

Drosophilidae of Australia. II.* *Scaptomyza* (Insecta: Diptera)

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Abstract

Although the cosmopolitan genus *Scaptomyza* contains about 400 species, only two occur in Australia, the endemic *S. australis* Malloch (= '*Drosophila*' *biradiata* Duda) and the cosmopolitan *S. pallida* (Zetterstedt). Redescriptions of both species are given. *S. australis* is widespread within Australia and exhibits a range of colour variability.

Introduction

A general diagnosis of members of the family Drosophilidae has been given, together with a taxonomic account of the genus *Drosophila* in Australia (Bock 1976).

The genus *Drosophila* is by far the largest in the family; the next largest genus, with about 400 known members or slightly over one-quarter the number of known *Drosophila* species, is *Scaptomyza* Hardy (Lin and Wheeler 1972). In spite, however, of the relatively large number of *Scaptomyza* species known world-wide, there are only two descriptions of Australian flies referable to this genus. One is *Scaptomyza australis* Malloch, 1923; the other is *Drosophila biradiata* Duda, 1923 [Duda regarded *Scaptomyza* as a subgenus of *Drosophila* (Duda 1924, p. 203)]. These two species have proved to be synonyms; both descriptions were published in papers which also contained synonymous descriptions of Australian *Drosophila* species; Malloch's paper has 12 days' priority (Bock 1976).

The cosmopolitan *S. pallida* is mentioned in Hackman (1959) as occurring in 'New South Wales'; it, but no other species, has been detected in this study based on Australia-wide collections. Australia therefore apparently possesses only two *Scaptomyza* species. These two species are described in the form used previously for *Drosophila* species (Bock 1976). The following abbreviations are used for museum collections:

- | | |
|-------|--|
| ANIC | Australian National Insect Collection, Division of Entomology, CSIRO, Canberra |
| HNM | Hungarian National Museum, Budapest |
| SM | Stockholm Museum |
| SPHTM | School of Public Health and Tropical Medicine, University of Sydney |
| USNM | United States National Museum, Washington D.C. |

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Genus *Scaptomyza* Hardy

Scaptomyza Hardy, 1849, p. 361. Type-species *Drosophila graminum* Fallen; type locality Europe.

Wheeler and Takada (1964) diagnosed *Scaptomyza* as follows: 'arista plumose, with 1–2 ventral branches; acrostichal hairs in 2–4 rows; no prescutellars; carina often reduced; rather slender species, many with leaf-mining larvae'. To this it might be added that most species are not only slender but small, rarely much more than 2 mm long, and thus smaller than most *Drosophila* species.

The most comprehensive account of the genus given to date is that of Hackman (1959), who discussed the genus on a world basis and recognized nine subgenera. The endemic Australian species *S. australis* is a member of the subgenus *Bunostoma*, other species of which are known from Pacific islands from Samoa to Hawaii. The cosmopolitan *S. pallida* is a *Parascaptomyza*. Since only one endemic species occurs in Australia, the subgeneric classification of the genus is not considered of sufficient relevance to warrant further discussion in this paper.

✓ 1. *Scaptomyza (Bunostoma) australis* Malloch

Scaptomyza australis Malloch, 1923, p. 618. (Type locality Sydney; holotype in USNM; several specimens determined by Malloch in SPHTM.)

✓ *Drosophila biradiata* Duda, 1923, p. 50. Syn. nov. (Type locality New South Wales; type series in HNM.)

Distinguishing Features

A small drosophiline fly, colour varying from pale tan (but at least posterior portion of 6th abdominal tergite black) to shiny black; arista well developed, with 2 ventral rays; 2 rows of acrostichal bristles present not reaching scutellar margin posteriorly.

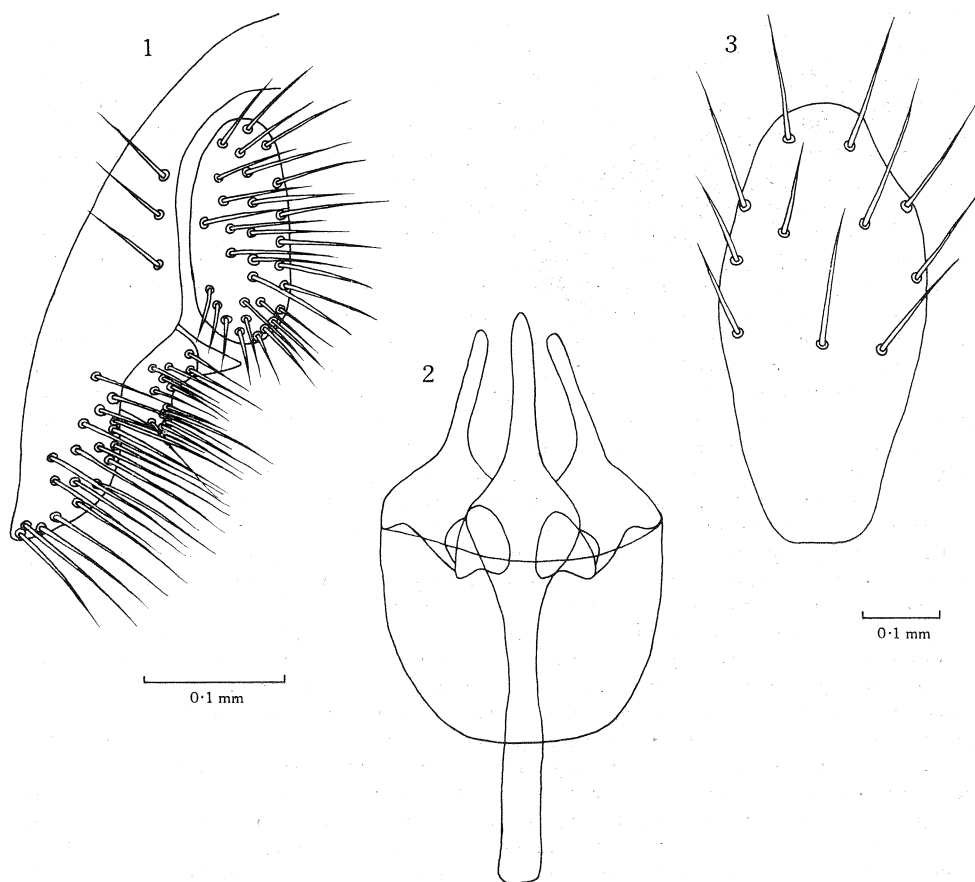
Description

Body length. c. 2·2 mm.

Head. Arista with 4–5 rays above, almost invariably with 2 rays below (very occasionally 1), plus terminal fork. Front 1·8 times broader than long, in pale specimens entirely pale yellowish tan, in dark specimens tan anteriorly, black about ocellar triangle and orbits posterior to proclinate orbital bristle. Occiput dusky laterally (pale specimens) to entirely blackened (dark specimens) with greyish patch below ocellar triangle. Front not sharply demarcated from occiput, head gradually rounded posterior to level of ocellar triangle. 2nd and 3rd antennal segments tan (in specimens of all colorations). Carina nose-like, not very broad below. 2nd oral bristle usually almost as large as 1st but occasionally somewhat smaller, succeeding oral bristles short and fine. Cheek slightly curved, pale, not greatly widened in posterior corner, greatest width c. 0·25 greatest diameter of eye. Eyes slightly oval, with dense fine pile. Orbital bristles in ratio 7 : 3 : 8; anterior reclinate orbital fine, lateral to proclinate orbital. Ocellar and vertical bristles large; postverticals well developed.

Thorax. Mesonotum shiny uniform pale tan to shiny black dusted with minute pollinose flecks. Various intermediates between these extremes, colour sometimes not uniform, mesonotum darkened between 2 rows of acrostichal bristles in centre

line and again laterally. Darker coloured specimens somewhat more numerous amongst specimens examined (see below). Acrostichal hairs in 2 rows in front of dorsocentral bristles, extending posteriorly to between anterior and posterior dorsocentrals. Ratio anterior : posterior dorsocentrals *c.* 0.7; anterior dorsocentrals closer to transverse suture than to posterior dorsocentrals. Anterior and posterior scutellar bristles about equal in length; anterior scutellars convergent; posterior scutellars crossed. Sterno-index *c.* 0.6; anterior sternopleural bristle fine; middle sternopleural short, very fine. Legs pale tan (specimens of all colorations); preapical bristles on all tibiae; apicals on 1st and 2nd tibiae.



Figs 1-3. *S. australis*: 1, male external genitalia; 2, male internal genitalia; 3, egg guide.

Wings. Hyaline. *C*-index *c.* 2.9; 4*V*-index *c.* 1.6; 5*X*-index *c.* 1.3; *M*-index *c.* 0.5. 3rd costal section with heavy setation on basal 0.4. Length *c.* 2.7 mm.

Abdomen. Pale specimens: tergites 1-5 uniform pale tan, tergite 6 tan on anterior third, black on posterior two-thirds, or entirely black; black specimens: all tergites shiny black, dusted with pollinose flecks; intermediate specimens: tergite 6 black, anterior tergites brownish.

Male genitalia (Figs 1, 2). Anal plate and upper portion of genital arch with microsetation (not shown in Fig. 1); clasper small, without short thick teeth but

with long bristles; lower portion of genital arch elongate and rather broad, with numerous long bristles. Aedeagus apically narrowed, not bifid, bare; posterior parameters long, curved.

Female genitalia. Egg guide weakly sclerotized, not pointed or serrate, with sparse bristles (Fig. 3).

Distribution

Mainland Australia generally; see p. 000.

Specimens Examined

SPHTM specimens determined by Malloch; Duda syntypes in HNM; Australia-wide ANIC collection as follows: **Queensland:** Thursday I., 10.xii.1948, 2♂, 2♀; Mossman, 8.ix.1923, 16. xii.1923, Mackerras, 1♂, 2♀; Ingham, light trap, 5–12. ii.1963, K. L. Harley, 1♀; Dawson River, near Duaringa, 8.v.1970, Z. Liepa, 1♀; Toowoomba, 3.i.1962, R. Lindsay, 1♀. **Northern Territory:** Illara Rock Hole, near Tempe Downs, 3.xiii.1963, P. Ramford, 1♂, 1♀; Milton Peak homestead, 5.xii.1968, A. O. Nicholls, 1♂, 3♀; 44–45 km NE. of Andado homestead, Simpson Desert, 29.ix.1972, Z. Liepa, 1♀. **New South Wales:** Leura, 28.xii.1963, D. H. Colless, 2♂, 1♀; Coolabah, 12.x.1963, D. H. Colless, 2♂, 1♀; Mt Tomah, 3000 ft, 18.xii.1967, M. S. Upton, 1♂, 2♀; Dorriggo, 1700 ft, 11.xi.1961, I. F. B. Common and M. S. Upton, 3♂, 1♀; Alpine Creek, Snowy Mountains Highway, 9.xii.1964, R. Lindsay, 2♂, 4♀; Eucumbene Dam, 18.xi.1962, D. H. Colless, 2♀; Bullenbung Creek, near Galore, 12.i.1964, Z. Liepa, 3♂; Forbes, 14.xi.1964, D. H. Colless, 1♂, 2♀; Narooma, 25.xi.1930, A. L. Tonnoir, 1♀; 1 mile S. of Hotel Kosciusko, 5300 ft, Kosciusko National Park, at light, 4.xii.1970, I. F. B. Common and J. S. Dugdale, 1♀; Brockelos Creek, 16.5 km S. of Bermagui, 22.vii.1973, 24–27.ii.1974, Z. Liepa, 2♂, 1♀; Wallaga Lake, Bermagui, 21.vii.1973, 24–27.ii.1974, Z. Liepa, 3♀; Merimbula, 21.iii.1976, Z. Liepa, 1♀; Snowy River, 5500 ft, 12.i.1967, D. H. Colless, 2♀; Parkes, 13.xi.1964, D. H. Colless, 1♀; Durras Lake, 22.ii.1965, D. H. Colless, 1♂; Mt Kaputar, 2000 ft, 7.x.1963, D. H. Colless, 1♀; 45 km SE. of Nyngan, 22.ix.1975, Z. Liepa, 1♀; Moruya River estuary, 19.vii.1973, Z. Liepa, 1♂; Mt Dromedary, 1000 ft, 24.xi.1965, I. F. B. Common and M. S. Upton, 1♀; Tinderry Range, 30 km NE. of Bredbo, 28.xii.1973, Z. Liepa, 1♀; Kangaroo Valley, 23.iii.1961, D. H. Colless, 1♀; The Rock, 14.ix.1968, Key, Upton and Balderson, 1♀; Sheepstation Creek, Araluen, 24.xi.1973, Kelsey and Liepa, 1♂; Wagga, 14.x.1960, P. Goodchild, 1♀; Manly, Sydney, 27.viii.1960, D. H. Colless, 3♀; Manly Reservoir, Sydney, 8.xii.1962, D. H. Colless, 1♀; 12 miles NW. of Milton, 1600 ft, 5.xi.1968, D. H. Colless, 2♂; Clyde Mountain (landslip), 22.ii.1965, D. H. Colless, 2♂; 10 miles SE. of Temora, 12.xi.1966, Z. Liepa, 2♂; 30 miles W. of Cobar, 24.xi.1949, S. J. Paramonov, 2♂; Mt Kosciusko, 11.xii.1931, A. L. Tonnoir, 1♂; Spencer's Creek, Kosciusko, 6.xi.1961, D. H. Colless, 1♂; Back Yamma State Forest, 11.xi.1964, D. H. Colless, 1♂, 3♀; 4 miles N. of Bateman's Bay, 14.x.1965, Z. Liepa, 1♂, 1♀; Cabbage Tree Creek, Clyde Mountain, 14.x.1965, Z. Liepa, 1♂, 1♀; Mogo, 15.x.1968, J. Cardale, 2♂, 2♀; 8 km NW. of Kurrajong, Bell Rd, 8.x.1974, Z. Liepa, 2♀; Brown Mountain Lookout, 8.x.1973, Z. Liepa, 1♀; Braidwood, 27.x.1968, J. C. Cardale, 1♀; Shoalhaven River, near Braidwood, 4.x.1973, Z. Liepa, 1♀; Shoalhaven River, 22.x.1952, S. J. Paramonov, 5♂, 14♀; Shoalhaven River, 9.i.1968, D. H. Colless, 1♂; near Braidwood, 3.xii.1952, S. J. Paramonov, 4♂, 15♀; Little Dog I., 23.xii.1952, R. Mykytowycz, 1♂, 1♀; Broadwater, 1926–32, D. S. North and E. G. Baber, 1♂, 3♀. **Australian Capital Territory:** Blundell's, 1930–31, several collectors, 4♂, 6♀; CSIRO Insectary, Jan. 1949, G. R. Wearne, 1♂, 11♀; Black Mountain, various dates and collectors, 3♀; Black Mountain, light trap, various dates, I. F. B. Common, 1♂, 8♀; Cotter-Murrumbidgee River junction, 29.xi.1962, D. H. Colless, 1♀; 2 miles E. of Mt Coree, 19.xi.1968, D. H. Colless, 1♀; Bull's Head, 19.xi.1968, D. H. Colless, 1♂, 1♀; Mt Majura, 11.vii.1961, D. H. Colless, 1♀; Paddy's River, 4.xi.1961, D. H. Colless, 1♀; Mt Coree, 30.i.1964, D. H. Colless, 1♂, 2♀; Canberra, 20.i.1948, Paramonov, 1♀; Oakey Creek, Tidbinbilla, 20.xi.1966, Z. Liepa, 2♀; Mt Gingera, various dates, D. H. Colless and R. Lindsay, 4♂, 2♀. **Victoria:** Forrest, 20 miles SE. of Colac, 1.i.1967, Z. Liepa, 1♀; Wyperfeld National Park, 51 km NW. of Hopetoun 4–7.ix.1974 Z. Liepa, 6♀; 47 km NW. of Hopetoun, 6.ix.1974, Z. Liepa, 1♀; Lake Albacutya, near Rainbow, 6.ix.1974, Z. Liepa, 1♂, 5♀; Barjarg, 22.x.1961, D. H. Colless, 2♂, 1♀; Bright, 22.x.1961, D. H. Colless, 1♂; Stratford, 28.x.1961, D. H. Colless, 1♀; Yatpool, Mallee district, 3.ix.1974, Z. Liepa, 1♂, 1♀; Lakes Entrance, North Arm,

5.viii.1973, Z. Liepa, 1♂; L. Cullulleraine, W. of Mildura, 26.xii.1966, Z. Liepa, 1♀; in jar from *Oncopera* larvae, Trafalgar, 4.x.1950, K. M. Price, 2♀. **South Australia:** Sleaford Bay, various dates, J. Casanova, 2♂, 5♀; Cape Jervis, Land's End, 10.x.1975, Z. Liepa, 1♂; Leigh Creek, 15.ix.1972, Z. Liepa, 1♀; Yumali, 8.viii.1968, Colless and Liepa, 1♂, 1♀; Oratunga Creek, 11 km E. of Parachilna, 4.x.1975, Z. Liepa, 3♀; Mt Crawford State Forest, 6.viii.1968, Colless and Liepa, 1♂, 1♀; Wilpena Pound, Flinders Ranges, 3.x.1975, Z. Liepa, 2♀; Moorlands, 8.viii.1968, Colless and Liepa, 2♂; 33 km SE. by S. of Oodnadatta, 23.ix.1972, Z. Liepa, 1♀; Port Germein, 5.x.1975, Z. Liepa, 1♀; 4.8 km NE. of Maree, at light, 15.ix.1972, Z. Liepa, 2♂, 2♀; Windy Creek, 22 km N. of Beltana, 14.ix.1972, Z. Liepa, 1♀; Hahndorf, 6.viii.1968, Colless and Liepa, 1♀; 6 km N. of Mt Sarah homestead, N. of Oodnadatta, at light, 14.ix.1972, Z. Liepa, 2♂, 6♀. **Western Australia:** Fremantle, 29.vii.1934, K. R. Norris, 1♀; Crawley, 20.viii.1934, K. R. Norris, 1♀; Mt Singleton, 15.vii.1963, V. Williamson, 1♂; 27 miles N. of Bunbury (coast road), 1.x.1970, D. H. Colless, 1♂; Stirling National Park, 54-mile post, 12.x.1970, D. H. Colless, 1♀; 2 miles SSW. of Dongara, 15.x.1970, D. H. Colless, 1♀; Pemberton, 2.xii.1936, K. R. Norris, 1♂; 7 miles N. by E. of Pemberton, 5.x.1970, D. H. Colless, 1♀; Millstream, at light, 7–10.iv.1971, D. H. Colless, 5♀; Millstream, 24.x.1970, D. H. Colless, 1♀; Crossing Pool, Millstream, at light, 21.x.1970, D. H. Colless, 2♀; 16 miles SE. by S. of Carnarvon, 16.x.1970, D. H. Colless, 1♀.

Special Comments

Although Duda mentioned only 'New South Wales' as a locality in his description of *biradiata*, his syntypes bear locality labels from the following sites: Sydney, Botany Bay; Paramatta, N.S.W.; Springwood, N.S.W.; Mt Victoria, N.S.W.; Brisbane; and one specimen, Ceylon, Pattipola, 2000 m. The Australian specimens are also labelled 'Biró 1900', the Ceylonese one 'Biró 1902'. The Ceylonese specimen is in very poor condition and doubtfully conspecific with the others.

The colour variations mentioned above are not geographically determined; all colours may occur within one area, and individuals at one extreme of the colour range have been bred out in the laboratory from wild-inseminated females at the other extreme (G. Prince, personal communication). The inheritance of body colour has not yet, however, been studied in detail; the species may be cultured on standard *Drosophila* medium but not easily. Whether or not an environmental effect contributes to adult body colour remains to be determined.

The species is widespread in Australia from far northern Queensland to southern Australia, in both east and west, occurring over a range of environments and habitats. It appears to be absent in rain forests, but frequently occurs in hot dry open sclerophyll habitats; at the opposite end of the environmental range numerous specimens have been collected in a Melbourne orchard (G. Prince, personal communication).

Feeding habits of the species have not yet been fully determined, but the larvae appear to be leaf miners. One of the SPHTM specimens bears a label 'mining *Stellaria media*' (i.e. chickweed), presumably having been bred out from the plant.

2. *Scaptomyza* (*Parascaptomyza*) *pallida* (Zetterstedt) → *e/moi* Takada

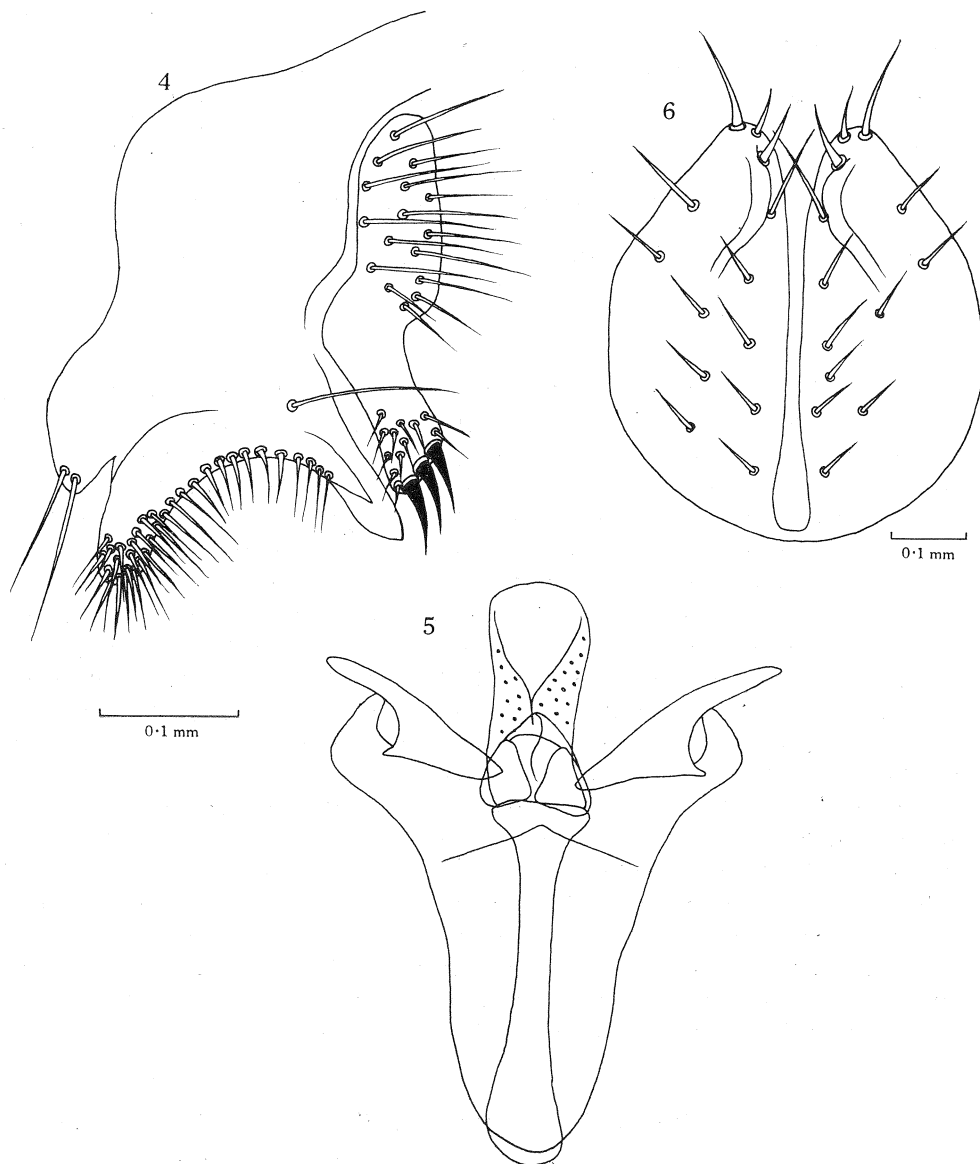
Drosophila pallida Zetterstedt, 1847, p. 2571. (Type locality Europe; holotype in SM.) For synonymies see Wheeler and Takada (1964).

Distinguishing Features

A small drosophiline fly with large greyish patches on mesonotum; abdomen dark at least posteriorly; arista large, with single ventral ray; 2 rows of acrostichal bristles present to scutellar margin.

Description

Head. Arista with 4–5 large straight rays above and 1 ray below plus large terminal fork. Front 1·4 times broader than long, tan anteriorly, greyish subshining about orbits posterior to proclinate orbital bristle and within and about ocellar triangle.



Figs 4–6. *S. pallida*: 4, male external genitalia; 5, male internal genitalia; 6, egg guide.

Occiput dusky laterally, greyish below ocellar triangle. Occipital margin rounded, front not sharply demarcated from occiput. 2nd and 3rd antennal segments tan. Carina nose-like but not greatly widened below. Vibrissa large; 2nd oral bristle fine, considerably shorter than vibrissa. Cheek curved, greatest width *c.* 0·25 greatest

diameter of eye. Eyes with dense fine pile. Orbital bristles in ratio 4 : 2 : 5; anterior reclinate orbital lateral to proclinate orbital. Ocellar, vertical and postvertical bristles large.

Thorax. Mesonotal coloration varying from pale to dark brown, subshining, with dense pale greyish pollinosity laterally from row of acrostichal bristles almost to lateral border of mesonotum; greyish pollinosity also on scutellum. Acrostichal hairs in 2 rows extending posteriorly to scutellar border. Anterior dorsocentral bristles close to transverse suture; ratio anterior : posterior dorsocentrals *c.* 0.7. Anterior and posterior scutellar bristles long; anterior scutellars convergent; posterior scutellars crossed. Sterno-index *c.* 0.5; anterior sternopleural bristle fine; middle sternopleural short, very fine. Legs tan; preapical bristles on all tibiae; apicals on 2nd tibiae only.

Wings. Hyaline. *C*-index *c.* 3.1; *4V*-index *c.* 1.5; *5X*-index *c.* 1.7; *M*-index *c.* 0.7. 3rd costal section with heavy setation on basal 0.3. Length *c.* 2.7 mm.

Abdomen. Pale tan darkening posteriorly to entirely black.

Male genitalia (Figs 4, 5). Anal plate and upper portion of genital arch with microsetation (not shown in Fig. 4); primary clasper large, strongly curved, with numerous medial bristles; secondary clasper present possessing several very large black medial bristles. Aedeagus broad, apically open, with numerous minute ornamentations; posterior parameres large, strongly curved, apically narrowed and rounded.

Female genitalia. Egg guide small but strongly sclerotized, especially apically, with large bristles (Fig. 6).

Distribution

Cosmopolitan (Burla 1954; Wheeler and Takada 1964); apparently rare within Australia, but collected from a very wide range of localities.

Specimens Examined

All in ANIC unless otherwise stated. **Queensland:** Millaa Millaa Falls, Atherton Tableland, 15.vii.1971, Z. Liepa, 2♂; Mt Glorious, 12.i.1962, R. Lindsay, 1♀. **New South Wales:** Dorriggo National Park, 12.x.1962, D. H. Colless, 1♂; Brown Mountain, 20.ii.1965, 27.ii.1974, Z. Liepa, 2♀; Eucumbene Dam, 18.xi.1962, D. H. Colless, 1♀; 4 miles E. of Nimmitabel, 8.iii.1963, D. H. Colless, 1♂; Minnamurra Falls, 29.i.1968, Z. Liepa, 2♀. **Australian Capital Territory:** Black Mountain, light trap, I. F. B. Common, 23.xi.1965, 1♂, 30.xii.1963, 1♀. **Victoria:** Melbourne, orchard, G. Prince, 1♂, 1♀; Bock; 47 km NW. of Hopetoun, 6.ix.1974, Z. Liepa, 1♂; 10 miles E. of Beech Forest, i.i.1967, Z. Liepa, 1♀. **South Australia:** Hahndorf, 6.viii.1968, Colless and Liepa, 1♀. **Western Australia:** Nedlands, light trap, 28.viii.–2.ix.1960, E. Holm, 1♂; Toodyay, 14.x.1970, D. H. Colless, 1♀; Pemberton, 2.xii.1936, K. R. Norris, 2♀; 9 miles W. of Pemberton, 4.x.1970, D. H. Colless, 1♀.

Key to Australian Species of *Scaptomyza*

- Acrostichal hairs not reaching level of posterior dorsocentral bristles; arista with 2 ventral rays in addition to terminal fork; 2nd oral bristle usually almost as large as 1st; mesonotum shining *australis*
- Acrostichal hairs reaching scutellar margin; arista with single ventral ray in addition to terminal fork; 2nd oral bristle considerably smaller than 1st; mesonotum subshining, laterally greyish. . . . *pallida*

Discussion

Given the large number of species and world-wide distribution of *Scaptomyza*, the extreme paucity of the Australian fauna seems remarkable on first consideration; the world distribution of *Scaptomyza* species is, however, highly uneven. The Hawaiian islands contain a large proportion of the world total of species, most of them endemic; in the single subgenus *Trogloscaptomyza* 86 of 87 known species occur only in Hawaii (Hardy 1974); there has thus been as substantial a proliferation of *Scaptomyza* species in Hawaii as of *Drosophila* species. A good case can, in fact, be made for considering Hawaii the place of origin of the genus *Scaptomyza* (Throckmorton 1975), with subsequent radiations into other parts of the world. Wheeler and Takada (1966) listed 55 species from the Nearctic and Neotropical zones; smaller numbers of species have been recorded from various Pacific islands. Fewer species occur in other parts of the world. Okada (1956) listed six species from Japan; a few more were subsequently added (Okada 1973a, 1973b); several species occur in neighbouring mainland Asia. Burla (1954) noted a total of four species from the Ethiopian zone; another three were added by Tsacas (1972). Harrison (1959) found three species in New Zealand, the cosmopolitan *pallida* (termed '*graminum*' because of a long-standing nomenclatural confusion; cf. Hackman 1959) and two endemics; New Zealand thus has a richer *Scaptomyza* fauna than Australia. Few species occur in Europe. In particular there appears to have been no radiation in south-east Asia, an area notable for several major bursts of drosophilid speciation from which, ultimately, Australia appears to have derived its *Drosophila* fauna and that of most if not all of its other drosophilid genera.

Only one species of *Scaptomyza*, *S. pallida*, is cosmopolitan; most of the remaining species have quite limited distributions. *S. australis* has been collected as far north as Thursday I.; whether or not it occurs further north than this (i.e. in New Guinea) remains to be determined. Although, as mentioned above, *australis* has been found to be common in an orchard, the species is not generally attracted to *Drosophila* fruit baits and is collected by sweeping. The widespread occurrence of this species in Australia and the fact that it can be cultured in the laboratory suggest that it may be a candidate for polytene chromosomal investigations.

Acknowledgments

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