A Revision of the Australian Hemerobiidae
(Insecta: Neuroptera)

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Abstract
The Australian Hemerobiidae are revised, and keys and illustrations provided to facilitate identification of all known species. The 34 species are referred to 10 genera, one of which (Notherobius) is described as new. Thirteen new species are described in the genera Psychobiella (one), Psectra (two), Carobius (six), Notherobius (three) and Zachobiella (one). Several specific synonyms are established, and the genera Oxybiella and Drepanomina are synonymised with Megaloma. Kimminsiella is synonymised with Psectra.

Introduction
Members of the Hemerobiidae, the ‘brown lacewings’, are among the more frequently encountered Neuroptera, and are generally considered to be beneficial as predators of a wide range of small insect pests. The family is widespread and contains slightly under 500 described species, but its systematics is convoluted and the correct generic placement of many described species is uncertain. Two genera (Hemerobius L., Micromus Rambur) together contain some 60% of described Hemerobiidae. Nakahara (1960) appraised many of the genera, but some of those raised by him (especially segregates from Micromus Rambur) have not been accepted by most later workers. Grouping of the approximately 40 apparently valid genera into subfamilies is also controversial. Indeed, some—the genera with two radial sector branches in the forewing—have been considered to constitute a separate family, Sympherobiidae, initially by Comstock (1918). The evidence for this division is flimsy, and only a single family is generally accepted by modern authors. Nakahara (1960) separated Notiobiella Banks from the remainder of the family as the subfamily Notiobiellinae on male genitalic features; this division is also questionable, as noted by Tjeder (1961) (who considered the ‘phallolingua’ of Nakahara to be an accessus), and I here treat the family as lacking subfamily divisions.

This paper is a revision of the Australian Hemerobiidae based on adult characters, and is the first such synopsis since that by Tillyard (1916). A number of isolated species from Australia were described in the 19th century, by Newman (1838), Walker (1853, 1858),
Gerstaecker (1885) and McLachlan (1863). There followed a hiatus of more than 20 years, until the more embracing accounts of Banks (1909) and Tillyard (1916). However, both the latter apparently overlooked some of the earlier descriptions and, as a result, it has been difficult to recognise some of their species; several synonyms established in this paper attest to this confusion. Further Australian species were described by Esben-Petersen (1929), Banks (1939) and Kimmins (1940) and, although a number of taxa were assessed by Nakahara (1960) (who provided the first available genitalic information for some species), Australian Hemerobiidae have received little systematic attention in recent years. New (1981) redescribed Hemerobius australis Walker, establishing that this widespread genus does indeed occur in Australia. Many accounts (including Klimaszewski and Kevan 1985) claim it to be absent from the region. Riek (1970) assessed the Australian Hemerobiidae to contain 22 species. Thirty-four species are here recognised, and are placed in 10 genera, allowing for new synonymy established here.

Most species are rare or apparently local, and only two can be considered both widespread and common. The biology of these, Drepanacra binocula (Newman) and Micromus tasmaniae (Walker), is discussed by New (1984), and their early stages have been described by New (1975) and New and Boros (1984), respectively. The biology of M. timidus Hagen is outlined (as M. vinaceus Gerstaecker) by Williams (1927). As Tillyard (1916) noted, more specimens of M. tasmaniae exist in collections than of all other Australian Hemerobiidae put together! Drepanacra runs it a poor second. Both occur also in New Zealand, where they are the most common of the five species in the country (Wise 1973). Of the other New Zealand taxa, Micromus bifasciatus Tillyard is apparently endemic, Wesmaelius subnebulosus (Stephens) is a holarctic species presumed to be introduced (although earlier presumed endemic and named as Boriomyia maorica Tillyard), and a species of Psectra is apparently very closely related to (perhaps identical with) an Australian species described below. Although reported from Australia (New 1984), the specimens I identified as 'Wesmaelius' are Psychobiella with aberrant venation, and I have not seen 'genuine' specimens of Wesmaelius from Australia.

The hemerobiid fauna of northern Australia has much in common with that of New Guinea (New, unpublished), and a number of species transcend Torres Strait. Few are more widely distributed, and only Micromus timidus Hagen occurs throughout much of the Old World tropics, including Africa (discussed by Tjeder 1961). H. australis, although apparently endemic, is rather similar to some Hemerobius species from southern Africa, mainland temperate South America and Robinson Crusoe I., and also seems to have relatives in New Guinea. Endemism in Australian Hemerobiidae appears to be high, with 25 species at present not known elsewhere. The most diverse genus, Carobius Banks, is represented also on Norfolk I. (New 1987).

Wing figures are from camera lucida projections of set insects or slide-mounted specimens. Figures of genitalia are from cleared abdomens stored in microvials of glycerine, and detailed drawings are referred to a scaled figure of the abdominal apex. Measurements are given in mm for the following: forewing length (FW), hindwing length (HW), antenna length (A) and body length (B). Terminology for wing venation and genitalia is based on Tjeder (1961) and is indicated in Figs 323–327. Tjeder's account should be consulted for a comprehensive definition of the family.

Material from the following collections has been examined:

Australian Museum, Sydney (AM)
Australian National Insect Collection, Canberra (ANIC)
British Museum (Natural History), London (BMNH)
Museum of Comparative Zoology, Harvard (MCZ)
Museum of the Northern Territory, Darwin (NTM)
Museum of Victoria, Melbourne (NMV)
Queensland Museum, Brisbane (QM)
South Australian Museum, Adelaide (SAM)
University of Queensland (UQ)
Western Australian Museum, Perth (WAM)
Zoologisches Museum, Berlin (ZBM)
Key to Genera of Australian Hemerobiidae

The following simple key is based on wing features; genitalic characters are an integral part of generic diagnoses, and any ambiguous taxa should be checked against the further details given for each genus.

1. Forewing without recurrent humeral vein ............................................. 2
   Forewing with recurrent humeral vein ............................................. 4

2(1). Forewing veins Sc and R₁ widely separated and linked by several crossveins; wing bluntly rounded ............................................. Psectra
   Forewing veins Sc and R₁ close throughout their lengths, linked only by a basal crossvein; wing tapered, sometimes very narrow ..................................... 3

3(2). Forewing vein Rs with at least 3 branches, normally 4–6, rarely more; no crossvein from R₁ to Rs near base of wing ..................................... Micromus
   Forewing vein Rs with 2 branches; a crossvein from R₁ to anterior fork of basal Rs branch ..................................... Zachobiella

4(1). Forewing tapered to narrow apex, sometimes falcate ................................ 5
   Forewing not strongly tapered or falcate ......................................... 8

5(4). Forewing falcate ............................................................................... 6
   Forewing tapered ................................................................................ 7

6(5). Forewing relatively broad, with 2 series of gradate veins .......... Drepanacra
   Forewing relatively longer, with 3 series of gradate veins .......... Drepanomina*

7(5). Forewing relatively narrow, Rs in 3 branches from R₁ .................. Oxybiella*
   Forewing relatively broader, Rs in 4 branches from R₁ .................. Megalomina*

8(4). Forewing veins Sc and R₁ widely separated and linked by several crossveins .......... Psectra
   Forewing veins Sc and R₁ close together, linked only by a basal crossvein, rarely a 2nd crossvein ................................................................. 9

9(8). Forewing with crossvein from R₁ to basal branch of Rs .................. 10
   Forewing without crossvein from R₁ to basal branch of Rs ............. 11

10(9). Basal branch of Rs forked near base; a crossvein from R₁ to distal branch of Rs ................................................................. Notherobius
   Basal branch of Rs not forked near base; no crossvein from R₁ to distal branch of Rs ................................................................. Carobius

11(9). Forewing vein Rs with 2 branches from R₁ .................................. Notiobiella
   Forewing vein Rs with 3 (rarely 4) branches from R₁ .................. 12

12(11). Forewing with 2 Sc–R₁ crossveins ........................................... Psychobiella
   Forewing with only basal Sc–R₁ crossvein ...................................... Hemerobius

Genus Notiobiella Banks

Buxtonia Esben-Petersen 1928, p. 93; Banks, 1932, p. 104.

Note: Banks (1932) redefined Notiobiella in a more restricted sense, transferring some species to Annandalia Needham.

Type species: Notiobiella unita Banks.

Type species of Buxtonia: Buxtonia fulva Esben-Petersen.

Body rather sturdy. Forewing broad and bluntly rounded; veins Sc and R₁ close together, linked by single crossvein near base of wing; costal area broad, costal crossveins before pterostigma forked, often more than once, recurrent humeral vein present; Rs in 2 branches from R₁, distal branch with 2 or 3 branches, basal branch forked near origin of distal branch; one series of gradate veins near centre of wing; all branches of Rs, MA and MP forked before wing margin. Hindwing shorter than forewing, pterostigma sometimes produced anteriorly; gradates sparse or absent. Tibiae moderately expanded towards apex.

Female. Ectoproct somewhat expanded ventrally, trichobothrial field moderately distinct; tergite IX not extending ventrally to apex of ectoproct; sternite VII broad, transverse or rounded; gonapophyses laterales broad, with blunt rounded stylus; spermatheca small and simple; subgenitale weakly developed, sometimes with lateral sclerotised rods.

*This separation follows traditional usage, but see pp. 368–9.
Male. Ectoproct strongly extended posteriorly, ventrally sometimes ornamented; tergite IX distinct; sternite IX broad, large. Aecessus not well developed, a median membranous saclike vertical process ('phallolingua' of Nakahara 1960); parameres well sclerotised, tapered posteriorly; hypandrium internum very small.

Nakahara's (1960) attribution of this genus as the sole member of his subfamily Notiobiellinae was based on the conspicuous median membranous phallolingua in the male genitalic complex. He accepted Tillyard's (1916) suggestion that Psychobiella Banks may represent the transition to Notiobiella in having a wholly membranous structure possibly homologous with the phallolingua; the male ectoproct of N. viridis Tillyard (Fig. 12) is very similar to that of Psychobiella, and the two genera are apparently related. The only possibly diagnostic venational features noted by Nakahara (1960) were the very close proximity of forewing Sc and R1, and the very long stem of the basal branch of Rs in the forewing; neither appears sufficient to place Notiobiella in a distinct subfamily. In his original diagnosis, Banks considered Notiobiella to be related to Sympherobius Banks, presumably because of having only two Rs veins in the forewing. Banks (1932) transferred species earlier placed in Notiobiella and having forewing veins Sc and R1 widely separated to Annandalia, now Psectra (see p. 347).

The genus is widely distributed, and contains about 35 described species. Four are known from Australia.

**Key to Species of Notiobiella**

1. Body, and wing venation, green to yellowish green, genae orange; (basal regions of forewing veins Sc-M expanded in male) ................................................................. *viridis*
   Body, and wing venation, never green: buff to brown, sometimes marked with black; (forewing in known males with veins unexpanded) ............................................. 2

2(1). Forewing bluntly rounded; forks and other membrane not shaded ........... *stigmatica*
   Forewing elongate, slightly tapered to rounded apex; many forks shaded and/or central areas of cells shaded or reflective ................................................................. 3

3(2). Forewing with many forks slightly shaded, central regions of cells not shaded (female, gonapophyses laterales relatively short: Fig. 2) ....................................................... *unita*
   Forewing with forks shaded and central region of cells shaded or reflective (female, gonapophyses laterales very long: Fig. 18) ................................................................. *multifurcata*

*Notiobiella unita* Banks

(Figs 1–3)

*Notiobiella unita* Banks, 1909, p. 80; 1932, p. 105.

**Coloration.** Very dark brown. Eyes black. Legs translucent greyish brown. Forewing pale greyish brown; venation pale except dark crossveins and slightly darkened apical forks; pterostigma not darkened. Hindwing venation pale.

**Female.** Forewing venation as Fig. 1. Abdominal apex as Fig. 2: ectoproct broadened ventrally; gonapophyses laterales very large, stylus rounded; spermatheca (Fig. 3) comma-shaped.

**Male.** Unknown.

**Dimensions.** FW 6, HW c. 5, A 3½, B 5.

**Type.** Holotype, ♀, 'Bundaberg district mid Queensland Australia', 'Type 11915', 'Notiobiella unita Banks type' (MCZ).

**Comments.** This species is still known only from the holotype, which is pinned and staged; the pin is substantially corroded and the specimen is very fragile. Although the genus *Notiobiella* is thus based on a species known from very sparse material, the venation clearly allies *unita* with other species placed in the genus. Banks (1932) suggested the possibility that
unita and stigmatica are the same species, but this cannot be confirmed until further material is collected. N. unita appears to be very similar to some individuals of N. multifurcata, but types of the two species are very distinct on the form of the gonapophyses laterales.

*Notiobiella stigmatica* Banks

(Figs 4-7)

*Notiobiella stigmatica* Banks, 1909, p. 80; Banks, 1932, p. 105.

**Coloration.** Pale straw brown. Eyes black. Labium and frons tinged with orange; genae dark brown; vertex pale; antenna: scape and pedical pale (rest missing). Pronotum margins slightly orange, long pale lateral hairs; pterothorax and abdomen pale. Legs pale. Wings pale except granular creamy pterostigma; forewing with faintly indicated pale band of grey-shaded gradate veins.

**Female.** Unknown.

**Male.** Forewing broad, venation as in Fig. 4. Hindwing pterostigma very prominent (Fig. 5). Legs long; TIII strongly expanded, other T moderately expanded. Abdominal apex (Fig. 6): ectoproct strongly produced, with dorsal apical spines and long setae; trichobothrial field poorly defined; sternite IX broad; parameres widely separated posteriorly, tapered and somewhat hooked (Fig. 7); other genitalia indistinct, phallosomia scarcely evident.

**Dimensions.** FW 5, HW c. 3, A (broken), B c. 6.

**Type.** Holotype, ♂, 'Middle Queensland Australia', 'Type 11912', 'Notiobiella stigmatica Banks type' (MCZ) (pinned and staged; pin corroded, insect fragile).

**Comments.** The sole known individual of *N. stigmatica* is somewhat damaged, as indicated above. The unusual parameres and the form of the hindwing form a distinctive character combination for the male, and the almost unmarked forewing may help association of the female when it is eventually discovered. See comment under *N. unita*.

*Notiobiella viridis* Tillyard

(Figs 8-15)


**Coloration.** Pale to bright green; yellowish when dried. Eyes grey. Face pale, except genae orange to bright red; palpi and antennae pale; vertex sometimes with traces of orange or tawny mark above back of eye, otherwise pale. Thorax unmarked except slight greying of scutal lobes; abdomen pale; legs pale. Forewing venation pale green; gradates and apical forks sometimes very pale grey. Hindwing venation wholly pale green.

Forewing considerably longer than hindwing; in male (only) with base of veins Sc-MP irregularly but conspicuously swollen (Fig. 8); venation as in Figs 8, 9.

**Female.** Abdominal apex as in Fig. 10: ectoproct lengthened ventrally; trichobothrial field with c. 12 small trichobothria; gonapophyses laterales very broad, stylus short and rounded; spermatheca short (Fig. 11) and apically sinuous.

**Male.** Abdominal apex as in Figs 12, 13: ectoprocts long, arched, hatchet-shaped; sternite IX short, broad. Gonarcus (Figs 14, 15) slender; phallosoma long, tapered, spiculate; parameres arched with slender apical spine, close together.

**Dimensions.** FW 5, HW 3-3½, A 3-3½, B 3-4½.

**Type.** Holotype, ♂, (Queensland) Brisbane, 26.vi.1911, H. Hacker (QM).

**Other material seen.** 43 ex. **Queensland:** Mt Bellenden Ker; Darr R., 31 km NW./N. Longreach; Elnasleigh R., 22 km S. by W. Lyndhurst HS.; Mt Tamborine; Roma; Springsure; Yeppoon. **Western**
Comments. In his description of this species, Tillyard (1916) commented on the 'peculiar thickening' of the veins near the base of the wing, and these are evident in his figure; the clear implication is that the unique type is a male. However, the specimen labelled as 'Type' (QM), with the same data as published by Tillyard, does not have the veins of the right forewing thickened, and those of the left forewing are partly flanked by foreign matter. This specimen has not been dissected, but is clearly a female. Tillyard did not note the brightly coloured genae, which are conspicuous on the type.

This species is highly unusual in the basal modification of the male forewing, and is the only green Australian hemerobiid.

*Notiobiella multifurcata* Tillyard

(Figs 16–26)


Coloration. Dark brown. Eyes black. Face wholly dark; palpi dark. Thorax dark; abdomen with very distinct cream markings on posterior of each tergite. Legs pale yellowish brown. Wings rather 'pearly' in appearance, with pinkish reflection; venation dull brown in forewing, paler in hindwing; crossveins and forks of forewing dark brown to black.

Female. Abdominal apex in Fig. 18: ectoproct long, posteriorly expanded, a small field of 6 weakly defined trichobothria; gonapophyses laterales very broad, stylus long and tapered; spermatheca (Fig. 19) slender, curved; subgenitale (Fig. 20) well defined.

Male (New Caledonia). Abdominal apex as in Fig. 22: ectoproct strongly elongated, with apical fringe of long hairs, a dorsal setose lobe and a field of 12 trichobothria; a discrete dorsal lobe (?tergite IX) above ectoproct; immediately anterior tergite slender, tapered ventrally; sternite IX broad. Genitalic complex (Figs 23, 24): accessorius a dorsally directed slender hook; gonarcus long and deep, slight lateral entoprocessus; parameres (Fig. 25) simple, rodlike; hypandrium internum (Fig. 26) apically broad.

Dimensions. FW 6, HW 5, A c. 3½, B 4.

Type. Holotype, ♀, Queensland, Coolangatta, 14.iv.1915, (BMNH, seen) (complete except for antennae missing beyond scape).

Other material examined. Queensland: 2♂, 25 km along Mt Lewis Rd, SW. Mossman (AM); 1♂, Shiptons Flat, (ANIC). New Caledonia: 1♂, Bā Bay; 1♂, Tinchialit, 2020 ft, (both BMNH, det. D. E. Kimmins).

Comments. This species appears to be rare in Australia, but was recorded from New Caledonia by Kimmins (1953), and I have seen apparently similar individuals from Indonesia and New Guinea. Although it is not absolutely certain that non-Australian individuals should be referred to *multifurcata*, I figure genitalia of the New Caledonia male for comparison with venationally similar Australian individuals when they are eventually found. The wing venation differs substantially from that of other *Notiobiella* so far known from Australia, the female gonapophyses laterales are unusually long and broad, and the male genitalia figured are very distinctive. See comment under *N. unita*.

Genus *Psychobiella* Banks

*Psychobiella* Banks, 1909, p. 79.

Type species: *Psychobiella sordida* Banks.
Body rather sturdy. Forewing broad, apex rounded; veins Sc and $R_1$ close together, linked by 2 short crossveins in basal half of wing (rarely, only basal crossvein present); costal area moderately broad, basally narrowed; recurrent humeral vein strongly developed, costal crossveins forked; Rs in 3 branches (rarely 4 branches from $R_1$), the basal branch forked before origin of second branch with 3 or 4 major forks; 2 series of gradate veins. Hindwing slightly shorter than forewing, pterostigma not expanded; 2 series of gradate veins.

Female. Ectoproct vertical; tergite IX ventrally expanded to at least posterior margin of ectoproct; tergite VIII about as deep as ectoproct; sternite VII broad; gonapophyses laterales broadly rounded, with long tapered apical stylus; spermatheca simple, only slightly dilated; subgenitale broad and medially emarginate.

Male. Ectoproct elongated and arched posterovertrally, very prominent; tergite IX slender; sternite IX broad, rounded or transverse. Gonarcus short, transverse; arcessus long, vertical, apically hooked; parameres vertical, elongate with strong ventral hook, in membranous sac (?phallolingua) with dorsal and posterior spiculate sclerites; hypandrium internum small, triangular.

This distinctive genus is confined to the Australian region. Nakahara (1960) suggested that the membranous putative phallolingua in the male genitalia may place it near Drepanacra Tillyard and Neuronema McLachlan, as well as marking a possible transition to Notiobiella. The form of the male genitalia and ectoproct are particularly distinctive. Occasional specimens with a four-branched forewing Rs vein occur.

Two species are noted here: one is described as new, and one earlier name is synonymised. They are separable on male genitalic features, and females are virtually identical.

**Key to Species of Psychobiella**

Male ectoproct tapered to rounded ventral point, not hooked; parameres with strong ventral hook (Fig. 34) ................................................. *sordida*

Male ectoproct with distinct ventral hook, parameres with only slight hook (Fig. 45) .... *occidentalis*

**Psychobiella sordida** Banks

(Figs 27–36)

*Psychobiella sordida* Banks, 1909, p. 79.

Coloration. Dark brown. Eyes black. Face pale; genae dark brown to black; vertex very dark brown; palpi pale; antennae: scape and pedicel pale brown, flagellum dark grey. Thorax and abdomen uniform dark greyish brown, posterior of abdominal tergites sometimes black. Legs pale yellowish brown, unmarked. Forewing slightly fumose, with very delicate grey mottling; veins predominantly greyish pink, longitudinal veins with very slightly darker intermittent lengths; gradates generally slightly darker; pterostigma sometimes reddish brown, otherwise greyish brown. Hindwing venation uniformly pale greyish brown.

Wings long, apex narrowed and rounded; venation as in Figs 27, 28.

Female. Abdominal apex as in Fig. 29: ectoproct and tergite IX deep; gonapophyses laterales broad, with prominent tapered stylus near apex; spermatheca (Fig. 30) long, coiled, expanded preapically; subgenitale (Fig. 29) broad, prominently bilobed.

Male. Abdominal apex as in Fig. 31: ectoproct greatly extended, dorsal surface arched; tergite IX slender; sternite IX long, rounded. Gonarcus (Figs 32, 33) transverse, rather deep; arcessus long, slender, apically hooked, subtended by membranous sac; presumed entoprocessus flanking base of arcessus; parameres (Figs 34, 35) vertically aligned, a strong ventral hook, fused dorsally, enclosed in membranous sac with 2 pairs of small lateral spiculate sclerites; hypandrium internum (Fig. 36) triangular, apex rounded.
Dimensions. FW 8–10\(\frac{1}{2}\), HW 7–9\(\frac{1}{2}\), A 5–8, B 5–7.

Types. Holotype, \(\varphi\), of *Psychobiella sordida* Banks: ‘Middle Queensland Australia’ ‘Type 11940’ ‘Psychobiella sordida Banks type’ (MCZ) (seen, pinned and staged, pin corroding, right hindwing missing). Holotype, \(\varphi\), of *Psychobiella fusca* Tillyard; Queensland, Brisbane, One Tree Hill, 23.ix.1915 (BMNH) (seen, body formerly broken and glued together between mesothorax and metathorax).

Other material examined. c. 80 ex, widely distributed in eastern Australia from southern Queensland (Mt Tamborine, Toowoomba, Lamington Natl Pk, through New South Wales and Victoria to southern Tasmania (Hobart), (AM, ANIC, BMNH, NMV, QM).

Comments. Tillyard (1916) separated *P. fusca* from *P. sordida* on coloration, on the number of hindwing Rs branches, and on whether or not the tibiae were fusiform or flattened. There appears to be considerable variation in all these features, and I have seen only one species of *Psychobiella* in more recently collected material from Queensland, which is clearly that figured by Nakahara (1960) as *P. fusca*.

The following species differs clearly from *P. sordida* in male genitalia, but females are difficult to separate. As presently known, *P. sordida* does not extend far from the eastern side of Australia.

*Psychobiella occidentalis*, sp. nov.

(Figs 37–46)

Coloration. Very similar to *P. sordida*, except forewing grey mottling slightly more contrasted than in many—but not all—individuals of *sordida*.

Wing venation as in Figs 37, 38.

Female. Abdominal apex as in Fig. 39: ectoproct deep; tergite IX deep and strongly expanded ventrally; gonapophyses laterales broad, dorsal tapered stylus; spermatheca (Fig. 40) coiled, preapically expanded; subgenitale (Fig. 41) prominent, apex broad and bilobed.

Male. Abdominal apex as in Fig. 42: ectoproct very deep, expanded ventrally, apex distinctly hooked; tergite IX slender; sternite IX broad, apex slightly emarginate. Gonarcus (Figs 43, 44) broad and shallow; arcessus slender, long, apex hooked, subtended by membranous area; entoprocessus small, well separated from base of arcessus; parameres (Figs 45, 46) short and vertical, dorsally fused, apex shallowly hooked, in membranous sac with 2 pairs of dorsal spiculate sclerites and small lateral hooked sclerite; hypandrium internum small, slender.

Dimensions. FW 8, HW 7, A c. 4, B 5\(\frac{1}{2}\).

Types. Holotype, \(\varphi\), South Australia, 40 [miles] NW. Keith, 21.x.1958, E. F. Riek (ANIC). Paratypes: 1\(\varphi\), same data as holotype (ANIC); 1\(\sigma\), Norwood, 10.xii.1891, J. G. Tepper; 1\(\varphi\), Athelstone, 18.ix.1973, J. J. H. Szent-Ivany; 1\(\varphi\), 1 ex., Blackwood, 6.xii.1957, 12.x.1955, N. B. Tindale; 2\(\varphi\), Belair, 1.i.1940. H. Womersley (all SAM).

Comments. See under *P. sordida*. Three females (SA, 31°18'S., 131°14'E., 37 km ENE. Nullabor Roadhouse, 21.v.1984, E. S. Nielsen and E. D. Edwards, ANIC) and a single male from Western Australia (Yanchep, 32 miles N. Perth, 29.i.-8.ii.1936, R. E. Turner, BMNH) are tentatively referred to this species, but are excluded from the type series. The parameres of the latter are rather longer than in the type male, although the ectoprocts are similar in form, and it is possible that this individual represents a further species of *Psychobiella*. 
Genus **Psectra** Hagen

*Psectra* Hagen, 1866, p. 376.  

**Syn. nov.**

Type species: *Hemerobius diptera* Burmeister.  
Type species of *Annandalia*: *Annandalia curta* Needham.  
Type species of *Kimminsieilla*: *Annandalia tillyardi* Kimmins.

Body sturdy. Forewing short, broad, bluntly rounded; veins Sc and R1 widely separated, linked by 2 crossveins in basal half of wing and 1 or 2 distal crossvein. Costal area sometimes broad, crossveins forked or simple; recurrent humeral vein usually present, rarely absent or only slightly curved; Rs with 2 branches, the basal branch forked well before origin of 2nd branch—usually slightly beyond second Sc-R1 crossvein; one series of gradate veins. Hindwing slightly, if at all, shorter than forewing (sometimes rudimentary in one non-Australian species), pterostigma sometimes slightly expanded; no gradate series, and very few crossveins.

**Female.** Ectoproct with dorsal apex well beyond trichobothrial field, slender; tergite IX slender, closely associated with ectoproct ventrally; an additional lateral plate (sternite VIII) between these and gonapophyses; sternite VII deep and broad, often excavated medially; gonapophyses laterales very large, convex, simple; spermatheca large, apically expanded; subgenitale weakly developed.

**Male.** Ectoproct and tergite IX closely associated; tergite VIII simple or expanded strongly into transverse or bilobed posterior projection; tergites IV- or V-VII with small median posterior projection; sternites relatively shallow. Gonarcus with lateral spikes or other processes; accessus absent; parameres closely associated. Hypandrium internum small.

The holarctic type species of *Psectra* is dimorphic, some individuals having rudimentary hindwings. All other species appear to be wholly macropterous. *Psectra* and *Annandalia* are united by the widely spaced veins Sc and R1 in the forewing, and the latter name has historically been applied to those species with a broad costal area and recurrent humeral vein. I here follow Tjeder (1961) in uniting these forms, as they seem not to differ in genitalic features of importance. However, the extreme elaborations of male terminalia used by Nakahara (1960) to justify his genus *Kimminsieilla* are unusual and restricted to a very few of the known species. Females resemble those of other *Psectra*, and it is preferable to regard all the species as representing a single genus. One species described below (*P. nakaharai*) is transitional between *tillyardi* and more typical species of *Psectra*.

Broad-winged *Psectra* are represented by five species in Australia, but I have seen only one female of the single narrower-winged species.

### Key to Species of *Psectra*

1. Forewing narrow, recurrent humeral vein not distinct .................................. *claudiensis*  
2. Forewing broader, recurrent humeral vein distinct ...........................................  
   2(1). Forewing with conspicuous central dark brown to black band, incorporating gradate veins .......................................................... *obliqua*  
   2(2). Forewing without dark central band .......................................................... 3  
3. Forewing very finely mottled with pale grey to greyish brown ................................  
4. Forewing not as above: markings, if present, less diffuse ........................................  
5. Male, median projection from tergite VIII long and curved (Fig. 65); female, sternite VII not medially excavated, gonapophyses laterales rounded .................................. *tillyardi*  
   Male, median process from tergite VIII relatively short (Fig. 85); female, sternite VII transverse and medially excavated, gonapophyses laterales very deep .................................. *nakaharai*  
5(3). Central region of forewing membrane hyaline (female, only, known) ............ *externa*  
   Central region of forewing shaded (male, only, known) ....................................... *franzensi*  

(N.B. It is possible that the two sexes separated here could prove conspecific when further material becomes available for study.)
**Psectra externa** (Banks)  
(Figs 47–49)

*Notiobiella externa* Banks, 1909, p. 80.  

**Coloration.** Pale brown. Eyes black. Face and vertex unmarked; distal flagellar segments slightly darkened. Thorax and abdomen uniformly pale. Legs pale, except t5 slightly darkened. Forewing very pale greyish brown, crossveins and apical forks dark, venation otherwise pale. Hindwing venation pale.

Sturdy. Legs with T1 expanded centrally. Forewing rather narrow, venation as in Fig. 47.

**Female.** Abdominal apex as in Fig. 48: ectoproct with field of 7 trichobothria; gonapophyses laterales very large and rounded; spermatheca (Fig. 49) large, strongly expanded and coiled centrally; subgenital small.

**Male.** Unknown.

**Dimensions.** FW 5, HW 4, A c. 3, B 5.

**Type.** Holotype, Q, ‘Australia Mid. Queensland’, ‘Type 21911’, ‘Notiobiella externa Banks type’ (MCZ) (pinned and staged; pin badly corroded and insect very delicate; head and forelegs separate and glued on pin, right antenna broken).

**Other material examined.** None. The identity of a specimen from N.T. (Burnside Station, May 1931) recorded by Handschin (1935) has not been confirmed.

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**Psectra obliqua** (Banks)  
(Figs 50–56)

*Notiobiella obliqua* Banks, 1909, p. 81.  

**Coloration.** Mid to dark brown. Eyes dark grey. Genae slightly darkened; face pale; vertex darkened immediately above eyes; palpi dark; antennae wholly pale. Thorax and abdomen darker than face. Legs pale: TIII with 2 darker brown spots on dorsal outer edge near centre. Forewing slightly fumose; venation mainly pale; Sc-R1 crossveins black; gradates and apical forks darkened; gradate veins shaded with brown. Hindwing unmarked.

Sturdy. Legs with TIII expanded. Forewing broad, venation as in Fig 50.

**Female.** Abdominal apex as in Fig. 51: ectoproct with field of 7 trichobothria; tergite IX very deep; gonapophyses laterales broad, rounded; spermatheca (Figs 52, 53) with long expanded apex, duct very narrow; subgenitale broad, apex slightly emarginate.

**Male.** Unknown.

**Dimensions.** FW 6, HW 4, A c. 3½, B 6.

**Type.** Holotype, ♂, ‘Australian North Queensland’, ‘Type 11913’, ‘Notiobiella obliqua Banks-type’. (MCZ) (pinned and staged, pin corroded and insect very fragile.)

**Other material examined.** New South Wales: 1 ex., Orara R., Cootes Crossing (AM).

**Comments.** Apparently very rare in Australia. Kimmins (1936) noted five female specimens of *'N. obliqua'* from the New Hebrides. These (BMNH, seen, one dissected) appear to be correctly identified, but male specimens from both localities are needed to confirm this. The forewing of a New Hebrides individual (det. Kimmins) is shown in
Fig. 54, and the genitalia in Figs 55, 56. All the New Hebrides individuals have a forewing \( R_1-Rs \) crossvein near the centre of the wing; this is absent from the two Australian specimens of \( P. obliqua \).

**Psectra franzeni** (Kimmins)
(Figs 57–62)

*Annandalia franzeni* Kimmins, 1940, p. 231.


**Coloration.** Pale brown. Eyes dark grey. Face pale centrally; genae dark brown; dark brown median spot immediately above antennal bases; vertex with narrow dark line each side of pale median region; palpi pale; antennae pale yellowish brown. Pronotum with median third pale, laterally darker brown. Pterothorax medium brown; metanotum paler medially, lateral scutal lobes very dark. Abdomen paler medially than laterally. Legs pale, all T with 1 or 2 small dark spots along outer edge. Wings pale, forewing slightly marked with greyish brown as in Fig. 57; hindwing unmarked.

Pronotum broader than long. Forewing venation as in Fig. 57.

**Female.** Unknown.

**Male.** Abdominal apex as in Figs 58, 59: ectoproct rather short, dorsal surface papillate; tergite IX deep, expanded medially; tergite VIII with prominent posterior lobe c. \( \frac{1}{2} \) depth, dorsally short, ventrally rounded; tergite VII with expanded dorsal spiculate field; sternite IX short and rounded. Genitalia (Fig. 60) a simple transverse arch with long lateral arms; parameres (Fig. 61) deep, with slight dorsal median hook; hypandrium internum (Fig. 62) small, tapered.

**Dimensions.** FW 5–6, HW 4–5, A c. 4\( \frac{1}{4} \), B 3–4.

**Types.** Holotype, \( \sigma \), Queensland, Cairns, 27.vi.1930 (damaged and repaired; wings re-glued, antennae missing) (BMNH, seen). Paratypes (all \( \sigma \)): 2, staged together, Queensland, Tully, 12.vi.31 L. F. [Franzen]; 1, Ingham, 23.iv.30; 1, Ingham, 10.vi.31 L. F. (all BMNH).

**Other material examined.** None.

**Comments.** The male genitalia of this north Queensland species are unusual, and differ markedly from those of all other Australian Hemerobiidae. Tergites VIII and IX are unusually elaborated.

**Psectra claudiensis**, sp. nov.
(Figs 90–93)

**Coloration** (in alcohol). Dark brown. Eyes black. Face generally pale; base of clypeus, perimeter of frons, narrowly darkened; genae dark; vertex pale; palpi very dark; antenna: scape and pedicel with narrow dark dorsal stripe, otherwise pale. Thorax slightly paler along midline, more so on pronotum. Abdomen uniformly brown. Legs generally pale; T1, II tinged with darker brown. Forewing finely mottled with very pale greyish brown; venation dark where shaded, otherwise pale. Hindwing pale except slight greying of veins from apical forks.

Venation as in Figs 90, 91: recurrent humeral vein absent; both wings rather narrow.

**Female.** Abdominal apex as in Fig. 92: ectoproct rounded, with field of 6 small trichobothria; tergite IX deep; gonapophyses laterales rounded; spermatheca (Fig. 93) strongly expanded at apex, and dorsally coiled; subgenitale weakly defined.

**Male.** Unknown.

**Dimensions.** FW 4·5, HW 4, A c. 3 (apex missing), B 4.
Type. Holotype, ♀, Queensland, Iron Range, Middle Claudie R., 2.x.1974, G. Daniels (AM).

Comments. Although known from only a single female, this species is very distinctive in the Australian fauna, as it is the only *Psectra* with narrow wings and lacking a distinct recurrent humeral vein and, in these features, approaches the appearance of several species of *Psectra* from elsewhere in the world. Genitalic structure clearly allies it with other species here allocated to this genus. Wing markings grossly resemble those of some individuals of *P. tillyardi*, and it is possible that this specimen is an unusual individual of that species. Any male *Psectra* from northern Queensland which lack a recurrent humeral vein merit very critical examination in order that the status of *claudiensis* be determined.

*Psectra tillyardi* (Kimmins), comb. rev.

(Figs 63–73)

*Annandalia tillyardi* Kimmins, 1940, p. 228.


Coloration. Brown. Eyes black. Clypeus and labrum very dark; frons with narrow pale areas laterally and (irregularly) along midline; vertex with central pale cross, the lateral arms linked to pale areas above each eye, anterior and posterior wholly dark; palpi black; antennae greyish brown. Pronotum with pale dorsolateral streaks, laterally pale, midline narrowly pale; pterothorax midline pale, metanotum overall paler than mesonotum; abdomen pale. Legs pale translucent greyish brown; T1 with traces of 2 grey bands; apex of T segments incipiently darkened. Forewing marked with pale greyish brown (Fig. 63), venation pale where not shaded. Hindwing pale, except brown pterostigma and adjacent apical veins.

Pronotum broader than long. Wing venation as in Figs 63, 64.

Female. Abdominal apex in Fig. 71: ectoproct short and deep; gonapophyses laterales broad and rounded; spermatheca (Fig. 72, 73) expanded and coiled apically, duct slender; subgenitale indistinct.

Male. Abdominal apex as in Figs 65, 66: tergite VIII strongly produced into long dorsal arched process (Fig. 69), with slight apical lateral lobes; tergites V–VIII each with small bilobed median posterodorsal projection; ectoproct with small rugose dorsal area, round field of 11–12 trichobothria. Gonarcus (Figs 65, 66) broad, with strong incurved apical lateral spines: a long dorsal spine subtended by 1 or 2 short spines; anterolateral (?) entoprocessus (Figs 66, 68) sinuous, tapered, ventrally setose; parameres (Fig. 70) apically broad, anteriorly divergent.


Types. Holotype, ♂, Queensland, Brisbane, 16.xi.1929. Paratypes: 1♂, same locality, 26.xi.1931; 1♀, Queensland, Toowoomba, 1.iv.1916; 1♀, New South Wales, Sydney, 4.x.1884 (all BMNH, seen).

Other material examined. Queensland: 1♀, Bramston Beach (ANIC). New South Wales: 2 ex., N.S.W.; nr Glen Innes, Lower Chain-of-Ponds Creek; Muogamarra Nature Reserve (AM).

Comments. The remarkably developed abdominal apex of the male of *tillyardi* led Nakahara (1960) to raise a new genus, *Kimminsiella*, to contain it. However, the next species treated here is intermediate in abdominal development between *tillyardi* and more ‘typical’ Australian *Psectra*, and forewing characters and female genitalia are wholly typical of this genus.

*P. tillyardi* appears to be rather rare, but widely distributed in parts of central eastern Australia.
Psectra nakaharai, sp. nov.
(Figs 74–89)

Coloration. Brown. Eyes black. Frons darkened laterally and between antennae; genae black; vertex with pale median stripe, pale immediately above eyes; palpi black; antennae dark greyish brown. Pronotum with broad pale median stripe, dorsolateral pale areas, anterolateral margins pale; mesonotum laterally black, pale median stripe; metanotum black; abdomen dark brown. Legs translucent greyish brown; TIII with 2 irregular grey bands in central third. Forewing mottled with very pale greyish brown as in Fig. 74; gradates, some other crossveins and marginal areas strongly shaded with dark brown; venation otherwise predominantly pale. Hindwing very pale except centre of pterostigma, shading in apical forks (where veins brown) and anal margin narrowly dark brown.

Sturdy. Wing venation as in Figs 74–77, 83, 84.

Female. Abdominal apex as in Figs 78, 79, 81: ectoproct slender; apparent tergite IX with separated ventral area below ectoproct; sternite VII broad, medially excavated; gonapophyses laterales very large and deep. Spermatheca (Figs 80, 82) large and coiled.

Male. Abdominal apex as in Fig. 85: tergite VIII with prominent bilobed dorsal extension (Fig. 86); tergites IV–VII with small median posterior processes; sternite IX tapered, apex rounded. Gonarcus (Figs 88, 89) medially divided, inner lobe with dense ‘brush’ of setae; entoprocessus well developed, forked, with lateroventral arm strongly extended; parameres (Figs 85, 87) with lateral process, close together, dorsoventrally aligned.

Dimensions. FW 5, HW 4, A 3½, B 4.

Types. Holotype, ♂, New South Wales, Gowee Gulch, near Rylstone, 29.viii.1956, D. K. McAlpine (AM). Paratypes: 1♂, New South Wales, Barren Grounds Fauna Res., 30.i.1973. V. J. Robinson (AM); Australian Capital Territory, 1♂, 35°19'S.,148°51'E., Wombat Ck, 6 km NE. Piccadilly Circus, 750 m, June 1984, Weir, Lawrence, Johnson, window trap (ANIC); 2♀, same locality, Mar. 1984; 1♂, 2♀, same locality, Mar. 1985; 1♀, same locality, April 1984; 1♀, same locality, Aug. 1984 (all ANIC); 1♂, Tasmania, 41°23'S.,147°25'E., Mt Barrow, 11 km E. by N. Nunamara, 30.i.1983, I. D. Naumann, J. C. Cardale (ANIC).

Comments. The development of the male abdomen of this species clearly allies it with P. tillyardi, but is not as extreme as in that species. The two sexes are only tentatively associated, but resemble each other closely in details of coloration. The female terminalia differ substantially from those of tillyardi.

Genus Carobius Banks

Carobius Banks, 1909, p. 78.

Type species: Carobius pulchellus Banks.

Forewing broad and rounded; costal area broad; costal crossveins forked, some usually more than once; recurrent humeral vein present; veins Sc and R1 close together, linked by short basal crossvein; Rs in 2 branches, the basal branch simple, the distal branch divided into 2–4 veins; outer gradate series well developed; inner gradate series absent, or represented by 1 or 2 veins only; a crossvein from R1 to stem of basal Rs branch. Hindwing broad, rounded; outer gradate veins present.

Female. Ectoproct simple or broadened ventrally; tergite IX dorsally deep, laterally narrow, ventral portion greatly expanded (sometimes as separated plate) to subtend much of ectoproct; sternite VII broad, transverse or rounded; gonapophyses laterales broad, with tapered central stylus; spermatheca usually simply coiled, occasionally more expanded; subgenitale simple.
**Male.** Ectoproct ventrally expanded, sometimes to long forcepate projections, which may be ornamented with spines and/or thickened setae; tergite IX deep and narrow, usually closely associated with ectoproct; sternite IX broad, rounded or transverse. Gonarcus arched, sometimes with strong lateral spines; an elongate median process (?arcessus); parameres variable, fused basally; hypandrium internum small, apex usually transverse.

This endemic genus is the most diverse in Australia, and nine species are noted here. The males often have highly ornamented ectoprocts, and the species are readily recognisable from this sex. Females are very similar, and are difficult or impossible to separate on genitalic features. Wing markings are useful in some instances.

Three species here attributed to a new genus differ from *Carobius* in both venational and genitalic features but are superficially otherwise similar to species retained in *Carobius*.

**Key to Species of Carobius**

1. Forewing predominantly uncoloured, with few (if any) defined dark markings, or a concentrated median band ................................................................. 2
   Forewing predominantly mottled with brown or grey, markings usually poorly defined ................................................................. 3

2(1). Forewing almost unmarked, gradates scarcely shaded ...................................... *trifurcatus*
   Forewing more extensively marked, at least some gradates strongly shaded, more often with extensive median shading ...................................... *pulchellus*

3(1). Hindwing apex, beyond gradate veins, pale grey (male ectoproct greatly elongated with narrow spinose apex: Fig. 197) ................................................................. *elongatus*
   Hindwing apex not darker than rest of hindwing (male ectoproct not as above) .......... 4

The following six species differ little in superficial appearance of body and wings, although the subtle differences in forewing pattern are indicated in the Figures: they can be convincingly separated only on male terminalia, as follows. Isolated females cannot be identified satisfactorily at this stage.

4(3). Ectoproct with several thickened pedicelled setae well before apex ............................................. 5
   Ectoproct without pedicelled setae before apex; apex often with spines ...................... 6

5(4). Ectoproct apex narrow, dorsally directed ......................................................... *pedicellatus*
   Ectoproct apex broad, ventrally directed ............................................................ *laticroctus*

6(4). Ectoproct apex broad, with row of short spines ................................................. *pectinatus*
   Ectoproct apex narrow, with few setae or spines .................................................... 7

7(6). Ectoproct very long and slender, a group of c. 10 long setae near apex ............... *angulatus*
   Ectoproct relatively shorter and broader, apex with no more than c. 2 prominent spines or setae ............................................................. 8

8(7). Ectoproct apex with 2 long dorsally directed spines .......................................... *spinous*
   Ectoproct apex with single short, medially directed spine .................................... *curvatus*

**Carobius angustus** Banks

(Figs 96–104)

*Carobius angustus* Banks, 1909, p. 78.

**Coloration.** Dark brown. Eyes black. Face and vertex dark; palpi dark; antennae greyish brown. Thorax dorsally dark glossy brown; abdomen slightly paler. Legs translucent greyish brown. Forewing strongly marked with greyish brown (Fig. 96), longitudinal veins with intermittent pale lengths. Hindwing venation pale.

Wing venation as in Figs 96, 97. Legs with all T expanded.

**Female.** Unknown.

**Male.** Abdominal apex as in Figs 98, 99: ectoproct with field of 12 trichobothria, a long slender process incurred and spined at apex; tergite IX very narrow; sternite IX (Fig. 100) rounded. Genitalic complex (Figs 101, 102): a long narrow, dorsally angled median spatulate process (?arcessus) from broad, anteriorly emarginate gonarcus; lateral slender ventrally directed entoprocessus; parameres (Fig. 103) broad, anteriorly fused, with dorsal rod-like sclerite in more membranous surround. Hypandrium internum as Fig. 104.
Dimensions. FW 5, HW 4½, A c. 3, B 5.

Type. Holotype, σ, 'Middle Queensland Australia', 'Type 11937', 'Carobius angustus Banks type' (MCZ) (pinned and staged, pin corroding).

Other material examined. Two damaged specimens (BMNH), both ex Tillyard collection bear labels with this species name: 1♂, Queensland, Brisbane, 1 ex., New South Wales, Palm Beach. Their condition does not permit confident appraisal.

Comments. Banks (1909), without dissection, erroneously designated the above type as a female. He noted the rather long and narrow wings, presumably the cause of the specific name, and this feature differentiates C. angustus from many of the other species noted here. The male genitalia are very distinctive.

Carobius pulchellus Banks
(Figs 105–135)


Coloration. Straw brown, marked with dark brown to black. Eyes dark grey to black. Face dark brown, clypeus sometimes pale; vertex pale, sometimes darkened laterally; palpi pale; antennal scape dorsally dark brown, otherwise pale yellowish brown. Pronotum pale medially and laterally; lateral scutal lobes of pterothorax dark brown, sometimes with pale inverted 'U'; abdomen dark brown. Legs pale, T sometimes darkened apically. Wings very pale to strongly patterned: forewing marked with greyish brown, sometimes as median suffusion (Fig. 125); gradates, some basal crossveins, forks of costal crossveins dark. Hindwing venation wholly pale; pterostigma slightly browned.

Wings broad and rounded, venation as in Figs 105, 106, 114, 115, 125–129. Legs with T11 slightly expanded; pronotum broader than long.

Female. Abdominal apex as in Figs 116, 130: ectoproct rounded, with field of 10 trichobothria; tergite IX broad, closely associated with ectoproct; gonapophyses laterales broad, stylus preapical; spermatheca (Figs 117, 131) slender to slightly expanded, coiled; subgenitale apex not broadened.

Male. Abdominal apex as in Figs 107, 108, 118–120: ectoproct with field of c. 12 trichobothria, a long slender ventral process medially curved at posterior and with single long apical spine; tergite IX deep; sternite IX (Fig. 109) broad, trapezoidal. Genitalic complex (Figs 110–112, 121–123, 132–135): gonarcus arched, with slender sinuous median process (?arcessus) and long slender entoprocessus; parameres long and broad, anteriorly fused, with a dorsal rod in a membranous lobe which is dorsally spiculate at apex; hypandrium internum (Figs 113, 114) usually rather broad, occasionally more slender.


Types. Holotype, σ, of Carobius pulchellus 'Brisbane, Queensland, Australia', 'Type 11936', 'Carobius pulchellus Banks-type' (MCZ). Holotype, ?♀, of Carobius subfasciatus, Tillyard, Queensland, Brisbane, Toowong, F. P. Dodd (BMNH) (head missing; left forewing, except base, and much of left hindwing missing; abdomen distorted and partly crushed). (Both seen.)

Other material examined. Queensland: 1♀, Bunya Mts; 1♂, Toowong (both BMNH, ex. Tillyard collection); 5 ex., Brisbane (det. Tillyard) (ANIC). New South Wales: 1 ex., Campbelltown (ANIC).

Comments. Banks (1909), without dissection, designated the type of C. pulchellus as female. The gross pattern of the male genitalia is similar to that of C. angustus, but the species are abundantly distinct on details. C. pulchellus appears not to be common, but
was recorded from Norfolk I. by Tillyard (1917). In his accounts of Australian species, Tillyard (1916) commented that *pulchellus* is 'very distinct', and figures the wings of an Australian individual much more heavily marked than the holotype: the anterior FW gradates, the basal subcostal space, and the basal crossveins are all shaded in Tillyard's figure and it is presumably based on the Toowong male noted above (see Fig. 128). The forewing of the Bunya Mts female is also illustrated (Fig. 127), together with several other strikingly marked specimens (Figs 125, 126, 129) to indicate the considerable range of variation found in this species. The Norfolk I. specimen (SAM) lacks an abdomen, but the forewing (figured by New 1987) is more like the *pulchellus* figured by Tillyard than any other known *Carobius*. At the extremes of variation, *C. pulchellus* and *C. subfasciatus* appear abundantly distinct, both on wing pattern and on small details of genitalia. However, the additional material examined, some of which is figured for comparison, clearly indicates that only a single species is represented. It differs from most other *Carobius* on the pale antennæ, and shares the lateral sclerites associated with parameres with *C. trifurcatus*.

*Carobius trifurcatus* Kimmins

(Figs 136–139)

*Carobius trifurcatus* Kimmins, 1940, p. 225.

**Coloration.** Pale yellowish brown. Eyes black. Face and palpi pale; vertex slightly paler medially than laterally. Antennæ brown, unicolorous. Thorax brown, with trace of yellower median mesonotal stripe; scutella cream; abdomen paler than thorax. Legs pale. Forewing unmarked except for slight brown streaking in subcostal cell; venation predominantly dark brown, pterostigmal veins white, some apical forks white. Hindwing venation pale except for slight browning in basal quarter of wing and near apex. (Kimmins noted incipient darker banding of forewing; this is scarcely evident.)

Forewing venation as in Fig. 136.

**Female.** Unknown.

**Male.** Abdominal apex as in Fig. 137: ectoproct ventrally elongate and medially curved; 2 long setae at apex; a field of 12 widely separated trichobothria; tergite IX slender; sternite IX broad, long. Genitalia (Fig. 138): arcessus short and slightly sinuous; entoprocessus nearly twice as long as arcessus, slender; outer ventral elongate spatulate process, apparently loosely attached to body of gonarcus. Parameres (Fig. 139) curved, basally fused, apices slightly divergent. Hypandrium internum small.

**Dimensions.** FW 6, HW 4½, A c. 4, B c. 5.

**Type.** Holotype, ♀, Queensland, National Park, 47, 3000 ft, 5.iii.21, R. J. Tillyard (BMNH, seen) (staged, abdomen stained and mounted between coverslips attached to specimen pin).

**Other material examined.** None.

**Comments.** The genitalic figures given for this species are slightly stylised, because of irregular orientation of the various parts between the coverslips. However, the various features illustrated by Kimmins (1940, fig. 4) are clearly visible, and his figure 4e confirms the unusual nature of the genitalic complex of this species. No similar specimens have been seen; although the lateroventral processes occur clearly also in *C. spinosus*, details of the male abdomen differ considerably in the two species.

*Carobius curvatus*, sp. nov.

(Figs 140–148)

**Coloration.** Brownish grey. Eyes black. Clypeus and labrum dark brown, except anterior
margins pale; genae pale; frons pale except for interantennal darkening; vertex darker; palpi pale; antennae uniform brownish grey. Pronotum slightly paler medially; mesonotum with central pale 'X'; metanotum dark; abdomen dark. Legs: F, T1, II slightly darkened at base and apex. Forewing with pale greyish brown mottling (Fig. 140); venation predominantly pale; gradates shaded, some anterior ones centrally hyaline. Hindwing pale.

Wing venation as in Figs 140, 141; wings rather long and narrow.

_Female._ Unknown.

_Male._ Abdominal apex as in Figs 142, 143: ectoproct with stout curved ventral process bearing short apical spine; an oval field of 12 trichobothria; tergite IX ventrally elongate; sternite IX (Fig. 144) broadly rounded. Gonarcus (Figs 145, 146) broadly arched; arcessus very short and basally broad; entoprocessus long, membranous; parameres (Fig. 147) basally fused, with lateroventral hooked processus; hypandrium internum (Fig. 148) small, slender.

**Dimensions.** FW 5 1/2, HW 4 3/4, A c. 5, B 5.

_Type._ Holotype, σ, South Australia, 31°47'S., 138°21'E., Nooltana Creek, 13 km NW. by N. of Hawker, 16.ix.1978, J. C. Cardale (ANIC) (in alcohol).

_Comments._ The male ectoproct of this species grossly resembles that of _C. pulchellus_, but is shorter, sturdier and with a considerably shorter apical spine. Genitalia show more pronounced differences of detail, and the forewing shape and pattern differ substantially from either of those species.

_Carobius spinosus_, sp. nov.

(Figs 149-158)

**Coloration.** Dark greyish brown. Eyes black. Clypeus and labrum, except anterior margins, dark; genae slightly darkened; frons buff except dark interantennal streak; vertex dark; palpi and antennae uniformly brownish grey. Pronotum with traces of pale median and dorsolateral markings; mesonotum predominantly pale medially; metanotum dark; abdomen uniformly greyish brown. Legs translucent greyish brown; F, T1, II dark, base and apex of TIII dark; t5 darker than rest of t. Forewing with very pale greyish brown markings (Fig. 149); Sc cell with 2 brown lengths in basal half; gradates strongly shaded; some lengths of Sc, R, Rs pale, few anterior gradates centrally hyaline, venation otherwise greyish brown. Hindwing pterostigma slightly browned; venation pale, more so in basal third of wing.

Pronotum broader than long. Wing venation as in Figs 149, 150.

_Female._ Abdominal apex as in Fig. 151: ectoproct lengthened ventrally; tergite IX short; sternite IX broad; gonapophyses laterales moderately broad, with long setose stylus (see inset); spermatheca (Fig. 152) with coiled preapical expansion, apex slender; subgenitale poorly defined.

_Male._ Abdominal apex as in Figs 153, 154: ectoproct with incurved blunt ventral process with 2 long dorsal apical spines and several short spicules, field of 13–14 trichobothria; tergite IX closely subtending ectoproct; sternite IX broad. Gonarcus (Figs 155, 156) long and deep; arcessus short, basally broad, arched; entoprocessus slender, strongly tapered; parameres (Fig. 157) long, anteriorly fused and dorsally reflexed, apically tapered and slightly divergent; adjacent laterodorsal rod-like sclerites; hypandrium internum (Fig. 158) small.

**Dimensions.** FW 5-5 1/2, HW 4-4 3/4, A c. 5, B c. 5.

_Types._ Holotype, σ, Western Australia, 31°17'S., 11°35'E., 28 km E. by S. of Southern Cross, 3.v.1983, E. S. Nielsen, E. D. Edwards (ANIC) (alcohol). Paratypes: 1σ, 4φ, same data as holotype; 5σ, 6φ, Madura Pass, 31°54'S., 127°01'E., 30.iv.1984, E. S. Nielsen and E. D. Edwards; 1σ, 1φ, 31°07'S., 121°24'E., 29 km SE. by E. Coolgardie, 5.v.1983, E. S. Nielsen and E. D. Edwards (all ANIC).
Comments. The male ectoproct of spinosus is more elaborate than that in any of the foregoing species, but clearly of the same basic pattern as in C. trifurcatus and C. pulchellus. Wing markings are similar to those of C. angustus.

Carobius lateproctus, sp. nov.
(Figs 159–169)

Coloration. Dark greyish brown to black. Eyes black. Clypeus and labrum, except anterior margins, black; genae dark; frons pale except narrow dark interantennal streak; vertex moderately dark brown; palpi dark; antennae: scape and pedicel as vertex, flagellum dark grey to black. Pronotum slightly pale anteromedially, narrow black median line on posterior half, laterally black; lateral scutal lobes of meso- and metanotum with inner and posterior margins paler than remainder. Abdomen greyish brown, posterior margin of anterior tergites pale. Legs I, II dark; III pale except apex of T, t darkened. Forewing strongly marked with greyish brown; Sc cell with 2 brown areas in basal half; base of pterostigma brown; venation predominantly dark, but hyaline lengths on some Rs branchlets and some gradates. Hindwing venation pale brown, gradates predominantly hyaline; pterostigma pale brown; membrane slightly fumose. Wing venation as in Figs 159, 160: wings rather narrow.

Female. Abdominal apex as in Fig. 161: ectoproct rather small; tergite IX with detached large ventral expansion; gonapophyses laterales rather narrow, stylus slender; spermatheca (Fig. 162) long and coiled, apex scarcely expanded; subgenital membrane.

Male. Abdominal apex as in Figs 163, 164: ectoproct with very large broad expansion, medially curved, apex ventrally reflexed, 1 or 2 pedicelled setae on inner side, apex with group of short setae and 1–2 thickened dorsal setae; tergite IX very short and slender; sternite IX (Fig. 165) long and narrow. Genitalic complex (Figs 166–168): gonarcus broad, anteriorly emarginate; arcessus long, slender, sinuous, apex spatulate; long slender lateral entoprocessus; parameres (Fig. 168) fused basally, apically fuscate; hypandrium internum (Fig. 169) small.

Dimensions. FW 6, HW 5, A c. 4, B 4–6.


Comments. C. lateproctus has the male ectoproct more prominent than any other species of Carobius.

Carobius pedicellatus, sp. nov.
(Figs 170–180)

Coloration. Dark greyish brown. Eyes black. Clypeus and labrum black, face otherwise pale except narrow black interantennal streak; genae very slightly darkened; vertex darkened centrally; palpi dark; antennae dark, except scape paler. Pronotum with pale lateral margins and irregular pale dorsal lateral streaking. Mesonotum with central pale patch; metanotum wholly dark; abdominal tergites dark, anterior ones with pale central patch. Legs translucent greyish brown; F and T1, II dark, apex of TIII dark, t5 dark. Forewing marked with greyish brown, gradates darker. Hindwing venation pale brown, basal half of pterostigma grey.

Pronotum broader than long. Wing venation as in Figs 170, 171.

Female. Abdominal apex as in Fig. 172: ectoproct ventrally expanded; tergite IX with broad detached ventral expansion; gonapophyses laterales slender, stylus long and slender; spermatheca (Fig. 173) coiled, apex scarcely expanded; subgenital membrane.

Male. Abdominal apex as in Figs 174, 175: ectoproct with long ventral extension, apex upturned, 2–4 short pedicelled setae at c. ½ dorsal length of extension, 1 or 2 thickened
setae at apex, 1–3 short slender setae flanking dorsal pedicelled setae; tergite IX with dorsal flange; sternite IX (Fig. 176) broad, apex trilobed. Genitalic complex (Figs 177–179): gonarcus arched; arcessus short and scarcely sinuous; a short dorsal recurved median spine; entoprocessus longer than arcessus, pointed, dorsally directed; parameres (Fig. 179) basally fused, broad apical lobes with lateral flanges; a broad median membranous sac associated with parameres; hypandrium internum (Fig. 180) small, strongly tapered.

**Dimensions.** FW 5–6, HW 4–5, A c. 4, B 4–5.

**Types.** Holotype, ♂, Western Australia, 31°54′S., 127°01′E., Madura Pass, 30.iv.1984, E. S. Nielsen and E. D. Edwards (ANIC) (in alcohol). Paratypes: 1♂, 1♀, same data as holotype; 1♂, 2♀, 28 km E. by S. Southern Cross, 3.v.1983, E. S. Nielsen and E. D. Edwards; 1♂, 1♀, 31°32′S., 118°03′E., Hines Hill, 22 km WSW. Merredin, 2.v.1983, E. S. Nielsen and E. D. Edwards; South Australia: 1♂, 1♀, 31°27′S., 131°47′E., 14 km NNW. Yalata Mission, 9.v.1983, E. S. Nielsen and E. D. Edwards (all ANIC).

**Comments.** The pedicelled setae on the male ectoproct indicate some possible relationships with *C. lateproctus*, but the extent and shape of the ectoproct itself differs markedly.

**Carobius pectinatus**, sp. nov.  
(Figs 181–191)

**Coloration.** Dark greyish brown. Eyes black. Face dark except buff–cream irregular 'U' below antennal sockets and across anterior of frons; clypeus and labrum darker than genae; vertex black, glossy; palpi dark; antennae black. Pronotum with indication of pale median stripe. Pterothorax black, with paler median mark and lateral mesoscutal lobes pale; abdomen dark grey. Legs dark, much of F and TI, II black, apex of TIII black. Forewing strongly mottled with pale grey, venation almost wholly grey, parts of R, pale, central section of few anterior gradate veins hyaline. Hindwing slightly fumose, especially apical half; some gradates largely or partially hyaline, basal lengths of many costal crossveins hyaline; basal half of pterostigma grey.

Pronotum broad. Wing venation as in Figs 181, 182.

**Female.** Abdominal apex as in Figs 183, 184: ectoproct broad, tergite IX greatly expanded ventrally; gonapophyses laterales slender, stylus long and tapered; sternite VII broad; spermatheca (Fig. 185) slender, coiled; subgenitale broad, elongate.

**Male.** Abdominal apex as in Figs 186, 187: ectoproct ventrally extended, apex incurved, broad, with row of c. 10 short thickened spines. Genitalic complex as in Figs 188, 189: gonarcus strongly bilobed anteriorly; arcessus deep, flanged, prominent; tapered entoprocessus close to midline beneath arcessus; parameres (Fig. 190) basally fused, only slightly divergent apically, broad lateral membranous lobes; hypandrium internum (Fig. 191) small.

**Dimensions.** FW 6, HW 5, A 3, B 4–5.


**Comments.** This species is much darker than many other *Carobius*. The well defined apical pecten on the male ectoproct is distinctive, as is the deeply arched arcessus. In the female, the gonapophyses laterales are rather narrower than in other known species.

**Carobius elongatus**, sp. nov.  
(Figs 192–200)

**Coloration.** Brown. Eyes black. Face dark brown, genae very dark; vertex almost black anteriorly; palpi pale except darkened outer edge; antennal scape and pedicel pale except dorsally, flagellum dark grey to black. Pronotum buff along midline, dorsolaterally dark,
lateral margins pale. Pterothorax brown, sutural lines buff; abdomen: sclerites brown, membrane pale. Legs generally pale: apex of T, most of t darker brown. Forewing venation mainly pale brown, with paler lengths on most longitudinal veins; pterostigma, gradates and parts of membrane shaded with greyish brown. Hindwing with most basal venation pale, distal venation brown, pterostigma shaded with pale greyish brown.

Pronotum much broader than long. Wing venation as in Figs 192, 193; forewing rather narrow.

**Female.** Abdominal apex as in Fig. 194: ectoproct deep, subtended by tergite IX; gonapophyses laterales small and slender, stylus long; spermatheca (Figs 195, 196) expanded and coiled; subgenitale small, membranous.

**Male.** Abdominal apex as in Figs 197, 198; ectoproct with long narrow extension bearing 2 rows of thickened spines on inner apical edge; sternite IX very long, rounded. Genitalic complex (Figs 199, 200): gonarcus broad, arched; accessus (?) a double-spine, sinuous; parameres (Fig. 200) long, basally fused, apices divergent and dorsally turned; hypandrium internum small.

**Dimensions.** FW 5, HW 4, A 4, B 5.

**Types.** Holotype, σ, New South Wales, Paddy's R., Bago S.F., 15.i.1980, A. S. Smithers (AM). Paratypes: 1 Q, same data as holotype (AM); 1 σ, Australian Capital Territory, Wombat Creek, 6 km NE. Piccadilly Circus, 750 m, Mar. 1985, flight interception trap. (ANIC).

**Comments.** The male ectoproct is much longer and narrower than in other Carobius described here, and the form of the ‘accessus’ is also distinctive.

**Genus** Notherobius, **gen. nov.**

Type species: N. nothofagi, sp. nov.

Body sturdy. Forewing broad, rounded and intricately patterned. Recurrent humeral vein present; costal crossveins forked; Sc and R1 close together, with single basal Sc crossvein; Rs arising in 2 branches, both branches forked soon after origin and anterior branch of each fork linked to R1 or (for basal branch) to base of distal branch by crossvein; outer gradate series of crossveins complete, inner series more variable. Hindwing with outer gradate series complete.

**Female.** Ectoproct and tergite IX deep; gonapophyses laterales with stylus; spermatheca apically expanded, duct long; subgenitale apparently poorly defined.

**Male.** Ectoproct elongate, without conspicuous spines; tergite IX short and deep; gonarcus arched; accessus a simple hook; entoprocessus small; parameres long, fused basally and only slightly divergent at apex; hypandrium internum present, small.

As noted in the discussion under Carobius, the size, general build and superficial appearance of species of the two genera is very similar. The wing venation of these genera differs substantially; in particular, Notherobius is distinct in the forked basal forewing Rs branch, the presence of a crossvein from R1 to the anterior fork of the distal Rs branch, and the more complete series of inner gradate veins. The male ectoproct and genitalia are also much simpler and less ornamented than in Carobius. The two forewing R1–Rs crossveins in Notherobius resemble the condition in broad-winged species of Zachobiella, but other aspects of venation render the genera abundantly distinct. Sympherobius Banks, the major genus of Hemerobiidae having only two Rs branches in the forewing, usually has the male ectoproct spined and the parameres more markedly divergent, as well as a less complete series of outer gradate veins. Sympherobius has not been recorded from the Pacific region. Sympheromima Kimmins, described from Guatemala, also has two Rs branches, but these fork more extensively, and the forewing is somewhat falcate. The type
of Sympheromima (BMNH, seen) lacks an abdomen, and the genitalic form is unknown, as noted by Nakahara (1960).

The genus is at present known only from south-eastern Australia.

**Key to Species of Notherobius**

1. Crossvein from basal branch of forewing Rs meeting base of distal branch of Rs (Fig. 201) ................................................................. *nothofagi*
   Crossvein from basal branch of forewing Rs meeting R₁ well before origin of distal branch of Rs ................................................................. 2

2(1). Parameres fused only at base, apical lobes rather narrow and not strongly hooked ........
   Parameres fused for most of length, apical lobes broad and strongly reflexed ... *nebulosus* *

*Males, only, known.

**Notherobius nothofagi**, sp. nov.  
(Figs 201–208)

*Coloration.* Very dark brown, almost black. Face dark, anterior margin of frons particularly so; vertex with traces of pale dorsolateral crescents; palpi dark; antennae pale greyish yellow. Pronotum with traces of pale median streak, this present but weakly defined on pterothorax; abdomen wholly dark. Legs translucent greyish brown; apex of T₁, whole of T₂ darkened. Forewing strongly and intricately spotted with dark greyish brown (Fig. 201), base of pterostigma reddened; venation pale where not shaded, otherwise dark brown. Hindwing slightly tinged with pale greyish brown; pterostigma brown; most venation darkened.

Wing venation as in Figs 201, 202: forewing with basal R₁–Rs crossvein very close to origin of 2nd branch of Rs; 2nd R₁–Rs crossvein present.

*Female.* Abdominal apex as in Fig. 203: ectoproct deep, with field of c. 14 trichobothria; tergite IX very deep; gonapophyses laterales broad, stylus tapered; spermatheca (Fig. 204) apically expanded, duct very long; subgenitale membranous.

*Male.* Abdominal apex as in Figs 205, 206: ectoproct deep, with lobed ventral expansion, a field of c. 12 trichobothria; tergite IX deep. Gonarcus (Figs 206, 207) long; arcessus slender, slightly curved; entoprocessus not defined, but small lateral lobe each side of arcessus; parameres (Figs 207, 208) vertically aligned, fused, with hastate apical expansion; hypandrium internum small.

*Dimensions.* FW 7, HW 6, A c. 4, B 4–5.

*Types.* Holotype, ♂, Victoria, Lake Mountain, Bellell Creek, 10 March 1985, beaten from *Nothofagus*, T. R. New, R. C. Welch (ANIC). Paratypes: 2♂, 3♀, same data as holotype (ANIC).

*Other material examined.* Tasmania: 5 ex. Lake Pedder; Arthur Plains; Wandie R. 10 km NNE. Waratah (ANIC, NMV).

*Comments.* The striking wing markings of this species are distinctive. This species has the basal R₁–Rs crossvein very close to the origin of the distal Rs branch, and genitalic characters also separate it from its congeners.

**Notherobius nebulosus**, sp. nov.  
(Figs 209–215)

*Coloration.* Brown, with darker brown to black markings. Eyes black. Face and palpi pale; genae dark; vertex slightly darkened medially, otherwise yellowish brown; antennae pale yellowish grey. Pronotum with narrow pale median stripe, irregular pale dorsolateral streak;
mesonotum with slight pale median and posterior marking; metanotum with broad pale median stripe, this continued along anterior half of abdomen. Legs greyish brown; F and T, I, II irregularly tinged with darker grey. Forewing (Fig. 209) extensively mottled with very pale grey; venation predominantly dark, intermittent pale lengths to longitudinal veins; pterostigma of both wings conspicuously dark. Hindwing venation pale grey.

Wing venation as in Figs 209, 210. Antennal segments rather broad.

**Female.** Unknown.

**Male.** Abdominal apex as in Fig. 211: ectoproct elongate and sinuous, without ventral process; tergite IX very deep, ventrally tapered; sternite IX short and broad. Gonarcus (Figs 212, 213) narrow, strongly arched; arcessus slightly sinuous; small sclerites (?)ento-processus) in membrane near base; parameres (Figs 214, 215) long, basally fused, distally close together with divergent apices.

**Dimensions.** FW 5, HW 4, A c. 2½, B 3½.


**Comments.** This and the next species appear to be close relatives, and resemble each other closely in wing form. The male genitalia, particularly the form of the parameres, confirm that they are distinct.

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**Notherobius hastatus, sp. nov.**

(Figs 216–226)

**Coloration.** Dark brown to black. Eyes black. Labrum, clypeus, genae black; frons with broad anterior pale yellowish brown band, this obsolete along eye margins, wholly black across base of antennal sockets; vertex uniformly dark; palpi black; antennae brown, distal flagellar segments (to f 35; rest missing) greyer brown. Pronotum with broad pale median stripe, narrower pale dorsolateral streaks and pale lateral margins. Pterothorax with traces of pale markings, especially along inner margins of lateral mesoscutal lobes and sides of both scutella. Abdomen dark brown. Legs straw brown; apex of all T slightly darkened; t5 darkened. Forewing strongly mottled with pale greyish brown (Fig. 216); venation predominantly dark, longitudinal veins with short pale lengths. Hindwing pale except for slight browning of basal ½ of pterostigma.

Pronotum broader than long. Wing venation as in Figs 216, 217.

**Female.** Unknown.

**Male.** Abdominal apex as in Figs 218, 220: ectoproct ventrally extended, apex slightly curved towards midline, not ornamented; tergite IX with sclerotised ridge and rugose tubercle near apex (Fig. 221); sternite IX (Fig. 219) broad, with narrow anterolateral arms. Gonarcus (Figs 222, 223) arched, deep; arcessus slender, detached from body of gonarcus; lateral hooked ovoid sclerites (?)ento-processus) in membrane each side of arcessus; parameres (Figs 224, 225) vertically aligned, basally fused, apically hooked and divergent; hypandrium internum (Fig. 226) small.

**Dimensions.** FW 7, HW 6, A c. 3 (broken), B 5.

**Type.** Holotype, σ, Victoria, Flowerdale, 29.xii.1953, Neboiss (NMV).

**Comments.** In both forewing venation and genitalic features, *N. hastatus* appears to be related to *N. nebulosus*. Both species are known only from males.
Genus Hemerobius L.

Hemerobius L., 1758, p. 549.

Note: extensive synonymy of this genus cited by Klimaszewski and Kevan, 1985, pp. 5-6.

Type species: Hemerobius humulinus L.

Forewing broad, tapered rounded apex; costal area moderately broad, costal crossveins forked; recurrent humeral vein present; veins Sc and R1 moderately close, linked by basal crossvein; Rs with 3 branches, no basal crossvein between branches; 2 complete series of gradate crossveins; outer series connecting arms of radial and medial forks. Hindwing almost as long as forewing; M forking well beyond 1st Rs branching; outer gradate series complete; inner series incomplete, usually with no more than 3 veins.

Female. Ectoproct rather deep, simple; tergite IX deep and subtending much of ectoproct; sternite VII broad, transverse; gonapophyses laterales broad, rounded, simple; spermatheca with relatively large membranous apical sac; subgenitale arcuate.

Male. Ectoproct ventrally produced, often terminating in distinct process (anoprocessus) sometimes with ventral lobe (cataprocessus), usually spined; tergite IX deep; sternite IX short and broad. Gonarcus broad; arcessus short, paired; parameres separate, usually rodlike, sometimes hooked; hypandrium internum short and broad.

One of the largest and most widely distributed genera in the family, with about 220 nominal species. One species occurs in Australia.

Hemerobius australis Walker
(Figs 94, 95)


As a recent illustrated description of this species is available (New 1981), details are not repeated here, other than illustration of the wing venation for use with the generic key. H. australis is not common and appears to be restricted to Queensland and New South Wales.

Additional material examined. 19 ex. Queensland: 8, Bunya Mts; 11, New South Wales (Bowman State Forest) (AM, ANIC).

Genus Zachobiella Banks

Zachobiella Banks, 1920, p. 335.

Type species: Zachobiella punctata Banks.

Forewing narrow to moderately broad, rounded; costal area narrow; costal crossveins simple; recurrent humeral vein absent; veins Sc and R1 moderately separated, linked by 1 or 2 crossveins in basal third of wing; Rs 2-branched, both branches forked near base; a crossvein from R1 to anterior fork of each Rs branch; main gradate veins in centre of wing, outer gradate series sometimes partly present. Hindwing slightly shorter than forewing, of similar shape; no gradate series; a single crossvein from MA–MP in middle of wing.

Female. Ectoproct large, rounded or ventrally expanded; tergite IX with large ventral extension; tergite VIII, sternite VII broad; gonapophyses laterales rounded, simple; spermatheca apically expanded; subgenitale poorly defined.

Male. Ectoproct with long narrow curved ventral extension; tergite IX with long ventral extension almost to end of ectoproct; tergite VIII with setose or spinose projections or lobes; sternite VIII rounded or with narrow setose apical lobe. Gonarcus deep and rather narrow, entoprocessus sometimes present; arcessus hooked, apically furcate; parameres fused.
This small genus appears to be limited to the Oriental and Australian regions, and to be rather isolated in the family. Three species occur in Australia and, although the narrow-winged \textit{Z. pallida} differs from the others in some features of significance for potential generic separation, more detailed knowledge of the Oriental taxa is needed before such a step is taken.

**Key to Species of \textit{Zachobiella}**

1. Both wings elongate and very narrow; male with projections on scape and vertex ...... \textit{pallida}
   Both wings broadly oval and tapered; male scape and vertex not ornamented ............. 2
2(1). Male: apex of ectoproct strongly angled dorsally, of tergite IX slender and setose; female: tergite IX strongly subtending ectoproct (WA) ......................... \textit{lobata}
   Male: apex of ectoproct curved dorsally, rather than angled, of tergite IX broad and rugose; female: tergite IX not strongly subtending ectoproct (eastern Australia) ................... \textit{submarginata}

**\textit{Zachobiella pallida} Banks**

(\textit{Figs 227-234; 282, 283})

\textit{Zachobiella pallida} Banks, 1939, p. 466.
\textit{Zachobiella angusta} Kimmins, 1940, p. 225. \textit{Syn. nov.}

**Coloration.** Pale brown to yellowish white. Eyes black. Clypeus black; genae browned; remainder of face pale; vertex slightly darkened above eyes; palpi pale; antennae greyish brown. Pronotum slightly darkened anteriorly; pterothorax uniform; abdomen usually browned dorsally, sometimes pale. Legs pale translucent greyish brown. Wings pale, unmarked: forewing gradates grey, sometimes slightly shaded, other veins pale. Hindwing gradates sometimes slightly darker than other veins.

Wings very narrow, apex slightly tapered, venation as in Figs 227, 228. Male antennal scape with prominent inner dorsal projection (Figs 282, 283), vertex with domed median process projecting forwards from head; unmarked.

**Female.** Abdominal apex as in Fig. 229: ectoproct and tergite IX closely associated, very deep; gonapophyses laterales small; spermatheca (Fig. 230) slightly expanded towards apex, duct long; subgenitale small and membranous, scarcely defined.

**Male.** Abdominal apex as in Figs 231, 232: tergite IX dorsally divided with long curved slender posterior projection above ectoproct; ectoproct with long upcurved posterior projection; an inner long process with several ‘teeth’ towards apex, and apex with short thickened ‘peg’; tergite VIII with (?eversible) setose sac each side of midline; posterior margin of tergite VII with 2–3 irregular rows of spines. Genitalia (Figs 233, 234): gonarcus long; presumed accessus bilobed; parameres not evident.

**Dimensions.** FW 4\textsuperscript{1}–5, HW 3–4, A c. 4, B 2\textsuperscript{1}–3\textsuperscript{1}.

**Types.** Holotype, \textita, of \textit{Zachobiella pallida} Banks: 'Q, L. Barrine Atherton Tab. 18.iv.32, 2800 ft', 'Australia, Harvard Exp. Darlington MCZ 27386', '\textit{Zachobiella pallida} Bks type' (ANIC ex MCZ) (complete except for tips of antennae). Holotype, \textita, of \textit{Zachobiella angusta} Kimmins: 'NQ Tully, 12.6.31, L.F.' (BMNH). (Both seen.)

**Other material examined.** 18 ex. **Queensland:** L. Barrine; Millaa Millaa Falls; Mareeba Dist.; Tully Falls, Ravenshoe; Shiptons Flat; The Crater, Mt Hypipamee (AM, ANIC).

**Comments.** Although the above types are both females, which are difficult to identify specifically in \textit{Zachobiella}, males in the remaining material seen from Queensland clearly indicate that only a single species of \textit{Zachobiella} occurs in northern Australia, and the above synonymy is supported also by concordance of size, wing and body features. Kimmins (1940)
noted that \textit{angusta} was 'closely allied to \textit{Z. pallida}' but did not comment further on supposed similarities or differences of the two species. \textit{Z. striata} Nakahara, 1966 (Taiwan) is also narrow-winged, but the wings are more extensively shaded, and the distal Rs branch in the forewing has a longer stem than in \textit{pallida}. The female holotype of \textit{Z. jacobsoni} Esben-Petersen (Sumatra, seen in Leiden) represents a further species in this group. The basal branch of Rs in the forewing arises much more basally than in \textit{Z. pallida}.

The development of the antennae and vertex in the male appears to be unique amongst known Hemerobiidae, although vertex elaboration occurs in males of some species of \textit{Meleoma} Fitch (Chrysopidae), and in some Sisyridae (Monserrat 1981). There do not appear to be any large or dense sensilla on the modified scape process, and it is possible that this is used to aid in holding the female during mating or, perhaps, for some form of prior display.

\textbf{Zachobiella submarginata} Esben-Petersen

(Figs 235–244)

\textit{Zachobiella submarginata} Esben-Petersen, 1929, p. 33.

\textbf{Coloration}. Pale straw brown with dark brown to black markings. Eyes black. Face pale; genae black; vertex pale; palpi black; antennae pale. Pronotum with broad pale median stripe, laterally dark. Mesonotum with narrow pale streak over central length, and irregular pale dorsolateral streaks, otherwise dark; scutellum wholly dark. Metanotum with complete median pale band. Abdomen greynish brown. Legs yellow–straw brown, unmarked except slight irregular brown streaks on TI, II (some specimens only). Wings very pale: forewing venation largely hyaline, greynish brown shading at forks (Fig. 235), gradates dark; slight irregular shading near posterior margin. Hindwing hyaline, except apical forks very slightly greved.

Wings broad, venation as in Figs 235, 236. Male vertex and antenna unornamented.

\textbf{Female}. Abdominal apex as in Fig. 237: ectoproct elongated ventrally; tergite IX deep; gonapophyses laterales moderately broad; spermatheca (Fig. 238) small, apex curved; subgenitale small.

\textbf{Male}. Abdominal apex as in Figs 239–242: ectoproct with long, dorsally curved ventral extension, apex with group of minute hairs, dorsal inner margin with additional narrow elongate projection; tergite IX closely associated with ectoproct, a long ventral projection with rugose apex; tergite VIII with central membranous lobes and anterior lateral projections bearing outer spine and subtended by group of basal setae; sternite VIII with long tapered setose apex. Genitalia (Figs 243, 244): gonarcus broad; presumed aecessus curved, apex emarginate; presumed entoprocessus close to aecessus, strongly hooked; parameres not distinct.

\textbf{Dimensions}. FW 5–7, HW 4–5\textfrac{1}{2}, A c. 3, B 3–4.

\textbf{Types}. Holotype (♀, teste Esben-Petersen; not now recognisable), Queensland, Mt Tamborine 5.ii.1928, L. Franzen (QM) (seen; right hindwing missing, part of left forewing present, left hindwing detached but present, body almost wholly disintegrated). Paratypes: 1♂, stated to be in Franzen collection, not found in QM; 1♂, in Esben-Petersen collection (Copenhagen) (not seen). Data for the paratypes are not given by Esben-Petersen (1929).

\textbf{Other material examined}. c. 40 ex. Queensland (Bunya Mts) through New South Wales (Fitzroy Falls, Mt Wilson, Kangaroo Valley) to Victoria (Bonang Highway: Sardine Creek, Lakes Entrance) (AM, ANIC).

\textbf{Comments}. \textit{Z. submarginata} is widely distributed through eastern Queensland, New South Wales and Victoria, but appears to be rather rare. It is closely related to the next described species, resembling it in wing form and in the dorsal elaboration of the male abdomen. The two are distinct on details of male structures, and are not at present known to be sympatric.
Zachobiella lobata, sp. nov.  
(Figs 245-255)

Coloration. Pale brown to buff, with darker brown markings. Eyes black. Face pale; genae black; vertex pale; palpi black; antennae pale. Pronotum with sides darkened, otherwise pale; pteronota dark brown, traces of broad pale median stripe; abdominal tergites slightly darkened. Legs pale translucent grey, unmarked. Forewing venation browned at forks, all gradates and Sc crossveins dark, otherwise hyaline; some greyish brown spotting along posterior third of wing. Hindwing venation pale, membrane hyaline.

Wings broad and apex narrowed; venation as in Figs 245, 246. Male vertex and antenna unornamented.

Female. Abdominal apex as in Fig. 247: ectoproct broad, rounded; tergite IX strongly subtending ectoproct; gonapophyses laterales broad; spermatheca (Fig. 248) long, slightly expanded preapically; subgenitale small, scarcely prominent.

Male. Abdominal apex as in Figs 249, 250: ectoproct with long ventral extension, angled dorsally before apex, inner dorsal margin with group of short setae but no additional process; tergite IX with long slender ventral extension with few long setae at tip, median dorsal groups of short setae; tergite VIII with large domed setose anterior projection, anterolateral sclerotised 'horns' with 3 long spines and apical spicules, posterolateral setose tubercles; sternite VIII with long narrow tapered setose apex. Genitalia (Figs 254, 255): gonarcus long and narrow; presumed arcessus a pair of long curved hooks; presumed entoprocessus long and tapered, incipiently bilobed; parameres not evident.

Dimensions. FW 6\frac{1}{2}, HW 5, A c. 4, B 4.


Comments. See comment under Z. submarginata, to which this species is clearly very closely related. At present, they appear to be a geographically separated species-pair not closely related to any other Australian Hemerobiidae.

Genus Micromus Rambur

Micromus Rambur, 1842, p. 416.

Note: the various subdivisions of Micromus proposed by Krüger (1922) and Nakahara (1960) have not been generally accepted; synonymy given by Tjeder (1961).

Type species: Hemerobius variegatus F.

Forewing slender and tapered; costal area narrow; many costal crossveins forked; recurrent humeral vein absent; veins R₁ and Sc close together, linked by basal crossvein; Rs in 4–6 branches (rarely 3 or more than 6); 2 complete sets of gradate crossveins. Hindwing with 2 sets of gradate veins.

Female. Ectoproct rounded; tergite IX very deep and closely associated with ectoproct; sternite VII broad, transverse or rounded; gonapophyses laterales rounded, simple; spermatheca elongate, scarcely expanded apically; subgenitale incipiently bilobed.

Male. Ectoproct with ventral, medially directed process (catoprocessus); tergite IX closely associated with ectoproct; sternite IX various, short to very long. Gonarcus broad, with or without entoprocessus and posteriorly directed lateral arms; arcessus single, hooked; parameres fused anteriorly; hypandrium internum small.

This widespread genus is very variable, and it is debatable whether some of the segregates raised by Nakahara (1960) should be regarded as valid genera. The variability noted in
Hawaiian forms by Zimmerman (1957) appears to link several ‘generic segregates’ and, whereas the type species of several of Nakahara’s entities appear to be very distinctive, they appear to form part of a substantial continuum of variation. About 150 specific names exist in *Micromus* s.l.

The two Australian species were referred to different genera by Nakahara, a step which seems not to be justified. Both are individually variable in wing venation, particularly in the number of branches to the forewing *Rs*. As Carpenter (1961) noted, the classification of *Micromus* ‘has presented unusual difficulties’ because of attempts to subdivide it, notably by Krüger (1922).

**Key to Species of *Micromus***

Usually at least 5 FW *Rs* branches (4–7); female ectoproct with narrow posterior process; male ectoproct with long medially-curved catoprocessus (predominantly northern Australia) ......................... *timidus*

Usually 4 FW *Rs* branches (3–6); female ectoproct simple; male ectoproct with short blunt catoprocessus (Australia-wide) ................................................................. *tasmaniae*

**Micromus timidus** Hagen

(Figs 256–263)

*Micromus* *timidus* Hagen, 1853, p. 481.

*Micromus* *navigatorum* Brauer, 1867, p. 508; Tjeder, 1961, p. 315.

*Micromus* *vinaceus* Gerstäcker, 1885, p. 111; Tjeder, 1961, p. 315.

The above synonymy includes only names applied in Australian literature; the extensive synonymy of this species is listed, and was largely established by, Tjeder (1961), who also provides an extensive description and figures of *M. timidus*.

**Coloration.** Brown. Eyes dark grey to black. Face pale; vertex darker; palpi pale; antennae unicolorous brown. Thorax and abdomen dark brown. Legs pale straw. Wing membranes usually slightly fumose; forewing longitudinal veins predominantly pale, *R*1 darkened at origins of *Rs* branches, *Rs* branches intermittently dark; costal crossveins partially dark; outer gradates dark, narrowly shaded with greyish brown. Hindwing venation straw brown.

Wings long and tapered; venation as in Figs 256, 257: forewing with 5–6, rarely 4 or 7, *Rs* branches.

**Female.** Abdominal apex as in Fig. 258: ectoproct small and deep; tergite IX deep and ventrally rounded, a slender lateral process; gonapophyses laterales long and slender; spermatheca (Fig. 259) long, slender, coiled; subgenitale (Fig. 258) broad, incipiently lobed.

**Male.** Abdominal apex as in Fig. 260: ectoproct deep with long, ventral, medially curved process, this expanded and incipiently serrated at apex; tergite IX slender, closely associated with ectoproct; sternite IX short, transverse. Genitalia (Figs 261–263): gonarcus with deep lateral flanges, rather narrow; arcessus slender, straight to strongly arched; entoprocessus prominent; parameres (Fig. 263) basally fused, laterally expanded about ½ length; hypandrium internum small, rather broad.

**Dimensions.** FW 5–8, HW 4–6½, A 4½–7, B 5–7.

**Material examined.** c. 30 ex. **Queensland:** Cape York Peninsula to Mt Tamborine. **New South Wales:** Lindfield. (AM, ANIC, BMNH.) Compared with specimens from Papua New Guinea, Indonesia, New Caledonia, India, Africa.

**Comments.** This species is very widely distributed; Tjeder (1961) cites the distribution as ‘South and Central Africa, Madagascar, the Seychelles, South India, Ceylon, Thailand, Malaya, Sumatra, Java, Bali, Formosa, Inomote Island, Okinawa Island, the Philippines, Buru Island, New Guinea, Australia (Halifax and Rockhampton), New Caledonia, New Hebrides, Fiji and Samoa Islands’. In Australia, it seems to be largely limited to the north-
east, and was introduced from Queensland into Hawaii as a biological control agent in 1919 (Williams 1927). Although several rather similar species are known from New Guinea (New, unpublished), the genitalia of both sexes of *M. timidus* appear distinctive: the lateral process on the female tergite IX has not been found in other species from the Australian region.

**Micromus tasmaniae** (Walker)

*Hemerobius tasmaniae* Walker, 1858, p. 186.

*Micromus froggatti* Banks, 1909, p. 77, nom. nov. for *M. australis* Froggatt (1904) (preocc.).


*Micromus perkinsi* Banks, 1939, p. 468.


*Austromicromus tasmaniae* (Walker): Nakahara, 1960, p. 35.

**Coloration.** Buff to pale brown. Eyes black, usually with greenish iridescence. Face pale, genae sometimes slightly darkened posteriorly; vertex usually darkened each side of narrow pale midline; palpi pale; antennae greyish brown, scape sometimes darkened. Pronotum with broad dark stripe each side of midline, pale median stripe sometimes almost obsolete; pterothorax usually darker medially than laterally, lateral scutal lobes not conspicuously darkened; abdomen pale, tergites sometimes darkened laterally. Legs generally pale; T, at least at apex, and t usually slightly darkened. Forewing longitudinal veins with conspicuous intermittent dark lengths; bases of *Rs* branches very dark; gradates dark brown, slightly shaded; pterostigma variable: dark brown to almost hyaline—usually dark in ♀. Hindwing venation pale greyish brown, gradates usually darkened.

Venation as in Figs 264, 265, 323: forewing *Rs* 3–6-branched, most commonly 4-branched (*n* = 500, mixed sexes, Victoria: 14 of 3-branched; 446 of 4-branched; 28 of 5-branched; 12 of 6-branched).

**Female.** Abdominal apex as in Fig. 266: gonapophyses laterales narrow; spermatheca (Fig. 267) slender; subgenitale (Fig. 266) prominent.

**Male.** Abdominal apex as in Fig. 268: ectoproct with small ventral catoprocessus; sternite IX very long, tapered. Gonarcus (Figs 269, 270) medially excavated, prominent posteriorly directed lateral arms; arcessus curved to blunt apex, this sometimes emarginate; parameres (Figs 271, 272) fused basally, with lateral hooked process, apex membranous and dorsally curved. Hypandrium internum small.

**Dimensions.** FW 4½–8, HW 4–6½, A 4–5, B 4–6.

**Types.** Holotype, ♀, of *Hemerobius tasmaniae* Walker, labelled: (1) 'Type'; (2) 'vdL'; (3) 'Saunders 68·3''; (4) 'Tasmania W'; (5) 'Hemerobius tasmaniae' W. det. D. E. Kimmins (BMNH) (pinned with wings folded, dirty, and abdomen scarcely visible; left antennal flagellum and some of right antenna missing; specimen only weakly attached to pin; *Rs* 4-branched). Holotype, (?)♂, of *Micromus perkinsi* Banks, 'Type' 'Middle Queensland Australia' 'Type 11924' (ANIC, ex MCZ) (pinned and staged, pin fragile). (Both seen.)

**Other material examined.** c. 2000 ex. throughout Australia, but apparently scarcer in the Northern Territory and northern Western Australia than elsewhere (? lack of collecting). Most abundant in the south and east. (AM, ANIC, BMNH, NTM, NMV, QM, SAM, UQ, WAM, my collection.) Occurs with *M. timidus* in northern Queensland.

**Comments.** This abundant species is very distinct on its 'speckled' wing venation and on genitalic features. The synonymy reflects, to some extent, variation in the number of forewing *Rs* branches; Tillyard's (1916) key specifies it having five branches. Banks (1939) characterised *M. perkinsi* as having three or four *Rs* branches and in differing slightly from 'froggatti' in angles of the gradate series. At that time Banks was apparently inclined to maintain *froggatti* distinct from *tasmaniae*, because he had seen no Tasmanian specimens
for comparison. Such differences in published accounts have raised the possibility of there being a complex of species allied to *tasmaniae* in Australia; I have dissected males from many parts of Australia and am confident that only one species is present.

Genus *Drepanacra* Tillyard

*Drepanacra* Tillyard, 1916, p. 293.


Type species: *Drepanepteryx humilis* McLachlan (a synonym of *Drepanepteryx binoculus* Newman).

Type species of *Menopteryx*: *Menopteryx lanceolatus* Gerstaecker.

Forewing broad and falcate; costal space broad; costal crossveins predominantly forked, irregularly linked by crossveins; recurrent humeral crossvein present; veins Sc and R1 moderately separated, linked by 2 crossveins in basal third of wing; Rs with 4–6 branches, basal and most distal branches usually forked; 2 sets of gradate veins. Hindwing very broad in central region, then tapered to narrow rounded apex; outer gradate series complete; inner gradate series irregular, sometimes only 1 or 2 veins present.

**Female.** Ectoproct deep and rounded; tergite IX deep; sternite VII broad and rounded; gonapophyses laterales broad, rounded, with slight dorsal stylus; spermatheca apically expanded; subgenitale slender, incipiently bilobed, with adjacent sclerotised rods in membrane.

**Male.** Ectoproct deep, reflexed medially; tergite IX deep (not as deep as ectoproct) and short; sternite IX short. Gonarcus broad, with deep lateral flanges; arcessus broad, arched, apically bilobed; parameres basally fused, apically hooked; pair of arcuate spiculate sclerites in membrane above parameres; membranous sac (?phallolingua) below arcessus.

A single species, which is very variable in forewing pattern.

*Drepanacra binacula* (Newman)  
(Figs 273–281, 284–291)

*Drepanepteryx binoculus* Newman, 1838, p. 400.  
*Drepanacra hardyi* Tillyard, 1916, p. 301.  

(In 1923 Tillyard synonymised all the above *Drepanacra*, together with the Australian 'varieties' *tasmanica* Tillyard (1916), *longitudinalis* Tillyard (1916), *pallida* Tillyard (1916), *rubrinervis* Tillyard (1916), and Norfolk I. and New Zealand forms with *D. binocola*.)

**Coloration.** Buff to mid brown. Eyes black. Face pale; genae usually darkened; interantennal area darkened; vertex with pale midline; cranial setae from dark bases; palpi pale; antennae greyish brown, intersegmental areas paler. Pronotum darkened posteriorly and dorsolaterally, midline usually narrowly pale; pteronota darkened except (sometimes) pale midline; thoracic setae dark, from dark bases. Abdomen buff, sometimes with anterior tergites dark. Legs greyish buff: apex of T, whole of t sometimes slightly darkened. Forewing variously marked with brown and/or grey, sometimes uniform or with hyaline areas, sometimes with highly contrasted markings (Figs 284–291); longitudinal venation usually with at least a few short dark lengths, gradates variously shaded or pale. Hindwing paler than forewing, sometimes with much of apex (in particular) fumose or pale brown.
Forewing falcate; hindwing very broad centrally, apex narrowed. Venation as in Figs 273, 274: some basal FW costal crossveins usually linked by cross veinlets, rarely all free.

**Female.** Abdominal apex as in Fig. 275: ectoproct moderately deep; tergite IX not markedly expanded ventrally; gonapophyses laterales broad, with slight rounded apophyses near apex; spermatheca (Fig. 277) strongly expanded preapically, apex relatively narrow; subgenitale (Fig. 276) slender, flanked by narrow sclerotised bars.

**Male.** Abdominal apex as in Fig. 278: ectoproct deep and rather slender (sometimes broader than shown), medially curved, unornamented; tergite IX deep, slender; sternite IX broad, rounded. Genitalia (Figs 279, 280): gonarcus broad, basally furcate, apex slender, bilobed, subtended by membranous sac; parameres fused basally, apices dorsally hooked, divided into 2 short hooks; 2 curved densely rugose sclerites in membrane above parameres; hypandrium internum (Fig. 281) slender.

**Dimensions.** FW 8-10, HW 7, 8, A 5-6, B 5-7½.

**Types.** Holotype, ♂, of Drepanepteryx binoculus Newman 'Ent. Club 4.4.12' (BMNH, rather mouldy). Holotype, ♀♂, of Megalomus lanceolatus Gerstaecker, labelled 'Menopteryx lanceolata Gerst., L. Krüger determ. 1922, 'Typus', 'Zool. Mus. Greifswald II 27458' (Greifswald: left hindwing, antennae missing, left forewing reglued). Holotype, ?♂, of Drepanepteryx humilis McLachlan, Moreton Bay (BMNH, abdomen glued on card). Holotype, ♀, of Drepanacra hardyi, Hobart, C. Cole, 18.12.15/5 (BMNH). (All seen.) I have also seen the types of most 'varieties' and forms from Norfolk Island and New Zealand (BMNH, SAM).

Other material examined. c. 450 ex. All States except Northern Territory, (? lack of collecting); apparently most common in south and east, including Tasmania. (AM, ANIC, BMNH, NMV, QM, SAM, UQ, WAM, my collection.)

**Comments.** As the foregoing extensive synonymy implies, this species is extremely variable, and Tillyard (1923) established the synonymy after rearing, from larvae from a single wattle tree in Hornsby, N.S.W., all known Australian and New Zealand 'species'. However, in the same paper Tillyard described several additional 'varieties' from New Zealand and produced a table of all known varieties. As these seem to represent individual variations rather than local populations, no formal purpose is served by keeping the trinomials in common use. Examples are figured (Figs 284–291) to indicate the general range of variation in *D. binocula*; examples of most have been dissected, and I am confident that only a single species is represented. This unusually rich variation in a lacewing merits further biological attention.

**Genus Megalomina Banks**

*Megalomina* Banks, 1909, p. 78.


Type species: *Megalomina acuminata* Banks.

Type species of *Drepanocria*: *Drepanocria gibbosa* Tillyard.

Type species of *Oxybiella*: *Oxybiella bridwelli* Tillyard.

Forewing with strongly acute or falcate apex; costal margin sinuous; costal area broadest soon after base; costal crossveins forked; recurrent humeral vein present; veins Sc and R₁ moderately close, linked by basal crossvein; Rs with 3–5 branches; 2 or 3 series of grade veins. Hindwing with acute or falcate apex; 2 series of grade veins.

**Female.** Ectoproct expanded ventrally; tergite IX very broad ventrally, subtending ectoproct; gonapophyses laterales, rounded, simple; spermatheca irregularly coiled; subgenitale long, apex incipiently bilobed.
Male. Ectoproct lengthened ventrally, with long ornamented ventral catoprocessus; tergite IX short, deep, strongly associated with ectoproct; sternite IX long, transverse. Gonarcus broad, lateral arms deep; arcessus broad, apically bilobed; small lateral entoprocessus; parameres shallow, basally fused; hypandrium internum triangular.

The three species included here are the generotypes of three separate genera, none of which has been constructively appraised since description. Drepanomina and Oxybiella were separated on details of wing venation which, now that further material has been examined, do not appear to be valid. On wing shape, the three species here included in Megalomina each appears distinctive, but their genitalia imply that they form a closely related group, readily separable from all other Australian Hemerobiidae. Parallel variation in wing shape within a genus occurs elsewhere in the family, the most striking example being the Hawaiian species allocated to Micromus, s.l. (figured by Zimmerman 1957).

Key to Species of Megalomina

1. Both wings falcate ................................................................. berothoides
   Both wings tapered to narrow apex, but not falcate ........................................ 2

2(1). Wings relatively narrow, forewing usually with 2 series of gradate veins (male: ectoproct with 2 short spines at narrow apex) ..................................................... bridwelli
   Wings relatively broad, forewing usually with 3 series of gradate veins (male: ectoproct with broad pectenate apex) ............................................................... acuminata

Megalomina acuminata Banks
(Figs 292–300)

Megalomina acuminata Banks, 1909, p. 78.

Coloration. Buff, with darker brown markings. Eyes dark grey to black. Face sometimes darkened laterally; genae sometimes darkened; vertex darkened laterally and posteriorly; palpi pale, apical segment darker than preceding ones; antennae dark greyish brown. Pronotum with broad pale median stripe, lateral thirds wholly dark; setae from small dark basal dots. Pterothorax with pale median stripe, lateral scutal lobes dark brown. Abdomen relatively uniform pale brown, sometimes with greyer median dorsal streak. Legs translucent greyish brown, traces of darker markings on T I, II. Forewing venation predominantly pale; longitudinal veins with small dark brown dots; many gradates dark and shaded with greyish brown; intensity of shading very variable, but usually at least traces of dark posterior streak and hyaline area as in Fig. 292. Hindwing hyaline or very slightly browned, venation pale brown.

Wings tapered to narrow apex; forewing costal margin sinuous; venation as in Figs 292, 293.

Female. Abdominal apex as in Fig. 294: ectoproct lengthened ventrally; tergite IX narrow dorsally, greatly expanded ventrally; gonapophyses laterales small, simple; spermatheca (Fig. 295) long and slender; subgenitale (Fig. 294) prominent, slender, scarcely lobed.

Male. Abdominal apex as in Fig. 296: ectoproct narrow dorsally, a dorsally curved ventral process with rim irregularly serrate; tergite IX slender; sternite IX long, apex transverse. Genitalia (Figs 297–299): gonarcus with deep lateral arms; arcessus short and poorly defined, apex with narrow median emargination; entoprocessus small, rounded, lateral; parameres (Fig. 299) basally fused, apices not strongly divergent; hypandrium internum (Fig. 300) slender.

Dimensions. FW 8–10, HW 7–9, A 7–8, B 5–6.

Type. Holotype, ♀, 'Australia Mid. Queensl.', 'Type 11939', 'Megalomina acuminata Bks. type' (MCZ). (Seen.)
Other material examined. 8 ex. Queensland: Brisbane. Australian Capital Territory: Canberra. (ANIC.)

Comments. On wing features, some individuals of *M. acuminata* are rather similar to *bridwelli*, and Tillyard's (1916) separation of these species on forewing gradate complement is not always valid. The generally narrower wing of *bridwelli*, and the considerable differences in form of the male ectoproct and genitalia between the two species, are the most reliable features for their separation.

*Megalomina bridwelli* (Tillyard), comb. nov.  (Figs 301-310)

*Oxybiella bridwelli* Tillyard, 1916, p. 305.

Coloration. Brown. Eyes black. Face slightly darkened laterally; vertex mainly yellowish brown, darkened postcrolaterally; palpi greyish brown; scape pale, rest of antenna dark greyish brown. Pronotum with pale median stripe, laterally brown; pterothorax darkened laterally, pale median stripe generally not defined. Abdomen brown. Legs translucent brown; T1, T2 with traces of darker banding on apical half; T4, T5 darker than rest of T. Forewing venation pale reddish brown; R1 darkened at origins of Rs branches; much of membrane pale brown, but distinct hyaline streaks (where veins hyaline) and localised darker brownish grey areas (Fig. 301); gradates pale. Hindwing with much of membrane slightly fumose. Wings narrow and strongly tapered; venation as in Figs 301, 302.

Female. Abdominal apex as in Figs 303, 304: ectoproct ventrally expanded; tergite IX rounded ventrally; gonapophyses laterales small; spermatheca (Fig. 305) slender and coiled; subgenitale long, slightly emarginate.

Male. Abdominal apex as in Fig. 306: ectoproct with slight narrow ventral extension, apex with 1 or 2 small 'pegs'; tergite IX small; sternite IX long and narrow. Genitalia (Figs 307-309): gonarcus very deep laterally, long, with lateral ridges; ?arcessus short, broad, rounded; slight rounded lateral entoproctus; parameres basally fused, a hooked outer lateral projection; hypandrium internum (Fig. 310) small, broad.

Dimensions. FW 8-9, HW 6½-8, A 7-8, B 5-6.

Type. Holotype, ♀, Queensland, Brisbane, Kedron Brook, 12.ix.1915, J. C. Bridwell (BMNH, seen).

Other material examined. 4 ex. Queensland: Killarney (ANIC).

Comments. See under *M. acuminata*. Apparently a rather rarer species, and geographically more restricted.

*Megalomina berothoides* (McLachlan), comb. nov.  (Figs 311-322)

*Drepanepteryx berothoides* McLachlan, 1869, p. 22.


Coloration. Buff, with dark brown to black markings. Eyes black. Face dark brown; vertex predominantly pale, trace of dark lines each side of midline, these sometimes convergent or joined anteriorly; palpi dark brown; antennae with apices of all segments darker than bases. Pronotum with broad pale median stripe, this sometimes obscure anteriorly; sometimes with narrow black median line along posterior half; laterally black; setae black. Pterothorax pale medially; lateral scutal lobes very dark, sometimes velvety black. Abdomen dark. Legs: F and T1, T2 with irregular slightly greyed marks, on T usually as 3 dark bands;
Australian Hemerobiidae (Neuroptera) 371

t5 slightly darker than rest of T. Forewing greyish brown except, sometimes, centrally where ± hyaline; longitudinal veins with alternating dark and pale lengths, R1 particularly dark at origins of Rs branches; some gradates dark. Hindwing fumose towards apex, centrally pale, pterostigma brown; venation brown where membrane fumose, otherwise pale.

Wings strongly falcate, with post apical margin excavated; forewing costal margin sinuous; venation as in Figs 311–314.

**Female.** Abdominal apex as in Fig. 315: ectoproct scarcely broadened ventrally; tergite IX ventrally rounded; gonapophyses laterales large; spermatheca (Figs 316, 317) strongly coiled; subgenitale (Fig. 315) long, moderately broad, apex with narrow deep median emargination.

**Male.** Abdominal apex as in Fig. 318: ectoproct with prominent dorsally curved ventral process, apex serrate; sternite IX long, apex transverse. Genitalia (Figs 319–322): gonarcus broad, lateral flanges deep; arcessus closely associated with gonarcus, broad, apex slightly bilobed; entoprocessus small, rounded; parameres basally fused, slender, no lateral flange; hypandrium internum (Fig. 322) small.

**Dimensions.** FW 8–11, HW 7½–10, A 7–9, B 4–6½.

**Types.** Holotype, ♀, of Drepanepteryx berothoides McLachlan, Melbourne, (BMNH) (abdomen missing but the sex stated by McLachlan; thorax broken and reglued, both hind wings torn). Holotype, ♀, of Drepanomina gibbosa Tillyard, no data (Tillyard 1916: 'Mr Froggatt informs me that it was taken in Victoria') (ANIC). (Both seen.)

**Other material examined.** 28 ex. New South Wales, including Australian Capital Territory; Victoria (Melbourne, Inverleigh, Grampians); South Australia (Adelaide) (AM, ANIC, NMV, SAM, my collection).

**Comments.** Individuals of this species vary slightly in wing shape (Figs 311, 312, cf. 313, 314) and in the complement of gradate veins, but I am confident of the above synonymy. Tillyard (1916) made no reference to McLachlan's species when he erected gibbosa. This seems to be the most common and widely distributed species of Megalomina, and differs markedly in wing shape from the other species in the genus.

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**References**


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Appendix. Checklist of Australian Hemerobiidae, with Summary of Known Distribution in Australia

**Notiobiella** Banks

- **unita** Banks Qld
- **stigmatica** Banks Qld
- **viridis** Tillyard N.T., W.A., Qld, N.S.W.
- **multifurcata** Tillyard Qld

**Psychobiella** Banks

- **sordida** Banks Qld, N.S.W., A.C.T., Vic., Tas.
- **occidentalis**, sp. nov. S.A., ?W.A.

**Psectra** Hagen

- **externa** (Banks) Qld
- **obliqua** (Banks) Qld, N.S.W.
- **franzeni** (Kimmins) Qld
- **claudiensis**, sp. nov. Qld
- **tillyardi** (Kimmins) Qld, N.S.W.
- **nakaharai**, sp. nov. N.S.W., A.C.T., Tas.

**Carobius** Banks

- **angustus** Banks Qld, ?N.S.W.
- **pulchellus** Banks Qld, N.S.W.
- **trifurcatus** Kimmins Qld
- **curvatus**, sp. nov. S.A.
- **spinosus**, sp. nov. W.A.
- **lateproctus**, sp. nov. N.T.
- **pedicellatus**, sp. nov. W.A., S.A.
- **pectinatus**, sp. nov. N.T.
- **elongatus**, sp. nov. N.S.W., A.C.T.

**Notherobius**, gen. nov.

- **nothofagi**, sp. nov. Vic., Tas.
- **nebulosus**, sp. nov. N.S.W.
- **hastatus**, sp. nov. Vic.

**Hemerobius** L.

- **australis** Walker Qld, N.S.W.

**Zachobiella** Banks

- **pallida** Banks Qld
- **submarginata** Esben-Petersen Qld, N.S.W., Vic.
- **lobata**, sp. nov. W.A.

**Micromus** Rambur

- **timidus** Hagen Qld, N.S.W.
- **tasmaniae** (Walker) N.T., W.A., Qld, S.A., N.S.W., A.C.T., Vic., Tas.

**Drepanacra** Tillyard

- **binocula** (Newman) W.A., Qld, S.A., N.S.W., A.C.T., Vic., Tas.

**Megalomina** Banks

- **acuminata** Banks Qld, A.C.T.
- **bridwelli** (Tillyard) Qld
- **berothoides** (McLachlan) S.A., N.S.W., A.C.T., Vic.
Figs 1-7. *Notiobiella* spp. 1-3, *N. unita* Banks: 1, forewing; 2, female, apex of abdomen, lateral; 3, spermatheca. 4-7, *N. stigmatica* Banks: 4, forewing; 5, hindwing; 6, male, apex of abdomen, lateral with insert of sternite IX, ventral; 7, genitalia dorsal, with (upper) lateral aspect of apex. Scales in millimetres.
Figs 8-15. *Notiobiella viridis* Tillyard: 8, male, forewing; 9, hindwing; 10, female, apex of abdomen, lateral; 11, spermatheca; 12-15, male: 12, apex of abdomen, lateral; 13, same, dorsal; 14, genitalic complex, lateral; 15, same, dorsal. Scales in millimetres.
Figs 16–26. Notiobiella multifurcata Tillyard: 16–20, type female: 16, forewing; 17, hindwing; 18, apex of abdomen, lateral; 19, spermatheca; 20, subgenitale; 21–26, male from New Caledonia: 21, forewing; 22, apex of abdomen, lateral; 23, genitalic complex, lateral; 24, same, dorsal; 25, anterior rod (? part of paramere), lateral; 26, hypandrium internum, ventral. Scales in millimetres.
Figs 27–36. *Psychobiella sordida* Banks: 27, forewing; 28, hindwing; 29, female, apex of abdomen, lateral, with insert of subgenitale and gonapophyses, ventral; 30, spermatheca; 31–36, male: 31, apex of abdomen, lateral; 32, gonarcus and arcessus, caudal; 33, same, lateral; 34, parameres and associated sclerites, lateral; 35, same, ventral; 36, hypandrium internum, lateral (upper) and ventral (lower). Scales in millimetres.
Figs 37-46. *Psychobiella occidentalis*, sp. nov.: 37, forewing; 38, hindwing; 39, female, apex of abdomen, lateral; 40, spermatheca; 41, subgenitale; 42-46, male: 42, apex of abdomen, lateral, with insert of sternites VIII, IX, ventral; 43, gonarcus and arcessus, caudal; 44, same, lateral; 45, parameres and associated sclerites, lateral; 46, same, ventral. Scales in millimetres.
Fig. 54–62. Psectra spp. 54–56, P. obliqua from New Hebrides, det. D. E. Kimmins, female: 54, forewing; 55, apex of abdomen, lateral; 56, spermatheca. 57–62, P. franzeni (Kimmins), male: 57, forewing; 58, apex of abdomen, except ectoproct and tergite IX lateral; 59, ectoproct and tergite IX, lateral; 60, gonarcus, lateral (lower) and dorsal (upper); 61, parameres, lateral; 62, hypandrium internum. Scales in millimetres.
Figs 63–73. *Psectra tillyardi* (Kimmins): 63, forewing; 64, hindwing; 65, male, apex of abdomen, lateral; 66, same, ventral; 67, apex of entoprocessus; 68, lateral sclerite, lateral; 69, apical process of tergite VIII, caudal; 70, parameres, ventral; 71, female, apex of abdomen; 72, spermatheca, lateral; 73, same, ventral. Scales in millimetres.
Figs 74–82. *Psectra nakaharai*, sp. nov., female: 74, 76, forewing; 75, 77, hindwing; 78, 81, apex of abdomen, lateral; 79, same, ventral; 80, 82, spermatheca, lateral (74, 75, 78–80, same specimen; 76, 77, 81, 82, same specimen). Scales in millimetres.
Figs 83–89. *Psectra nakaharai*, sp. nov., male: 83, forewing; 84, hindwing; 85, apex of abdomen, lateral; 86, apical process of tergite VIII, posterodorsal; 87, lateroventral sclerites, ventral; 88, gonarcus and parameres, lateral; 89, same, ventral. Scales in millimetres.
Figs 90–93. *Psectra claudiensis*, sp. nov., female: 90, forewing; 91, hindwing; 92, apex of abdomen, lateral; 93, spermatheca.


Scale in millimetres.
Figs 96–104. *Carobius angustus* Banks, holotype male: 96, forewing; 97, hindwing; 98, apex of abdomen, lateral; 99, ectoprocts and tergite IX, dorsal; 100, sternites VIII and IX, ventral; 101, genitalia, lateral; 102, same, dorsal; 103, apex of parameres, ventral; 104, hypandrium internum, ventral. Scale in millimetres.
Figs 105–113. Carobius pulchellus Banks, holotype male: 105, forewing; 106, hindwing, 107, apex of abdomen, lateral; 108, ectoprocts and tergite IX, dorsal; 109, sternite IX, ventral; 110, genitalia, lateral; 111, same, dorsal; 112, parameres, ventral; 113, hypandrium internum, ventral. Scale in millimetres.
Figs 114–124. *Carobius pulchellus* Banks, series determined as *C. subfasciatus* Tillyard: 114, forewing; 115, hindwing; 116, female, apex of abdomen, lateral; 117, spermatheca; 118–124, male: 118, apex of abdomen, lateral; 119, same, dorsal; 120, sternite IX, ventral; 121, genitalia, lateral; 122, same, ventral; 123, same, dorsal; 124, hypandrium internum, ventral.
Figs 125-129. *Carobius pulchellus* Banks: forewings of: 125, type of *C. subfasciatus*; 126, male from Narrabeen, ex Tillyard series of *C. subfasciatus*; 127, female from Bunya Mtn, ex Tillyard collection; 128, male from Toowong, ex Tillyard collection; 129, female from Bulimba det. Tillyard as *C. subfasciatus*. 
Figs 130–139. *Carobius* spp. 130–135. *C. pulchellus* Banks: 130, apex of abdomen, female from Bunya Mtn; 131, spermatheca; 132–134, male from Toowong 132, gonarcus and associated structures, dorsal; 133, genitalia, lateral; 134, parameres, ventral; 135, genitalia, lateral, of Narrabeen male (see legend to 125–129 for forewings of these specimens). 136–139, *C. trifurcatus* Kimmins, holotype male: 136, forewing; 137, apex of abdomen, lateral; 138, gonarcus and associated structures, lateral; 139, parameres, lateral (upper) and dorsal (lower). Scales in millimetres.
Figs 140–148. *Carobius curvatus*, sp. nov., male: 140, forewing; 141, hindwing; 142, apex of abdomen, lateral; 143, ectoprocts and tergite IX, dorsal; 144, sternite IX, ventral; 145, genitalia, lateral; 146, same, dorsal; 147, parameres, ventral; 148, hypandrium internum, lateral (upper) and ventral (lower). Scale in millimetres.
Figs 149–158. *Carobius spinosus*, sp. nov.: 149, forewing; 150, hindwing; 151, apex of abdomen, lateral; 152, spermatheca; 153–158, male: 153, apex of abdomen, lateral; 154, same, dorsal; 155, genitalia, lateral; 156, gonarcus and associated structures, dorsal; 157, parameres and associated structures, ventral; 158, hypandrium internum, lateral (upper) and ventral (lower). Scale in millimetres.
Figs 159–169. Carobius lateproctus, sp. nov.: 159, forewing; 160, hindwing; 161, female, apex of abdomen, lateral; 162, spermatheca; 163–169, male: 163, apex of abdomen, lateral; 164, ectoprocts and tergite IX, dorsal; 165, sternites VIII and IX, ventral; 166, genitalia, lateral; 167, gonarcus and arcessus, dorsal; 168, genitalia, ventral; 169, hypandrium internum, ventral. Scales in millimetres.
Figs 170–180. *Carobius pedicellatus*, sp. nov.: 170, forewing; 171, hindwing; 172, female, apex of abdomen, lateral; 173, spermatheca; 174–180, male: 174, apex of abdomen, lateral; 175, same, dorsal; 176, sternites VIII and IX, ventral; 177, genitalia, lateral; 178, same, dorsal; 179, same, ventral; 180, hypandrium internum, lateral (upper) and ventral (lower). Scales in millimetres.
Figs 182–191. *Carobius pectinatus*, sp. nov.: 181, forewing; 182, hindwing; 183, female, apex of abdomen, lateral; 184, same, ventral; 185, spermatheca; 186–191, male: 186, apex of abdomen, lateral, with insert of sternite IX, ventral; 187, same, dorsal; 188, genitalia, lateral; 189, gonarcus and associated structures, dorsal; 190, parameres (upper) and apex of entoprocessus (lower), ventral; 191, hypandrium internum, ventral (upper) and lateral (lower). Scales in millimetres.
Figs 192-200. *Carobius elongatus*, sp. nov.: 192, forewing; 193, hindwing; 194, female, apex of abdomen, lateral; 195, spermatheca, lateral; 196, same, ventral; 197-200, male: 197, apex of abdomen, lateral, with insert of apex of ectoproct; 198, ectoprocts and tergite IX, dorsal; 199, genitalia, lateral (upper) and dorsal (lower); 200, same, ventral. Scales in millimetres.
Figs 201-208. Notherobius nothofagi gen. et sp. nov.: 201, forewing; 202, hindwing; 203, female, apex of abdomen, lateral; 204, spermatheca; 205-208, male: 205, apex of abdomen, lateral; 206, ectoproct and genitalia, dorsal; 207, genitalia, lateral; 208, parameres, ventral. Scales in millimetres.
Figs 209–215. *Notherobius nebulosus*, sp. nov., male: 209, forewing; 210, hindwing; 211, apex of abdomen, lateral, with insert of sternite IX, ventral; 212, gonarcus and arcessus, lateral; 213, same, posterodorsal; 214, parameres, lateral; 215, same, ventral. Scale in millimetres.
Figs 216–226. *Notherobius hastatus*, sp. nov., male: 216, forewing; 217, hindwing; 218, apex of abdomen, lateral; 219, sternite IX, ventral; 220, ectoprocts and tergite IX, dorsal; 221, apex of tergite IX, lateral; 222, genitalia, lateral; 223, same posteroventral; 224, parameres, ventral; 225, same, lateral; 226, hypandrium internum, lateral (upper) and ventral (lower). Scale in millimetres.
Figs 227-234. *Zachobiella pallida* Banks: 227, forewing; 228, hindwing; 229, female, apex of abdomen, lateral; 230, spermatheca; 231-234, male: 231, apex of abdomen; lateral, with insert of apex of ventral process; 232, tergites VII and VIII, dorsal; 233, genitalia, lateral; 234, apex of arcessus, dorsal. Scales in millimetres.
Figs 235–244. *Zachobiella submarginata* Esben-Petersen: 235, forewing; 236, hindwing; 237, female, apex of abdomen, lateral; 238, spermatheca; 239–244, male: 239, apex of abdomen, lateral; 240, ectoproct bases, dorsal; 241, tergite VIII, dorsal; 242, sternite IX, ventral; 243, genitalia, lateral; 244, same, dorsal. Scale in millimetres.
Figs 245–255. *Zachobiella lobata*, sp. nov.: 245, forewing; 246, hindwing; 247, female, apex of abdomen, lateral; 248, spermatheca; 249–255, male: 249, apex of abdomen, lateral; 250, same, dorsal; 251, apex of sternite IX, ventral; 252, apex of posterior process of tergite VIII; 253, apex of tergite IX; 254, genitalia, lateral; 255, same, dorsal. Scales in millimetres.
Figs 256–263. *Micromus timidus* Hagen: 256, forewing; 257, hindwing; 258, female, apex of abdomen, lateral, with insert of subgenitale, ventral; 259, spermatheca, lateral; 260–263, male: 260, apex of abdomen, lateral; 261, gonarcus and associated structures, lateral; 262, same, dorsal; 263, parameres, lateral (upper) and ventral (lower). Scales in millimetres.
Figs 264–272. *Micromus tasmaniae* (Walker): 264, forewing (N.B. usually only four Rs branches; see Fig. 323); 265, hindwing; 266, female, apex of abdomen, lateral, with inserts of subgenitale in lateral (left) and ventral (right) aspects; 267, spermatheca, lateral; 268–272, male: 268, apex of abdomen, lateral; 269, gonarcus and associated structures, lateral; 270, same, dorsal; 271, parameres, lateral; 272, same, ventral. Scales in millimetres.
Figs 273–281. *Drepanacra binocula* (Newman): 273, forewing; 274, hindwing; 275, female, apex of abdomen, lateral; 276, subgenitale and lateral supporting rods, ventral; 277, spermatheca, lateral; 278–281, male: 278, apex of abdomen, lateral; 279, genitalia, lateral; 280, same, dorsal; 281, hypandrium internum, ventral. Scales in millimetres.
Figs 282, 283. Zachobiella pallida Banks, male: 282, head, lateral; 283, same, dorsal.
Figs 284–291. Drepanacra binocula (Newman), to illustrate variation in forewing pattern of named forms: 284, binocula, cf. type; 285, excisa; 286, longitudinalis; 287, suboculata; 288, hardyi; 289, humilis; 290, bilineata; 291, tasmanica.
Figs 292–300. *Megalomina acuminata* Banks: 292, forewing; 293, hindwing; 294, female, apex of abdomen, lateral; with insert of subgenitale, ventral; 295, spermatheca, lateral; 296–300, male: 296, apex of abdomen, lateral, with inserts of ectoproct apex (above) and sternite IX, ventral (below); 297, genitalia, lateral; 298, same, dorsal; 299, parameres, ventral; 300, hypandrium internum, ventral. Scales in millimetres.
Figs 301–310. *Megalomina bridwelli* (Tillyard): 301, forewing; 302, hindwing; 303, female, apex of abdomen, lateral; 304, same, ventral; 305, spermatheca; 306–310, male: 306, apex of abdomen, lateral with insert of sternite IX, ventral; 307, genitalia, ventral; 308, same, dorsal; 309, parameres, ventral; 310, hypandrium internum, ventral. Scales in millimetres.
Figs 311-314. *Megaloma berothoides* (McLachlan); 311, 313, forewings; 312, 314, hindwings to indicate differences in wing shape.
Figs 323–327. Terminology: 323, forewing of *Micromus tasmaniae* (Walker), to indicate venation, with insert of recurrent humeral vein of, e.g., *Carobius* spp. (rec.); 324, female, apex of abdomen, lateral; 325, male, apex of abdomen, lateral; 326, male genitalia, lateral, with inserts of parameres and hypandrium internum, both ventral; 327, gonarcus and associated structures, dorsal. gl, gonapophyses laterales; sp, spermatheca; sg, subgenitale; a, accessus; e, entoproctus; g, gonarcus; p, parameres; hi, hypandrium internum; ect, ectoproct; t, tergite; s, sternite. Segment Nos in roman numerals; venation in Fig. 323 in standard terminology.