figs. 58, 64). T8 a semicircular, lightly sclerotised plate with long scales; no abdominal scale tufts, levers indicated by lightly sclerotised intersegmental ventral sclerite and small, semicircular S8 without apodemal projections. Tegumen a narrow, simple band. Gnathos two lateral sclerotised bands, membranous near tegumen. Valva strongly sclerotised but not inflated, constricted medially on ventral margin, with a narrow keel on ventral margin of cucullus 'neck', cucullus ovate, with dense large bristles on inner surface and some short spines along margin, especially in ventroproximal angle of cucullus; with long scales from outer surface of cucullus. Juxta smallish, triangular, caulis very long. Phallus long, strongly sinuate and rather slender, hardly tapering beyond slightly bulbous base, apex bevelled; vesica with a large patch of small, transverse cornuti.

Female (Fig. 21). Wingspan: (14) 16–21 mm. As male.

Female genitalia (Fig. 76). S7 with deeply excavated, V-shaped hind margin, strongly sclerotised medially, anteriorly to ostium. Sterigma a sclerotised, dorsally pointed ring around ostium, rarely dorsally interrupted. Posterior half of ductus bursae slender, partially sclerotised and curved near middle, anterior half gradually widening, with inception of ductus seminalis 1/3 from corpus bursae. Corpus bursae without spinules; signa two large, flattened, curved horns with a large basal opening

Distribution and biology. *Archiphlebia endophaga* is known from several localities widely scattered across the south-western part of the continent from South Australia and the southernmost part of the Northern Territory across much of Western Australia (Fig. 85). There are no host records in the ANIC, but in his description Meyrick (1911) records that the holotype has been bred from a larva feeding 'on pods of *Acacia* sp., eating the seeds and ejecting refuse through a hole, in October'.

Comments. One single male among several typical *A. endophaga* specimens from near Carnarvon has an indistinctly defined broad grey band along the margin of a rather orange yellow hindwing. The male genitalia also are subtly different and the specimen could well represent an additional species of *Archiphlebia*.

***Archiphlebia gilva*, sp. nov.**

(Figs. 22, 77, 85)

Material examined. *Types.* **Western Australia:** Holotype ♀, 13 mi [21 km] WSW of Collie, 6.iv.1968, I. F. B. Common, ANIC genitalia slide No. 16972. Paratypes: 1 ♀, same label data as holotype; 2 ♀, 32.11S 116.05E, 10 km SE of Armadale, 26.i.1993, E.D.E. & E. S. Nielsen (ANIC).

Diagnosis. Superficially, *A. gilva* (known from females only) is very much like *A. endophaga*, but its hindwing is less deeply yellow and has a much wider terminal grey band, and the blackish mark in the apical area of the forewing is a confluent semicircular blotch usually not extending to the costa. In the female genitalia the posteriorly sclerotised, curved ductus bursae is shared with *A. endophaga*, but *A. gilva* has a collar-like, projecting sterigma rather than a flat margin around the ostium.

Description. Female (Fig. 22). Wingspan: 14–16 mm (n=4). Head, palpi, antennae and thorax with dark brownish grey partly white-tipped scales, red-brown scales on terminal segment of palpi and in two tufts behind antennae; posterior crest very large, with raised, distally enlarged white scales. Fore and mid leg dark grey-brown banded with ochreous, hind leg light yellowish ochreous touched with greyish brown. Forewing subtriangular with costa straight nearly to apex and with oblique termen; with 2–3 parallel, transverse, interrupted rows of raised blackish scales on dorsum to fold; with accessory cell moderately large, chorda from between R_1 and R_2 to between R_4 and R_5 ; mottled throughout in irregular transverse striation with leaden grey, white, pale grey, red-brown and blackish; costal strigulae indistinctly pale and separated by dark grey in basal third, much more pronounced, white

with dark grey spots distally; basal 2/3 of wing predominantly leaden grey with indistinct paler transverse striae especially dorsally near base and with at least two incomplete transverse lines of blackish scales, raised in dorsal half, at about 1/3 and middle of costa; an outwardly convex pale transverse band from 2/3 costa to dorsum before tornus, consisting of sinuate, interconnecting, incomplete white lines dorsally outlining some black scales indicating an incomplete narrowly triangular pretornal mark, and followed by a parallel leaden grey band from tornus towards 3/4 costa and then by a semicircular blackish mark in centre of apical region, outlined by pale ochreous scales along its convex distal margin and not usually extending to costa; apical and terminal area between semicircular blackish mark and margin with subconcentric incomplete rings of first leaden grey, then red-brown then barred white and dark grey, the latter extending into the cilia. Underside dark grey, spotted with white along costa and pale along dorsum. Hindwing with M_2 bent quite close to short stalk of M_3 and CuA_1 at base; light yellowish ochreous, with narrow to broad ill-defined grey band around termen and apex; cilia light grey, yellowish on dorsum.

Female genitalia (Fig. 77). S7 with deeply concave, U-shaped hind margin, sclerotised medially only and anteriorly to ostium with raised transverse parallel rugae. Sterigma a projecting ring-shaped wide collar surrounding ostium, posteriorly higher, tongue-shaped. Ductus bursae a parallel-sided, rigid, strongly sclerotised and anteriorly curved tube nearly to inception of ductus seminalis about 1/3 from corpus bursae, from there gradually widening into corpus bursae. Corpus bursae without spinules; signa two large, wide, flattened, curved horns with a large basal opening.

Distribution and biology. *Archiphlebia gilva* is known from only four specimens from two localities in the southwestern corner of Western Australia (Fig. 85), in the area of the jarrah forest. No host records are available.

Comments. The female genitalia of *A. gilva* are so distinct that the species is named even though no males are available, calling attention to the fact that this closely related species is occupying the ecologically different habitat of the wet southwest, in contrast to the dry-adapted *A. endophaga*.

***Archiphlebia rutilescens* (Turner, 1945)**

(Figs. 23, 24, 37, 41, 59, 65, 78, 85)

Cnephasia rutilescens Turner, 1945: 70. Horak *et al.*, 1996: 135 (*Cryptophlebia*); Komai & Horak, 2006: 435 (*Archiphlebia*).
Eucosma diaema Turner, 1946: 204. Horak *et al.* 1996: 135 (synonymised with *rutilescens*).

Material examined. *Types.* Lectotype *Cnephasia rutilescens* Turner (here designated): ♀, Queensland, Chinchilla, 28.x.1935 (ANIC). Paralectotype *Cnephasia rutilescens* Turner: ♀, Queensland, Leichhardt, 15.i.1940. W. B. Barnard (ANIC). Holotype *Eucosma diaema* Turner: [Queensland], 'record lost [,] larva on fruit'.

Other material. **Western Australia:** 2 ♀, Kalumburu Mission, 23–25.v.1993; 1 ♀, Drysdale River, 3–8.viii.1975; 1 ♀, Morgan Falls, 16/17.viii.1975. **Northern Territory:** 1 ♀, nr Cape Crawford, 26.x.1975; 1 ♀, nr Musselbrook Camp, 14.v.1995. **Queensland:** 3 ♂, 1 ♀, nr Musselbrook Camp, 11–19.v.1995; 1 ♀, nr Heathlands, 18.iii.1992; 1 ♀, Coen, 12.i.1994; 2 ♀, nr Hann River, 15.i.1994; 3 ♀, Jowalbinna, 16.i.1994; 1 ♀, Mt Lewis nr Mt Molloy, 15.iii.1964; 1 ♀, The Crater nr Atherton, 26.xi.1998; 1 ♂, 1 ♀, Yeppoon, 20.ix.1954, 15.xii.1964; 2 ♂, 7 ♀, 10 km SSE Yeppoon, 18–21.x.1975, 28.xi.1986, 8.xii.1984; 2 ♂, 2 ♀, Carnarvon Nat. Park (Oasis Lodge, Gorge), 31.iii.1957, 23–25.x.1989.

Diagnosis. Lacking sexual dimorphism, *A. rutilescens* is easily recognised by its unique wing pattern with a reddish brown blotch in forewing apex delineated by a pale ochreous band from tornus to 2/3 costa, and by a large accessory cell with the chorda from halfway between R_1 and R_2 . Unlike *A. endophaga*, or any *Cryptophlebia* or *Thaumatographa* species, the male genitalia of *A. rutilescens* have a distally strongly narrowed valva. The female genitalia are characterised by broad semicircular ovipositor lobes and a strongly modified S7 with laterally projecting keels, unlike any other *Archiphlebia*, *Cryptophlebia* or *Thaumatographa*.

Redescription. Male (Fig. 23). Wingspan: 12.5–15.0 mm. Head (Fig. 41), palpi, and antennae with ochreous scales, red- and more rarely grey-tipped on frons, vertex and laterally on palpi; thorax with tegulae ochreous, remainder orange or reddish ochreous. Legs pale ochreous, fore and mid legs variably sprinkled and ringed with reddish or grey-brown, hind tibia unmodified. Forewing (Fig. 37) subtriangular with oblique termen; accessory cell moderately large, chorda from between R_1 and R_2 to opposite R_5 ; ground colour pale ochreous, present along distal

2/3 dorsum, in a narrow band along termen and in a wide transverse band across wing from tornus to 2/3 costa, mixed with orange or reddish ochreous scales in basal 2/3 wing and variably sprinkled with white-tipped blackish scales, especially in basal third and along costa where they form indistinct spots between costal strigulae; with a large subtriangular blotch of orange or reddish ochreous scales filling apical area between pale terminal line and pale oblique band; cilia with mixed ochreous and white-tipped grey scales. Underside grey except for ochreous costa and dorsum. Hindwing (Fig. 37) unmodified, with M_2 and base of stalked M_3 and CuA_1 moderately close; dark grey with grey cilia.

Male genitalia (Figs. 59–65). T8 subrectangular, without modified scales; S8 large, subrectangular, without apodemal projections but with dense long hair scales, scale tufts absent but lightly sclerotised intersegmental ventral sclerite present. Tegumen dorsally rounded, a simple moderately broad band. Gnathos two small, short lateral tegumen processes. Valva inflated in basal half, somewhat flattened distally, widest in basal half; cucullus narrow, roughly parallel-sided dorso-ventrally with round apex, its inner surface densely set with large spines becoming large setae towards dorsal margin, with a narrow keel along ventral margin ending in some triangular flat teeth on sacculus. Juxta large, triangular, caulis short, not as long as juxta. Phallus straight or weakly sinuate, gradually tapering from rounded base to apex; vesica with an elongate patch of very small, transverse cornuti.

Female (Fig. 24). Wingspan: 13–15 mm. Forewing as in male, hindwing may be reddish ochreous in basal half, darkened with grey towards margin.

Female genitalia (Fig. 78). Ovipositor lobes broadly subsemicircular. Ostium in U-shaped excavation of highly modified S7 with two large ovate strongly concave posterolateral portions connected to a raised triangular unscaled medioanterior plate along two lines converging towards ostium, with connecting rims of medial plate laterally projecting as keels. Sterigma a small cup. Ductus bursae narrow posteriorly, widening from inception of ductus seminalis near middle to anterior spinulose band at merger with corpus bursae. Corpus bursae not spinulose; signa two large, flat, curved, pointed horns with large square basal opening.

Distribution and Biology. *Archiphlebia rutilescens* occurs in Queensland, the Northern Territory and northernmost Western Australia in a wide band along the coast from north of Brisbane to the Kimberleys (Fig. 85, based on material in the ANIC). The only host record is Turner's (1946) statement that the holotype of *Eucosma diaema* was reared from fruit, without further details (see *Comments*). The localities are mostly monsoon forest or riverine vegetation.

Comments. The three syntypes of *Cnephasia rutilescens* are all females, only two of which have been located, both in the ANIC. They were not dissected as they are unmistakable by their wing pattern and the medially naked S7. Nevertheless, to unequivocally establish the identity of the name, a lectotype has been selected for *A. rutilescens*. The original descriptions give a wingspan of 15–18 mm for *Cnephasia rutilescens* and 18 mm for *Eucosma diaema*, but the actual type and syntype specimens in the ANIC fall within the range of 13–15 mm. Turner (1946) states that the holotype of *E. diaema* is from Queensland, 'one specimen bred from fruit', but then goes on to say 'Unfortunately the record of locality and host plant has been lost'. *Archiphlebia rutilescens* has two large keels on S7 in the female and a large juxta, a short caulis and a slender cucullus in the male, all in contrast to the type of *Archiphlebia*.

Genus *Thaumatotibia* Zacher

Thaumatotibia Zacher, 1915: 529. Heppner, 1980: 334 (synonymised with *Cryptophlebia*); Horak *et al.* 1996: 135 (as synonym of *Cryptophlebia*); Komai, 1999: 46, figs. 39, 41–44, 51, 53–68, 374, 386 (reinstated as separate genus); Komai & Horak, 2006: 427, figs. 106, 107, 894–904. Type species: *Thaumatotibia roerigii* Zacher, 1915 [= *Argyroplote leucotreta* Meyrick, 1913], by monotypy.

Metriophlebia Diakonoff, 1969: 89. Razowski, 1977: 259; Clarke, 1986: 162 (as synonym of *Cryptophlebia*); Komai, 1999: 46 (synonymised with *Thaumatotibia*). Type species: *Eucosma chaomorpha* Meyrick, 1929, by monotypy.

Diagnosis. Small to medium-sized, grey-brown to blackish brown moths with broad forewings with a brownish to blackish pretornal spot, with sinuate, medially widened labial palpi with short scales. Thorax with an easily abraded loose posterior tuft of upcurved, paddle-shaped scales; legs unmodified in all Australian species. *Thaumatotibia* species are characterised by a rudimentary M-stem and a small or entirely lacking accessory cell (Figs. 35, 36), with the chorda in Australian species usually coincident with the margin of the discal cell or at most

from just before R_3 to R_4 in the occasional specimen. R_3 , R_4 and R_5 are often (in all Australian species) approximated at base, and R_4 is either equidistant from R_3 and R_5 or variable from equidistant to connate to short-stalked with R_3 in the one species. Hindwing with M_2 moderately to closely approximated to stalk of M_3 and CuA_1 at base. In male, abdominal tuft conspicuous, upcurved, T8 usually a transverse plate with concave, sinuate hind margin with projecting lateral points, with long scales from transverse plate but never from lateral membranous pockets or shallow pouches as in *Cryptophlebia*. Coremata with or without (*T. zophophanes*) scale tufts, which are invaginated in deep, membranous pockets if present and not connected with intersegmental ventral sclerite; S8 semicircular, without lateral apodemal projections. The coremata scales may be absent (*T. zophophanes*) and this seems correlated with a simple T8 with a straight hind margin. The male genitalia are characterised by an elongate-ovate valva with a slightly domed outer surface carrying a patch of long scales, which are shared with *Cryptophlebia* and *Archiphlebia*, and with dense large spines ventrodistally on inner surface. In all Australian species of *Thaumatotibia* the caulis is very long and its base is developed into conspicuous, spinulose, paired lobes, which are diagnostic for the genus in Australia. The phallus is clavate with a series of short, transverse cornuti. The female genitalia are characterised by a sterigma consisting of a ventral rim (protruded in *T. zophophanes*) ending on each side in a posterior band or patch of modified scales, and a corpus bursae with two large, horn-shaped signa, a ring of spinules around its entrance and usually at least an indication of a diverticulum nearby.

Distribution and biology. *Thaumatotibia* occurs in the Ethiopian, Oriental, Australian and the eastern part of the Palaearctic regions. In Australia it has been collected along the east coast from the northern half of New South Wales to the tip of Cape York in Queensland, and from the Darwin region in the Northern Territory (Figs. 86, 87). As detailed by Komai (1999) in a table of host plants of the *Grapholita* group, *Thaumatotibia* feeds on taxonomically diverse plant families and has been reported as a borer in fruit of Rutaceae, Lauraceae, Myrtaceae, Theaceae, Proteaceae, Sterculiaceae, Malvaceae and Rubiaceae and in stems of Poaceae. At least several pest species are polyphagous, such as *T. encarpa* (Meyrick) from Southeast Asia, *T. leucotreta* (Meyrick) and *T. batrachopa* (Meyrick) from Africa, and *T. zophophanes*, which is a pest on macadamia and avocado in Australia.

Comments. The identity of *Thaumatotibia*, based on *Thaumatotibia roerigii* described by Zacher (1915) from Togo as a probable glyphigterigid feeding on cotton capsules, has only recently been resolved. No type could be located, but given the host and the unmistakable secondary sexual characters mentioned in the description, Heppner (1980) realised that *roerigii* must be a junior synonym of the African *Thaumatotibia leucotreta* (Meyrick). Consequently, in line with the taxonomic assignment of *T. leucotreta* at the time, Heppner (1980) synonymised *Thaumatotibia* with *Cryptophlebia*. Unaware of *Thaumatotibia*, Diakonoff (1959) described the genus *Metriophlebia* for *Eucosma chaomorpha* Meyrick from the Marquesas Islands and the Seychelles, pointing to the close relationship with *Cryptophlebia*. Clarke (1986) did not consider *Metriophlebia* a separate genus and synonymised it with *Cryptophlebia*, but Komai (1999) demonstrated the distinct nature of the group and the fact that it included both *T. leucotreta* and *T. chaomorpha*, and reinstated *Thaumatotibia*.

Komai (1999) presents a comprehensive revision of *Thaumatotibia*, including a detailed, well-illustrated description of the genus, a review of all Palaearctic species and of immature stages, and tables with host plant and pheromone information. He lists three derived characters (apomorphies) unique to *Thaumatotibia* which readily justify generic rank: 1) T8 in male with convex hind margin laterally produced into curved points; 2) sterigma with two posterolateral bands or patches of modified scales; and 3) corpus bursae with a spinulose band around entrance of ductus bursae. Based on a partly different character set, Adamski & Brown (2001: fig. 1) present a hypothetical phylogeny for the *Ecdytolopha* group, with *Thaumatotibia* one step above *Ecdytolopha*, as the sister group to *Gymnandrosoma* + (*Pseudogalleria* + *Cryptophlebia*). *Thaumatotibia* has several plesiomorphic features such as presence of an anal comb in the larva and a bifid uncus in at least one species and is overall less derived than *Cryptophlebia*.

Komai (1999) separates *Thaumatotibia* into two species groups, each diagnosed by a derived character: the *T. chaomorpha* group by spinulose basal lobes of the caulis and the *T. leucotreta* group by usually modified male hind tibia with an enlarged inner apical spur. The former group includes all the Australian species and occurs in Asia from India and Nepal to Japan and extends from Australia and New Guinea into the Pacific to the Marquesas Islands, the latter group is more restricted, from Africa and Madagascar into the Indian Ocean to Reunion Island.

***Thaumatotibia zophophanes* (Turner, 1946)**

(Figs. 25, 28, 36, 39, 60, 61, 66, 79, 86)

Argyroploce zophophanes Turner, 1946: 217. Horak *et al.*, 1996: 135 (*Cryptophlebia*); Komai, 1999: 55 (as undescribed 'species a' of *Thaumatotibia*), fig. 386 (pupa); Komai & Horak, 2006: 430, figs. 106, 894, 895, 898, 899, 902 (as *Thaumatotibia zophophanes*).

Articolla scioessa Turner, 1946: 218. Horak *et al.* 1996: 135 (*Cryptophlebia*); Komai & Horak 2006: 430 (synonymised with *zophophanes*)

Material examined. *Types.* Holotype *Argyroploce zophophanes* Turner, ♀, Queensland, Kuranda, 25.ix.1927, W. B. Barnard, ANIC genitalia slide 16885 ♀ (ANIC). Holotype *Articolla scioessa* Turner, ♂ (without abdomen), Queensland, Lake Barrine, 28.x.1938, fruit *Acronychia vestita* (ANIC).

Other material. **Queensland:** 2 ♂, Cape York (Bamaga), 5.iv.1964, 15.x.1992; 3 ♂, 5 ♀, nr Heathlands, 12–19.iii.1992; 1 ♀, Moreton, 12.xii.1993; 3 ♂, 10 ♀, Claudie River (Lamond Hill, Quinn Park, Crossing, Phillip Hill), 15–19.ii.1985; 21 ♂, 39 ♀, McIlwraith Range (Weather Station, Golden Nugget Creek, Leo Creek Mine), 14/15.i.1988, 26.vi.–11.vii.1989; 1 ♂, Gap Creek, 31.v.1996; 1 ♂, 1 ♀, Moses Creek nr Mt Finnigan, 15/16.x.1980; 6 ♂, Shiptons Flat, 19.x.1980; 1 ♂, Summit Mt Misery, 9.xi.1988; 2 ♂, Cape Tribulation, 10.ix.1986; 1 ♂, 16 km S Daintree, 29.iv.1955; 1 ♀, Mossman, 13.iii.1964; 1 ♀, nr Mt Lewis, 5.iii.1988; 2 ♀, Mt Lewis, 15.iii.1964, 18.iv.1964; 3 ♂, Kuranda, 9.ix.1985, 25.ix.1927; 1 ♂, Whitfield Range, 3.iv.1975; 1 ♀, nr Mt Tip Tree, 20.x.1980; 1 ♂, nr Mareeba, v.1988; 1 ♂, 1 ♀, Walkamin, 10.iv.2000; 1 ♂, Tolga, 6.v.1997; 1 ♀, Lake Barrine, 28.vii.1938; 2 ♀, Yungaburra, 25.v.1989, 11.vi.2000; 4 ♂, 2 ♀, Base Cableway Mt Bellenden-Ker, 24–31.x.1981; 1 ♂, 1 ♀, Cableway Tower 3 Mt Bellenden Ker, 27.x.1981; 2 ♂, 7 ♀, Lake Eacham, 25.26.v.1989, 15.ix.1985; 12 ♂, 8 ♀, Malanda, 20&28.ii.1991, 14.ii.1992, 12–29.v.1992; 1 ♂, east base Mt Bartle Frere, 24.iv.1955; 1 ♀, Mission Beach, 13/14.v.1980; 1 ♂, 1 ♀, Birthday Creek nr Paluma, 25.ix.1980; 1 ♂, Paluma, 7.iv.1979; 2 ♂, 8 km SSE Eungella, 6.ix.1988, 8.xi.1988.

Diagnosis. *Thaumatotibia zophophanes* can be distinguished from *T. aclyta* and *T. maculata* by its dark forewings without a distinctly paler distal portion and in the male by its grey hindwings and abdomen with an anal tuft. The male of *T. zophophanes* lacks coremata scale tufts and its bipartite uncus is unique, absent in *T. aclyta* and *T. maculata*. The female genitalia of *T. zophophanes* can be recognised by a strongly protruding rim around the ostium, large patches of modified scales behind the ostium, and a narrow (rather than an anteriorly widening) ductus bursae.

Redescription. Male (Fig. 25). Wingspan: 10.0–14.5 mm. Head (Fig. 39) and thorax greyish red-brown to blackish brown, always with some reddish brown on top of head; thorax with loose (and easily lost) posterior tuft of long, upcurved, paddle-shaped pale grey scales. Legs blackish brown with whitish rings on tarsi except for greyish hindlegs with white-ringed dark tarsal segments. Abdomen grey to brownish grey, with concolorous, grey anal tuft in male. Forewing subtriangular, moderately wide with oblique termen; from greyish reddish brown to blackish brown with complex wing pattern of greyish, red-brown, pinkish white and silvery scales, with an irregular paler region from 2/3 costa to tornus followed by a dark subtriangular band from 3/4 costa tapering to narrow point near termen above tornus, then a staggered series of short, curved, subparallel whitish lines separated by silvery and some red-brown scales in a band along termen, oblique in apex then parallel to termen; wing very variably overlaid with dark grey to blackish scales often obliterating pattern except for pale band along termen, some pale costal strigulae beyond middle, a conspicuous white dot on end of cell in middle of wing often with some scattered, irregular pale dots beyond in a region from tornus to 2/3 costa, usually a pale-edged, triangular red-brown pretornal mark and a band of ochrous and red-brown scales along dorsum; fringe pale reddish-brown banded with dark grey to dark grey. Hindwing unmodified, brownish grey to grey.

Male genitalia (Figs. 60, 61, 66). T8 rectangular, with straight hind margin; coremata without scale tufts, S8 a semicircular plate. Tegumen a wide band, with a well-developed bipartite uncus of two sharp, medially connected laterodistal points. Gnathos two very weakly sclerotised rising arms, laterally obsolete. Valva elongate-ovate, widest in distal third but only little dilated; with a short vertical keel forming a rectangular, projecting point at end of sacculus, preceded by a vertical band of short bristles along margin of basal excavation and followed by a semicircular indentation on ventral margin; cucullus ovate with outer surface slightly domed, inner surface with a wide band of moderately long, strong spines around ventral and distal margin. Juxta a low and wide triangle, basal caulis lobes finely spinulose. Phallus very long, lightly and evenly sinuate, clavate at base and tapering to very narrow tip; vesica with 2–4 small, longitudinal cornuti.

Female (Figs. 28, 36). Wingspan: 11–20 mm. As male, but triangular pretornal mark more distinct.

Female genitalia (Fig. 79). Complex sterigma with ostium surrounded by a strongly protruding subrectangular to circular rim anteriorly fused with raised median portion of S7, with two large ovate depressed patches of modified scales posterolaterally of ostium, anteriorly each delineated by a crescentic fold. Ductus bursae less than half length of corpus bursae, narrow throughout with a long ring-shaped sclerite anterior to ostium and a small lateral sclerite at 1/3 from ostium, just anterior to inception of ductus seminalis. Corpus bursae ovate, with a band of coarse spinules around its entrance and a small nose-shaped appendix nearby, with two long, slender, curved and pointed horn-shaped signa with ovate hollow base and flattened apex.

Distribution and biology. *Thaumatotibia zophophanes* occurs in rain forest regions in Queensland from the tip of Cape York south to Eungella, with adults collected throughout the year (Fig. 86, based on material in the ANIC). A single male in the ANIC from Mt Sinewit in New Britain suggests that the species is present also in New Guinea. The holotype of *scioessa* was reared from fruit *Acronychia vestita* F. Muell. (fuzzy lemon aspen) (Rutaceae) collected at Lake Barrine (Turner 1946). Following this lead, R. Bauer and B. Pinese (QLD DPI, Mareeba) collected on the Atherton Tableland fruit of some of the over ten species of *Acronychia* known from north Queensland rain forest. Due to a poor fruiting season in 2000 only very few fruit of *A. vestita* were located, none of them infested. However, *zophophanes* was repeatedly reared from fruit of *Acronychia acidula* F. Muell. (lemon aspen), with up to 90% of collected *A. acidula* fruit infested. Seasonal activity observations indicate that *zophophanes* develops on aspen fruit (and possibly other rainforest hosts) prior to migrating to commercial crops (B. Pinese pers. comm. 2001). The emergence of *zophophanes* as a pest on the Atherton Tableland in recent years, first in macadamia (Proteaceae) at Malanda in 1991 (G. Waite pers. comm. 2001) and subsequently in avocado (Lauraceae) in 1996 (B. Pinese pers. comm. 2001), initially prompted this revision.

Comments. Both *T. zophophanes* and *T. scioessa* were described in the same paper (Turner 1946). We (Komai & Horak, 2006) designated *zophophanes* as the senior synonym because its holotype still had an abdomen (lost in that of *scioessa*) and thus provided genitalia to unequivocally establish its identity. *Thaumatotibia zophophanes* is unique within the genus with its derived sterigma and a bipartite dorsal tegumen process considered to be the unicus.

***Thaumatotibia aclyta* (Turner)**

(Figs. 26, 29, 62, 67, 80, 86)

Alypeta aclyta Turner, 1916: 529. Horak *et al.* 1996: 135 (*Cryptophlebia*); Komai & Horak, 2006: 430 (*Thaumatotibia*).

Material examined. *Types.* Lectotype *Alypeta aclyta* Turner (here designated), ♂, Queensland, Brisbane, 6.xi.1910, ANIC genitalia slide 16884 ♂ (ANIC).

Other material. Northern Territory: 1 ♂, Petherick's Rainforest Park, 18.ix.1983; 1 ♂, 1 ♀, Casuarina Beach, Darwin, 22.x.1972. **Queensland:** 1 ♀, nr Heathlands, 24.vii.1992; 1 ♀, Batavia Downs, 22.vii.1992; 4 ♂, Moonlight Creek, 13.xi.1993; 4 ♂, McIlwraith Range (Weather Station, Golden Nugget Creek), 3–7.vii.1989; 1 ♀, Mt Webb Nat. Park, 29.ix.1980; 2 ♂, 1 ♀, nr Hope Vale Mission, 4–10.x.1980; 4 ♀, nr Cooktown, 16/17.v.1977, 11/19.x.1980; 1 ♂, Airlie Beach, 19.viii.1977; 1 ♀, Cape Hillsborough, 6.x.1983; 7 ♂, 4 ♀, nr Yeppoon, 25.iv.1986, 10–15.vii.1982, 21.viii.1984, 28.viii.1983, 6/7.ix.1981, 7.ix.1980, 27.x.1975; 1 ♂, Parkhurst, 25.ii.1989; 1 ♂, 1 ♀, Rockhampton, 15&31.iii.1948; 1 ♀, nr Gympie, 14.iii.1958; 1 ♀, Buderim, 14.viii.1973; 1 ♂, Yarraman, 25.iv.1950; 1 ♂, Bunya Mts, 25.iii.1957; 1 ♂, Brisbane, 25.xii.1923; 1 ♂, 2 ♀, Toowoomba, 5.xi.1998, 8.xi.1988, 14.ix.1925; 1 ♂, Lamington Nat. Park, 3.xii.1996. **New South Wales:** 1 ♀, Buringbah, 13.iii.1958; 2 ♂, Tooloom, 30.x.1961; 3 ♂, Upper Allyn River, 8/9.xi.1960.

Diagnosis. *Thaumatotibia aclyta* has a distally paler forewing like *T. maculata*, but the male lacks the conspicuous black scales present on the hindwing of *T. maculata*, and in the female the pale forewing tip is partly obscured by a dark transverse blotch, which is absent in the male of *T. aclyta* and in both sexes of *T. maculata*. The male genitalia are very similar in the two species, differing only by the shorter coremata scale bundles and the presence of a short triangular fold rather than a long keel beyond the basal excavation in *T. aclyta*. The female of *T. aclyta* has an anteriorly gradually widening ductus bursae like *T. maculata*, but in *T. aclyta* the patches of modified scales behind the ostium are wider and more divergent.

Redescription. Male (Fig. 26). Wingspan: (9) 11–16 mm. Head and thorax greyish reddish ochreous to dark grey touched with reddish-brown on top of head; thorax with a loose (and easily lost) posterior tuft of long, upcurved, paddle-shaped whitish scales. First two pairs of legs dark grey with white-ringed tarsi, hindleg whitish grey. Abdomen pale greyish ochreous, with concolorous, pale anal tuft. Forewing subtriangular, moderately wide, with oblique termen; grey-brown in basal half except for ochreous scale tuft near base of dorsum and often similar scales along its margin, much paler distally with whitish ground colour beyond a line from pretornal mark to beyond middle of costa, reticulate with reddish ochreous scales along veins and obliquely transverse parallel blackish and greyish wavy lines running from between distal costal strigulae to termen, and mottled with silvery scales near tornus and sprinkled with reddish ochreous near costa; with a white dot in middle of wing over closing vein, near edge of dark basal half, and a triangular reddish brown pretornal mark sprinkled with black and outlined with whitish scales; cilia mixed whitish, red-brown and blackish scales. Hindwing very pale brownish grey, unmodified.

Male genitalia (Figs. 62, 67). T8 with posterolateral corners strongly projecting, hind margin deeply concave and sinuate; coremata consisting of two very large and rather short composite scales bundles deeply invaginated in membraneous pocket on each side, and S8 with angled to sharply rounded hind margin. Tegumen a wide band without any trace of uncus but with a semicircular depression on each side associated with spinulose membrane presumably indicating gnathos remnants. Valva narrowly elongate-ovate, widest in middle; with outer margin of basal excavation with a vertical band of small bristles intersected by a longitudinal triangular fold above middle of valva; cucullus narrowly ovate with outer surface lightly domed, inner surface with a wide band of moderately long, strong spines around ventral and distal margin, shorter near margin. Juxta a narrow and high triangle, basal caulis lobes rounded, small, and roughly spinulose. Phallus long, sharply bent beyond strongly clavate base, distal 3/4 narrow, nearly parallel-sided and straight; vesica with numerous (15–20), evenly spaced, small, transverse cornuti.

Female (Fig. 29). Wingspan: (10) 12–17 mm. As male, but with an ill-defined darker preapical blotch in pale distal half of forewing, and with hindwing darker grey.

Female genitalia (Fig. 80). Ostium in small V-shaped excavation in hind margin of S7. Sterigma simple, a narrow ring ventrally around ostium merging on each side into two strongly outwardly diverging, ovate, oblique bands of modified scales. Ductus bursae about half length of corpus bursae, anteriorly gradually widening, with a long ring-shaped sclerite anterior of ostium and inception of ductus seminalis 1/3 from ostium. Corpus bursae tear-shaped, with a band of fine spinules around its entrance and a small triangular appendix nearby, with two moderately long, curved and pointed horn-shaped signa with ovate hollow base and flattened apex.

Distribution and biology. *Thaumatotibia aclyta* is widely distributed and has been collected from the upper Allyn River New South Wales along the east coast of Queensland to nearly the tip of Cape York, and several specimens from the Darwin region in the Northern Territory (Fig. 86, based on material in ANIC). There is no host record, but all localities are monsoon forest, gallery forest or rain forest.

Comments. Only one of the two syntypes could be located, and it is here designated as the lectotype to unequivocally establish the identity of the name. *Thaumatotibia aclyta* is closely related to *T. chaomorpha* (Meyrick) (Meyrick 1929, Clarke 1986) from the Marquesas Islands, but differs in wing pattern, cornuti arrangement and the shape of S7 in the female.

***Thaumatotibia maculata*, sp. nov.**

(Figs. 27, 30, 35, 63, 68, 81, 87)

Thaumatotibia sp.: Komai & Horak, 2006: fig. 107.

Material examined. *Types.* **Queensland:** holotype ♂, 15.04S 145.07E, Mt Webb National Park, 29.ix.1980, E. D. Edwards, ANIC genitalia slide No. 17018 (ANIC); paratypes: 1 ♂, 11.40S 142.43E, 18 km NEbyE Heathlands, 19.iii.1992, E. D. E.; 2 ♀, 11.440S 142.44E, 14 km W by S Captain Billy Landing, RF, 9.ix.1993, P. Zborowski & S. Shattuck; 9 ♂, 11.41S 142.42E, 14 km ENE Heathlands, 11–12.xi.1993, rainforest, P. Zborowski & M. Horak; 1 ♂, 11.41S 142.42E, 15 km NE by E Heathlands, 15.iii.1992, E. D. E.; 1 ♀, 11.42S 142.29E, 10 km WNW Heathlands, 8.ix.1993, P. Zborowski & S. Shattuck; 1 ♂, 13.44S 143.21E, 1 km E Golden Nugget Creek, McIlwraith Range, 520 m, 30.vi.1989, Nielsen, Edwards & Horak; 2 ♂, 1 ♀, same label data as holotype but 2 ♂

30.ix.1980; 2 ♂, 15.16S 144.59E, 14 km W by N of Hope Vale Mission, 10.x.1980, E. D. E.; 1 ♂, 15.47S 145.14E, Shiptons Flat near Cooktown, 17.x.1980, 19.x.1980, E. D. E.; 1 ♂, 17.16S 145.54E, Base Cableway Mt Bellenden-Ker, 80 m, 22.x.1981, E. D. E.; 2 ♀, 17.02S 145.37E, 3 km N by E of Mt Tip Tree, 760 m, 20.x.1980, E. D. E.; 2 ♀, Lake Eacham, 730 m, 2.v.1955, I. F. B. C.; (ANIC, BMNH).

Diagnosis. *Thaumatotibia maculata* is very similar to *T. aclyta*, but the male is easily recognised by two patches of conspicuous black modified scales on the white hindwing (Figs. 27, 35). The female of *T. maculata* is very similar to that of *T. aclyta* but with the forewing distally more distinctly paler as it lacks the ill-defined dark preapical blotch present in *T. aclyta*. The male genitalia of *T. maculata* can be separated from those of *T. aclyta* only by the longer coremata scales bundles and a long narrow longitudinal keel beyond the basal excavation rather than a short triangular fold. The female genitalia also are very similar to those of *T. aclyta* with the more slender and less strongly diverging bands of modified scales of the sterigma the only consistent difference.

Description. Male (Fig. 27). Wingspan: 9.0–14.5 mm. Head and thorax light to dark brownish grey, sprinkled with red-brown, especially on top of head; thorax with a loose (and easily lost) posterior tuft of long, upcurved, paddle-shaped whitish scales. First two pairs of legs dark grey with white-ringed tarsi, hindleg whitish grey. Abdomen pale greyish ochreous, with concolorous, pale anal tuft. Forewing (Fig. 35) subtriangular, moderately wide, with oblique termen; grey-brown in basal half except for ochreous band along dorsum, very pale distally with whitish ground colour beyond a line from pretornal mark to beyond middle of costa, with subparallel, obliquely transverse ochreous to red-brown wavy lines running from between distal costal strigulae to termen, sprinkled with ochreous near costa; with a white dot in middle of wing, darkest in middle of termen. Hindwing (Fig. 35) white except for pale grey apex, with black, modified scales on upper surface (Fig. 35), a diamond-shaped patch distally in costal half of cell and a band along the Cu-stem, the two distally sometimes linked by a V-shaped line of single black scales.

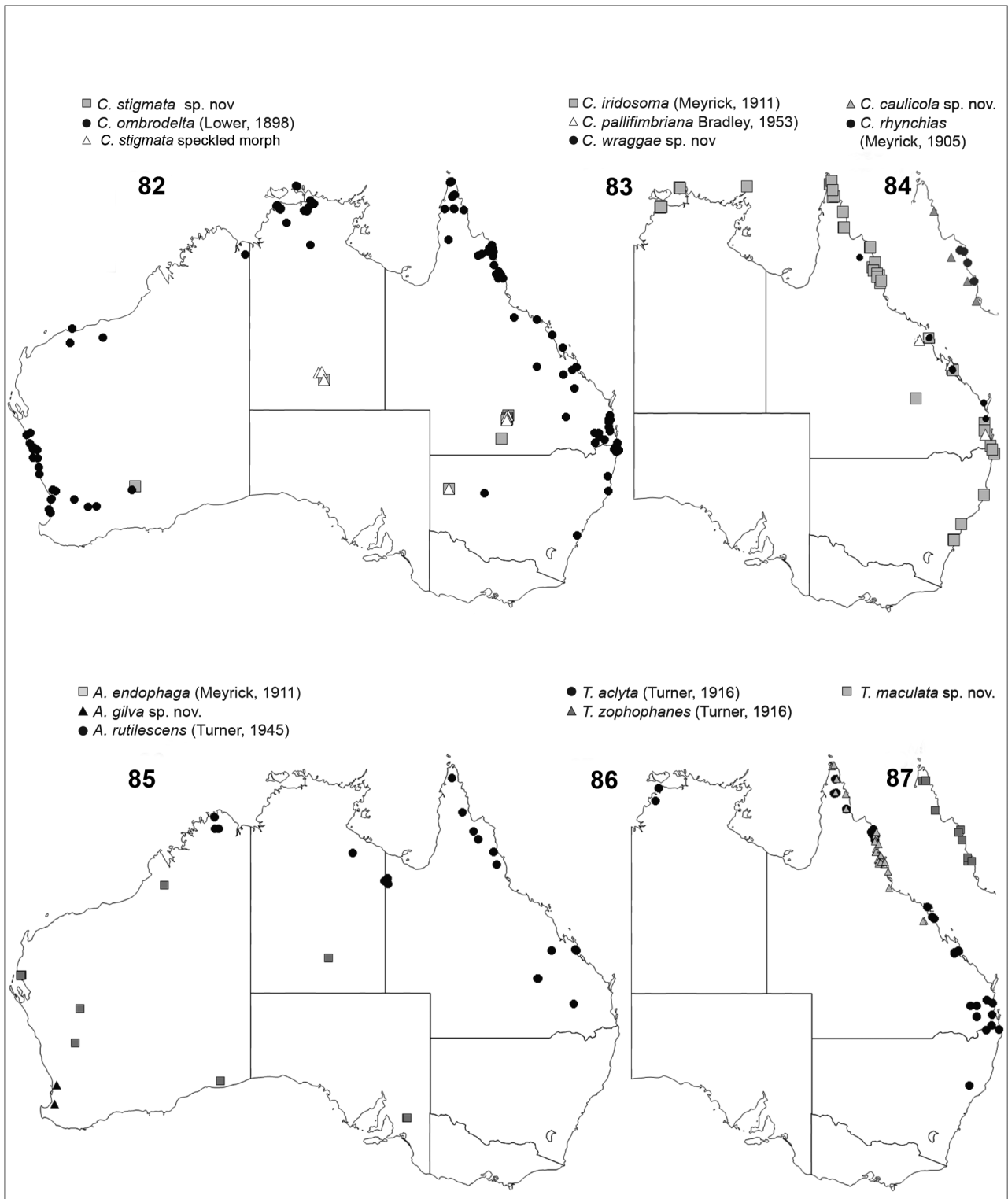
Male genitalia (Figs. 63, 68). T8 with posterolateral corners strongly projecting, hind margin deeply concave and sinuate; coremata consisting of two very long composite scale bundles deeply invaginated in a membraneous pocket on each side, S8 subtriangular with angled hind margin. Tegumen a wide band without any trace of uncus but with a semicircular depression on each side associated with weakly sclerotised and spinulose membrane presumably indicating gnathos remnants. Valva narrowly elongate-ovate, widest in middle; with outer margin of basal excavation with a vertical band of short bristles intersected by a narrow keel-shaped, serrated, longitudinal ridge above middle of valva; cucullus narrowly ovate with outer surface lightly domed, inner surface with a wide band of moderately long, strong spines around ventral and distal margin, shorter near margin. Juxta diamond-shaped, basal caulis lobes rounded, small and roughly spinulose. Phallus long, sharply bent beyond clavate base, distal 3/4 narrow, nearly parallel-sided and straight; vesica with numerous, evenly spaced, small, transverse cornuti.

Female (Fig. 30). Wingspan: 11.5–15.0 mm. As male, but pretornal patch well-defined and hindwing medium grey.

Female genitalia (Fig. 81). Ostium in small V-shaped excavation in hind margin of S7. Sterigma simple, a narrow ring ventrally around ostium merging on each side into two moderately diverging, narrow, oblique bands of modified scales. Ductus bursae about half length of corpus bursae, anteriorly gradually widening, with a long ring-shaped sclerite anterior to ostium and inception of ductus seminalis 1/3 length from ostium. Corpus bursae tear-shaped, with a band of fine spinules around its entrance and a small triangular appendix nearby, with two moderately long, curved and pointed horn-shaped signa with wide hollow base and flattened apex.

Distribution and biology. *Thaumatotibia maculata* is restricted to the Cape York Peninsula, including the Cairns region (Fig. 87). There is no host record, but the species has been collected from rain forest localities only.

Comments. The species name refers to the male hindwing marked by black sex scales. There is a single male of a closely related, unidentified species from the Woodlark Islands, Papua New Guinea, in the ANIC, also with modified black scales on the hindwing but with the keel-shaped ridge on the valva near the basal excavation elliptical rather than narrowly blade-shaped as in *T. maculata*, with clearly pointed caulis lobes and with coarse spinules associated with the gnathos remnants. *Thaumatotibia hemitoma* (Diakonoff) (Komai 1999) from Japan is another closely related species, with the keel-shaped ridge nearly triangular but without modified black scales on hindwing.



FIGURES 82–87. Distribution maps of *Cryptophlebia*, *Archiphlebia* and *Thaumatotibia*. 82, *C. ombrodelta*, *C. stigmata*, *C. stigmata* speckled morph. 83, *C. iridosoma*, *C. wraggae*, *C. pallifimbriana*. 84, *C. caulicola*, *C. rhynchias*. 85, *A. endophaga*, *A. gilva*, *A. rutescens*. 86, *T. aclyta*, *T. zophophanes*. 87, *T. maculata*.

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