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Australian Journal of Zoology

Best wishes from Ian Bock

Supplementary Series No. 71

Drosophilidae of Australia
III. *Leucophenga* (Insecta : Diptera)

Ian R. Bock

27 June 1979

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Drosophilidae of Australia
III.* *Leucophenga* (Insecta : Diptera)

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Abstract

The Australian species of *Leucophenga* are reviewed. Redescriptions are provided for all species (several previously unknown from Australia are recorded for the first time), and eight additional species are described as new. The total fauna comprises 21 described species, plus several others for which adequate material is not yet available. Sexual dimorphism within the Australian *Leucophenga* fauna ranges from extreme to nil. *Leucophenga* species occur over much of the Australian continent, but appear to be absent from the south-west. The Australian *Leucophenga* fauna probably originated by immigration(s) from the north.

Introduction

After *Drosophila* and *Scaptomyza*, *Leucophenga* is the third largest genus in the family Drosophilidae, with about 170 described species (Lin and Wheeler 1972). The Australian species of *Drosophila* and *Scaptomyza* have been reviewed (Bock 1976, 1977*a*); 81 species of *Drosophila* were included in Bock (1976), but several more have since been discovered (Bock 1977*b*; Bock and Parsons 1978*a*, 1978*b*; Cook *et al.* 1977; Parsons and Bock 1977). Only two species of *Scaptomyza* are known to occur in Australia.

The Australian *Leucophenga* fauna is to date very poorly known. The earliest description of an Australian species (now) referable to *Leucophenga* is the French worker Macquart's (1851) description of *Drosophila albofasciata*, from 'New South Wales'. Apart from a mention by Malloch (1924), who failed to identify any of his specimens to this species (but see 'Special Comments' under *Leucophenga albofasciata* below), Macquart's description has remained unacknowledged and *L. albofasciata* unrecognized as such.

In 1894, the Finnish worker Bergroth described several Australian Diptera including two Drosophilidae. One species, *Drosophila balteata*, is a synonym of the cosmopolitan *D. melanogaster* (Wheeler 1959); the other, *D. bellula*, was listed in Wheeler's (1959) catalogue as transferred to the genus *Leucophenga*, but has otherwise apparently not been mentioned and has remained unrecognized. Both *L. albofasciata* and *L. bellula* are redescribed below; both species also occur in south-east Asia, and were described separately from that region by de Meijere.

Eight further descriptions of *Leucophenga* species from Australia were subsequently published, all by Malloch (1923, 1924, 1925, 1927, 1935). Seven of Malloch's descriptions were based on either one or two specimens; in each of the latter cases

* Part II, *Aust. J. Zool.*, 1977, 25, 337–45.

both specimens were of the same sex (but see 'Special Comments', *Leucophenga albofasciata*), i.e. seven of Malloch's descriptions were based on one sex only. Given that sexual dimorphism within *Leucophenga* is sometimes pronounced, it is not surprising that four of Malloch's descriptions concerned males and females of only two species (discussed below under *L. albofasciata* and *L. scutellata*).

Pronounced sexual dimorphism is a feature of some, although by no means all, species of *Leucophenga*. Substantial sexual dimorphism within the family Drosophilidae is, in fact, rare. In many species there is a simple difference in body size, the male usually smaller than the female. Some species of *Drosophila* are dimorphic in abdominal coloration, and in some groups of *Drosophila* species the males possess modified fore-tarsi. Some *Leucophenga* species, however, are strongly dimorphic both in coloration and in several structural features. In the former category one type of dimorphism consists of a general pollinosity in the males, which is absent or greatly reduced in the females. A second type, which also involves some structural modification, consists of a transverse silvery band across the abdomen of males; this feature is never present in females, which possess a pattern of black spots or stripes on a yellow or brown background. The silvery band of the males usually includes the posterior part of the second tergite, all of the third, and the anterior part of the fourth; the third tergite is reduced in size and largely or entirely desclerotized, while the fourth is hypertrophied; the tergites of the female abdomen are unmodified in length. In many pinned males the third tergite is folded beneath the second and barely visible; it may be inferred that the males are capable of concealing the stripe, presumably emphasizing it during courtship.

Features commonly showing structural dimorphism in *Leucophenga* species are the width of the front and the size of the palps. The frontal width of males of several species is noticeably less than that of females; this type of dimorphism, where present in the Australian species, is associated with one of the colour dimorphisms discussed above. In palpal dimorphism the palps of males are substantially smaller than those of females but bear stronger setation.

Quite apart from dimorphic variation, the taxonomic study of *Leucophenga* species has long been complicated by a degree of intraspecific variability of colour and pattern, especially of the abdomen, considerably greater than that found in species of other drosophilid genera (cf. Wheeler and Takada 1964; Bächli 1971; Lin and Wheeler 1972). Bächli (1971) suggested that polymorphisms account for such variability, but the genetic bases of the variations have not been investigated and, indeed, would not be easily amenable to investigation, since *Leucophenga* species have to date proved impossible to culture.

Given that this genus sometimes shows a high degree of sexual dimorphism, assignment of males and females to one species is necessarily based on occasion on circumstantial evidence. Although in the past this phenomenon has posed difficulties where large numbers of species, or very similar species, have been investigated (Lin and Wheeler 1972), it has not proved a problem in most of those studied in the present investigation, where the fauna reviewed is relatively small and most of the species relatively well differentiated. Appropriate comments regarding recognition of conspecific males and females in dimorphic species are made in the species descriptions below.

Little is known of the ecology of the Australian *Leucophenga* species. Members of the genus are generally believed to be fungivorous (Throckmorton 1975), but this

remains to be demonstrated for many species. Some Australian species are occasionally collected at mushroom baits along with larger numbers of certain *Drosophila* species (Bock and Parsons 1978*b*), while others in the same area are not so attracted and have only been collected by sweeping. The latter finding does not, of course, exclude the possibility of fungal diets; *Drosophila polypori* Malloch, a species never taken at mushroom baits, is known to breed in soft fungi (Bock and Parsons 1978*b*). Parsons (unpublished data) bred out adults of *L. scutellata* Malloch in the laboratory from an ascomycete collected in Bruxner National Park, N.S.W., although this species is not attracted to fungal baits. *Leucophenga* species appear to be most easily collected in rain forests, but they are by no means restricted to them; there are numerous records of collections of several species (especially *albofasciata* and *scutellata*) from non-rain forest areas (see below).

The following revision is based on the extensive collections of the Division of Entomology, CSIRO (Australian National Insect Collection) and the Australian Museum, together with smaller numbers of specimens in the collections of the Department of Genetics and Human Variation at La Trobe University, and in the University of Queensland Department of Entomology.

Genus **Leucophenga** Mik

Leucophenga Mik, 1886, p. 317. Type-species *Drosophila maculata* Dufour, 1839; type locality Europe.

Arista with several straight rays both above and below terminal fork. Front narrow, in several species narrower in male than female. Carina rudimentary or absent. Cheek usually very narrow, with single vibrissa. Eyes very large, bright red, bare. All 3 orbital bristles large, posterior reclinate typically closer to inner vertical than to proclinate orbital. Mesonotum with numerous rows of acrostichal hairs and pair of large prescutellar bristles. Middle sternopleural bristle minute; anterior and posterior sternopleurals large. Anterior scutellar bristles large, divergent. Minute propleural bristles present. Costa reaching only to apex of 3rd longitudinal wing vein or slightly beyond; 3rd costal section with minute ventral thorn-like spines. Preapical bristles present on mid and hind tibiae; apical bristles present on mid tibiae. Claspers of male external genitalia without strong teeth. Egg guides usually highly reduced.

Species Descriptions

Bock (1976) discussed the general form of species descriptions in the genus *Drosophila*. The same procedure is adopted below for *Leucophenga* descriptions except that frontal breadth is expressed as a proportion of the width of the head rather than the ratio of frontal breadth to length. The former ratio permits easier comparison between the sexes in species dimorphic for the character.

Compared to *Drosophila*, the male genitalia of *Leucophenga* species are uniformly simple. The external genitalia consist of a genital arch, a pair of anal plates and a pair of claspers. All structures bear micropubescence and a number of larger bristles, but the claspers never bear the strong, rounded or pointed black 'teeth' usual in *Drosophila*; secondary claspers are never present. The internal genitalia consist of a narrow aedeagus and hypandrium and a pair of parandrites. While species-specific differences may be detected in the male genitalia, especially the internal genitalia, of

Leucophenga species, detailed high-power microscopic examination is required. Since the various species are far more easily separable by reference to characteristics of external morphology, descriptions and figures of male genitalia have not been included in the present study. The egg guides of *Leucophenga* species are similarly, in most cases, highly reduced, consisting only of a minute sclerite with a few small bristles or none. In the following descriptions, mention is made of the egg guides only in species in which they are appreciably developed.

Where strongly dimorphic species are concerned, it has been found simpler to describe males and females separately. Following the descriptions, general comments are offered on the differences between males and females and the evidence for their association, geographic distribution, and any other pertinent features of the species.

There is no universal agreement on a subdivision of the genus *Leucophenga*. The Australian species are considered below in four groupings, which may or may not be 'natural' but which are convenient for purposes of taxonomic treatment. Further comments on relationships, both within the Australian fauna and between the Australian fauna and that of other parts of the world, are offered in the Discussion.

The following abbreviations are used for the locations of specimens discussed in this paper:

AM	Australian Museum, Sydney
ANIC	Australian National Insect Collection, Division of Entomology, CSIRO, Canberra
LT	Department of Genetics and Human Variation, La Trobe University, Melbourne
SPHTM	School of Public Health and Tropical Medicine, University of Sydney
UQ	Department of Entomology, University of Queensland, Brisbane
Amsterdam	Zoologisch Museum, Universiteit van Amsterdam, Amsterdam, Holland
Berlin	Museum für Naturkunde an der Humboldt-Universität, East Berlin, Germany
Paris	Museum National d'Histoire Naturelle, Paris, France
Tokyo	National Science Museum, Tokyo, Japan
Washington	U.S. National Museum, Washington D.C., U.S.A.

Species described by Duda (1923) were stated to be based on collections located in the Hungarian National Museum (Természettudományi Múseum Állattára, Budapest), but according to Papp (personal communication) the Duda specimens, if they still survive, are in Berlin.

Group 1

Species in which the third tergite of the male abdomen is reduced, largely or entirely desclerotized, and largely or entirely white to silvery in colour.

1. *Leucophenga albofasciata* (Macquart)

Drosophila albofasciata Macquart, 1851, p. 277. (Holotype in Paris; type locality New South Wales.)

Drosophila albicincta de Meijere, 1908, p. 156. Syn. nov. (Holotype in Amsterdam; type locality Java.)

Leucophenga leucozona Duda, 1923, p. 29. Syn. nov. (Holotype ? in Berlin; type locality New Guinea.)

Leucophenga niveifasciata Malloch, 1923, p. 614. Syn. nov. (Holotype in AM; type locality Woolgoolga, N.S.W.)

Leucophenga polita Malloch, 1923, p. 615. Syn. nov. (Holotype in AM; type locality Woolgoolga, N.S.W.)

Leucosphenga sp. [*sic*], Bailey and Richards, 1975, p. 103.

Male

Distinguishing features. Front narrow. Inner vertical bristles small; postverticals minute. Ocellar bristles reduced. Halteres apically black. 2nd abdominal tergite with large apical bristles. Abdomen with transverse silvery band.

Body length. *C.* 3.4 mm.

Head. Arista with 6–7 rays above and 3–4 below plus terminal fork. Front *c.* 0.2 breadth of head, tan; periorbits paler; ocellar triangle blackened. 2nd antennal segments tan; 3rd tan, slightly darkened anteriorly. Cheek almost linear, extremely narrow. Palps small, tan, with several large ventral bristles. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital posterolateral and very close to proclinate orbital. Outer vertical bristles as large as posterior reclinate orbitals; inner verticals 0.5 length of outer verticals; postverticals minute. Ocellar bristles $>\frac{1}{2}$ length of proclinate orbitals but fine.

Thorax. Mesonotum tan to dark brown, in some specimens darker centrally. Scutellum usually concolorous with mesonotum, but in several specimens slightly paler about bases of scutellar bristles, in several others darker about bases of anterior scutellars. Pleura paler than mesonotum, with variable small darker area in middle region. Halteres tan with apical black spots. Acrostichal hairs in *c.* 14 irregular rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.7. Legs pale tan.

Wings (Fig. 1). Entirely hyaline. *C*-index *c.* 2.7; 4*V*-index *c.* 1.8; 5*X*-index *c.* 1.2; *M*-index *c.* 0.5. 3rd costal section with heavy setation on basal 0.7. Length *c.* 3.0 mm.

Abdomen (Fig. 2). Tergite 1 pale to dark tan. Tergite 2 usually with black submedian spots of variable size extending from posterior margin almost to anterior margin with remainder of dorsum of tergite (between spots and anteriorly) tan, but in some specimens virtually all dorsum of tergite black; posterior $\frac{1}{10}$–$\frac{1}{5}$ of tergite with superimposed whitish pollinosity; posterior margin with 3–5 usually extremely large bristles on each side, but in small proportion of specimens posterior bristles not greatly enlarged; incurved portions of tergite pale tan. Tergite 3 desclerotized, short, entirely whitish pollinose, in most pinned specimens largely or entirely folded beneath tergite 2. Tergite 4 very long, tan with large black submedian spots and superimposed whitish pollinosity on anterior half; incurved portions black. Tergite 5 black, sometimes with submedian brown patches. Tergite 6 small, black. Colour variation of abdomen ranges from brown and black as described to practically entirely black, but transverse white pollinose band always present.

Female

Distinguishing features. Thorax brown; halteres with apical black spots. Abdominal tergites 3 and 4 with apical black bands extended forwards in midline; remaining tergites otherwise patterned.

Body length. *C.* 3.7 mm.

Head. Arista with 6–7 rays above and 3 below plus terminal fork. Front *c.* 0.35 breadth of head, tan; periorbits paler; ocellar triangle blackened. 2nd and 3rd antennal segments tan. Cheek almost linear, extremely narrow. Orbital bristles in

ratio 3 : 3 : 4; anterior reclinate orbital lateral and very close to proclinate orbital. Vertical and ocellar bristles large; postverticals minute. Palps as in male.

Thorax. As described for male, including variability of mesonotal colour from pale to dark brown, darker centrally.

Wings. As described for male.

Abdomen (Fig. 3). Tergite 1 pale tan. Tergite 2 tan with large lateral black spots; incurved portions tan. Tergite 3 tan with posterior black band of variable width extending forwards in midline; band absent in some specimens on incurved portions of tergite except at extreme edges. Tergite 4 black with anterior submedian tan patches; incurved portions black. Tergite 5 black with pair of submedian and, in some specimens, pair of lateral tan patches; incurved portions of tergite black. Tergite 6 similar to tergite 5. In some specimens abdomen substantially infuscated so that only pattern on tergite 2 clearly evident.

Dimorphism

Head. Front appreciably narrower in male than female. Inner vertical bristles, and to lesser extent ocellar bristles, reduced in male; inner verticals and ocellars not reduced in female.

Abdomen. Male with transverse silvery band; female with black and tan patterning only. Large to very large bristles present on posterior margin of 2nd tergite in male; similar bristles absent in female. Tergite 3 of male short, tergite 4 very long; tergites 3 and 4 of female same length as tergites 2 and 5.

Distribution

The species is widespread, ranging from India across south-east Asia and New Guinea to Australia, and possibly occurs in Africa. Duda (1939) identified a number of African specimens as '*Leucophenga albicincta*', but the species was not detected in the surveys by Burla (1954) or Bächli (1971). Indian records (as *albicincta*) are given by Singh and Gupta (1974). Okada (1966) recorded *L. leucozona* from Nepal, but Okada's species appears to be clearly different from that described by Duda. South-east Asian and New Guinea records appear to be lacking apart from the original descriptions of *albicincta* and *leucozona* and one specimen (female) from New Guinea mentioned by Duda (1923), but the paucity of records from these areas is not surprising in view of the fact that the areas concerned have only been superficially collected. Within Australia the species is widespread across the north of the continent where it appears to be the commonest species of *Leucophenga*; the south-eastern distribution extends well into New South Wales, but it has not been collected in Victoria.

Specimens Examined

Holotypes: *albicincta, niveifasciata, polita.* **Western Australia** (ANIC unless otherwise noted): West Kimberley, D. H. Colless: 8 km S. of Cape Bertholet, 19.iv.1977, 3♂, 1♀, 5 km SSW. of Cape Bertholet, 21.iv.1977, 1♂, Martin's Well (malaise trap), 28.iv.1977, 2♂, 5♀, 1 km S. of Martin's Well, 26.iv.1977, 3♀; The Pool, King River, Wyndham, 10.xi.1929, T. G. Campbell, 12♂, 18♀; Wyndham, 6.iii.1930, T. G. Campbell, 2♂, 5♀; Brock Creek, Burnside, January 1932, T. G. Campbell, 1♂; Beverley Springs HS., Aug. 1974, S. J. Miles, numerous ♂♀ in alcohol (LT); 14°39′S., 126°57′E., Drysdale River, 18–21.viii.1975, I. F. B. Common and M. S. Upton, 1♂; 14°49′S., 126°49′E., Carson Escarpment, 9–15.viii.1975, I. F. B. Common and M. S. Upton, 21♂, 7♀; 15°02′S., 126°40′E., Morgan Falls, 16–17.viii.1975, I. F. B. Common and M. S. Upton,

12♂, 22♀; 15°02'S., 126°55'E., Drysdale River, 3–8.viii.1975, I. F. B. Common and M. S. Upton, 11♂, 10♀. **Northern Territory** (all ANIC): Koongarra, 15 km E. of Mt Cahill, 6–9.iii.1973, D. H. Colless, 10♂, 6♀; Baroalba Creek Gorge, 19 km NE. by E. of Mt Cahill, 18.xi.1972; D. H. Colless, 1♂, 1♀; Baroalba Creek Springs, 19 km NE. by E. of Mt Cahill, D. H. Colless, 28.x.1972, 1♀, 29.x.1972, 1♀, 17.xi.1972, 1♀, 18.xi.1972, 1♂; Nourlangie Creek, 8 km E. of Mt Cahill, D. H. Colless, 26.x.1972, 2♂, 1♀, 27.x.1972, 1♀; Magela Creek, 9 km SSE. of Mudginbarry HS., 6.xi.1972, D. H. Colless, 2♂; Jabaluka Lagoon, 14 km N. of Mudginbarry HS., 13.xi.1972, D. H. Colless, 1♀; 8 km ENE. of Victoria River Downs, 12.viii.1973, L. P. Kelsey, 1♀; Cooper Creek, 11 km S. by W. of Nimbuwah Rock, 1.xi.1972, D. H. Colless, 1♂; Burrell's Creek, Stuart Highway, 24.xi.1972, D. H. Colless, 1♂, 1♀; 48 miles SW. of Daly River, 14°11'S., 130°08'E., 25.viii.1968, M. Mendum, 1♀; 16°34'S., 135°41'E., Leila Creek, 14 km NW. Cape Crawford, 6.xi.1975, M. S. Upton, 3♂, 2♀; Bessie Spring, 16°40'S., 135°51'E., 8 km ESE. of Cape Crawford, 26.x.1975, M. S. Upton, 2♂, 14♀; Surprise Creek, 16°25'S., 136°05'E., 45 km SW. by S. of Borroloola, 5.xi.1975, M. S. Upton, 27♂, 28♀, 15.iv.1976, D. H. Colless, 2♂, 1♀; McArthur River, 16°27'S., 136°05'E., 48 km SW. by S. of Borroloola, 29.x.1975, M. S. Upton, 2♂, 1♀, 14.iv.1976, D. H. Colless, 4♂, 2♀; Bukalara Plateau, 46 km SSW. of Borroloola, 23.iv.1976, J. E. Feehan, 6♂, 2♀; W. of Bukalara Plateau, 23.iv.1976, D. H. Colless, 3♀; Cattle Creek, 16°32'S., 136°10'E., 54 km S. by W. of Borroloola, 27.x.1975, M. S. Upton, 4♂, 13♀; Caranbirini WH., 16°16'S., 136°05'E., 33 km SW. of Borroloola, 3.xi.1975, M. S. Upton, 2♂, 10♀, 22.iv.1976, D. H. Colless, 3♂, 1♀; Batten Creek, 31 km WSW. of Borroloola, 16.iv.1976, D. H. Colless, 1♂, 1♀; 22 km WSW. of Borroloola, D. H. Colless, 16.iv.1976 (at light), 3♀, 17.iv.1976 (malaise trap), 1♂, 1♀; Goose Lagoon, 16°10'S., 136°15'E., 11 km SW. by S. of Borroloola, 31.x.1975, M. S. Upton, 1♂, 6♀, 17.iv.1976, D. H. Colless, 1♂, 1♀; 16°08'S., 136°06'E., 22 km WSW. of Borroloola, 2.xi.1975, M. S. Upton, 16♂, 35♀; 16°19'S., 136°05'E., 36 km SW. of Borroloola, 4.xi.1975, M. S. Upton, 1♂, 1♀; 15°58'S., 136°21'E., 12 km NNE. of Borroloola, 1.xi.1975, M. S. Upton, 1♂. **Queensland** (ANIC unless otherwise noted): 11°40'S., 142°50'E., Captain Billy Creek, Cape York, 9–13.vii.1975, G. Monteith, 1♂; Claudie River near Mt Lamond (malaise trap), 18.xii.1971, D. K. McAlpine and G. Holloway, 17♀ (AM); 7–14 miles W. of Herberton via Watsonville, 1.v.1967, D. H. Colless, 1♂; Mt Garnet Rd, 13 miles W. of Ravenshoe, 2.v.1967, D. H. Colless, 1♂; 9 miles W. of Paluma, 19.iv.1969, P. Ferrar, 1♂, 3♀; Ingham (light trap), 15.iii.1961, K. L. Harley, 1♂; Townsville (in house), I. R. Bock, 11.v.1976, 1♂, 1♀, 22.v.1976, 1♂, 1♀, 21.ix.1976, 3♂, 2♀ (LT); Macrossan, Burdekin River, 10.vi.1958, T. G. Campbell, 1♀; 63 miles N. of Marlborough, 9.v.1955, K. R. Norris, 1♀; Don River, Dululu Rd, 1.v.1947, I. M. Mackerras, 1♀; Darr River, 31 km NW. by N. of Longreach, 7.iv.1976, D. H. Colless, 1♀; Carnarvon Gorge, 29.v.1954, F. A. Perkins, 1♂, 1♀ (UQ); Eidsvold, 29.iv.1930, T. L. Bancroft, 1♂; Eidsvold, Dec. 1922, K48519, 1♂ (AM); Charleville, 9.i.1963, D. E. Havenstein, 1♂; Noondoo, 26.ii.1963, A. L. Dyce and M. D. Murray, 5♂, 2♀; Mt Walsh National Park, Biggenden, 7.xii.1971, H. Frauca, 6♂, 5♀; Bin Bin Range via Didcot, W. of Biggenden, Dec. 1974, H. Frauca, 17♂, 17♀; near Rosewood (brigalow scrub), 29.xii.1961, R. Lindsay, 1♀; Stanthorpe, 25.ii.1925, 2♂, 7.x.1925, 3♂, 2♀ (UQ); Deception Bay, 23.iii.1954, 2♂, 9♀ (UQ); Samford, 19.xii.1961, R. Lindsay, 3♀; Albert River, 1939, 1♂ (UQ); Cash's Crossing, 16.x.1956, A. Diatloff, 1♂ (UQ); Brisbane, various dates, 7♂, 2♀ (UQ). **New South Wales** (AM unless otherwise noted): Cattai Creek, near Windsor, 26.v.1928, A. Musgrave, 27♂, 12♀; Windsor, 12.iii.1927, B. Bertram Collection, 1♂; Kurrajong, 19.xii.1954, A. Musgrave, 11♂, 13♀; Mt Wilson, Blue Mts, 17.iii.1972, D. K. McAlpine, 1♂; 2 miles S. Mendooran, 1–3.v.1970, D. K. McAlpine and G. Holloway, 1♂; Goonoo State Forest, 5 miles S. Mendooran, 24.iii.1971, D. K. McAlpine, 1♂, 1♀; 4.8 km S. Kioloa, N. of Durras, 3.x.1971, Z. Liepa, 1♂ (ANIC); rain forest, Iluka, Clarence River, 25.xi.1970, D. K. McAlpine, 1♀; Wahroonga, Sept. 1955, A. Musgrave, 1♀; Bronte, near Sydney, 12.iv.1956, D. K. McAlpine, 1♀; Australian Museum, Sydney, 4.v.1956, D. K. McAlpine, 1♀. **Australian Capital Territory** (all ANIC): Canberra, 10.x.1950, Paramonov leg., 1♀; Black Mtn (light trap), I. F. B. Common, 22.iii.1955, 1♀, 16.iv.1955, 2♀.

Special Comments

The synonymy of this species is rather complicated, partly because the descriptions of the early workers were extremely brief and insufficient to permit accurate comparisons with actual specimens. Malloch (1923) remarked that his *niveifasciata* seemed to resemble de Meijere's *albicincta*, but Malloch believed the two species to

be distinct because de Meijere had not mentioned the very distinctive large bristles on the second abdominal tergite. The latter bristles are, however, certainly present in de Meijere's holotype male. Later, Malloch (1924) quoted Macquart's description *in extenso*, but failed to associate it with his *niveifasciata*. Curiously, however, he suggested that *albofasciata* could be the same species as Duda's *leucozona*; Duda's description clearly mentions the large bristles on the second abdominal tergite, although Macquart's does not. Duda described *L. leucozona* on the basis of a single specimen 'strongly enveloped in cobweb', but his more extensive description matches specimens determined by Malloch as *niveifasciata* quite well. Duda did not, however, associate his *leucozona* with de Meijere's *albicincta*, even though he examined the Amsterdam collection (de Meijere's material consisted of the holotype male and one additional female), and identified a further female from New Guinea to *albicincta*. The two 'species' were keyed to alternate sections of couplet 22 in Duda's (1924*a*) key to the Oriental *Leucophenga* species, but the characters given for *albicincta* are those of the female while those given for *leucozona* are those of the male. It is quite evident from Duda's writings (1923, 1924*a*) that he was greatly confused by the sexual dimorphisms in some *Leucophenga* species. Duda was apparently unaware of Macquart's description of *albofasciata*, although, strangely, he mentioned (Duda 1923) a Vietnamese *Leucophenga* also described by Macquart in an earlier paper. Malloch described male and female, both from the same locality, as separate species, but a misidentification of sex apparently contributed to the error; Malloch believed that his two type specimens of *niveifasciata* were male and female when in fact both were male; his single specimen of *polita* was a female.

In spite of the pronounced dimorphism in the species, recognition of males and females of *L. albofasciata* as conspecific is simplified by the occurrence in Australia of only one other species, *L. scutellata*, with which they are likely to be confused; there are many similarities between the two species but both sexes of *scutellata* possess distinct basal black spots on the scutellum. Convincing circumstantial evidence for the association of *albofasciata* males and females is the collection of the two sexes, but no other *Leucophenga* specimens, simultaneously at the one locality. Bailey and Richards (1975) reported numerous males and females (here all identified as *L. albofasciata*) swarming about a deep hole in the ground in north-western Western Australia. At many of the other localities listed above, both sexes of *albofasciata* were taken simultaneously, but no other *Leucophenga* specimens were noted.

2. *Leucophenga scutellata* Malloch

Leucophenga scutellata Malloch, 1923, p. 614. (Holotype in AM; type locality Sydney.)
Leucophenga conjuncta Malloch, 1924, p. 350. Syn. nov. (Holotype in AM; type locality unknown.)

Male

Distinguishing features. Front narrow. Inner vertical bristles reduced; ocellar bristles greatly reduced; postvertical bristles minute. Scutellum with basal lateral black spots. Halteres apically black. Abdomen with transverse silvery stripe.

Body length. *C.* 3.8 mm.

Head. Arista with 5–7 rays above and 2–3 below plus terminal fork. Front *c.* 0.25 breadth of head, tan; periorbits slightly paler; ocellar triangle blackened.

2nd and 3rd antennal segments tan. Cheek slightly curved, extremely narrow. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital posterolateral to proclinate orbital. Inner vertical bristles *c.* 0.5 length of outer verticals. Ocellar bristles very short, fine. Postvertical bristles minute.

Thorax. Mesonotum pale to mid-tan; pleura paler. Scutellum tan with large basal lateral black spots (anterior scutellar bristles arising within); scutellar margin in most specimens whitened posterior to basal black spots. Halteres tan with apical black spots. Acrostichal hairs in *c.* 14 irregular rows in front of dorsocentral bristles, *c.* 12 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.45. Sterno-index 0.75. Legs pale tan.

Wings. Entirely hyaline. *C*-index *c.* 2.7; 4*V*-index *c.* 1.8; 5*X*-index *c.* 1.0; *M*-index *c.* 0.4. 3rd costal section with heavy setation on basal 0.7. Length *c.* 3.7 mm.

Abdomen (Fig. 4). Tergite 1 tan. Tergite 2 with narrow anterior median tan patch sometimes extending posteriorly in midline, dorsum otherwise black, posterior $\frac{1}{3}$ with whitish pollinosity; incurved portions of tergite tan anteriorly, whitish pollinose posteriorly. Tergite 3 desclerotized, entirely whitish pollinose. Tergite 4 long, black, with whitish pollinosity on anterior $\frac{1}{3}$ and tiny median posterior tan patch; incurved portions of tergite black. Tergite 5 black, in most specimens with submedian and lateral tan patches; incurved portions black. Tergite 6 tan centrally, black laterally.

Female

Distinguishing features. Thorax tan; scutellum with lateral basal black spots; halteres tan with apical black spots. 2nd abdominal tergite tan with lateral black spots; 3rd–5th tergites tan with posterior black bands extended forwards in midline.

Body length. C. 3.9 mm.

Head. Arista with 6–7 rays above and 2–3 below plus terminal fork. Front *c.* 0.3 breadth of head, tan; ocellar triangle blackened. 2nd and 3rd antennal segments tan. Cheek curved, very narrow. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital posterolateral to proclinate orbital. Inner vertical bristles 0.7 length of outer verticals. Ocellar bristles same size as inner verticals. Postverticals very small.

Thorax. As described for male.

Wings. As described for male.

Abdomen (Fig. 5). Tergite 1 tan. Tergite 2 tan with lateral black patches; incurved portions tan. Tergites 3–5 each tan with posterior black band of variable width, extended forwards in midline almost to anterior margin of tergite, slightly widened laterally; incurved portions tan, then black at extremities. Tergite 6 tan centrally, black laterally.

Dimorphism

Head. Front narrower in male than female. Inner vertical bristles smaller in male than female. Ocellar bristles greatly reduced in male, slightly reduced in female.

Abdomen. Male with transverse pollinose band; female with black and tan patterning only. Apical bristles on tergites of male slightly larger than those of female. Tergite 3 of male short, tergite 4 long; tergites 3 and 4 of female same length as tergites 2 and 5.

Distribution

L. scutellata is widespread in northern and eastern Australia, from the Northern Territory and north Queensland to central New South Wales; its distribution is thus substantially coextensive with that of *L. albofasciata*, but the latter species also occurs in the north of Western Australia. There are no records of the existence of *L. scutellata* in south-east Asia or New Guinea, a surprising situation in view of its relatively widespread occurrence in northern Australia.

Specimens Examined

Holotypes: *scutellata, conjuncta.* **Northern Territory** (all ANIC): Casuarina Beach, Darwin, 22.x.1972, D. H. Colless, 6♂, 8♀; Koongarra, 15 km E. of Mt Cahill, 6–9.iii.1973, D. H. Colless, 1♂, 1♀; Koongarra, Airfield Rd, 16 km E. by N. of Mt Cahill, 10.iii.1973, D. H. Colless, 1♀; Baroalba Creek Springs, 19 km NE. by E. of Mt Cahill, D. H. Colless, 29.x.1972, 10♂, 7♀, 16–17.xi.1972, 8♂, 1♀, 13.vi.1973, 4♂, 5♀; Baroalba Creek Gorge, 19 km E. by N. of Mt Cahill, D. H. Colless, 18.xi.1972, 6♂, 6♀, 14.vi.1973, 1♂, 1♀; Howard Springs, June 1964, K. R. Norris, 11♂, 8♀; Cooper Creek, 19 km E. by S. of Mt Borradaile, D. H. Colless, 2.xi.1972, 1♀, 10.xi.1972, 5♂, 2♀; 8 km SW. by S. of Oenpelli Mission, 6–7.vi.1973, D. H. Colless, 2♂, 2♀; Magela Creek, 2 km N. of Mudginbarry HS., 15.xi.1972, D. H. Colless, 1♀. **Queensland:** Dividing Range, 15 km W. of Captain Billy Creek, Cape York Peninsula, 11° 40'S., 142° 45'E., 4–9.vii.1975, S. R. Monteith, 1♂, 1♀ (ANIC); Claudie River near Mt Lamond, 31.v.1966, D. K. McAlpine, 1♂, 15–18.xii.1971 (ex malaise trap), D. K. McAlpine and G. Holloway, 3♀ (AM); Leo Creek Rd, *c.* 500 m, McIlwraith Range, 30 km NE. of Coen, 29.vi–4.vii.1976, G. B. and S. R. Monteith, 1♂, 1♀ (ANIC); Mossman Gorge, 23.iv.1967, D. H. Colless, 1♂ (ANIC); 5–8 miles Mt Lewis Rd, off Mossman–Mt Molloy Rd, 22.iv.1967, D. H. Colless, 1♂ (ANIC); Kuranda Range State Forest, 7–8 miles Black Mountain Rd, 20.iv.1967, D. H. Colless, 3♂, 1♀ (ANIC); Kuranda, D. K. McAlpine, 17.v.1958, 1♂, 20.v.1958, 1♀, 22.v.1958, 1♂, 24–25.xii.1958, 4♀ (AM); 2 miles W. of Kuranda, 7.v.1967, D. H. Colless, 2♂, 1♀ (ANIC); 3 miles W. of Kuranda–Mareeba Rd, 3.v.1967, D. H. Colless, 1♂ (ANIC); Mulgrave River, 4 miles W. of Gordonvale, 1–13.i.1967, D. K. McAlpine and G. Holloway, 1♂, 5♀ (AM); Upper Mulgrave River, 10 miles Goldsborough Rd, 9.v.1967, D. H. Colless, 1♂ (ANIC); Goldsborough–Mulgrave Forest Rd, *c.* 20 km Gillies Highway, swept rain forest, Aug. 1976, I. R. Bock, 1♂ (LT); Gillies Highway 2 miles W. of Little Mulgrave, 18.iv.1967, D. H. Colless, 3♂, 2♀ (ANIC); Finch Hatton Gorge, 8.xii.1961, McAlpine and Lossin, 1♂, 2♀ (AM); Head of Clohessy River, Atherton Tableland, 20.v.1958, D. K. McAlpine, 1♂ (AM); Tinaroo Falls Dam (open savannah), 27.iv.1967, D. H. Colless, 4♂, 3♀ (ANIC); Summit, Walter Hill Range, Cardstone–Ravenshoe Rd, 16.i.1967, D. K. McAlpine and G. Holloway, 1♂ (AM); 7–14 miles W. Herberton, via Watsonville, 1.v.1967, D. H. Colless, 3♂, 3♀ (ANIC); Speewah Rd, 5 miles S. Kuranda, 12.i.1967, D. K. McAlpine and G. Holloway, 1♂, 1♀ (AM); Rocky Creek, 7 miles N. Atherton, 3.v.1967, D. H. Colless, 1♂, 2♀ (ANIC); Rocky River, riverine forest, 19.vi.1960, C. N. Smithers, 1♂ (AM); Mt Edith Forest Rd, 1½ miles off Danbulla Rd, 6.v.1967, D. H. Colless, 1♀ (ANIC); Mt Garnet Rd, 13 miles W. Ravenshoe, 2.v.1967, D. H. Colless, 1♀ (ANIC); Wongabel State Forest, 7.v.1967, D. H. Colless, 2♂, 4♀ (ANIC); Yungaburra (State Forest 452), 29.iv.1967, D. H. Colless, 1♂ (ANIC); Malanda, K. R. Norris, 11.iii.1944, 1♀, 7.iv.1944, 1♂ (ANIC); Barron Falls, 21.v.1958, D. K. McAlpine, 1♀ (AM); Earl Hill, N. of Cairns, 8.v.1967, D. H. Colless, 1♂, 1♀ (ANIC); Crystal Cascades, Cairns, 19.iv.1967, D. H. Colless, 6♂, 1♀ (ANIC); Behanna Creek near Aloomba, 25.v.1958, D. K. McAlpine, 1♀ (AM); Bamboo Creek, near Miallo, N. of Mossman, 25.iv.1967, D. H. Colless, 1♂, 1♀ (ANIC); Big Mitchell Creek, Mareeba–Molloy Rd, 4.v.1967, D. H. Colless, 1♀ (ANIC); Mt Garnet Rd, 13 miles W. of Ravenshoe, 2.v.1967, D. H. Colless, 1♂ (ANIC); Kirrama, sweeping, July 1975, I. R. Bock, 1♂, 2♀ (LT); Bramston Beach, near Innisfail, 30.iv.1967, open savannah, D. H. Colless, 1♀ (ANIC); Townsville, 27.xi.1925, B. Brett, 1♂ (UQ); Broken River, Eungella, 9.xii.1961, McAlpine and Lossin, 1♂, 1♀

(AM); St Helen's Creek, Mackay District, 13.xii.1961, D. K. McAlpine, 1♂ (AM); Yeppoon, 10.v.1955, K. R. Norris, 1♂ (ANIC); Ayr, 19.xii.1951, J. H. Southern, 1♂ (UQ); Coppermine Creek, 67.5 km N. of Marlborough, 5.vii.1971, Z. Liepa, 1♂, 1♀ (ANIC); Bundaberg, H. Frauca, July 1971, 1♂, 25.v.1973, 1♂ (ANIC); North Bundaberg, H. Frauca, 21.iii.1972, 1♂, 3.vi.1972, 1♂ (ANIC); Pinock River Gorge, Hogback Range, WSW. of Bundaberg, 4.vi.1972, H. Frauca, 1♀ (ANIC); Wombye, near Nambour, 11–16.x.1965, D. H. Colless, 2♀ (ANIC); Montville, 12.v.1937, F. W. Grogan, 1♂ (UQ); Hidden Canyon, Bluff Range, west slope, near Biggenden, 22.viii.1975, H. Frauca, 1♂ (ANIC); Beerburrum Creek, Beerburrum, 23.v.1966, Z. Liepa, 1♂ (ANIC); Carnarvon Gorge, 29.v.1954, F. A. Perkins, 2♂ (UQ); Glasshouse Mts, 28.viii.1964, J. McEvoy, 1♂ (UQ); Stanthorpe, 8.i.1925, 1♂, 1♀ (UQ); Mt Mee Forestry Reserve, 20.xi.1965, G. Monteith, 1♀ (UQ); Lawes, 15.i.1957, G. Dietloff, 1♂ (UQ); Maleny, May 1936, 1♂ (UQ); Samford, 19.xii.1961, R. Lindsay, 1♀ (ANIC); Deception Bay, 23.v.1966, Z. Liepa, 1♀ (ANIC); Clayton Gully, 2½ miles E. Cunningham's Gap, 1.vi.1966, Z. Liepa, 1♀ (ANIC); Canungra, 28.iii.1937, G. L. Wilson, 1♂ (UQ); Mt Tamborine, 17.ii.1960, F. A. Perkins, 1♂ (UQ); Lamington National Park, 14–20.ii.1938, I. C. Yeo, 1♂, 29.x.1955, F. A. Perkins, 1♂, 24.v.1962, I. Cunningham, 1♂ (UQ); Brisbane, various dates, 6♂, 2♀ (UQ). **New South Wales:** Brockelos Creek 16.5 km S. of Bermagui, 24–27.ii.1974, Z. Liepa, 6♂, 10♀ (ANIC); Brunxer Park: 11.x.1962, D. H. Colless, 1♂, 1♀, 25.vi.1976, Z. Liepa, 2♀, 19.iv.1970, D. H. Colless, 2♀ (ANIC), D. K. McAlpine, 2.iv.1960, 3♂, 21.ii.1965, 1♂, 8♀ (AM), bred from fungus, 3.ii.1976, P. A. Parsons, 3♂, 3♀ (LT); c. 2 miles NW. of Bruxner Park, 16.iv.1970, D. H. Colless, 3♂, 3♀ (ANIC); 18 miles Dorrigo–Coramba Rd, 18.iv.1970, D. H. Colless, 1♀, 33 miles Dorrigo–Coramba Rd, 2♂, 2♀, 36 miles Dorrigo–Coramba Rd, 1♀ (ANIC); 15 miles N. Putty, 15.x.1962, D. H. Colless, 1♀ (ANIC); Colo Vale, 21.ix.1960, D. H. Colless, 1♀ (ANIC); Barrington House, 92 km NE. of Singleton (swamp), 28.vi.1976, Z. Liepa, 1♂, 8♀ (ANIC); Barrington House via Salisbury, 17–20.xii.1967, A. Macqueen, 1♂, 1♀ (UQ); Salisbury, 1–5.xi.1957, F. A. Perkins, 1♂, 3♀ (UQ); Barrington Tops, 7.iv.1949, E. F. Riek, 1♂ (ANIC); Minnamurra Falls, D. H. Colless, 5.vii.1961, 1♂, 1♀, 31.i.1962, 1♀, 28.v.1963, 1♀ (ANIC); Tookoom, 27.x.1925, 1♀ (UQ); Palm Creek, Royal National Park, D. H. Colless, 29.xii.1960, 2♂, 2♀, 1.ii.1962, 1♂, 1♀, 22.vii.1963, 2♀ (ANIC); Royal National Park, D. K. McAlpine, 13.vii.1971, 2♂, 3♀ (AM), National Park, D. K. McAlpine, various dates, 3♂, 10♀ (AM); Wallaroo State Forest (north coast), 10.x.1962, D. H. Colless, 2♂ (ANIC); Dorrigo National Park, 30.iii.1960, D. K. McAlpine, 1♀ (AM); Cheviot Hills, 20.iv.1958, K. R. Norris, 1♂ (ANIC); 30 miles S. of Singleton, Putty Rd, 6.ii.1968, D. H. Colless, 1♂, 1♀ (ANIC); Colo River, Putty Rd, 29.vi.1976, Z. Liepa, 1♂ (ANIC); Bellinger River, 16.xi.1964, D. K. McAlpine, 2♂, 4♀ (AM); The Island, Bellingen, 29.iii–1.iv.1960, D. K. McAlpine, 2♂, 1♀ (AM); Halfway Creek, 18 miles S. Grafton, 27.xi.1970, D. K. McAlpine, 1♂ (AM); Whian Whian State Forest near Lismore, 25.ii.1965, D. K. McAlpine, 1♂ (AM); Upper Allyn near Eccleston, D. K. McAlpine, 4.v.1967, 1♀, 12.xii.1969, 1♂ (AM); Moonpar State Forest near Dorrigo, 4.iv.1960, D. K. McAlpine, 1♂ (AM); Deep Creek, Narrabeen, 25.viii.1962, D. H. Colless, 2♀ (ANIC); 6 km W. Coramba, 26.vi.1976, Z. Liepa, 1♀ (ANIC); Porter's Dam Rd, 16 km NW. Milton, 9.ii.1974, Z. Liepa, 1♀ (ANIC); Cabbage Tree Creek, Clyde Mountain, 1.ii.1973, D. H. Colless, 1♀ (ANIC); Huonbrook near Mullumbimby, D. K. McAlpine, 4.xii.1961, 1♀, 2.iii.1965, 1♂, 1♀ (AM); Turramurra, 5.vii.1971, D. Clyne, 1♂ (AM); Otford, 18.i.1964, D. K. McAlpine, 1♂, 3♀ (AM); Mt Keira, 4.xi.1956, E. F. Riek, 1♂ (ANIC); Clyde Mountain, 19.iii.1966, C. Totterdell, 1♂ (ANIC); Scotts Head, near Warrell Creek, 13.ii.1968, D. H. Colless, 1♀ (ANIC); 9 km SE. of Batemans Bay, 17.v.1975, Z. Liepa, 1♂ (ANIC); Oxford Falls, 22.iv.1956, D. K. McAlpine, 1♂ (AM); Johnson's Hill, Myall Lakes, 27.vi.1964, D. K. McAlpine, 1♀ (AM); Nightcap National Park near Mullumbimby, 29.i.1961, D. K. McAlpine, 1♀ (AM); Pacific Highway 1 mile S. Hawkesbury River, 29.ix.1956, D. K. McAlpine, 1♀ (AM); Wilson River Reserve via Bellangry, 26.xi.1966, D. K. McAlpine, 7♂ 4♀ (AM); Springwood, Blue Mountains, 10–30.i.1956, D. K. McAlpine, 5♂, 7♀ (AM); Sassafras Gully, Springwood, D. K. McAlpine, 23.iv.1955, 1♀, 23.ix.1972, 4♀, 25.ix.1972, 4♂ (AM); Mt Wilson, Blue Mountains, 15.iv.1971, D. K. McAlpine, 1♀, 30.iii.1976, D. K. McAlpine and M. A. Schneider, 1♀ (AM); Mt Keira, near Wollongong, 9.v.1970, D. K. McAlpine and G. Holloway, 1♀, G. A. Holloway, 4.vi.1971, 1♀, 6.v.1972, 1♀ (AM); McGarr's Creek, Ku-ring-gai Chase, 23.ix.1962, D. H. Colless, 1♀ (ANIC); Bronte, near Sydney, 14.iv.1956, D. K. McAlpine, 1♂ (AM); Manly Reservoir, Sydney, D. H. Colless, 3.iv.1961, 1♂, 21.vii.1963, 1♀ (ANIC). **Australian Capital Territory:** Ginninderra Falls, 28.ii.1962, D. H. Colless, 1♀ (ANIC).

Special Comments

Malloch based his descriptions of *L. scutellata* and *L. conjuncta* on two females and two males respectively. Association of males and females to the one species has here been based on the fact of their simultaneous occurrence and collections at many sites, as well as the morphological similarities between the sexes in such features as scutellar patterning. As mentioned above, Parsons bred out three females of '*scutellata*' and three males of '*conjuncta*' from one ascomycete collected in nature.

L. scutellata seems to be closely related to *L. albofasciata.* The males of both species possess the silvery abdominal band, and the other dimorphic differences (narrower front and reduced inner vertical and ocellar bristles in the male) are similar in the two species.

3. *Leucophenga gibbosa* (de Meijere)

Drosophila gibbosa de Meijere, 1914, p. 264. (Holotype in Amsterdam; type locality Java.)

Male and Female

Distinguishing features. Front infuscated. Wings with strong dusky tinge. Thorax dark brown; halteres with apical black spots. Abdomen largely black; male with transverse silvery stripe.

Body length. Range *c.* 3.0–5.0 mm, most specimens large.

Head. Arista with 6–10 rays above and 3–5 below plus small terminal fork. Front dusky dark tan; periorbits slightly silvery; ocellar triangle blackened. Breadth of front *c.* 0.27 breadth of head in male, *c.* 0.30 breadth of head in female. 2nd and 3rd antennal segments tan, darker anteriorly. Cheek almost linear, extremely narrow. Orbital bristles in ratio 3 : 4 : 5; anterior reclinate orbital lateral to proclinate orbital. Inner vertical bristles *c.* 0.7 length of outer verticals in both sexes; ocellar bristles slightly shorter in male. Postverticals very small, crossed.

Thorax. Mesonotum and scutellum mid-brown; pleura paler in most specimens. Halteres dark tan with apical black spot. Acrostichal hairs irregular, *c.* 20 rows in front of dorsocentral bristles, *c.* 10 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs tan.

Wings. (Fig. 6). Translucent with strong dusky tinge, more intense towards costa. *C*-index *c.* 2.4; 4*V*-index *c.* 1.9; 5*X*-index *c.* 1.1; *M*-index *c.* 0.5. 3rd costal section with heavy setation on basal *c.* 0.8. Length in range 2.6–4.0 mm.

Abdomen. Tergite 1 tan. Tergite 2 narrowly tan anteriorly and in midline; bulk of dorsal portion of tergite black; posterior border of tergite tan in female, silvery in male; innermost portions of incurved parts of tergite tan. Tergite 3 in male short, largely desclerotized, silvery, with few bristles on posterior border on each side. Tergite 3 in female tan on up to anterior $\frac{1}{4}$ (variable), otherwise entirely black, with large bristles along posterior margin. Tergite 4 in male very long, black, with strong silvery pollinosity superimposed on anterior $\frac{1}{3}$. Tergite 4 in female tan on up to anterior $\frac{1}{2}$ (variable), otherwise black, with sparse large bristles along posterior border. Tergite 5 black, in some specimens (more often males) with small central posterior tan patch. Tergite 6 largely tan, black anterolaterally.

Dimorphism

Head. Front slightly narrower in male than female. Ocellar bristles only slightly smaller in male than female.

Abdomen. Male abdomen with transverse pollinose stripe; female abdomen black, or largely black with tan bands anteriorly on tergites 2–4. Tergite 3 of male short (usually concealed beneath tergite 2); tergite 4 long. Tergites 3 and 4 of female similar in length to tergites 2 and 5. Tergites 3 and 4 of female only with large posterior bristles.

Distribution

Within Australia, *L. gibbosa* appears to be restricted to rain-forest habitats in Queensland and New South Wales. De Meijere's holotype and two further specimens in Amsterdam, all from Java, and a single female collected in West Malaysia (Takada and Momma 1975) appear to be the only other records of the species. Recent collecting has revealed that *L. gibbosa* is present in New Guinea (Bock and Parsons, unpublished data).

Specimens Examined

Holotype. **Queensland:** Claudie River, 5 miles W. of Mt Lamond, 23.xii.1971, D. K. McAlpine, G. Holloway and D. P. Sands, 1♀ (AM); Mossman Gorge, 23–24.iv.1967, D. H. Colless, 2♂, 1♀ (ANIC); Finch Hatton Gorge, 8.xii.1961, McAlpine and Lossin, 1♀ (AM); The Crater near Herberton, 4.i.1967, D. K. McAlpine and G. Holloway, 4♂, 1♀ (AM); Fisher Creek, Palmerston Highway, 30.iv.1967, D. H. Colless, 1♂ (ANIC); Kuranda, D. K. McAlpine, 20.v.1958, 1♀, 28.xii.1958, 1♂ (AM); Summit, Walter Hill Range, Cardstone–Ravenshoe Rd, 16.i.1967, D. K. McAlpine and G. Holloway, 1♂, 2♀ (AM); Kuranda Range State Forest, 7–8 miles Black Mountain Rd, 20.iv.1967, D. H. Colless, 2♂ (ANIC); Tolga, 5.iii.1961, R. Straatman, 1♀ (ANIC); Mt Edith Forest Rd, 1 mile off Danbulla Rd, 6.v.1967, D. H. Colless, 1♀ (ANIC); Wongabel State Forest, 7.v.1967, D. H. Colless, 1♀ (ANIC); Mulgrave River, 4 miles W. Gordonvale, 21.v.1966, D. K. McAlpine, 1♂, 1♀ (AM); Upper Mulgrave River, 10 miles Goldsborough Rd, 9.v.1967, D. H. Colless, 2♂, 3♀ (ANIC); Thornton Range, Hutchinson Creek, 7.i.1967, D. K. McAlpine and G. Holloway, 1♀ (AM); Paluma, 17.iv.1976, I. R. Bock, 2♂, 4♀ (LT); Paluma, 17.i.1967, D. K. McAlpine and G. Holloway, 1♂ (AM); Birthday Creek near Paluma, 18.i.1967, D. K. McAlpine and G. Holloway, 4♂, 5♀ (AM); St Helen's Creek, Mackay District, 13.xii.1961, D. K. McAlpine, 2♀ (AM); Crediton Creek near Eungella, 12.xii.1961, McAlpine and Lossin, 1♂, 2♀ (AM); Broken River, Eungella, 9.xii.1961, McAlpine and Lossin, 3♂, 3♀ (AM); Byfield, 10.v.1955, Common and Norris, 1♀ (ANIC); Mt Tamborine, 20.xii.1961, McAlpine and Lossin, 1♀ (AM); Tamborine, 15.ii.1960, F. A. Perkins, 2♂, 1♀, January 1961, J. H. Bryan, 1♂ (UQ). **New South Wales** (AM unless otherwise noted): Legume, 8.iv.1925, 1♀ (UQ); Dorrigo National Park, 2200 ft, MV lamp, 26.i.1970, G. Holloway, 1♂; Bruxner Park near Coffs Harbour, 21.ii.1965, D. K. McAlpine, 1♂; Upper Allyn near Eccleston, 13.xii.1969, D. K. McAlpine, 1♂; Iluka, Clarence River, 18.i.1971, D. K. McAlpine and A. Hughes, 1♀; Wilson River Reserve via Bellangry, 26.xi.1966, D. K. McAlpine, 2♀; Huonbrook near Mullumbimby, 2.iii.1965, D. K. McAlpine, 1♀, 4.xii.1961, McAlpine and Lossin, 1♀; National Park, 8.i.1966, D. K. McAlpine, 1♂.

Special Comments

L. gibbosa resembles the previous two species in the males possessing a transverse silvery abdominal band. The degree of sexual dimorphism is, however, reduced in this species, both with respect to frontal breadth and chaetotaxy, and abdominal patterning; confusion of the two sexes as separate species is therefore unlikely. *L. gibbosa* is further distinguished from *albofasciata* and *scutellata* in possessing strongly darkened wings; in this respect it resembles several of the species below which lack the silvery abdominal band in the males.

The scutellum in a few of the specimens examined bears lateral black spots about the anterior scutellar bristles, and in one female the scutellum is entirely blackened except at the apex, but in other specimens collected from the same sites as these, and simultaneously with them, the scutellum is concolorous with the mesonotum.

4. *Leucophenga janicae*, sp. nov.

Types

Holotype ♂ (ANIC): Gillies Highway 2 miles W. of Little Mulgrave, Queensland, 18.iv.1967, D. H. Colless. Paratypes (Queensland and ANIC unless otherwise noted): same data as holotype, 2♂, 1♀; Mossman Gorge, 24.iv.1967, D. H. Colless, 2♂, 1♀; Kuranda, D. K. McAlpine, 16–17.v.1958, 3♂, 3♀ (AM); Kuranda Range State Forest, 20.iv.1967, D. H. Colless, 1♂; 2 miles W. of Kuranda, 7.v.1967, D. H. Colless, 1♂, 1♀; Fisher Creek, Palmerston Highway, 30.iv.1967, D. H. Colless, 1♂; Earl Hill, N. of Cairns, 8.v.1967, D. H. Colless, 2♂; The Boulders, Babinda, 10.v.1967, D. H. Colless, 1♂; St Helen's Creek, Mackay District, 18.xii.1961, D. K. McAlpine, 1♂ (AM); Casuarina Beach, Darwin, Northern Territory, 22.x.1972, D. H. Colless, 1♂.

Male and Female

Distinguishing features. Wing infuscated towards costal margin. Thorax pale to mid-brown, without pleural stripes. Abdominal tergite 3 of male reduced and largely silvery but with some bristles; abdominal tergites 3–5 otherwise tan with posterior black bands.

Body length. 4.1 mm (holotype); 3.5–4.7 mm (paratype range).

Head. Arista with 8–9 rays above and 4–6 below plus terminal fork. Breadth of front 0.26 breadth of head in male, 0.32 breadth of head in female. Front mid-brown; ocellar triangle blackened. 2nd antennal segments tan; 3rd tan, broadly darkened anteriorly. Cheek slightly curved, extremely narrow. Orbital bristles in ratio 3 : 4 : 5; anterior reclinate orbital lateral and slightly posterior to proclinate orbital. Ocellar and inner vertical bristles equal, *c.* 0.6 length of outer verticals. Postverticals vestigial.

Thorax. Mesonotum and scutellum pale to mid-brown; pleura slightly paler. Halteres tan, weakly darkened apically. Acrostichal hairs in 14–16 irregular rows in front of dorsocentral bristles, *c.* 10 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.45. Sterno-index 0.8. Legs uniformly pale tan.

Wings. Translucent, infuscated more intensely towards costa. *C*-index 2.7; 4*V*-index 2.0; 5*X*-index 1.0; *M*-index 0.5. 3rd costal section with heavy setation on basal 0.7. Length (holotype) 3.8 mm.

Abdomen. Tergite 1 tan. Tergite 2 tan, slightly infuscated posteriorly. Tergite 3 in male reduced, largely silvery, darkened and with sparse marginal bristles postero-laterally. Tergite 3 in female not reduced, tan in anterior 0.6, darkened in posterior 0.4; incurved portions tan. Tergite 4 in male long, tan with apical black band of near uniform width; tergite 4 of female similar but slightly less long. Tergite 5 tan with apical black band. Innermost portions of incurved parts of tergites 4 and 5 black. Tergite 6 tan centrally, black laterally.

Dimorphism

Front slightly broader in female. Abdominal tergite 3 of male reduced, tergite 4 slightly broadened; abdominal tergites 3 and 4 of female not modified.

Distribution

Northern Territory (single specimen); north Queensland.

Specimens Examined

Types only as above.

Special Comments

L. janicae resembles *albofasciata, scutellata* and *gibbosa* in modification of the third abdominal tergite in the male, but the tergite is not desclerotized to the same extent as in the latter three species. The degree of sexual dimorphism in *janicae* is smaller than that in *albofasciata* and *scutellata*, comparable to that in *gibbosa*.

Group 2

Species in which the male bears a general pollinosity which is absent or greatly reduced in the female.

5. ***Leucophenga argentata*** (de Meijere)

Drosophila argentata de Meijere, 1914, p. 258. (Holotype in Amsterdam; type locality Java.)
Leucophenga halteropunctata Duda, 1924*a*, p. 188; 1924*b*, p. 239. (Holotype in Berlin; type locality Taiwan.) [Female of *argentata*: Wheeler and Takada 1964; Lin and Wheeler 1972.]

Male

Distinguishing features. Body entirely silvery pollinose. Abdominal tergite 4 with 3 large black dorsal spots.

Body length. C. 3.6 mm.

Head. Arista with 5–7 rays above and 2–3 below plus terminal fork. Front 0.23 breadth of head, slightly wider anteriorly, very pale tan; periorbits white; ocellar triangle blackened. 2nd and 3rd antennal segments concolorous with front. Cheek slightly curved, extremely narrow. Palps small, tan. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital lateral, slightly posterior and very close to proclinate orbital. Ocellar bristles very greatly reduced, smaller than acrostichals. Inner vertical bristles considerably reduced, thin, *c.* 0.4 length of outer verticals. Postvertical bristles reduced, slightly larger than ocellars.

Thorax. Mesonotum and scutellum tan with strong superimposed silvery pollinosity; scutellum with small to very small black spots at bases of anterior scutellar bristles in 4 of the 6 specimens examined. Pleura tan with weak pollinosity. Halteres tan with apical black spot. Acrostichal hairs in 8–10 rows in front of dorsocentral bristles, 4 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4. Sterno-index 0.8. Legs tan with faint darkening on hind knees.

Wings. Hyaline, with weak to strong dark spot about distal part of R_1 in 5 of the 6 specimens examined. *C*-index *c.* 2.1; 4*V*-index *c.* 2.2; 5*X*-index *c.* 1.2; *M*-index *c.* 0.6. 3rd costal section with heavy setation on basal 0.65. Length *c.* 3.4 mm.

Abdomen. Tergites 1 and 2 entirely pale tan. Tergite 3 pale tan, with black spot at extremity of incurved portion in 5 of the 6 specimens examined. Tergite 4 pale tan with 3 large black spots; incurved portion with large medial black spot. Tergite 5 pale tan, with 3 small black spots in 5 specimens; incurved portion with large medial black spot in same 5 specimens. Tergite 6 tan. All tergites with strong silvery pollinosity.

Female

Distinguishing features. Thorax tan; scutellum with basal black spots and pale apex; halteres with apical black spots. Abdominal tergites 2–5 with pattern of black spots.

Body length. C. 3.6 mm.

Head. Arista with 6–7 rays above and 3–4 below plus terminal fork. Front 0.32 breadth of head, tan; periorbits slightly silvery; ocellar triangle blackened. 2nd and 3rd antennal segments concolorous with front, 3rd slightly dusky below. Cheek slightly curved, very narrow. Palps small, tan. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital lateral, slightly posterior and close to proclinate orbital. (One of the 2 specimens examined bears a supernumerary orbital bristle between the proclinate and anterior reclinate orbitals on the right side of the head.) Ocellar bristles reduced, *c.* twice length of acrostichals and same width. Inner vertical bristles thin, *c.* 0.7 length of outer verticals. Postvertical bristles smaller than acrostichals.

Thorax. Mesonotum tan with faint pollinosity. Scutellum tan centrally, with large black spots about anterior scutellar bristles, broadly whitened apically. Pleura pale tan. Halteres tan with apical black spots. Acrostichal hairs in 8–10 rows in front of dorsocentral bristles, 4–6 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs tan with slight darkening on hind knees.

Wings. As described for male.

Abdomen. Tergite 1 tan. Tergite 2 tan with anterolateral black spots; incurved portions tan. Tergites 3 and 4 tan with 3 large dorsal black spots each; incurved portions of tergites tan, black at extremities. Tergite 5 tan with 3 small black dorsal spots; incurved portions of tergite tan, black at extremities. Tergite 6 tan, incurved portions black at extremities.

Dimorphism

Head. Front appreciably broader in female than male, slightly darker in female. Ocellar bristles reduced in both sexes but larger in female. Inner vertical bristles longer in female than male.

Thorax. Pollinosity very strong in male, very weak in female. Scutellum of female tan with large basal black spots and white apex; scutellum of male entirely whitish pollinose, or with small basal black spots. Pleura with reduced pollinosity in male, without pollinosity in female.

Abdomen. Strongly pollinose in male, without pollinosity in female. Female with more extensive pattern of black spots than male.

Distribution

Recorded from Java (de Meijere 1914), Taiwan (Duda 1924*b*; Lin and Wheeler 1972), Philippines (Sturtevant 1927; ? different species: Lin and Wheeler 1972), Micronesia (Wheeler and Takada 1964), Nepal (Okada 1966; ? different species), Okinawa (Okada 1968) and New Guinea (Lin and Wheeler 1972). The species appears to be widespread, although very rare, in Queensland, and a single specimen has been collected in the Northern Territory.

Specimens Examined

Holotype: *argentata*. **Northern Territory:** Casuarina Beach, Darwin, 22.x.1972, D. H. Colless, 1♀ (ANIC). **Queensland:** Big Mitchell Creek, Mareeba–Molloy Rd, 4.v.1967, D. H. Colless, 1♂ (ANIC); Dunk I., rain forest, light trap, 20.iv.1971, D. A. Duckhouse, 1♂, rain forest, 21.iv.1971, 1♂ (ANIC); Bundaberg, tea-tree swamp, 25.v.1972, H. Frauca, 2♂ (ANIC); Brisbane, 29.x.1930, F. A. Perkins, 1♂, 24.x.1955, F. R. From, 1♂ (UQ); Burleigh Heads, on vegetation, 31.xii.1970, R. W. G. Jenkins, 1♀ (ANIC).

Special Comments

The abdominal pattern of *argentata* has previously been noted to be quite variable (Lin and Wheeler 1972). The small spots at the bases of the anterior scutellar bristles in four of the Australian males are absent in the holotype and have apparently not been recorded in specimens from other regions.

6. *Leucophenga subpollinosa* (de Meijere)

Drosophila subpollinosa de Meijere, 1914, p. 263. (Holotype in Amsterdam; type locality Java.)

Leucophenga minuta Malloch, 1927, p. 2. Syn. nov. (Holotype in SPHTM; type locality Cairns District, Queensland.)

Male

Distinguishing features. Small. Wing with basal black band. Pleura with dark brown longitudinal stripe. Body, especially thorax, with strong whitish to silvery pollinosity.

Body length. C. 2.4 mm.

Head. Arista with 6–8 rays above and 2–3 below plus terminal fork. Front *c.* 0.33 breadth of head, whitish pollinose; ocellar triangle with greenish black pollinosity. 2nd and 3rd antennal segments pale tan. Cheek slightly curved, very narrow. Orbital bristles in ratio 2 : 2 : 3; anterior reclinate orbital posterior and slightly lateral to proclinate orbital. Ocellar and vertical bristles long. All bristles silvery.

Thorax. Mesonotum and scutellum tan with general silvery pollinosity. Pleura tan, with dark brown longitudinal stripe above sternopleural bristles, and silvery pollinosity. Halteres tan with apical black spot. Acrostichal hairs in 8 irregular rows in front of dorsocentral bristles, 4–6 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.25. Sterno-index 0.8–0.9. All bristles silvery. Legs pale tan.

Wings (Fig. 7). Hyaline, with black stripe from distal costal incision towards alula, less intense at latter (cf. *Lissocephala* spp.). *C*-index *c.* 2.1; 4*V*-index *c.* 2.3; *5X*-index *c.* 2.1; *M*-index *c.* 0.75. 3rd costal section with heavy setation on basal 0.9. Length *c.* 1.9 mm.

Abdomen. Tergite 1 tan. Tergite 2 pale tan with strong whitish pollinosity. Tergite 3 tan on anterior $\frac{2}{3}$–$\frac{3}{4}$, blackened on posterior $\frac{1}{4}$–$\frac{1}{3}$, with slight whitish pollinosity. Tergites 4 and 5 similar to tergite 3 but without pollinosity. Tergite 6 tan to brown.

Female

Distinguishing features. Similar to male but pollinosity greatly reduced or absent. Mesonotum pale to mid-brown.

Body length. C. 2.6 mm.

Head. Similar to male but front *c.* 0.4 breadth of head; front tan; ocellar triangle blackened. Front slightly silvery in some specimens. Bristles with slight silveriness only.

Thorax. Mesonotum and scutellum tan to mid-brown, with weak silvery pollinosity in some specimens. Pleura tan with dark brown longitudinal stripe, without pollinosity. Setation as in male but bristles less silvery. Legs tan.

Wings. As described for male.

Abdomen. Tergite 1 tan. Tergite 2 tan, slightly blackened anterolaterally. Tergites 3–5 dark brown to blackish, darker posteriorly. Tergite 6 tan to brown.

Dimorphism

Head. Front slightly narrower in male than in female. Male front whitish pollinose; female front tan. Bristles distinctly silvery in male, slightly silvery in female.

Thorax. Pollinosity strong in male, weak or absent in female. Bristles more strongly silvery in male than in female.

Abdomen. Tergites 2 and (to lesser extent) 3 of male pollinose; all tergites of female without pollinosity.

Distribution

The species is widespread, ranging from Australia and Micronesia through south-east Asia, Asia and Japan to Africa (Okada 1956; Wheeler and Takada 1964; Bächli 1971; but cf. 'Special Comments' below).

Specimens Examined

Holotypes. **Northern Territory** (all ANIC): 1 km N. Cahill's Crossing (E. Alligator River), 1.xi.1972, D. H. Colless, 1♂, Cooper Creek, 19 km E. by S. Mt Borradaile, D. H. Colless, 10.xi.1972, 1♂, 5.vi.1973, 1♂; Koongarra, 15 km E. Mt Cahill, 6–9.iii.1973, D. H. Colless, 1♂; Baroalba Creek Springs, 19 km NE. by E. Mt Cahill, 29.x.1972, D. H. Colless, 1♀; Katherine, 7.vi.1964, K. R. Norris, 1♂, 4♀. **Queensland** (ANIC unless otherwise noted): Iron Range, 14.vi.1971, J. Feehan, 1♂, 2♀; 7–14 miles W. Herberton via Watsonville, 1.v.1967, D. H. Colless, 1♂, 1♀; Junction of Goldmine and Davies Creeks, Kuranda–Mareeba Rd, 3.v.1967, D. H. Colless, 1♀; Upper Mulgrave River, 8 miles Goldsborough Rd, 9.v.1967, D. H. Colless, 1♀; Glasshouse Mts (swept near creek), 23.iv.1977, P. A. Parsons, 2♂ (LT); Brisbane, 26.vii.1939, F. A. Perkins, 1♀ (UQ). **New South Wales:** Brunswick Heads, 22.v.1966, Z. Liepa, 1♂ (ANIC).

Special Comments

Although the distribution of *L. subpollinosa* is regarded as widespread, it was suggested by Bächli (1971), on the basis of an examination of specimens from Java,

Sumatra, Taiwan, Nepal and Africa, that a species mixture ('Artgemisch') could be involved. As with several other widespread species in the genus, the problem is compounded by an appreciable degree of intraspecific variability to the extent that a decisive judgment on species boundaries is not always possible. Bächli, noting that the description given by Wheeler and Takada (1964) for the Micronesian specimens did not fit specimens from other regions well, speculated that the Micronesian material could represent a separate species. The Australian specimens, however (Malloch's '*Leucophenga minuta*'), match de Meijere's holotype quite closely and there seems no doubt that the two forms are conspecific.

Bächli (1971) discussed six African species, including *subpollinosa*, which exhibit the present type of dimorphism and established the *subpollinosa* species-group for them; the two Oriental species *nigroscutellata* Duda (Taiwan) and *costata* Okada (Nepal) were also considered to belong to the group, but further Oriental species exhibiting male pollinosity were not included.

7. ***Leucophenga poeciliventris*** Malloch

Leucophenga poeciliventris Malloch, 1923, p. 614. (Holotype in AM; type locality Blue Mountains, N.S.W.)

Male

Distinguishing features. Front narrow, pale. Mesonotum with strong silver-greyish pollinosity. Abdominal tergites with large black spots, tergites 2–3 pollinose.

Body length. C. 4.1 mm.

Head. Arista with 5–6 rays above and 2–4 below plus terminal fork. Front narrower posteriorly, breadth in middle region *c.* 0.25 breadth of head. Front very pale tan; periorbits slightly silvery; ocellar triangle blackened. 2nd and 3rd antennal segments pale tan; 3rd slightly darkened anteriorly. Cheek slightly curved, extremely narrow. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital lateral and slightly posterior to proclinate orbital, very close to latter. Ocellar bristles greatly reduced, smaller and finer than acrostichals. Postvertical bristles extremely small, smaller than ocellars. Inner vertical bristles short and fine, *c.* 0.4 length of outer verticals.

Thorax. Mesonotum mid-brown, with strong superimposed silvery greyish pollinosity. Scutellum mid- to dark brown, darker laterally, pale apically, with reduced pollinosity. Pleura brown, irregularly darkened. Halteres tan, apically black. Acrostichal hairs in *c.* 10 rows in front of dorsocentral bristles, *c.* 4 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8–0.9. Legs pale tan; knees of mid and hind legs darkened.

Wings. Hyaline. *C*-index *c.* 2.7; 4*V*-index *c.* 2.2; 5*X*-index *c.* 1.4; *M*-index *c.* 0.7. 3rd costal section with heavy setation on basal 0.6. Length *c.* 3.2 mm.

Abdomen (Fig. 8). Tergite 1 pale tan. Tergite 2 tan, with anterolateral black patches and strong pollinosity; incurved portions of tergite tan. Tergite 3 tan with large central and smaller lateral black patches, and strong pollinosity; incurved portions of tergite black. Tergites 4 and 5 each with 3 very large coalescing black patches, without pollinosity; incurved portions of tergites black. Tergite 6 brown to black.

Female

Distinguishing features. Mesonotum mid-brown; scutellum with basal black spots. Abdominal tergites 2–5 tan, each with 3 dorsal black spots.

Body length. C. 4.2 mm.

Head. Arista with 4–6 rays above and 3–4 below plus terminal fork. Front *c.* 0.33 breadth of head, pale to mid-brown; periorbits slightly paler; ocellar triangle blackened. 2nd antennal segments tan; 3rd slightly dusky. Cheek slightly curved, very narrow. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital lateral and very close to proclinate orbital. Ocellar bristles reduced, *c.* twice size of acrostichals. Postvertical bristles very fine, slightly smaller than acrostichals. Inner vertical bristles *c.* 0.7 length of outer verticals.

Thorax. Mesonotum pale to mid-brown, with no trace of pollinosity. Scutellum brown with lateral basal black patches, apically pale. Pleura pale brown with irregular darker patches. Halteres apically black. Acrostichal hairs in *c.* 10 rows in front of dorsocentral bristles, *c.* 4 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5–0.6. Sterno-index 0.8–0.9. Legs as in male but darkening on 2nd knees weak.

Wings. As described for male.

Abdomen (Fig. 9). Tergite 1 tan. Tergite 2 tan, with weak median and larger lateral black spots; incurved portions of tergite tan. Tergite 3 tan with large median and smaller lateral black spots; incurved portions of tergite black. Tergites 4 and 5 each tan with large median and lateral black spots almost coalescing in some specimens; incurved portions of tergites black. Tergite 6 tan centrally, black laterally.

Dimorphism

Head. Front narrow (narrower posteriorly) and very pale in male, appreciably broader (not narrowed posteriorly) and darker in female. Ocellar and postvertical bristles in male very greatly reduced; ocellars and postverticals in female reduced to lesser extent. Inner vertical bristles in male considerably reduced; inner verticals in female reduced to lesser extent.

Thorax. Mesonotum with strong pollinosity in male; pollinosity absent in female.

Abdomen. Pollinosity present on tergites 2 and 3 of male, absent in female. Pattern of black spots differing slightly between sexes.

Distribution

The species appears to be endemic and restricted to south-eastern Australia, ranging from southern Queensland to Tasmania.

Specimens Examined

Holotype. **Queensland:** Eidsvold, 11.viii.1929, 1♀ (ANIC); Cunningham's Gap, 2484 ft, 1–2.vi.1966, Z. Liepa, 1♀ (ANIC); Torbul Point, Aug. 1964, A. Teroud, 1♀ (UQ); Goodna (scrub), 10.iv.1933, 1♀ (UQ). **New South Wales:** Minnamurra Falls, D. H. Colless, 5.vii.1961, 1♂, 4♀, 31.i.1962, 2♂, 1♀, 28.v.1963, 2♂, 1♀ (ANIC); Upper Kangaroo Valley, 23.xi.1960, D. H. Colless, 3♂ (ANIC); Deep Creek, Narrabeen, D. H. Colless, 23.ix.1961, 1♀, 25.viii.1962, 1♂ (ANIC); Upper Allyn River, 14.ii.1968, D. H. Colless, 1♂ (ANIC); Clyde Mountain, Cabbage Tree Creek, 26.x.1960, D. H. Colless, 2♀ (ANIC); Wootton (north coast), 10.x.1962,

D. H. Colless, 1♀ (ANIC); 4 miles N. Batemans Bay, 14.x.1965, Z. Liepa, 1♀ (ANIC); Porter's Dam Rd, 16 km NW. Milton, 9.ii.1974, Z. Liepa, 1♂ (ANIC); Kincumber, SW. Terrigal, 8.xii.1976, Z. Liepa, 1♂ (ANIC); Mt Darragh, 14.xi.1976, P. A. Parsons, 1♂ (LT); Macquarie Pass, 9.x.1969, Common and Upton (light trap), 1♂ (ANIC); Kenny's Creek, SE. Araluen, 1.x.1967, Z. Liepa, 1♀ (ANIC); Bruxner Park near Coffs Harbour, 21.ii.1965, D. K. McAlpine, 1♂ (AM); Otford, 18.i.1964, D. K. McAlpine, 1♂, 1♀ (AM); Otford, 31.xii.1962, D. H. Colless, 1♀ (ANIC); Palm Creek, Royal National Park, D. H. Colless, 2.i.1962, 1♀, 22.vii.1963, 3♂ (ANIC); Royal National Park, 31.xii.1963, D. K. McAlpine, 1♀, 16.x.1975, G. and A. Daniels, 1♀ (AM); National Park, D. K. McAlpine, 28.iv.1956, 1♂, 6♀, 14.x.1956, 2♂, 3.xi.1956, 3♂, 23.xi.1956, 5♂, 10.viii.1957, 1♂ (AM); Mount Wilson, Blue Mountains, D. K. McAlpine, 5.xii.1956, 1♂, 17.iii.1961, 1♀ (AM); Springwood, Blue Mountains, 10.i.1956, D. K. McAlpine, 1♂, 1♀ (AM); Sassafras Gully, Springwood, Blue Mountains, D. K. McAlpine, 23.iv.1955, 1♂, 17.xi.1956, 4♂ (AM); Wentworth Falls, Blue Mountains, 22.i.1963, D. K. McAlpine, 1♂ (AM); below Govett's Leap, Blue Mountains, 7.xii.1956, D. K. McAlpine, 2♂ (AM); Manly Reservoir, Sydney, 21.vii.1963, D. H. Colless, 1♂ (ANIC); Mt Keira near Wollongong, 13.vii.1969, G. A. Holloway, 1♀ (AM); Kurrajong, 26.x.1966, McAlpine and Holloway, 2♀ (AM); Wilson River Reserve via Bellangry, 26.xi.1966, D. K. McAlpine, 1♀ (AM); creek N. of Wroxham, N.S.W.–Vic. border, 8.iii.1977, P. A. Parsons, 2♀ (LT). **Victoria:** Nowa Nowa, 28.x.1961, D. H. Colless, 1♂ (ANIC); Smellie's Inlet, Mallacoota National Park, 8.iii.1977, P. A. Parsons, 1♀ (LT); Toorloo Arm, Lakes Entrance, 22.vii.1964, D. H. Colless, 2♀ (ANIC). **Tasmania:** 2 miles E. of Tonganah, 23.i.1960, D. K. McAlpine, 2♂, 1♀ (AM).

Special Comments

Males and females of *L. poeciliventris* are superficially quite dissimilar (Malloch's description was given on the basis of a single female). The abdominal pattern, however, is substantially the same in both sexes, tergites 2 and 3 of the male with pollinosity superimposed on the basic pattern of black spots on a tan background. Apart from the male pollinosity, the thoracic coloration is also essentially the same in both sexes, i.e. brown mesonotum; scutellum brown, blackened laterally, pale apically; pleura irregularly darkened; and halteres apically black. Only one other species (*L. violae*, sp. nov.) exhibiting the same type of dimorphism as *poeciliventris* and extending over a similar range is known; the former species is distinguished by patterned wings and a conspicuous pleural stripe.

8. ***Leucophenga violae***, sp. nov.

Types

Holotype ♂: Leura Falls, New South Wales, 3.i.1973, D. H. Colless (ANIC). Paratypes: same data as holotype, 4♀ (ANIC); Blundells, Australian Capital Territory, 12.i.1931, A. L. Tonnoir, 2♂ (ANIC); 33 miles Dorrigo–Coramba Road, New South Wales, 18.iv.1970, D. H. Colless, 1♀ (ANIC); Mount Wilson, Blue Mountains, New South Wales, 30.iii.1976, D. K. McAlpine and M. A. Schneider, 1♀ (AM); Katoomba, New South Wales, G. A. Hardy, 16.i.1956, 1♀, 31.xii.1960, 1♀ (AM).

Male

Distinguishing features. Wing patterned (Fig. 10). Mesonotum and anterior half of abdomen with strong silvery greyish pollinosity. Pleura with dark longitudinal stripe.

Body length. 4.2 mm (holotype); 3.9–4.3 mm (male paratype range).

Head. Arista with 5–6 rays above and 2 below plus terminal fork. Front slightly narrowed posteriorly, 0.28 breadth of head in middle region, very pale tan; ocellar triangle blackened. 2nd antennal segments concolorous with front; 3rd slightly dusky.

Cheek slightly curved, very narrow. Orbital bristles in ratio 5 : 5 : 6; anterior reclinate orbital posterior to proclinate orbital (all 3 orbitals almost in line). Ocellar, vertical and postvertical bristles well developed; inner vertical 0.7 length of outer vertical. Posterior reclinate orbital bristle close to verticals.

Thorax. Mesonotum tan with large darker patches, and strong superimposed silvery greyish pollinosity. Scutellum brown, broadly darkened laterally, apex (between posterior scutellar bristles) pale; scutellum with superimposed pollinosity. Pleura tan with dark brown longitudinal stripe across mesopleuron posteriorly to base of halteres. Halteres tan with apical black spot. Acrostichal hairs in 6–8 irregular rows in front of dorsocentral bristles, 2–4 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4–0.5. Sterno-index 0.9. Legs pale tan; mid and hind knees very slightly darkened.

Wings (Fig. 10). Hyaline with dark brown patches: small patches basally and about anterior and posterior crossveins; larger almost rectangular patch near end of 2nd longitudinal vein, extending posteriorly to halfway between 3rd and 4th longitudinal veins; and small weak patch at end of 3rd longitudinal vein. *C*-index 2.1; 4*V*-index 1.7; 5*X*-index 0.7; *M*-index 0.4. 3rd costal section with heavy setation on basal 0.65. Length (holotype) 3.6 mm.

Abdomen (Fig. 11). Tergite 1 tan. Tergite 2 tan with small faint central and large lateral black patches, and strong pollinosity; incurved portions of tergite black with tan patch. Tergite 3 tan with weak central and more distinct lateral black patches, and strong pollinosity; incurved portions of tergite black in posterior corner, otherwise tan. Tergite 4 black with large anterolateral tan patches (very weak in paratype males), and pollinosity on anterior $\frac{1}{3}$–$\frac{1}{2}$; incurved portions of tergite black with small central tan patch laterally. Tergite 5 black (including incurved portions) with small submedian tan patches and small lateral tan patches. Tergite 6 tan posteriorly, with black hemispherical patches anteriorly.

Female

Distinguishing features. Wing patterned (Fig. 10). Mesonotum brown, darker laterally. Scutellum pale at apex and anterolaterally. Abdominal tergites 2–5 black with submedian tan patches.

Body length. 3.9–4.4 mm (female paratype range).

Head. Arista with 5–6 rays above and 2–3 below plus terminal fork. Front 0.4 breadth of head, mid-brown; periorbits paler; ocellar triangle blackened. 2nd antennal segments concolorous with front; 3rd slightly dusky. Cheek almost linear, very narrow. Orbital bristles in ratio 4 : 4 : 5; all 3 orbitals almost in line. Ocellar, vertical and postvertical bristles well developed; inner verticals 0.7 length of outer verticals.

Thorax. Mesonotum centrally mid-brown with some paler areas, especially between middle 2 rows of acrostichals and prescutellars, and about posterior dorsocentrals; mesonotum dark brown lateral to extended lines of dorsocentral bristles. Scutellum dark brown, darker laterally, pale at apex between posterior scutellar bristles, and laterally anterior to anterior scutellar bristles. Pleura tan with broad dark longitudinal stripe at level of middle of mesopleuron posteriorly to base of haltere. Halteres tan with apical black spot. Thorax entirely without pollinosity. Acrostichal hairs in

c. 8 irregular rows in front of dorsocentral bristles, 4–6 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4. Sterno-index 0.8–0.9. Legs pale tan; mid and hind knees slightly darkened.

Wings. As described for male.

Abdomen (Fig. 12). Tergite 1 pale tan. Tergite 2 black with submedian tan patches merging in some specimens; incurved portions of tergite tan, black in posterior corner. Tergites 3–5 black with anterior submedian tan-greyish patches and small lateral tan patches; incurved portions of tergites black. Tergite 6 tan centrally, black laterally. Egg guides well developed, elongate, slender, with numerous long hairs.

Dimorphism

Head. Front appreciably wider and much darker in female than in male. 2nd antennal segments darker in female than in male.

Thorax. Mesonotum with strong pollinosity in male, without pollinosity in female. Underlying coloration of mesonotum in male darker than basic coloration of mesonotum in female.

Abdomen. Anterior half of male abdomen pollinose; female without pollinosity. Pattern on tergites 2–4 different in males and females.

Distribution

L. violae is known only from south-eastern Australia.

Specimens Examined

Types only as above.

Special Comments

L. violae resembles *L. poeciliventris* in the pollinosity dimorphism and in the narrowed and paler front of the male; *violae* males, however, lack the reduction in ocellar, postvertical and inner vertical bristles which accompanies the narrowed front in *poeciliventris* males. The ranges of the two species are also similar, but the species are easily distinguished by the patterned wings and pleural stripe present only in *violae*. The number of rays in the arista and the number of rows of acrostichal hairs are both lower in *violae* than is usual amongst members of the genus *Leucophenga*.

9. ***Leucophenga patternella***, sp. nov.

Types

Holotype ♀: Otford, New South Wales, 26.i.1959, D. K. McAlpine (AM). Paratype ♂: rain forest, Iluka, Clarence River, New South Wales, 24.xi.1970, D. K. McAlpine (MV lamp) (AM).

Male and Female

Distinguishing features. Wing patterned (Fig. 13). Thorax with weak silvery pollinosity, weaker in female. Posterior reclinate orbital bristles very large.

Body length. 4.6 mm (holotype); 4.5 mm (paratype).

Head. Arista with 7 rays above and 3–4 below plus terminal fork. Front 0.36 breadth of head, pale tan; ocellar triangle blackened immediately adjacent to ocelli. 2nd and 3rd antennal segments concolorous with front. Palps small, tan. Cheek linear, wider in posterior corner, greatest width almost 0.1 times greatest diameter of eye. Orbital bristles in ratio 6 : 7 : 10; anterior reclinate orbital posterolateral and close to proclinate orbital; posterior reclinate orbital exceptionally large. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum tan to mid-brown; when viewed from in front, weak silvery pollinosity present in male, weaker pollinosity present in female. Scutellum tan, paler apically. Pleura and halteres tan. Acrostichal hairs in *c.* 14 rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5–0.6. Sterno-index 0.7. Legs tan.

Wings (Fig. 13). Translucent with vaguely defined brownish tinges, most intense about posterior crossvein (small area) and distal half of 2nd longitudinal vein (large area). *C*-index 2.9; 4*V*-index 1.8; 5*X*-index 1.0; *M*-index 0.45. 3rd costal section with heavy setation on basal 0.8. Length (holotype) 4.6 mm.

Abdomen. Tergite 1 tan. Tergite 2 black with narrow T-shaped tan area anteriorly and in midline; incurved portions of tergite black with tan patch in posterior corner. Tergites 3 and 4 each black with large anterior submedian tan patches; incurved portions of tergites black. Tergite 5 black with smaller anterior submedian tan patches; incurved portions of tergite black. Tergite 6 black with median anterior tan patch. Male abdomen weakly silvery pollinose when viewed from in front.

Dimorphism

Female pollinosity restricted to thorax, weaker than in male.

Distribution

Known only from the type specimens (New South Wales).

10. ***Leucophenga stigma***, sp. nov.

Type

Holotype ♂: head of Clohesy River, Atherton Tableland, Queensland, 20.v.1958, D. K. McAlpine (AM).

Male

Distinguishing features. Thorax tan, with weak whitish pollinosity. Wings clear, with dark basal spot.

Body length. 3.5 mm.

Head. Arista with 7 rays above and 3–4 below plus terminal fork. Front 0.32 breadth of head, pale tan; periorbits slightly silvery; ocellar triangle blackened immediately adjacent to ocelli. 2nd and 3rd antennal segments concolorous with front. Palps small, pale tan. Cheek linear, very narrow. Orbital bristles in ratio 3 : 3 : 5; anterior reclinate orbital posterior and very slightly lateral to proclinate orbital. Posterior reclinate orbital bristle very large, close to vertical bristles. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum tan, with weak whitish pollinosity when viewed from in front. Scutellum tan, apically whitened. Pleura pale tan with slight darkening on pteropleuron. Halteres tan. Acrostichal hairs in *c.* 12 rows in front of dorsocentral bristles, *c.* 10 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4. Sterno-index 0.9. One acrostichal hair just lateral to prescutellar bristle on each side enlarged. Legs pale tan.

Wings. Hyaline, with black spot about apical portion of R_1. *C*-index 2.2; 4*V*-index 2.0; 5*X*-index 1.3; *M*-index 0.65. 3rd costal section with heavy setation on basal 0.8. Length 2.9 mm.

Abdomen. Tergite 1 pale tan. Tergite 2 pale tan with small anterolateral black spots; incurved portions of tergite tan. Tergite 3 tan, with weak narrow posterior black band, and stronger narrow median black band from anterior to posterior margins; incurved portions of tergite tan with large medial black spot. Tergites 4 and 5 each weakly dark brownish with submedian tan patches; incurved portions of tergites tan with large black spot. Tergite 6 tan centrally, weakly black laterally and on incurved portions. Tergites 2–4 with very weak pollinosity when viewed from in front.

Distribution

Known only from the holotype (north Queensland).

Special Comments

Although only the male of this species is available for description, it seems very unlikely that the female, when discovered, will not be easily identifiable. The male front is not narrowed and the ocellar, vertical and postvertical bristles are all well developed; any dimorphism will therefore almost certainly prove to be restricted to a diminution in the (already weak) general pollinosity observed in the male.

L. stigma somewhat resembles the Sumatran species *L. argentina* (de Meijere), especially in possession of the basal black spot in the wing, but in the latter species the pollinosity is developed to a much greater extent than in *stigma* and there are further differences in the structure of the arista (10–12/5 rays plus terminal fork in *argentina*) and the abdominal pattern.

Group 3 *multabilis sp. group of Bächli*

Species in which the palps of the female are hypertrophied but bear reduced setation. Male palps in all cases are 'normal', i.e. small, bearing several large bristles, and fully withdrawn into the subcranial cavity when the proboscis is not extended; female palps are about three times the size of the male palps, bear only a few sparse much smaller bristles, and protrude from the subcranial cavity when the proboscis is withdrawn.

11. *Leucophenga bellula* (Bergroth)

Drosophila bellula Bergroth, 1894, p. 75. (Holotype location unknown; type locality Coomooboolaroo, near Duaringa, central Queensland.)

Drosophila maculiventris de Meijere, 1908, p. 155, *nec* van der Wulp, 1897, p. 142. Syn. nov. (Holotype in Amsterdam; type locality Java.)

Drosophila guttiventris de Meijere, 1911, p. 414. (Replacement name for *maculiventris*.) Syn. nov.

Male and Female

Distinguishing features. A small species, body entirely tan except for pattern of black spots on abdominal tergites 2–5. Wings clear.

Body length. C. 2.9 mm.

Head. Arista with 5–7 rays above and 2–3 below plus terminal fork. Front *c.* 0.35 breadth of head, tan; periorbits slightly silvery; ocellar triangle slightly darkened. 2nd and 3rd antennal segments tan. Cheek slightly curved, very narrow. Palps tan, hypertrophied in female. Orbital bristles in ratio 4 : 3 : 4; anterior reclinate orbital posterior and slightly lateral to proclinate orbital. Inner and outer vertical and ocellar bristles large, subequal. Postverticals small.

Thorax. Mesonotum, scutellum, pleura and halteres uniformly tan. Acrostichal hairs in *c.* 14 irregular rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4; anterior dorsocentrals close to posterior dorsocentrals. Sterno-index 0.8. Legs pale tan.

Wings. Entirely hyaline. *C*-index *c.* 2.6; 4*V*-index *c.* 2.1; 5*X*-index *c.* 1.0; *M*-index *c.* 0.6. 3rd costal section with heavy setation on basal 0.7. Length *c.* 2.4 mm.

Abdomen (Fig. 14). Tergite 1 tan. Tergite 2 tan with large lateral black spots; incurved portions of tergite tan. Tergite 3 tan with central black spot somewhat pointed anteriorly; incurved portions of tergite tan. Tergite 4 tan with large lateral black spots and small central black spot; incurved portions of tergite largely black. Tergite 5 tan with small central black spot and, in some specimens, smaller lateral black spots; incurved portions of tergite largely black in some specimens. Tergite 6 tan; incurved portions black in some specimens.

Dimorphism

Restricted to difference in size of palps.

Distribution

L. bellula is apparently a widespread species ranging from Australia through south-east Asia to Micronesia, Taiwan, Japan, India and Nepal (Duda 1923, 1924*a*; Wheeler and Takada 1964; Okada 1956, 1966, 1970; Lin and Wheeler 1972); there is, however, some doubt regarding the conspecificity of all specimens hitherto identified as this species (the '*guttiventris*' of the above authors). Duda (1939) reported a subspecies ('*L. guttiventris curvipila*') from Uganda, Africa, but Bächli (1971) recognized Duda's specimens as a valid species separate from the Oriental '*guttiventris*'. Whether or not all of the specimens reported from the remaining areas above should be regarded as members (in some cases variants) of the same species, or whether two or more sibling species are involved, is a question that has been raised several times but which may nevertheless not be resolved for some time (further comments concerning variability in the species are made below).

Within Australia *bellula* ranges across the north of the continent to central New South Wales in the east. The collection sites recorded below are largely open or dry forest areas, i.e. the species is not primarily an inhabitant of rain forests.

Specimens Examined

Holotype: *guttiventris*. **Western Australia:** Kimberley Research Station, Wyndham, 15.i–15.v.1953, R. Lukins, 5♂, 1♀ (ANIC). **Northern Territory** (all ANIC): Howard Springs, June 1964, K. R. Norris, 2♂; Berry Springs, 15.vi.1964, K. R. Norris, 1♂; Bessie Spring, 16°40′S., 135°51′E., 8 km ESE. Cape Crawford, 26.x.1975, M. S. Upton, 3♀; Cattle Creek, 16°32′S., 136°10′E., 54 km S. by W. Borroloola, 27.x.1975, M. S. Upton, 3♀; 16°08′S., 136°06′E., 22 km WSW. Borroloola, 2.xi.1975, M. S. Upton, 1♀, 22 km WSW. Borroloola, 17.iv.1976, D. H. Colless (malaise trap), 2♀; Cooper Creek, 19 km E. by S. Mt Borradaile, D. H. Colless, 10.xi.1972, 1♂, 1♀, 5.vi.1973, 1♂; 48 miles SW. of Daly River, 14°11′S., 130°08′E., 25.viii.1968, M. Mendum, 1♀; Brock's Creek, 15.iii.1932, T. Campbell, 1♀; Magela Creek, 9 km SSE. Mudginbarry HS., 7.xi.1972, D. H. Colless, 1♀; 1 km N. Cahill's Crossing (E. Alligator River), 31.x.1972, D. H. Colless, 1♀. **Queensland** (ANIC unless otherwise noted): Claudie River near Mt Lamond, ex malaise trap, 18.xii.1971, D. K. McAlpine and G. Holloway, 1♀ (AM); Tinaroo Falls Dam (open savannah), 27.iv.1967, D. H. Colless, 1♂, 4♀; 7–14 miles W. Herberton, via Watsonville, 1.v.1967, D. H. Colless, 4♂, 1♀; Kuranda Range State Forest, 7–8 miles Black Mountain Rd, 20.iv.1967, D. H. Colless, 1♀; Junction of Goldmine and Davies Creeks, Kuranda–Mareeba Rd, 3.v.1967, D. H. Colless, 1♀; Rocky Creek, 7 miles N. Atherton, 3.v.1967, D. H. Colless, 1♀; Branston Beach near Innisfail (open savannah), 30.iv.1976, D. H. Colless, 1♀; Coppermine Creek, 67.5 km N. Mardborough, 5.viii.1971, Z. Liepa, 1♀; 10 miles S. Bowen, 26.ix.1950, E. F. Riek, 1♀; Bundaberg, H. Frauca, July 1971, 1♂, 15–29.ii.1972, 1♀; North Bundaberg, 3.vi.1972, H. Frauca, 1♂; Tantitha, Bundaberg, 6.v.1972, H. Frauca (in wallum), 1♂; near Rosewood (Brigalow scrub), 29.xii.1961, R. Lindsay, 3♂; Nindooinbah, 4.x.1954, K. R. Norris, 1♀; Woombye near Nambour, 11–16.x.1965, D. H. Colless, 1♂; Nambour, 12.i.1946, R. Colbran, 1♀ (UQ); Maleny, May 1936, 1♀ (UQ); Gatton, 23.iii.1961, J. Martin, 1♀ (UQ); Collard Creek, 21 miles NE. of Biloela, 15.xi.1957, T. E. Woodward, 1♂ (UQ); Palm Creek, 12 miles S. Miriam Vale, 6.v.1970, Z. Liepa, 1♀; Mt Beerwah, 5.v.1970, Z. Liepa, 1♀; Boonah, 2.ii.1948, P. Bertie, 1♀ (UQ); Caboolture, 25.viii.1959, F. A. Perkins, 1♀ (UQ); Glasshouse Mountains, 29.viii.1958, I. C. Yeo, 1♂, 1♀ (UQ); Glasshouse Mountains (swept near creek), 23.iv.1977, P. A. Parsons, numerous ♂♀ (LT); Brisbane, various dates, 4♂, 5♀ (UQ); Samford, 19.xii.1961, R. Lindsay. 1♂, 1♀. **New South Wales:** Brunswick Heads, 22.v.1966, Z. Liepa, 1♀ (ANIC); Coffs Harbour, 25.vi.1976, Z. Liepa, 7♂, 4♀ (ANIC); 6 km W. Coramba, 26.vi.1976, Z. Liepa, 5♂, 4♀ (ANIC); 4 miles N. Dubbo, 25.iii.1971, D. K. McAlpine, 2♂ (AM); 10 miles S. Forster on E. bank of Wallis Lake, 3.iii.1968, G. A. Holloway, 1♀ (AM); Timor Rock, Warrumbungle Range, 27.iii.1971, D. K. McAlpine, 1♂, 4♀ (AM); Baulkham Hills, from mushroom sheds, 23.iii.1971, 8♀ (AM); Bronte, near Sydney, 21.iv.1956, D. K. McAlpine, 1♂, 1♀ (AM); Royal National Park near Sydney, 13.vii.1971, D. K. McAlpine, 1♀ (AM).

Special Comments

Considerable variability in the abdominal pattern of this species has been reported by various authors. Other species in the same complex or group have also been reported to exhibit a high degree of abdominal pattern variation, and previous workers have sometimes experienced difficulties in separating some of these species. Okada (1970) figured *bellula* ('*guttiventris*') abdomens from localities in Japan, Taiwan, India, Java and Nepal; a certain amount of variability is evident in both the presence and size of the spots on the abdominal tergites. There is less variability amongst the Australian specimens; the dorsal spots on tergites 2–4 (two, one and three spots respectively) are constant in all specimens examined and only tergites 5 and 6 show variability, although in most specimens tergite 5 possesses three small spots while tergite 6 is tan. De Meijere's holotype (*guttiventris*) possesses the same abdominal pattern as the majority of the Australian specimens as described above, but two of the four additional de Meijere specimens (not mentioned in the original description) lack the spots on tergites 2 and 4, and one of the four specimens bears a label '*L. guttiventris* de M. var. *nigripalpis* Duda det. Duda'. *L. nigripalpis* was,

apparently, later described as a valid species (Duda 1923) with more extensive abdominal blackening than *bellula*; the former species is also distinguished by possession of black palps, while the palps of *bellula* are tan. The holotype of *guttiventris* is headless, but the palps were described by de Meijere (1908) as 'ganz gelb' (i.e. tan), and the abdominal pattern is identical to that occurring in most of the Australian specimens; there thus seems no doubt that the two are conspecific, even if a species mixture is involved in de Meijere's remaining specimens.

12. *Leucophenga tritaeniata* Duda

Leucophenga tritaeniata Duda, 1923, p. 26. (Holotype ? in Berlin; type locality Madang, New Guinea.)

Male and Female

Distinguishing features. Wings patterned (Fig. 15). Palps black. Mesonotum and scutellum mid-brown; apex of scutellum pale. Abdomen largely black.

Body length. C. 3.0 mm.

Head. Arista with 6–8 rays above and 3–4 below plus terminal fork. Front *c.* 0.35 breadth of head, pale tan; ocellar triangle blackened. 2nd and 3rd antennal segments tan. Cheek curved, very narrow, blackened along ventral margin. Orbital bristles in ratio 4 : 4 : 5; anterior reclinate orbital posterolateral and very close to proclinate orbital. Ocellar and vertical bristles large; postverticals very fine. Palps black, hypertrophied in female.

Thorax. Mesonotum mid-brown. Scutellum mid-brown anteriorly (darkened laterally), pale, almost whitened apically. Pleura pale tan; some specimens with dark brown spot of variable size in middle region. Halteres pale tan. Acrostichal hairs in *c.* 10 irregular rows in front of dorsocentral bristles, 6–8 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4; anterior dorsocentrals close to posterior dorsocentrals. Sterno-index 0.7–0.8. Legs pale tan.

Wings (Fig. 15). Clear with 3 large brown patches faintly joined between 1st and 2nd longitudinal veins: 1st patch basal to anterior crossvein, from costa to just beyond 4th longitudinal vein; 2nd patch from costa to just beyond 5th longitudinal vein, including posterior crossvein; 3rd (weaker) patch from costa to just beyond apical quarter of 3rd longitudinal vein. *C*-index *c.* 1.8; 4*V*-index *c.* 2.1; 5*X*-index *c.* 1.2; *M*-index *c.* 0.65. 4th longitudinal vein greatly weakened apically. 3rd costal section with heavy setation on basal 0.7. Length *c.* 2.6 mm.

Abdomen. Tergite 1 pale tan. Tergite 2 in some specimens black in posterior half and on incurved portions, tan in anterior half but blackened in anterolateral corners; tergite 2 in some specimens entirely black, or black with small central tan patch anteriorly. Tergite 3 in some specimens black (including incurved portions) with tan patches anterolaterally; in some specimens entirely black. Tergites 4–5 entirely black. Tergite 6 tan centrally, black laterally and on incurved portions. Egg guides developed and sclerotized, broadly rounded apically, with few small bristles.

Dimorphism

Restricted to difference in size of palps.

Distribution

Recorded from New Guinea (Duda 1923, holotype only), and specimens as listed below collected in the Northern Territory and north Queensland.

Specimens Examined

Northern Territory: Howard Springs, June 1964, K. R. Norris, 1♂ (ANIC). **Queensland** (ANIC unless otherwise noted): Mulgrave River 4 miles W. Gordonvale, 4.i.1959, D. K. McAlpine, 1♂ (AM); Tinaroo Falls (open savannah), 27.iv.1967, D. H. Colless, 1♂, 3♀; Kuranda, 24.xii.1958, D. K. McAlpine, 1♀ (AM); Kuranda Range State Forest, 7–8 miles Black Mountain Rd, 20.iv.1967, D. H. Colless, 1♂; Earl Hill, N. of Cairns, 8–11.v.1967, D. H. Colless, 1♂, 2♀; Lake Placid near Cairns, 2.i.1959, D. K. McAlpine, 1♀ (AM); Crystal Cascades, Cairns, 19.iv.1967, D. H. Colless, 1♂; Bramston Beach near Innisfail, 30.iv.1967, D. H. Colless (rain forest fringe), 1♀; Dunk I. (rain forest), 20–21.iv.1971, D. A. Duckhouse, 1♂, 1♀.

13. *Leucophenga flavohalterata* Malloch

Leucophenga flavohalterata Malloch, 1925, p. 334. (Holotype in Washington; type locality Cronulla, N.S.W.)

Male and Female

Distinguishing features. Wing infuscated towards costal margin (Fig. 16). Mesonotum mid-brown. Scutellum dark brown, pale about edges. Abdomen largely black.

Body length. C. 3.0 mm.

Head. Arista with 5–6 rays above and 3 below plus terminal fork. Front 0.37 breadth of head, mid-brown, darker posteriorly in some specimens; posterior half of periorbits darkened; ocellar triangle black. 2nd antennal segments mid-brown; 3rd slightly dusky. Cheek linear, extremely narrow. Orbital bristles in ratio 5 : 5 : 6; anterior reclinate orbital posterolateral and close to proclinate orbital. Ocellar and vertical bristles large; postverticals fine. Palps black, hypertrophied in female.

Thorax. Mesonotum mid-brown, slightly darker posteriorly. Scutellum dark brown with narrow pale band (wider at apex) about margins posterior to anterior scutellar bristles. Pleura paler than mesonotum; halteres concolorous with pleura. Acrostichal hairs in *c.* 12 irregular rows in front of dorsocentral bristles, 4–6 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8–0.9. Legs pale tan; mid and hind knees slightly darkened.

Wings (Fig. 16). Translucent, infuscated towards costal margin. *C*-index *c.* 2.6; 4*V*-index *c.* 2.2; 5*X*-index *c.* 1.2; *M*-index *c.* 0.6. 3rd costal section with heavy setation on basal 0.7. Length *c.* 2.6 mm.

Abdomen (Fig. 17). Tergite 1 tan. Tergite 2 largely black, with small central tan area anteriorly and very narrow posterior tan band; incurved portions of tergite black, tan in anterior corner. Tergite 3 largely black, with anterolateral tan patches narrowly meeting in midline; incurved portions of tergite black, tan in anterior corner. Tergites 4–5 entirely black including incurved portions. Tergite 6 tan centrally, black laterally. Egg guides developed, narrowly rounded apically, almost bare.

Dimorphism

Restricted to difference in size of palps.

Distribution

Apparently endemic to Australia, the species has been recorded from north Queensland to New South Wales. The total number of specimens recorded below is quite small; indeed the north Queensland record is confined to a single individual, and it appears that, although relatively widespread, *L. flavohalterata* is rare.

Specimens Examined

Queensland (both AM); Lake Barrine near Yungaburra, 3.i.1967, McAlpine and Holloway, 1♂; Binna Burra, Lamington National Park, 1.ii.1961, D. K. McAlpine, 1♀. **New South Wales:** Deep Creek, Narrabeen, 28.xii.1961, D. H. Colless, 1♂ (ANIC); Wilson's Creek near Mullumbimby, 29.i.1961, D. K. McAlpine, 1♀ (AM); Leura Falls, 3.i.1973, D. H. Colless, 1♂ (ANIC); Kurrajong, 26.x.1966, McAlpine and Holloway, 1♀ (AM); Bruxner Park, Coffs Harbour, 11.x.1962, D. H. Colless, 1♀ (ANIC); Macquarie Pass, 9.x.1969, Common and Upton (light trap), 1♀ (ANIC); Wallaga Lake, Bermagui, 24–27.ii.1974, Z. Liepa, 1♀ (ANIC); 30 miles S. Singleton, Putty Rd. 6.ii.1968, D. H. Colless, 1♀ (ANIC); Araluen Valley, 12.iii.1967, Z. Liepa, 1♀ (ANIC); Pacific Highway 1 mile S. Hawkesbury River, 29.ix.1956, D. K. McAlpine, 2♀ (AM); Calga, Hawkesbury District, 29.ix.1956, D. K. McAlpine, 1♀ (AM); National Park, D. K. McAlpine, 4.x.1954, 1♀, 4.xi.1956, 1♂, 1♀, 30.x.1965, 1♂ (AM); Katoomba, G. H. Hardy, 30.xii.1955, 1♂, 10.xii.1957, 1♂, 6.xii.1958, 1♀, 1.ii.1959, 1♀, 8.vi.1960, 1♀ (AM); Springwood, Blue Mountains, 10–30.i.1956, D. K. McAlpine, 2♂, 5♀ (AM); Sassafras Gully, Springwood, D. K. McAlpine, 17.xi.1956, 3♂, 4♀, 23.ix.1972, 4♂ (AM).

14. *Leucophenga angusta* Okada

Leucophenga angusta Okada, 1956, p. 28. (Holotype in Tokyo; type locality Tokyo, Japan.)

Leucophenga nigriventris (Macquart) of various authors, nec. *Drosophila nigriventris* Macquart, 1843 (synonym of *Drosophila melanogaster* Meigen, 1830: Tsacas 1967; Bock and Wheeler 1972; Lin and Wheeler 1972).

Male

Distinguishing features. Thorax entirely tan. Wings clear. Abdomen almost entirely black, velvety.

Body length. C. 3.4 mm.

Head. Arista with 6–8 rays above and 3–4 below plus terminal fork. Front 0.31 breadth of head, tan; ocellar triangle blackened immediately adjacent to ocelli. 2nd and 3rd antennal segments concolorous with front. Palps small, brown to dusky. Cheek linear, extremely narrow. Orbital bristles in ratio 5 : 4 : 6; anterior reclinate orbital posterolateral and close to proclinate orbital. Ocellar and vertical bristles large; postverticals well developed.

Thorax. Mesonotum, scutellum, pleura and halteres entirely tan to mid-brown. Acrostichal hairs in *c.* 12 rows in front of dorsocentral bristles, 6–8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.3. Sterno-index 0.8. Legs tan; mid and hind knees darkened.

Wings. Hyaline, faintly brownish; veins pale brown. *C*-index *c.* 2.4; 4*V*-index *c.* 2.0; 5*X*-index *c.* 1.2; *M*-index *c.* 0.55. 3rd costal section with heavy setation on basal 0.65. Length *c.* 2.6 mm.

Abdomen. Tergite 1 tan. Tergite 2 black with small tan patch centrally at anterior margin. Tergite 3 black; incurved portions tan (black in Cairns specimen). Tergite 4 entirely black. Tergite 5 black with weak submedian tan patches; incurved portions of tergite tan (entire tergite black in Cairns specimen). Tergite 6 black. Black coloration of all tergites velvety.

Female

According to Lin and Wheeler (1972), the female *angusta* differs from the male in possessing not only large palps but also a pattern of spots on the abdominal tergites. A single specimen, which may be the female corresponding to the above males, agrees with their description except in the following respects. The palps are large and black, and the abdominal pattern is as follows: Tergite 1 tan. Tergite 2 black with anterior central tan patch; incurved portions tan. Tergite 3 with elongate central black patch and large lateral black patches, otherwise tan; incurved portions tan. Tergites 4 and 5 each tan with large central and lateral black patches; incurved portions black. Tergite 6 black with small central tan patch. (The 'typical pattern' of Taiwanese specimens described by Lin and Wheeler is: '2nd tergite darker on lateral corners, 3rd segment all pale, 4th with three prominent black areas, 5th with a small central spot, 6th with a small spot in each posterior corner'.)

Distribution

L. angusta has previously been recorded from Japan (Okada 1956, 1964, 1965), Vietnam, Java and Micronesia (Wheeler and Takada 1964) and Taiwan (Lin and Wheeler 1972). (Earlier records were given as '*nigriventris*'). The species is evidently rare in Australia.

Specimens Examined

Queensland: Earl Hill, N. of Cairns, 8.v.1967, D. H. Colless, 1♂ (ANIC); Goldsborough–Mulgrave Forest Rd c. 20 km Gillies Highway, swept rain forest, Aug. 1976, I. R. Bock, 1♀ (? *angusta*) (LT); 63 miles N. Marlborough, 9.v.1955, K. R. Norris, 1♂ (ANIC). **New South Wales:** rain forest, Ruka, Clarence River, 24.xi.1970, D. K. McAlpine, 1♂ (AM); Manly Reservoir, Sydney, 21.vii.1963, D. H. Colless, 1♂ (ANIC); Como West, near Sydney, 6–9.xi.1972, L. S. Willan (MV lamp), 1♂ (AM).

Special Comments

The Australian male specimens differ from those described by Okada (1956), Wheeler and Takada (1964) and Lin and Wheeler (1972) in body length (the Asian specimens are smaller) and, to a small extent, in abdominal pattern (less tan is present on the tergites of the Asian males). In other respects (head and thoracic coloration, setation, wing indices) the Australian specimens match the Asian ones, and are thus presumably the same species. The perennial difficulty posed by variation in abdominal pattern of *Leucophenga* species, both in distinguishing intraspecific from interspecific variation to define species limits, and in association of conspecific males and females, is examplified by the present case.

15. *Leucophenga cooperensis*, sp. nov.

Types

Holotype ♂: Cooper Creek, Northern Territory, 19 km E. by S. of Mt Borradaile, 10.xi.1972, D. H. Colless (ANIC). Paratypes: same data as holotype, 3♂, 3♀ (ANIC).

Male and Female

Distinguishing features. Thorax entirely tan. Wings clear. Palps black. Abdomen pale brown with black markings.

Body length. 3.0 mm (holotype); 2.4–3.3 mm (paratype range).

Head. Arista with 5–7 rays above and 3–4 below plus terminal fork. Front 0.32 breadth of head, tan; ocellar triangle with small black marks adjacent to ocelli. 2nd and 3rd antennal segments concolorous with front. Palps black, hypertrophied in female. Cheek almost linear, very narrow. Orbital bristles in ratio 5 : 4 : 5; anterior reclinate orbital posterolateral and close to proclinate orbital. Ocellar and vertical bristles large.

Thorax. Mesonotum, scutellum, pleura and halteres entirely tan. Acrostichal hairs in *c.* 14 irregular rows in front of dorsocentral bristles, *c.* 6 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.3–0.4. Sterno-index 0.7–0.8. Legs entirely pale tan.

Wings. Hyaline. *C*-index 1.9; 4*V*-index 1.9; 5*X*-index 1.4; *M*-index 0.6. 3rd costal section with heavy setation on basal 0.7. Length (holotype) 2.3 mm.

Abdomen (Figs 18, 19). Tergite 1 tan. Tergite 2 in male ranging from tan to largely black (incurved portions tan); tergite 2 in female tan. Tergite 3 in male ranging from largely tan (black posteriorly) to black (incurved portions tan); tergite 3 in female tan with tiny central black patch on posterior margin (in middle of tergite in New South Wales specimens). Tergite 4 in male black (incurved portions tan); tergite 4 in female black with anterolateral tan patches of variable size (incurved portions of tergite tan). Tergite 5 tan in both sexes (with small median black patch in New South Wales specimens). Tergite 6 in both sexes tan; incurved portions black. Egg guides developed but weakly sclerotized.

Dimorphism

Palps hypertrophied in female. Abdominal patterns differing as described above, blackening on female abdomen in most specimens less than that on male abdomen.

Distribution

Collected in the Northern Territory (35 specimens as listed below) and New South Wales (two specimens only; cf. Special Comments).

Specimens Examined

Types as above. **Northern Territory** (all ANIC): same data as holotype, 3♂, 18♀; Cooper Creek, 19 km E. by S. of Mt Borradaile, 5.vi.1973, D. H. Colless, 1♀; Baroalba Creek Gorge, 19 km E. by N. of Mt Cahill, 29.x.1972, D. H. Colless, 1♀; Magela Creek, 2 km N. of Mudginberry HS., 15.xi.1972, D. H. Colless, 1♂, 1♀; McArthur River 48 km SW. by S. of Borroloola, 14.iv.1976, D. H. Colless, 1♀; 1 km N. of Cahill's Crossing, E. Alligator River, 8.xi.1972, D. H. Colless, 1♀. **New South Wales** (both AM): rain forest, Iluka, Clarence River, 24.xi.1970, D. K. McAlpine, 1♀; Oxford Falls, 22.iv.1956, D. K. McAlpine, 1♀.

Special Comments

As noted above, the abdominal blackening in the New South Wales specimens differs slightly from that in the type and other Northern Territory specimens, but the New South Wales specimens otherwise agree with the Northern Territory ones.

16. *Leucophenga* species A

Female

Distinguishing features. Palps large, black. Thorax brown; wings clear. Abdominal tergites with large black spots.

Body length. 3.2 mm.

Head. Arista with 8 rays above and 4 below plus terminal fork. Front 0.35 breadth of head, tan. 2nd and 3rd antennal segments concolorous with front. Cheek linear, extremely narrow. Palps large, black. Orbital bristles in ratio 4 : 3 : 4; anterior reclinate orbital posterolateral to proclinate orbital. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum and scutellum dark tan; pleura and halteres pale tan. Acrostichal hairs in *c.* 12 rows in front of dorsocentral bristles, 6–8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4. Sterno-index 0.8. Legs pale tan; hind knees slightly darkened.

Wings. Hyaline. *C*-index 2.6; 4*V*-index 2.3; 5*X*-index 1.4; *M*-index 0.6. 3rd costal section with heavy setation on basal 0.7. Length 2.6 mm.

Abdomen. Tergite 1 tan. Tergite 2 black with anterior central tan patch; incurved portions of tergite tan. Tergite 3 tan with 3 ill-defined black patches: small central spot, and large lateral spots; incurved portions of tergite tan. Tergite 4 tan with 3 large black spots centrally and laterally; incurved portions of tergite black. Tergite 5 pale tan with 3 very small black spots centrally and laterally; incurved portions of tergite tan. Tergite 6 tan centrally, black laterally and on incurved portions.

Specimen Examined

Queensland: Dunk I., rain forest, 21.iv.1971, D. A. Duckhouse, 1♀ (ANIC).

Special Comments

The single female described above to some extent resembles *L. nigripalpis* Duda but its abdominal pattern differs somewhat from that of *nigripalpis* as described by Duda (1923). It is possible that the Dunk I. specimen is a new species; the corresponding male, when discovered, may or may not have the same abdominal pattern.

Group 4

Species possessing darkened or patterned wings, without sexual dimorphism.

17. ***Leucophenga ornata*** Wheeler

Drosophila ornatipennis de Meijere, 1914, p. 256, *nec* Williston, 1896, p. 407. (Holotype in Amsterdam; type locality Java.)

Leucophenga ornata Wheeler, 1959, p. 184 (replacement name for *ornatipennis*).

Male

Distinguishing features. Wings patterned (Fig. 20). Thorax tan; scutellum apically paler. Abdominal tergites 3–5 blackish with anterior submedian tan spots.

Body length. *C.* 3.4 mm.

Head. Arista with 6–7 rays above and 3–4 below plus terminal fork. Front 0.33 breadth of head, dark tan; ocellar triangle infuscated. 2nd and 3rd antennal segments concolorous with front. Cheek linear, very narrow. Palps small, dusky brown. Orbital bristles in ratio 3 : 4 : 6; anterior reclinate orbital posterior and slightly lateral to proclinate orbital, *c.* $\frac{1}{4}$ of distance from proclinate to posterior reclinate. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum tan. Scutellum slightly darker than mesonotum, apically paler. Pleura pale tan. Halteres tan. Acrostichal hairs in *c.* 12 irregular rows in front of dorsocentral bristles, 8–10 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs pale tan; knees of mid and hind legs slightly darkened.

Wings (Fig. 20). Hyaline with extensive brown markings. Large, diffuse patch present basally. Anterior and posterior crossveins within separate patches; and large, pale diffuse patch present about distal half of 2nd longitudinal vein, meeting patch about posterior crossvein posteriorly. *C*-index *c.* 1.9; 4*V*-index *c.* 2.4; 5*X*-index *c.* 1.0; *M*-index *c.* 0.6. 3rd costal section with heavy setation on basal 0.8. Length *c.* 3.5 mm.

Abdomen. Tergite 1 tan. Tergite 2 blackish with anterior central tan area; incurved portions of tergite tan. Tergite 3 blackish with narrow anterior submedian tan patches; incurved portions of tergite black. Tergites 4 and 5 blackish with anterior submedian tan patches; incurved portions of tergites black. Tergite 6 black.

Distribution

Previously reported from Java (de Meijere 1914), Japan (Okada 1956), Korea (Kang *et al.* 1959), Nepal (Okada 1966), and the Philippines and Taiwan (Lin and Wheeler 1972). The Australian specimens are from northern Queensland.

Specimens Examined

Holotype. **Queensland:** Claudie River near Mt Lamond, 31.v.1966, D. K. McAlpine, 1♂ (AM); The Crater National Park, July 1975, P. A. Parsons, 1♂ (LT).

Special Comments

No females of *L. ornata* were examined (the holotype is a male), but according to Okada (1956) and Lin and Wheeler (1972) they are similar to males.

Okada (1956) reported the Japanese specimens as possessing a pleural stripe. Lin and Wheeler (1972) described the pleural stripe in their Taiwanese specimens, but also noted that of four Philippine specimens which they examined, two possessed the stripe while two lacked it. The holotype and the Australian specimens lack the pleural stripe; one cannot help but suspect that a species mixture could be involved in the others.

18. *Leucophenga regina* Malloch

Leucophenga regina Malloch, 1935, p. 90. (Holotype in SPHTM; type locality Mt Molloy, north Queensland.)

Male and Female

Distinguishing features. Body large, brown. Wing patterned (Fig. 21). Abdominal tergites with bristles arising from black spots.

Body length. C. 4.8 mm.

Head. Arista with 7–9 rays above and 3–4 below plus terminal fork. Front 0.33 breadth of head, tan; periorbits slightly paler; ocellar triangle slightly raised, tan with small black patches, just adjacent to ocelli. 2nd antennal segments tan; 3rd tan, darker below. Cheek slightly curved, very narrow. Palps slender, brown.

Orbital bristles relatively short, in ratio 3 : 3 : 4; all 3 orbitals almost in line. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum, scutellum, pleura and halteres mid-brown. Scutellum in some specimens slightly paler apically and laterally anterior to anterior scutellar bristles. Acrostichal hairs in *c.* 12 irregular rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4–0.5. Sterno-index 0.7. Legs pale brown.

Wings (Fig. 21). Hyaline with extensive brown markings of irregular outline: 1st patch basally; 2nd from costa posteriorly, enclosing anterior crossvein, to 5th longitudinal vein; 3rd patch just distal to 2nd, extending from costa across posterior crossvein to posterior edge of wing; and 4th, apical patch, paler posteriorly, broadly confluent with 3rd patch. *C*-index *c.* 1.9; 4*V*-index *c.* 2.0; 5*X*-index *c.* 0.4; *M*-index *c.* 0.3. 2nd longitudinal vein strongly curved towards costa apically. 3rd costal section with heavy setation on basal 0.8. Length *c.* 4.1 mm.

Abdomen. Tergite 1 pale brown, darker laterally. Tergites 2–6 pale to mid-brown with all bristles arising from brown to black spots; larger bristles on posterior margins of tergites arising from larger spots.

Dimorphism

Nil.

Distribution

L. regina appears to be a rare species confined to Queensland; the nine flies recorded below and the ten listed by Malloch from the type locality appear to be the only specimens known.

India : Bibliography Chapter, 1982

Specimens Examined

Holotype. **Queensland:** Earl Hill, N. of Cairns, 8.v.1967, D. H. Colless, 1♀ (ANIC); Kuranda, 26.xii.1958, D. K. McAlpine, 1♂, 1♀ (AM); 2 miles E. of Cardstone, 15.i.1967, McAlpine and Holloway, 2♂, 1♀ (AM); Mulgrave River, 4 miles W. of Gordonvale, 4.i.1959, D. K. McAlpine, 1♂, 1♀ (AM); S. Pine River, 17.i.1963, G. Monteith, 1♀ (UQ).

19. *Leucophenga quadripunctata* (de Meijere)

Drosophila quadripunctata de Meijere, 1908, p. 154. (Holotype in Amsterdam; type locality Java.)

Male and Female

Distinguishing features. Wing patterned (Fig. 22); 3rd costal section with heavy setation on entire length. Thorax brown; apex of scutellum white.

Body length. 4.0–5.1 mm (range of 3 Queensland specimens examined).

Head. Arista with 7–8 rays above and 4 below plus terminal fork. Front *c.* 0.32 breadth of head, tan; periorbits paler; ocellar triangle blackened. 2nd antennal segments tan; 3rd slightly dusky. Cheek almost linear, extremely narrow. Palps tan. Orbital bristles in ratio 1 : 1 : 2; anterior reclinate orbital posterior and close to proclinate orbital. Ocellar, vertical and postvertical bristles large.

Thorax. Mesonotum mid-brown; scutellum darker, apically white; pleura concolorous with mesonotum above, paler below. Halteres tan. Acrostichal hairs in

c. 18 rows in front of dorsocentral bristles, *c.* 12 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs pale brown with trace of darkening in mid and hind knees.

Wings (Fig. 22). Hyaline to slightly brownish anteriorly, with darkening basally at level of distal costal incision posteriorly to midway between 4th and 5th longitudinal veins; about anterior and posterior crossveins; and weakly at apex of 2nd longitudinal vein. *C*-index *c.* 1.8; 4*V*-index *c.* 1.9; 5*X*-index *c.* 1.1; *M*-index *c.* 0.6. 3rd costal section with heavy setation on entire length. Length 3.5–4.3 mm (range of Queensland specimens).

Abdomen. Tergite 1 tan. Tergite 2 tan anteriorly in central region with irregular extensions of coloration towards posterolateral corners, dorsum otherwise black; incurved portions of tergite black with central tan spot. Tergites 3–5 each with tan area in anterolateral corners extending irregularly backwards, dorsum of each tergite black posteriorly and in midline; incurved portions of each tergite black with lateral tan spot. Tergite 6 black with weak submedian tan patches.

Dimorphism

Nil.

Distribution

L. quadripunctata is apparently a very rare species. De Meijere's description was stated to be based on 'several specimens' (presumably those noted below, although only one is labelled as a paratype) from Semarang, Java. Duda (1924*a*) included *quadripunctata* in his key to *Leucophenga* species, and also provided a photograph of a wing. However, the '*quadripunctata*' wing he figured differs from those of the holotype and the present specimens in two respects (discussed further under the following species). Duda (1926) reported the presence of a single female of '*L. quadripunctata*' in a large collection of drosophilids from Sumatra. The only other record to date appears to be that of Okada (1956) who described '*L. quadripunctata*' on the basis of a single male from Japan; the wing described and figured by Okada does not entirely match that of de Meijere's holotype.

Specimens Examined

Holotype and 5 additional specimens (Amsterdam). **Queensland** (all AM): 2 miles N. of Tully River bridge, Cardstone–Ravenshoe Rd, 16.i.1967, D. K. McAlpine and G. Holloway, 1♀; Mulgrave River 4 miles W. Gordonvale, 15.xii.1961, McAlpine and Lossin, 1♂, 1.i.1967, D. K. McAlpine and G. Holloway, 1♂.

Special Comments

The abdomen of de Meijere's holotype differs slightly from those of the Queensland specimens, having the tan coloration in more discrete spots. However, abdominal patterns in *Leucophenga* species, as already observed, are known to be quite variable, and there is close agreement between the Queensland specimens and the *quadripunctata* holotype in other respects.

20. *Leucophenga* species B

Male and Female

Distinguishing features. Wings patterned (Fig. 23); 2nd longitudinal vein curved towards costa. Thorax brown; apex of scutellum white.

Body length. *C.* 3.0 mm.

Head. Arista with 6 rays above and 2 below plus terminal fork. Front 0.3 breadth of head, tan; ocellar triangle with blackening immediately adjacent to ocelli. 2nd antennal segments tan; 3rd slightly dusky. Cheek linear, extremely narrow. Palps tan. Anterior reclinate orbital bristle posterior, slightly lateral and close to proclinate orbital.

Thorax. Mesonotum mid-brown. Scutellum dark brown, apically white. Pleura mid-brown above, paler below. Halteres tan. Acrostichal hairs in *c.* 12 rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.4. Sterno-index 0.9. Legs pale tan with slight darkening of mid and hind knees.

Wings (Fig. 23). Hyaline with 4 dark brown patches: basally at level of distal costal incision; about anterior and posterior crossveins; and at apex of 2nd longitudinal vein. 2nd longitudinal vein curved apically towards costa. *C*-index *c.* 1.3; 4*V*-index *c.* 2.3; 5*X*-index *c.* 1.0; *M*-index *c.* 0.6. 3rd costal section with heavy setation on basal 0.85. Length *c.* 2.8 mm.

Abdomen. Tergite 1 very pale tan, slightly darker laterally. Tergite 2 tan anteriorly in central region, black posteriorly and laterally; incurved portions of tergite tan. Tergites 3–4 each black with submedian tan spots anteriorly; incurved portions of tergites black with tan spot. Tergite 5 similar to tergites 3–4 but dorsal tan spots smaller. Tergite 6 tan centrally, black laterally and on incurved portions.

Dimorphism

Nil.

Distribution

Two Australian specimens as noted below; cf. 'Special Comments'.

Specimens Examined

Queensland: 14 miles SW. of Sarina, 8.v.1955, Norris and Common, 1♀ (ANIC). **New South Wales:** Upper Allyn near Eccleston, 17.xi.1965, D. K. McAlpine, 1♂ (AM). (Neither specimen in good condition.)

Special Comments

The wing figured by Duda (1924*a*) as that of '*L. quadripunctata*' differs from that of the *quadripunctata* holotype in two respects: the costal index of Duda's specimen (*c.* 1.3) is appreciably lower than that of the *quadripunctata* holotype (*c.* 1.8); and the spot at the end of the second longitudinal vein in Duda's specimen is considerably more intense than that in the *quadripunctata* holotype. The wing of the Duda specimen in fact closely resembles those of the two specimens described above; Duda did not indicate the origin of the photographed specimen.

20. *Leucophenga* species C

Female

The single specimen of this species resembles species B except in the following respects. The spot at the end of the second longitudinal wing vein is larger than in species B, and there is an additional pale spot at the end of the third longitudinal vein. Abdominal tergites 2 and 3 are black. Tergites 4 and 5 are black with large

submedian tan spots (incurved portions black with tan spots). Tergite 6 is black with submedian tan spots.

Specimen Examined

Queensland: 2 miles S. Mt Lamond, Iron Range, 29.xii.1971, D. K. McAlpine and G. Holloway, 1♀ (AM).

22. *Leucophenga cyanorosa*, sp. nov.

Types

Holotype ♂: below Govett's Leap, Blue Mountains, New South Wales, 14.ix.1957, D. K. McAlpine (AM). Paratypes (all AM): New South Wales: Wentworth Falls, Blue Mountains, D. K. McAlpine, 22.iv.1957, 1♂, 18.iii.1958, 1♀, 31.i.1959, 1♀; Mt Wilson, Blue Mountains, D. K. McAlpine, 11.xii.1959, 2♀, 17.iii.1961, 1♂; Katoomba, 28.i.1955, G. H. Hardy, 1♂.

Male and Female

Distinguishing features. Wings patterned (Fig. 24). Mesonotum with large brown areas separated by narrower tan areas. Pleura with dark longitudinal stripe. Abdominal tergites with complex pattern of dark brown and tan markings.

Body length. 4.3 mm (holotype); 3.4–4.4 mm (paratype range).

Head. Arista with 7–8 rays above and 3–4 below plus terminal fork. Front 0.41 breadth of head, dark brown centrally gradually becoming pale tan at orbital margins; ocellar triangle dark brown to black. 2nd antennal segments tan, darker anteriorly; 3rd antennal segments pale brown. Cheek linear, slightly wider in posterior corner, greatest width *c.* 0.1 times greatest diameter of eye. Palps small, slender, slightly dusky. Orbital bristles in ratio 5 : 4 : 5; all 3 orbitals almost in line. Ocellar, vertical and postvertical bristles well developed.

Thorax. Mesonotum tan with extensive dark brown markings: small pair between posterior dorsocentral bristles; elongate submedian pair from just in front of anterior dorsocentral bristles to head; and 3 elongate lateral markings lateral to level of dorsocentral bristles, becoming progressively narrower laterally. Scutellum dark brown, darker posterolaterally, pale tan apically and anterolaterally. Pleura pale tan with narrow dark brown stripe across top of mesopleuron, and broad dark brown stripe across middle of mesopleuron posteriorly to base of halteres. Halteres pale tan with dark brown apical spot. Acrostichal hairs in 10–12 irregular rows in front of dorsocentral bristles, *c.* 8 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs pale tan; mid and hind knees slightly darkened.

Wings (Fig. 24). Hyaline with brown markings: rectangular dark brown patch basally from distal costal incision to halfway between 4th and 5th longitudinal veins; small dark brown rectangular patch which includes anterior crossvein; and large pale to dark brown areas distal to latter with small hyaline areas within. *C*-index 2.0; 4*V*-index 1.4; 5*X*-index 0.6; *M*-index 0.25. 3rd costal section with heavy setation on basal 0.7. Length (holotype) 4.2 mm.

Abdomen. Tergite 1 tan. Tergite 2 dark brown laterally and posteriorly, with pale tan area anteriorly narrowly extending into lateral brown areas; incurved portions tan laterally, dark brown medially. Tergites 3–5 each with central dark brown longitudinal band which extends laterally in posterior half of tergite to halfway across side

of tergite; narrow oblique dark brown band present just beyond latter and directed posterolaterally, in some specimens band V-shaped with apex medial; incurved portions of tergites dark brown medially and posteriorly; remainder of each tergite pale tan. Tergite 6 dark brown centrally and laterally, otherwise pale tan; incurved portions dark brown medially, tan laterally.

Dimorphism

Nil.

Distribution

Known only from New South Wales.

Specimens Examined

New South Wales: types as above. Tooloom, 1.xii.1924, 1♂ (poor condition) (UQ).

Special Comments

The species is named after the occurrence of the type specimens in the Blue Mountains (Greek: *cyaneos*, blue; *oros*, mountain).

23. *Leucophenga zebra*, sp. nov.

Types

Holotype ♂ (ANIC): Upper Mulgrave River, 10 miles Goldsborough Rd., north Queensland, 9.v.1967, D. H. Colless. Paratypes (all Queensland): same data as holotype, 4♂, 2♀ (ANIC); Claudie River near Iron Range Airport, 7.vi.1966, D. K. McAlpine, 1♂ (AM); Claudie River near Mt Lamond, 3.vi.1966, D. K. McAlpine, 1♀ (AM); Mossman Gorge, 23.iv.1967, D. H. Colless, 1♂, 1♀ (ANIC); Gillies Highway 2 miles W. of Little Mulgrave, 18.iv.1967, D. H. Colless, 7♂, 4♀ (ANIC); 9.6 km W. of Gordonvale, Gillies Highway, 11.vii.1971, Z. Liepa, 1♀ (ANIC); Thornton Range, Hutchinson Creek, 7.i.1967, D. K. McAlpine and G. Holloway, 1♂ (AM); Lake Barrine, 3.i.1967, D. K. McAlpine and G. Holloway, 1♀ (AM).

Male and Female

Distinguishing features. Wings infuscated, especially towards costa. Pleura pale tan with broad dark longitudinal stripe. Abdomen brownish.

Body length. 2.7 mm (holotype); 2.4–4.3 mm (paratype range).

Head. Arista with 5–7 rays above and 2–4 below plus terminal fork. Front 0.35 breadth of head, dark rufous tan; ocellar triangle slightly darkened. 2nd and 3rd antennal segments tan, darker anteriorly. Cheek slightly curved, greatest width *c.* 0.1 times greatest diameter of eye. Orbital bristles in ratio 5 : 4 : 5; all 3 orbitals in line. Ocellar and vertical bristles long; postverticals absent.

Thorax. Mesonotum mid- to dark brown. Scutellum concolorous with mesonotum, paler apically. Pleura pale tan with broad dark longitudinal stripe, from above base of 1st coxa across middle of mesopleuron back to base of haltere. Halteres pale tan. Acrostichal hairs in *c.* 16 irregular rows in front of dorsocentral bristles, *c.* 10 irregular rows between dorsocentrals. Ratio anterior : posterior dorsocentrals *c.* 0.4; anterior dorsocentrals fine, close to posterior dorsocentrals. Sterno-index 0.8. Legs uniformly pale tan.

Wings. Translucent, infuscated most intensely towards costa. *C*-index 2.6; 4*V*-index 1.8; 5*X*-index 1.4; *M*-index, 0.5. 3rd costal section with heavy setation on entire length. 3rd and 4th longitudinal veins slightly convergent apically. Length (holotype) 2.6 mm.

Abdomen. Tergite 1 tan. Tergite 2 tan in broad central area, gradually darkening laterally (including incurved portions). Tergites 3–4 tan on most of dorsum, gradually darkening laterally and on incurved portions, slightly darker in midline; in some specimens tan coloration restricted to anterolateral patches, in others, tergites generally dusky. Tergite 5 similar to tergites 3 and 4 but tan coloration slightly darker. Tergite 6 darker than tergite 5.

Dimorphism

Nil.

Distribution

The species appears to be restricted to north Queensland.

Specimens Examined

Types only as above.

Ungrouped Species

24. *Leucophenga* species D

Female

Distinguishing features. Thorax brown; scutellum dark brown. Pleura with broad dark longitudinal band. Wings hyaline. Abdomen largely black.

Body length. 3.4 mm.

Head. Arista with 7 rays above and 3-4 below plus terminal fork. Front 0.32 breadth of head, dark brown, blackish posteriorly; ocellar triangle black. 2nd antennal segments dark brown; 3rd blackish. Cheek curved. Palps small, tan. Orbital bristles in ratio 3 : 3 : 4; anterior reclinate orbital lateral and slightly posterior to proclinate orbital. Ocellar bristles large. Inner vertical bristles 0.6 length of outer verticals.

Thorax. Mesonotum mid-brown; scutellum uniformly dark brown. Pleura pale brown with broad dark longitudinal band across mesopleuron posteriorly to base of halteres; borders of band not sharply defined. Halteres tan with apical black spot. Acrostichal hairs in *c.* 14 rows in front of dorsocentral bristles, *c.* 8 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs tan; mid and hind knees strongly darkened.

Wings. Hyaline. *C*-index 2.6; 4*V*-index 2.2; 5*X*-index 1.2; *M*-index 0.6. 3rd costal section with heavy setation on basal 0.75. Length 3.1 mm.

Abdomen. Tergite 1 dusky tan. Tergite 2 tan, black laterally and on incurved portions. Tergites 3 and 4 each black with narrow anterior tan band (narrower in middle); incurved portions of tergites black. Tergite 5 entirely black. Tergite 6 tan centrally, black laterally.

Specimen Examined

New South Wales: Upper Allyn River, 14.ii.1968, D. H. Colless, 1♀ (ANIC).

25. *Leucophenga lubrica*, sp. nov.

Types

Holotype ♀: Crediton Creek, near Eungella, Queensland, 12.xii.1961, McAlpine and Lossin (AM). Paratype ♂: National Park, New South Wales, 19.iii.1957, D. K. McAlpine (AM).

Male and Female

Distinguishing features. Mesonotum mid-brown; scutellum dark, apically pale. Pleura pale with broad dark longitudinal stripe. Wings clear. Abdominal tergites 3–5 black with small anterior submedian tan spots.

Body length. 3.4 mm.

Head. Arista with 7–8 rays above and 3–4 below plus terminal fork. Front 0.34 breadth of head, tan, darker posteriorly; ocellar triangle partly darkened. 2nd antennal segments tan; 3rd mid-brown. Cheek linear, very narrow. Palps small, dusky. Orbital bristles in ratio 2 : 2 : 3; all 3 orbitals in line. Ocellar, vertical and postvertical bristles large.

Thorax. Mesonotum mid-brown. Scutellum mid- to dark brown, apically pale. Pleura tan with broad dark clearly defined longitudinal stripe across middle of mesopleuron posteriorly to base of halteres. Halteres pale tan. Acrostichal hairs in *c.* 14 rows in front of dorsocentral bristles, *c.* 10 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0.5. Sterno-index 0.8. Legs pale tan with slight darkening on mid and hind knees.

Wings. Hyaline. *C*-index 1.8; 4*V*-index 1.5; 5*X*-index 1.1; *M*-index 0.4. 3rd costal section with heavy setation on basal 0.8. Length 3.4 mm.

Abdomen. Tergite 1 tan. Tergite 2 shiny black with tan crescentic band anteriorly. Tergites 3–5 each shiny black with small tan submedian spots anteriorly (one pair per tergite). Incurved portions of tergites 2–5 largely tan. Tergite 6 shiny black.

Dimorphism

Nil.

Distribution

Known only from holotype and paratype, but apparently relatively widespread (the distance between the localities of the type specimens is about 1400 km in a straight line).

Special Comments

Superficially this species resembles *L. zebra* in the clearly defined dark pleural stripe, but it is easily distinguished from it by the clear wings and distinctive abdominal pattern. To some extent *L. lubrica* resembles species D, but in the latter the abdominal tergites lack tan spots, the apex of the scutellum is not pale, and the pleural stripe is less well demarcated.

26. *Leucophenga* species E

Female

The single specimen of this species resembles the female of *L. scutellata* except in the following respects: ocellar bristles shorter and finer than in *scutellata*; front

narrower (0.26 breadth of head). Halteres not blackened apically; basal black scutellar spots weak. Abdominal tergite 2 tan anteriorly, black posteriorly and laterally including incurved portion. Tergites 3–4 tan anteriorly, with posterior black band of uniform width (*c.* $\frac{1}{2}$ width of tergite) extending onto incurved portion. Tergite 5 entirely black except for narrow longitudinal tan band in midline. Tergite 6 tan centrally, black laterally.

Specimen Examined

Queensland: Summit, Walter Hill Range, Cardstone–Ravenshoe Rd, 16.i.1967, D. K. McAlpine and G. Holloway, 1♀ (AM).

Discussion

The Australian *Leucophenga* fauna comprises somewhat over 20 species. Twenty-one species (eight of them new) are described above; in addition, the five other forms designated 'species A–E' probably also represent new species, but the material available is inadequate for full description. *Leucophenga* is therefore the second largest drosophilid genus in Australia after *Drosophila* (the third largest is probably *Mycodrosophila* or *Liodrosophila*: Bock, unpublished data). On a world basis, the largest numbers of *Leucophenga* species occur in Africa and Asia or south-east Asia. Bächli (1971) recorded over 60 African species. Oriental records are rather widely scattered but total at least several dozen; many more species may remain to be discovered in parts of south-east Asia and New Guinea, areas little explored for Drosophilidae. Wheeler and Takada (1964) listed eight Micronesian species. However, in the Pacific region, only one species has been recorded from Samoa (Wheeler and Kambysellis 1966), and none is known from Hawaii or New Zealand. Wheeler (1970) listed 21 *Leucophenga* species from South America, while fewer species have been recorded from North America, and very few are known from Europe. Within Australia *Leucophenga* species occur across the north of the continent and along the eastern side, including Tasmania (Fig. 25). No *Leucophenga* species has been collected in the south-west, an area which has a reduced drosophilid fauna but which nevertheless harbours three endemic and several more widespread *Drosophila* species as well as both Australian species of *Scaptomyza*. It is thus likely that *Leucophenga* originated in Africa, Asia or south-east Asia and that the Australian fauna was derived by immigration from the north, possibly (at least partly) during periods of recent geological history when land bridges connected Australia and New Guinea.

Little attention has been given in the past to infrageneric classifications of *Leucophenga* with regard to either subgenera or species-groups. In addition to the typical subgenus, Wheeler and Takada (1964) suggested recognition of two subgenera, *Neoleucophenga* Oldenberg and *Paraleucophenga* Hendel (a synonym of the latter being *Trichiaspiphenga* Duda). *Paraleucophenga* is distinguished by an arista which lacks long ventral rays, and small marginal hairs on the scutellum in addition to the usual four large bristles; it is now accorded full generic status (Bächli 1971; Lin and Wheeler 1972). *Neoleucophenga* Oldenberg (1914*a*, 1914*b*) was established (as a genus) for the single European species *L. quinquemaculata* Strobl, differing from the typical *Leucophenga* species in several aspects of wing venation, most notably in the continuation of the costa (in weakened form) to the apex of the fourth longitudinal vein. An additional South American species of *Neoleucophenga* was listed by Wheeler (1970), but it is clear that, in the absence of any more recent attempt at a subgeneric division, almost every species of *Leucophenga* is a member of the typical subgenus.

A universal species grouping has not yet been achieved for the genus. The most comprehensive grouping attempted to date is that of Bächli (1971), who included most of his African species in eight species-groups; several non-African species were also included in some of the groups. (Interestingly, *L. quinquemaculata* Strobl was included in one of them.) Lin and Wheeler (1972) noted that five of Bächli's groups were represented in Asia, but the only grouping formally recognized by them in their arrangement of the Taiwanese species was the '*angusta* complex' (Okada 1970) (i.e. the species with dimorphic palps), which coincided with Bächli's *mutabilis* species-group.

The species of *Leucophenga* may be grouped by various criteria, including the type of dimorphism (if present). Amongst the Australian species (and more generally) five types of dimorphism occur: presence in the male only of a transverse white-silvery abdominal stripe associated with at least partial reduction and desclerotization of the third tergite; presence in the male of a general weak to strong pollinosity which is either greatly reduced or absent in the female; narrowing of the male front, often in association with a greater or lesser degree of reduction of the ocellar, vertical (especially inner vertical) and postvertical bristles; hypertrophy of the palps in the female; and difference between the sexes in abdominal pattern. More than one of these types may occur in one species; the abdominal stripe and the general pollinosity are usually associated with at least some frontal narrowing and bristle reduction; the stripe and general pollinosity may be associated with differences in abdominal pattern (apart from those imposed by presence or absence of the stripe itself); hypertrophy of the female palps is associated in some cases with differences in abdominal pattern. At least in Australian species, frontal narrowing in the male and abdominal pattern differences do not occur singly.

If it is accepted that the abdominal stripe dimorphism has probably only evolved once in the genus, the species described above as group 1 make up a natural species-group. Bächli (1971) established the *proxima* group for five African species exhibiting this character, and added a further four non-African species to the group, including *albofasciata* (= *albicincta*) and *scutellata*.

The six species treated under group 2 cover two of Bächli's groups: the *argentata* group (male with general pollinosity) and the *subpollinosa* group (wing with basal darkening; pollinosity present at least on anterior part of male abdomen). In addition, two of the Australian species also possess patterned wings. It thus appears likely that the six Australian species in which the males exhibit a general pollinosity may be a somewhat heterogeneous assemblage.

The group 3 species, as has already been noted, coincide with Bächli's *mutabilis* species-group and Okada's *angusta* complex (Okada 1970; Lin and Wheeler 1972). In some of the species the sexes differ only in palp size, while in others there is also a difference in abdominal pattern. Wings are usually clear, but a few African species possess some shading, and in *tritaeniata* the wing possesses three large dark markings. Bächli included 16 African species in the group and noted in his diagnosis that the male mesonotum of some species was silvery. The latter character is not present in any of the Australian species.

The group 4 species are distinguished only by shading or patterning of the wings, and lack any type of dimorphism. Wing colour ranges from a general infuscation (*zebra*) through weak differentiation of some darkened areas (*ornata, quadripunctata*) to strongly marked patterning (*regina*). These species probably do not comprise a

natural assemblage; as noted above, patterned wing species also occur in groups 2 (*violae, patternella*) and 3 (*tritaeniata*), and one species of the group 1 (*gibbosa*) also has wings with a general infuscation. At least one species (*lubrica*) is not distinguished either by infuscated or patterned wings, or by any type of dimorphism.

Some fairly probable relationships are thus evident within the Australian *Leucophenga*, but in view of the numerous uncertainties of relationships remaining among many species it does not now seem useful to attempt a formal species grouping.

In summary, Australia possesses over 21 species of *Leucophenga*, several of which appear to be endemic, while others (perhaps more recent invaders) are more widespread in New Guinea, south-east Asia or beyond. *Leucophenga* species occur over much of the Australian continent but are evidently absent from the south-west. Some species are restricted to rain forests, but many are widespread in drier habitats.

Key to Australian species of *Leucophenga*

1. 3rd abdominal tergite partly or completely white, desclerotized and devoid of bristles, short, usually largely concealed beneath 2nd tergite; 4th tergite appreciably longer than 3rd or 5th 2
   3rd abdominal tergite not white, desclerotized or concealed beneath 2nd tergite; 4th tergite about same length as 3rd and 5th 5
2(1). Wing with general infuscation, intense towards costal margin ..... *gibbosa* (male)
   Wing hyaline 3
3(2). 3rd abdominal tergite not entirely desclerotized, with brownish coloration and several bristles in posterolateral corners ..... *janicae* (male)
   3rd abdominal tergite entirely desclerotized, white and devoid of bristles 4
4(3). Posterior margin of 2nd abdominal tergite with several very large bristles; scutellum without distinct basal black spots ..... *albofasciata* (male)
   Bristles on posterior margin of 2nd abdominal tergite not unusually large; scutellum tan with basal black spots ..... *scutellata* (male)
5(1). Thorax and anterior portion of abdomen with intense silvery or greyish pollinosity masking underlying colour when viewed from in front 6
   Thorax and abdomen not pollinose, or at most with weak pollinosity not masking underlying colour 9
6(5). Wing with distinct pattern of dark markings ..... *violae* (male)
   Wing not patterned, or at most with small basal dark patch 7
7(6). Pleura with distinct longitudinal dark stripe ..... *subpollinosa* (male)
   Pleura pale or irregularly darkened, without clearly defined dark stripe 8
8(7). Abdomen almost white, with discrete black spots on tergites 4 and (usually) 5 ..... *argentata* (male)
   Abdomen tan with large, sometimes coalescing black spots on tergites 3–5 ..... *poeciliventris* (male)
9(5). Wing entirely hyaline, or at most with small basal dark spot or patch 10
   Wing infuscated (especially towards costa), or with more or less well defined pattern.. 25
10(9). Pleura with clearly defined dark longitudinal band 11
   Pleura pale or irregularly darkened, without obvious longitudinal band 13
11(10). Wing with small basal dark patch; mesonotum sometimes with weak pollinosity ..... *subpollinosa* (female)
   Wing entirely hyaline 12
12(11). Abdominal tergites 3–5 each shiny black with small tan submedian spots anteriorly ..... *lubrica* (male and female)
   Abdominal tergites 3–5 black, tergites 3 and 4 each with narrow anterior tan band ..... species D (female)

13(10). Abdominal tergites 3–5 each tan with 3 small to large dorsal black spots 14
Abdominal tergites 3–5 dark, banded, or with pattern of spots not as above 17

14(13). Scutellum with basal black patches, apically pale 15
Scutellum without basal black patches, not pale apically 16

15(14). 5th abdominal tergite tan with 3 small dorsal black spots ..... *argentata* (female)
5th abdominal tergite tan with 3 very large, sometimes coalescing dorsal black spines ..... *poeciliventris* (female)

16(14). 5th abdominal tergite tan with large central and lateral dorsal black patches ..... ? *angusta* (female)
5th abdominal tergite tan with very small central and lateral dorsal black spots ..... species A (female)

17(13). 4th abdominal tergite tan with small central and large lateral dorsal black spots 18
4th abdominal tergite not as above 19

18(17). Palps small, with large bristles, concealed in subcranial cavity when proboscis withdrawn ..... *bellula* (male)
Palps large, with few small bristles, protruding from subcranial cavity when proboscis withdrawn ..... *bellula* (female)

19(17). Abdomen almost entirely black, velvety ..... *angusta* (male)
Abdomen not almost entirely black; black coloration, when present, not velvety 20

20(19). 2nd abdominal tergite tan dorsally except for small to large lateral black spots 21
2nd abdominal tergite not as above 23

21(20). Scutellum with basal black patches ..... *scutellata* (female)
Scutellum without basal black patches 22

22(21). Thorax with weak pollinosity; wing with small basal black spot ..... *stigma* (male)
Thorax without pollinosity; wing entirely hyaline ..... *albofasciata* (female)

23(20). Abdominal tergites 2–4 each tan with posterior black band; tergite 2 black laterally ..... species E (female)
Abdominal tergites 2–4 not banded as above 24

24(23). Palps small, with large bristles, concealed in subcranial cavity when proboscis withdrawn; dorsal coloration of 3rd abdominal tergite ranging from tan anteriorly, black posteriorly to entirely black ..... *cooperensis* (male)
Palps large, with few small bristles, protruding from subcranial cavity when proboscis withdrawn; 3rd abdominal tergite tan dorsally with tiny central black patch ..... *cooperensis* (female)

25(9). Wing without defined pattern, with general infuscation usually more pronounced towards costa 26
Wing with more or less well defined pattern of darker and lighter areas 30

26(25). Pleura with clearly defined dark longitudinal band ..... *zebra* (male and female)
Pleura without dark longitudinal band 27

27(26). Scutellum pale apically 28
Scutellum not pale apically 29

28(27). Palps small, with large bristles, concealed in subcranial cavity when proboscis withdrawn ..... *flavohalterata* (male)
Palps large, with few small bristles, protruding from subcranial cavity when proboscis withdrawn ..... *flavohalterata* (female)

29(27). 2nd abdominal tergite largely black; 3rd tergite black at least on posterior 0.75 ..... *gibbosa* (female)
2nd abdominal tergite tan with slight infuscation posteriorly; 3rd tergite black on posterior 0.4 only ..... *janicae* (female)

30(25). Pleura with clearly defined dark longitudinal band(s) 31
Pleura without obvious dark longitudinal band(s) 32

31(30). Pleura with 1 band; mesonotum brown, darker laterally ..... *violae* (female)
Pleura with 2 bands; mesonotum with complex pattern of pale and dark areas ..... *cyanorosa* (male and female)

32(30). Wing with 3 large dark patches; 4th longitudinal vein greatly weakened apically 33
Wing not as above, 4th longitudinal vein normal 34

33(32). Palps small, with large bristles, concealed in subcranial cavity when proboscis withdrawn ..... *tritaeniata* (male)
Palps large, with few small bristles, protruding from subcranial cavity when proboscis withdrawn ..... *tritaeniata* (female)

34(32). 2nd longitudinal vein strongly curved towards costa apically; wing with extensive pattern of pale and darker markings (Fig. 21) ..... *regina* (male and female)
Wing not as above 35

35(34). Anterior crossvein clear 36
Anterior crossvein within dark patch 37

36(35). Mesonotum and abdomen with weak silvery pollinosity ..... *patternella* (male)
Mesonotum with very weak pollinosity; abdomen without pollinosity ..... *patternella* (female)

37(35). Wing with strong dark patch at end of 2nd longitudinal vein 38
Wing with weak coloration only at end of 2nd longitudinal vein 39

38(37). Apical portion of 3rd longitudinal vein clear ..... species B (male and female)
Apex of 3rd longitudinal vein within pale spot ..... species C (female)

39(37). Large diffuse patch present about distal half of 2nd longitudinal vein ..... *ornata* (male and female)
Small weak patch only present at apex of 2nd longitudinal vein ..... *quadripunctata* (male and female)

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Note Added in Proof

Since the above was written, the author has had the opportunity to examine a large number of specimens of *L. maculata* in the collection of the Museum für Naturkunde, East Berlin. *L. maculata* closely resembles *L. poeciliventris* both in general coloration and pattern and in the type of dimorphism present. However, the ocellar and postvertical bristles in *maculata*, although slender, are well developed, while the corresponding bristles in *poeciliventris* are vestigial. The humeral areas of the thorax are also paler in *maculata* than in *poeciliventris*. *L. poeciliventris* thus appears to be a valid species. The distribution of *maculata* is given by Lin and Wheeler (1972) as 'ranging from Europe across the entire Palaearctic Region to Korea and Japan, and south to Taiwan and Indonesia'. The types of other species, locations of which are given above as '? Berlin' were not found in the collection of the Museum für Naturkunde; these types should probably be considered lost.
According to Morge (personal communication) the holotype of *L. halteropunctata* is in the collection of the Deutsches Entomologisches Institut, Institut für Pflanzenschutzforschung Kleinmachnow, Zweigstelle Eberswalde, East Germany. Grateful acknowledgment is due to Dr H. Schumann for his considerable help during the author's visit to East Berlin.

19.ii.1979

Species Index

The following table lists the Australian species of *Leucophenga*. Species recorded from Australia for the first time in the present work are indicated by an asterisk. Synonyms and homonyms are indicated in roman type.

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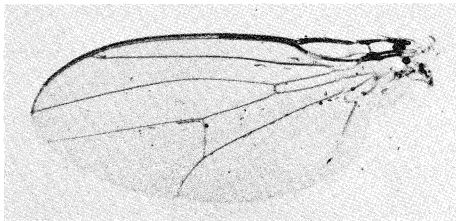
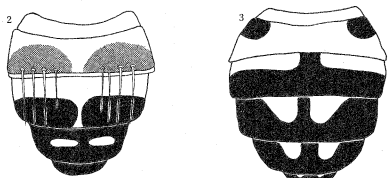
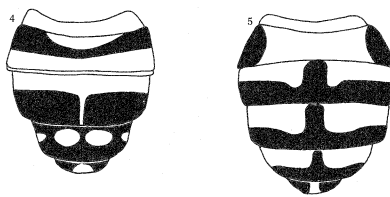


Fig. 1. *L. albofasciata*, wing.



Figs 2 and 3. *L. albofasciata*: *2*, male abdomen; *3*, female abdomen.



Figs 4 and 5. *L. scutellata*: *4*, male abdomen; *5*, female abdomen.

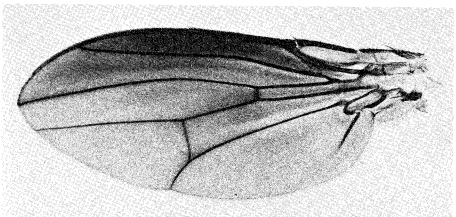


Fig. 6. *L. gibbosa*, wing.

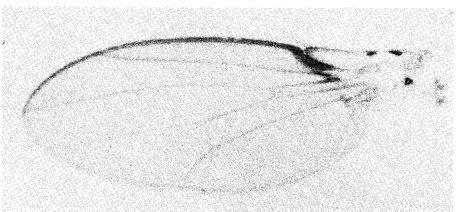
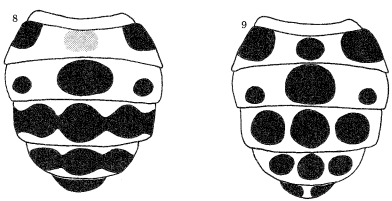


Fig. 7. *L. subpollinosa*, wing.



Figs 8 and 9. *L. poeciliventris*: *8*, male abdomen; *9*, female abdomen.

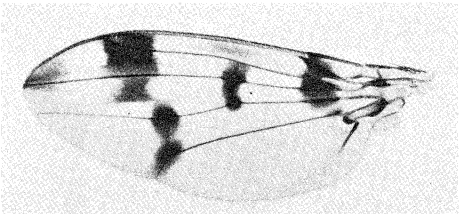
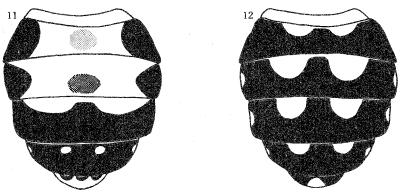


Fig. 10. *L. violae*, wing.



Figs 11 and 12. *L. violae*: *11*, male abdomen; *12*, female abdomen.

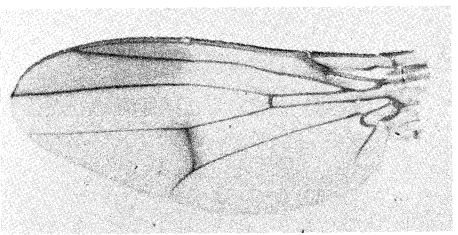


Fig. 13. *L. patternella*, wing.

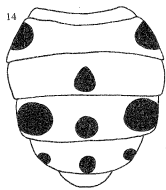
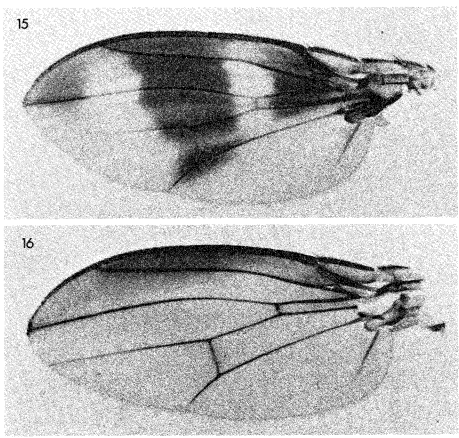


Fig. 14. *L. bellula*, abdomen.



Figs 15 and 16. Wings: *15, L. tritaeniata*; *16, L. flavohalterata.*

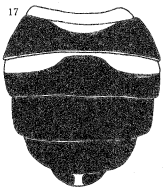
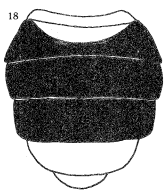
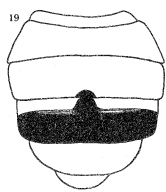


Fig. 17. *L. flavohalterata*, abdomen.





Figs 18 and 19. *L. cooperensis*: *18*, male abdomen; *19*, female abdomen.

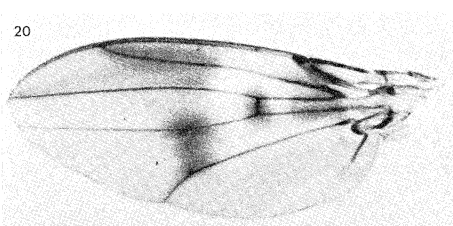
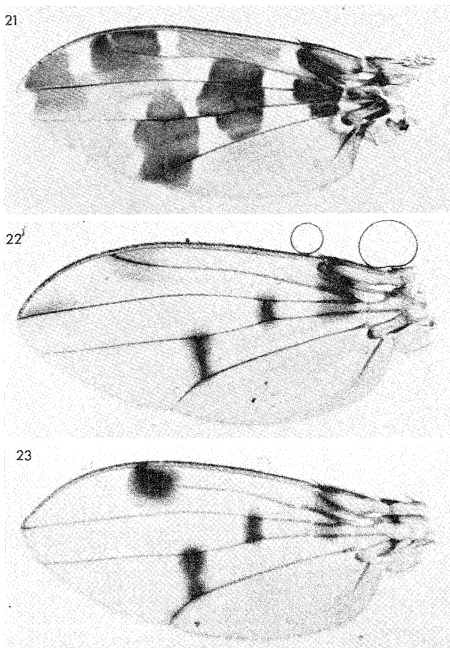


Fig. 20. *L. ornata*, wing.



Figs 21–23. Wings: *21, L. regina*; *22, L. quadripunctata*; *23, Leucophenga*, sp. B.

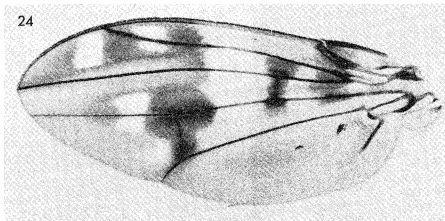


Fig. 24. *L. cyanorosa*, wing.

Fig. 25. Australian localities at which *Leucophenga* has been collected.