Aust. J. Zool., 1986, **34**, 305–13

The Drosophilidae (Insecta : Diptera) of Norfolk Island

Ian R. Bock

Department of Genetics and Human Variation, La Trobe University, Bundoora, Vic. 3083.

Abstract

Eleven species of Drosophilidae in four genera (*Drosophila*, including three cosmopolitan species, *Scaptomyza*, *Mycodrosophila*, and *Leucophenga*) are recorded from Norfolk and Philip Is. Four species (two *Drosophila*, one *Scaptomyza*, one *Leucophenga*) are described as new.

Introduction

The Drosophilidae of some parts of the Pacific basin are now fairly well known. The Hawaiian fauna, with its hundreds of species (albeit in only two 'lineages'), has been examined in great detail from both taxonomic and cytogenetic points of view (Carson and Yoon 1982). The Fijian–Samoan Is harbour at least 48 drosophilid species in 12 genera, with one of the latter (*Samoaia* Malloch) endemic to the Islands (Wheeler and Kambysellis 1966). Only 14 species (11 *Drosophila*, three *Scaptomyza*) occur in New Zealand, and a collection on Lord Howe I. in 1979 yielded only four species of *Drosophila* (Parsons and Bock 1979).

Norfolk I. is a small (33 km^2), isolated island about 1400 km east of Brisbane. The very much smaller Philip I. lies a few kilometres to the south. Norfolk I. is about 800 km from Lord Howe, over 600 km from both New Zealand and New Caledonia, and about 1400 km from Fiji.

No systematic collection and analysis of the drosophilid fauna of Norfolk I. has previously been attempted, but about 1000 specimens were collected on two trips to Norfolk and Philip Is by the Division of Entomology, CSIRO, in 1984. A reliable sample of the Norfolk fauna is therefore now available and an analysis of the collections is presented below. New species are described in the form used previously for Australian Drosophilidae (Bock 1976, 1979, 1982).

Collection Results

All material was preserved in alcohol after collection. All specimens have been returned to the Australian National Insect Collection, Division of Entomology, CSIRO, Canberra. Numbers of specimens examined are given under each species heading below as males, females. Norfolk I. National Park is abbreviated to NINP.

Genus **Drosophila** Fallén

1. ***Drosophila (Sophophora) ananassae*** Doleschall

Specimens examined. **Norfolk I.:** nr Highlands Guesthouse, 20–26.iii.1984, J. E. Feehan, 0, 2; pan trap in palm forest 20–26.iii.1984, D. C. F. Rentz, 0, 1; Mt Pitt, 220 m, NINP, 2.iv.1984, E. D.

0004-959X/86/020305$02.00

Edwards, 1, 0; Rocky Point Reserve, 8.iv.1984, 0, 1; 29°01'S.,167°57'E., Red Rd, flight intercept, M. Jowett, June 1984, 102, 159, Nov. 1984, 2, 3.

Special Comments

D. ananassae is one of the world's eight cosmopolitan *Drosophila* species. It is well established in natural habitats in the Fijian Is and in south-east Asia, and is probably native to one of these regions; a sibling species (*pallidosa* Bock & Wheeler) also occurs in (and is restricted to) the Fijian-Samoan Is. The coloration of *ananassae* is, furthermore, pale throughout its range except in the Fijian Is, where members of the species are very dark brown (and superficially quite unlike specimens from other areas). Of considerable interest is the finding that all the Norfolk specimens possess the Fijian coloration, which suggests a very close relationship between the two populations.

2. *Drosophila (Sophophora) simulans* Sturtevant

Specimens examined. **Norfolk I.:** Selwyn Pine Rd, 120 m, E. D. Edwards, 25.iii.1984, 1, 0, 28.iii.1984, 0, 1; nr Highlands Guesthouse, Stop 1 at light, 20–26.iii.1984, D. C. F. Rentz, 0, 2; Mt Bates, 300 m, NINP, 9.iv.1984, E. D. Edwards, 1, 0; 29°01'S.,167°57'E., Red Rd, flight intercept, June 1984, M. Jowett, 1, 0. **Philip I.:** Upper Long Valley, pitfall trap baited with rabbit intestines, 29.iii.1984, J. E. Feehan, 0, 1; 29°07'S.,167°57'E., 20–24.xi.1984, L. Hill, Red Road Valley, 0, 2, Moo-oo Beach, 1, 0.

Special Comments

D. simulans is another cosmopolitan species. It almost certainly evolved in Africa, but has been dispersed about the globe in association with man.

3. *Drosophila (Drosophila) immigrans* Sturtevant

Specimens examined. **Norfolk I.:** nr Highlands Guesthouse, pitfall trap baited with human faeces, 20–26.iii.1984, E. D. Edwards, 1, 0; 29°01'S.,167°55'E., Rocky Point Reserve, 14.xi–2.xii.1984, I. D. Naumann, 0, 1; 29°01'S.,167°57'E., Red Rd Track, NINP, malaise trap, I. D. Naumann, 0, 1.

Special Comments

Also a cosmopolitan species closely associated with man, *immigrans* probably originated in south-east Asia–New Guinea.

4. *Drosophila (Scaptodrosophila) enigma* Malloch

Specimen examined. **Norfolk I.:** 29°01'S.,167°57'E., Filmy Fern Walk, NINP, 14.xi–2.xii.1984, I. D. Naumann, 1, 0.

Special Comments

D. enigma is an Australian native; the species is widespread in urban environments in the south-east (Bock 1984). Several years ago the species was discovered in New Zealand (Parsons 1980), to which area it appears to be a recent introduction or immigrant. A closely related species (*D. howensis* Parsons & Bock) occurs on Lord Howe I.

5. *Drosophila (Scaptodrosophila) norfolkensis*, sp. nov.

Types. Holotype ♀: 29°01'S.,167°56'E., Mt Bates, 300 m, NINP, 23.iii.1984, E. D. Edwards. Paratypes: Norfolk I.: Selwyn Pine Rd, 120 m, 22.iii.1984, E. D. Edwards, 1, 0; 29°03'S.,167°55'E., Rocky Point Reserve, 14.xi–2.xii.1984, I. D. Naumann, 1, 1; 29°02'S., 167°57'E., Highlands Guesthouse, 14.xi–2.xii.1984, L. Hill, 1, 0; 29°01'S.,167°56'E., Bullock's Hut Rd, 20.xi.1984, I. D. Naumann, 2, 2.

Distinguishing features. Small; body dark brown; *C*-index low; *C*3 fringe extensive.

Body length. 1·7 mm (holotype).

Head. Arista with 3 rays above and 2 below plus terminal fork. Front 1·1 × broader than long, brownish, more rufous anteriorly, darkened about ocellar triangle and bases of orbital bristles. 2nd antennal segment rufous brownish; 3rd segment dusky. Carina very prominent, rather nose-like. Palp brownish, with small subapical bristle. Cheek curved, *c.* 0·1 times greatest eye diameter. Eye bare. Anterior reclinate orbital bristle small, lateral to proclinate orbital; proclinate and posterior reclinate orbitals large, subequal. Ocellar and postvertical bristles large; vertical bristles very large.

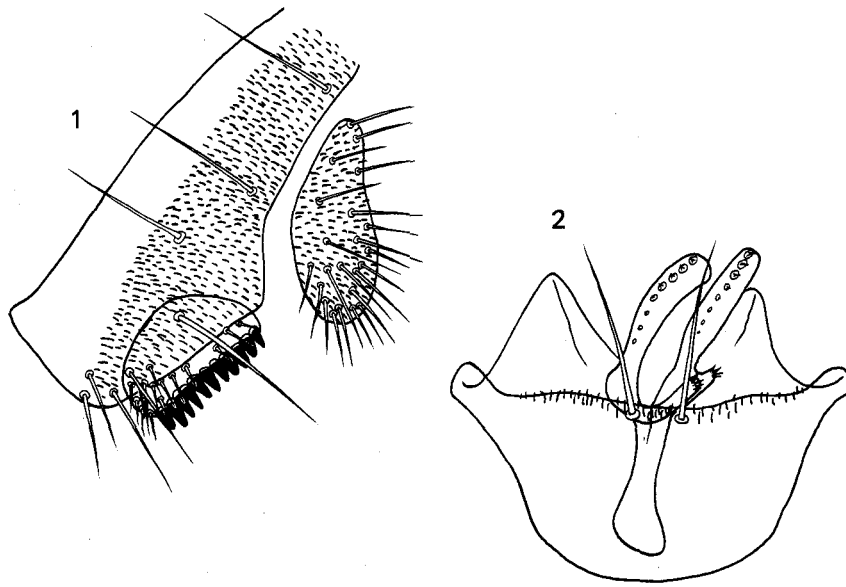
Thorax. Mesonotum dark brown. Acrostichal hairs in 6 rows in front of dorsocentral bristles, 4 rows between dorsocentrals; prescutellar bristles large. Ratio anterior : posterior dorsocentrals 0·5. Scutellum dark brown. Pleura entirely dark brown; haltere paler. Scutellar bristles increasing in size from 1st to 3rd. Legs darker above, becoming paler below. Preapical bristles on all tibiae; apicals on 1st and 2nd tibiae.

Wing. Hyaline; anal vein absent. *C*-index, 1·4; 4*V*-index, 2·7; 5*X*-index, 2·1; *M*-index, 0·8; 3rd costal section with heavy setation on basal 0·85. Length (holotype), 1·6 mm.

Abdomen. Entirely dark brown.

Male genitalia (Figs 1, 2). Dark brown. Clasper large, with row of strong marginal teeth. Hypandrium with pair of prominent spines. Aedeagus bifid.

Female genitalia. Egg guide dark brown, with terminal and subterminal hairs.



Figs 1, 2. *Drosophila norfolkensis*: *1*, male external genitalia; *2*, male internal genitalia.

Relationships

D. norfolkensis is one of a small number of small *Scaptodrosophila* spp. possessing an entirely blackish coloration. The species strongly resembles the north-eastern Australian *D. altera* Bock, but the prescutellar bristles in *norfolkensis* are more strongly developed, and the male genitalia are quite unlike those of *altera*. The blackish *Scaptodrosophila* species are probably a heterogeneous assemblage and it would not be fruitful to speculate on relationships within this complex until further information is available; however, the subgenus *Scaptodrosophila* is clearly Oriental–Australian and *norfolkensis* therefore shows an affinity with the fauna of those regions.

6. *Drosophila (Scaptodrosophila) inornata* Malloch (?)

A single damaged male specimen is present (29°02'S.,167°57'E., Highlands Guesthouse, Norfolk I., 14.xi–2.xii.1984, L. Hill) which, in external morphology, strongly resembles the Australian *inornata*, although the male genitalia show minor differences. Confirmation of the determination must wait further specimens.

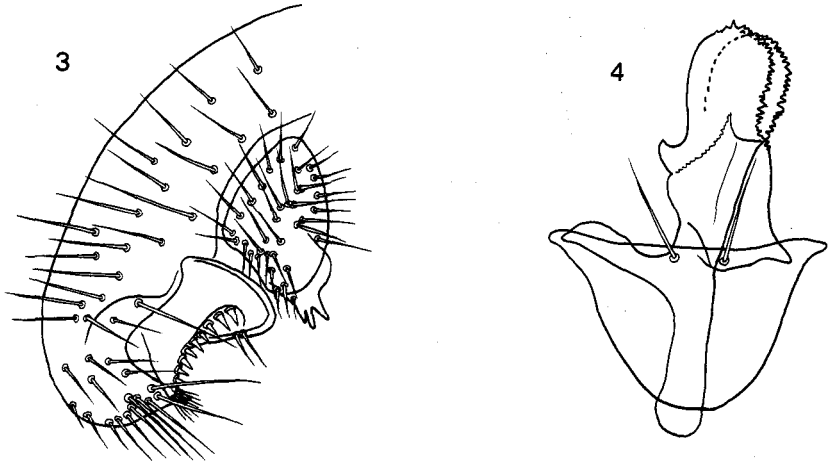
7. *Drosophila (Hirtodrosophila) naumanni*, sp. nov.

Types. Holotype ♀: 29°01'S.,167°57'E., Red Rd Track, NINP, malaise trap, 14.xi–2.xii.1983, I. D. Naumann. Paratypes: same data as holotype, 0, 1; Filmy Fern Valley, 120 m, Norfolk I., 6.iv.1984, E. D. Edwards, 1, 1.

Distinguishing features. Body largely tan; pleura with darker longitudinal band; abdominal tergites 2–4 blackish. Wing slightly dusky, more intensely about crossveins. Anterior reclinate orbital bristle vestigial. *C*-index high.

Body length. 4·0 mm (holotype); 3·1 and 4·3 mm (♀ paratypes); 2·6 mm (♂ paratype).

Head. Arista with 4–5 rays above and 2 rays below plus terminal fork. Frontal breadth 1·5 × length; front dark rufous tan; ocellar triangle slightly blackened. 2nd antennal segment concolorous with front, with some duskiness; 3rd segment pale tan. Carina rather weak, low, rounded, with hint of median ridge. Palp tan, with a few bristles. Cheek slightly curved, *c.* 0·1 times greatest eye diameter. Vibrissa strong; succeeding orals fine and short. Ocellar, vertical and postvertical bristles large.



Figs 3, 4. *Drosophila naumanni*: *3*, male external genitalia; *4*, male internal genitalia.

Thorax. Mesonotum and scutellum tan, former with some irregular dark patches. Acrostichal hairs in 10 rows in front of dorsocentral bristles, 6 rows between dorsocentrals. Ratio anterior : posterior dorsocentrals 0·75. Pleura pale tan, with dark longitudinal band (not sharply bordered) extending anteriorly from pleurotergite and pteropleuron across lower part of mesopleuron, not reaching anterior margin of latter. Haltere pale tan. Legs pale tan; preapical bristle on 3rd tibia only; apical on 2nd tibia only.

Wing. Slight infuscation present, a little more intense about crossveins, especially posterior crossvein. *C*-index, 4·8; 4*V*-index, 1·6; 5*X*-index, 1·2; *M*-index, 0·4. 3rd costal section with heavy setation on basal 0·5. Length (holotype), 3·6 mm.

Abdomen. Tergite 1 very small, blackish. Tergites 2–4 black dorsally with (in holotype) very narrow median interruptions (stronger on tergite 2); incurved portions of tergites pale at medial

margins. Tergite 5 pale tan with median dorsal dark patch. Tergite 6 similar to tergite 5 but dark patch broadened posteriorly.

Male genitalia (Figs 3, 4). Genital arch black, very broad. Anal plate with unusual, ventral toothed extension. Clasper large, with small medial teeth. Aedeagus apically expanded. Hypandrium rather shallow.

Female genitalia. Egg guide strongly sclerotized, apically darkened, apically rounded with *c.* 12 strong black teeth and single fine subterminal hair.

Relationships

Relationships within the subgenus *Hirtodrosophila* are frequently unclear. The large and well defined *hirticornis* species-group includes many of the species (all of which appear to be fungus feeders–breeders) known in south-east Asia, New Guinea and Australia; but amongst the remainder, which appear to comprise a heterogeneous assemblage, few formal relationships have been recognized. Several of the remaining species (such as the Australian *mycetophaga*, *polypori* and *hannae*) are also known to be fungus breeders. Other Australian *Hirtodrosophila* species show no demonstrable relationships with fungi in their natural habitats and probably feed on and breed in quite different substances; however, it must be added that details of their life histories remain to be determined.

In general morphology, *D. naumanni* appears to be allied to the three Australian fungus-breeding species mentioned above. The latter species are commonly collected on bracket fungi, although they do not necessarily breed in the same fungi about which they often congregate (cf. Parsons and Bock 1976). The very strongly developed egg guides of *naumanni* suggest, however, that the females oviposit in something rather tougher than fungi (the egg guides of *mycetophaga*, *polypori* and *hannae* are appreciably weaker than those of *naumanni*).

Genus **Scaptomyza** Hardy

8. *Scaptomyza australis* Malloch

Specimens examined. **Norfolk I.:** Selwyn Pine Rd, 120 m, 22.iii.1984, E. D. Edwards, 1, 0; Mt Bate, 300 m NINP, E. D. Edwards, 21.iii.1984, 1, 0, 9.iv.1984, 1, 0; Filmy Fern Valley, 6.iv.1984, E. D. Edwards, 0, 1; nr Highlands Guesthouse, 20–26.iii.1984, J. E. Feehan, 0, 1; 29°03′S.,167°55′E., Rocky Point Reserve, 14.xi–2.xii.1984, L. Hill, 2, 1, I. D. Naumann, 5, 3, T. A. Weir, 1, 0; 29°01′S., 167°57′E., Red Rd Track, NINP, 14.xi.–2.xii.1984, I. D. Naumann, 0, 2 (1 ex malaise trap); 29°01′S., 167°55′E., Anson Bay Reserve, 14.xi–2.xii.1984, I. D Naumann, 0, 1; 29°01′S.,167°56′E., South Spar Track, NINP, 11.xi.1984, T. A. Weir, 0, 2; 29°02′S.,167°57′E., Highlands Guesthouse, 14.xi–2.xii.1984, T. A. Weir, 1, 0; 29°04′S.,167°58′E., Point Hunter Reserve, 29.xi.1984, I. D. Naumann, 0, 2. **Philip I.:** Upper Long Valley, 9.iii.1984, J. E. Feehan, pitfall trap baited with rabbit intestines, 0, 1, 26.iii.1984, E. D. Edwards, 6, 7, 26.iii–2.iv.1984, D. F. Rentz, pan trap, 0, 1; 29°07′S.,167°57′E., 20–24.xi.1984, Long Valley, I. D. Naumann, 0, 2; Lower Long Valley, malaise trap, I. D. Naumann, 2, 1; Red Rd Valley, L. Hill, 1, 1; between Red Road and Whitewood Valleys, I. D. Naumann, 2, 2; at light, L. Hill, 1, 1; pitfall trap on grassy ridge, T. A. Weir, 0, 1.

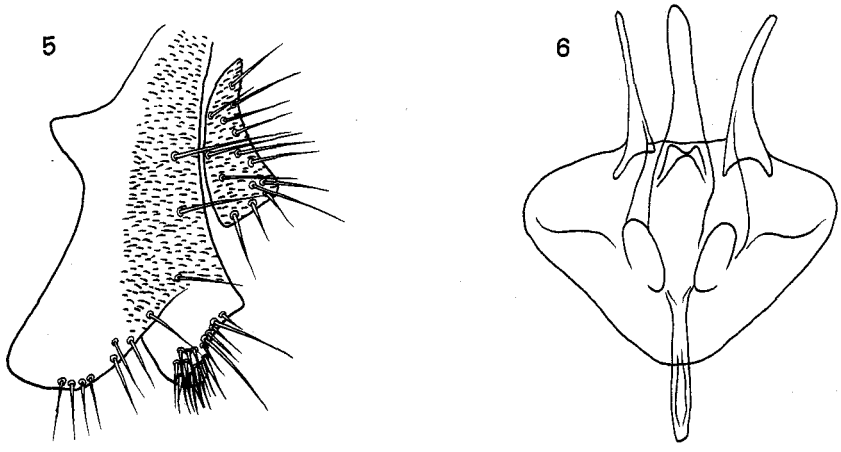
Special Comments

S. australis is an Australian species, widespread throughout mainland Australia including both coastal and inland habitats. The species has not previously been recorded from other areas. Most Australian specimens are shiny black (the typical coloration for members of the subgenus *Bunostoma* Malloch, to which *S. australis* belongs), but occasional individuals have been collected which are entirely yellow except for blackening on the sixth abdominal tergite; further comments on color variation are given by Bock (1977). The Norfolk I. specimens recorded above are all yellow (with black sixth abdominal tergites). The male genitalia of the Norfolk specimens also differ slightly from those of Australian specimens in possessing a less heavily sclerotized process adjacent to the upper portion of the clasper (figs in Bock 1977, Hackman 1959); but this difference does not seem sufficient to justify classification of the Norfolk individuals as a separate species

in the absence of the more convincing data that could be supplied by laboratory tests of any reproduction isolation that may exist between the two forms.

9. *Scaptomyza philipensis*, sp. nov.

Types. Holotype ♀: 29°07′S.,167°57′E., Upper Long Valley, Phillip I., 20–24.xi.1984, L. Hill. Paratypes: **Norfolk I.:** Selwyn Pine Rd, 120 m, 22.iii.1984, E. D. Edwards, 1, 0; nr Highlands Guesthouse, 20–26.iii.1984, J. E. Feehan, 0, 1; Mt Bates, 300 m, NINP, 21.iii.1984, E. D. Edwards, 1, 0; Filmy Fern Valley, 6.iv.1984, E. D. Edwards, 0, 1; 29°03′S.,167°55′E., Rocky Point Reserve, 14.xi–2.xii.1984, T. A. Weir, 0, 3, I. D. Naumann, 0, 2 (1 ex pan trap); 29°01′S.,167°56′E., South Spar Track (bottom), NINP, 19.xi.1984, I. D. Naumann, 2, 7; 29°01′S.,157°56′E., Bullock's Hut Rd, NINP, 20.xi.1984, I. D. Naumann, 2, 0; 29°01′S.,167°57′E., Filmy Fern Walk, NINP, pan traps, 14.xi–2.xii.1984, I. D. Naumann, 0, 1; 29°01′S.,167°57′E., Red Road Track, NINP, I. D. Naumann, 2, 3, malaise trap, 102, 80, flight intercept window-trough trap, T. A. Weir, (ANIC 1041), 28, 199. **Philip I.:** Upper Long Valley, 26.iii.1984, E. D. Edwards, 6, 8, D. C. F. Rentz, pan trap, 0, 1, 29.iii.1984, pitfall trap baited with rabbit intestines, J. E. Feehan, 0, 1; 29°07′S., 167°57′E., Long Valley, 20–24.xi.1984, I. D. Naumann, 11, 14; 29°07′S.,167°57′E., Upper Long Valley, 20–24.xi.1984, L. Hill, 8, 11 (0, 2 at light), I. D. Naumann, 19, 17; 29°07′S., 167°57′E., Rocky Valley, 20–24.xi.1984, I. D. Naumann, 6, 9; 29°07′S.,167°57′E., Red Rd Valley, 20–24.xi.1984, L. Hill, 3, 1; 29°07′S.,167°57′E., between Red Rd and Whitewood Valleys, 20–24.xi.1984, I. D. Naumann, 1, 0, L. Hill, at light, 0, 2, T. A. Weir, pitfall trap on grassy ridge, 1, 2; 29°07′S.,167°57′E., Whitewood Valley, 20–24.xi.1984, I. D. Naumann, 16, 16.



Figs 5, 6. *Scaptomyza philipensis*: *5*, male external genitalia; *6*, male internal genitalia.

Distinguishing features. Mesonotum with 4 rows of acrostichal hairs. Thorax pale; pleura with broad dusky longitudinal band above.

Body length. 2·5 mm (holotype); 2·0–2·6 mm (paratype range).

Head. Arista with 4 rays above and 1–2 rays below plus small terminal fork. Breadth of front 1·1 × length; front tan; ocellar triangle blackened within. 2nd and 3rd antennal segments tan. Carina nose-like. Palp pale tan. Cheek curved, *c.* 0·1 times greatest eye diameter. Eye with fine pile. Orbital bristles in ratio 4 : 3 : 5. Anterior reclinate orbital lateral and slightly posterior to proclinate orbital. Ocellar, vertical and postvertical bristles large.

Thorax. Mesonotum tan. Acrostichal hairs in 4 rows in front of dorsocentral bristles, 4 rows

decreasing to 2 between dorsocentrals. Ratio anterior : posterior dorsocentrals 0·7. Scutellum tan. Anterior scutellar bristles a little larger than posterior scutellars. Pleura tan with broad longitudinal dusky band above. Knob of haltere pale tan; stalk dusky anteriorly. Legs tan; preapical bristles present on all tibiae; apical on 2nd tibia only.

Wing. Hyaline. *C*-index, 3·5; 4*V*-index, 1·8; 5*X*-index, 1·4; *M*-index, 0·5. 3rd costal section with heavy setation on basal 0·4. Length (holotype), 2·1 mm.

Abdomen. Largely tan. Tergites 2–5 with narrow dark apical bands, stronger in male. Tergite 6 in female with darker, much broader band; tergite 6 in male entirely shiny black except for small areas at margins of incurved portions.

Male genitalia (Figs 5, 6). Clasper small, with numerous bristles. Aedeagus straight, slender. Parandrites large.

Female genitalia. Egg guide developed but small, slender, with marginal hairs.

Relationships

This species is also a member of the subgenus *Bunostoma*. This subgenus includes a total of about a dozen species known from Australia and Pacific Oceania. Most of the species are, however, Hawaiian endemics; apart from the present species and the Australian *australis* recorded above, one species is known from Samoa, one from Bonin Is, and one from Marquesas Is. Most *Bunostoma* species also possess only two rows of acrostichal hairs.

Genus **Mycodrosophila** Oldenberg

10. *Mycodrosophila rosemaryae* Bock

Specimens examined. **Norfolk I.:** nr Highlands Guesthouse, pitfall trap baited with human faeces, 10–26.iii.1984, E. D. Edwards, 1, 0; 29°01′S.,167°57′E., Red Rd Track, NINP, malaise trap, 14.xi–2.xii.1984, I. D. Naumann, 1, 0.

Special Comments

This species is widespread along the eastern coast of Australia, is not known from any other regions, and is probably an Australian native.

Genus **Leucophenga** Mik

11. *Leucophenga pacifica*, sp. nov.

Types. Holotype ♀: 29°01′S.,167°56′E., South Spar Track (bottom), NINP, 19.xi.1984, I. D. Naumann. Paratypes: nr Highlands Guesthouse, NINP, Stop 2, 20–26.iii.1984, J. E. Feehan, 0, 1; Mt Bates, 300 m, 9.iv.1984, E. D. Edwards, 1, 0; nr Mt Bates 180 m, Stop 3, 20–26.iii.1984, E. D. Edwards, 0, 1; Filmy Fern Valley, 6.iv.1984, E. D. Edwards, 1, 1; 29°03′S.,167°55′E., Rocky Point Reserve, 14.xi–2.xii.1984, I. D. Naumann, 10, 3, L. Hill, 1, 0, T. A. Weir, 0, 1; 29°01′S.,167°56′E., South Spar Track, 11.xi.1984, T. A. Weir, 0, 1, South Spar Track (bottom), 19.xi.1984, I. D. Naumann, 2, 7; 29°01′S.,167°57′E., Filmy Fern Walk, 14.xi–2.xii.1984, I. D. Naumann, 3, 3; 29°02′S.,167°57′E., Highlands Guesthouse, 14.xi–2.xii.1984, L. Hill, 0, 2; 29°01′S.,167°57′E., Red Rd Track, NINP, 15–17.xi.1984, L. Hill, 0, 1, 14.xi–2.xii.1984, T. A. Weir, 0, 2, I. D. Naumann, 7, 28 (0, 2 malaise trap); 29°01′S.,167°56′E., Bullock's Hut Road, NINP, 20.xi.1984, I. D. Naumann, 0, 1.

Distinguishing features. Front dark tan; occiput dusky. Thorax tan. Palp blackish, small in male, large in female. Abdomen largely blackish.

Body length. 3·5 mm (holotype); 2·4–3·6 mm (paratype range); males generally appreciably smaller than females.

Head. Arista with 4–5 (usually 4) straight rays above and 2 straight rays below plus small terminal fork. Breadth of front equal to length. Front dark tan; ocellar triangle with blackening adjacent to ocelli only. 2nd antennal segment dark tan; 3rd segment pale tan; both segments

slightly dusky. Palp blackish, with (in both sexes) a few weak bristles in addition to dense pubescence, large in female, small in male. Cheek linear, very narrow. Eye large, bare. Anterior reclinate orbital bristle a little smaller than proclinate orbital; posterior reclinate orbital a little larger than proclinate. Ocellar and vertical bristles large in both sexes; postverticals rather weak.

Thorax. Mesonotum tan. Acrostichal hairs in *c.* 10 rows in front of dorsocentral bristles (a little irregular), *c.* 8 rows between dorsocentrals. Prescutellar bristles large; an enlarged acrostichal present lateral to each prescutellar. Ratio anterior : posterior dorsocentrals *c.* 0·5; anterior dorsocentral bristle weak. Scutellum tan; scutellar bristles subequal. Pleura and haltere pale tan. Legs pale tan; preapical bristles on all tibiae (weak on 1st and 3rd tibiae); apical on 2nd tibia only.

Wing. Weak duskiness present, more intense towards costal margin. *C*-index, 2·3; 4*V*-index, 1·9; 5*X*-index, 2·2; *M*-index, 0·7. 3rd costal section with heavy setation on basal 0·6. Length (holotype), 2·7 mm.

Abdomen. Male: Tergite 1 tan. Tergites 2–4 blackish, with narrow tan areas only at extremities of incurved portions of tergites. Tergite 5 blackish, with median tan spot posteriorly and narrow tan strips at medial margins of incurved portions. Tergite 6 tan centrally, black laterally. *Female*: Tergite 1 tan. Tergite 2 blackish with submedian anterior tan spots of variable size, coalescing in some specimens. Tergite 3 blackish with large median oval tan area anteriorly. Tergites 4–6 blackish, tergites 5–6 with small area of tan coloration as in male.

Relationships

The species is a member of the dimorphic palp complex, the members of which are distinguished by possession of abnormally large palps in the females only. Sexual dimorphism in these species may otherwise range from nil to extreme differences in abdominal coloration; in the present species the male and female abdomen differ to a modest extent.

Discussion

The Norfolk I. drosophilid fauna is clearly of modest size, as might have been expected given the small area of the island, its isolation, and the lack (especially in New Zealand) of substantial drosophilid faunas in the lands closest to it. The Norfolk fauna nevertheless presents several interesting aspects.

Three of the *Drosophila* species discovered on the island (*ananassae*, *simulans*, *immigrans*) are cosmopolitan. (There are five other cosmopolitan species of *Drosophila*.) It is perhaps slightly surprising that *melanogaster* (probably the most widely distributed species of the genus and well known from Australia, New Zealand and Fiji–Samoa) was not found on Norfolk, although it also appears to be absent on Lord Howe (Parsons and Bock 1979). In any case it is most likely that these three species were introduced to Norfolk I. within historical times by man.

Of some interest is the discovery of three or four species hitherto known only from Australia. *Drosophila enigma*, as noted above, is a south-eastern Australian species which has adapted to urban environments. It may also be a recent introduction to Norfolk I. *Scaptomyza australis* is very widespread in Australian natural habitats and is also sometimes found in cities. The fact that this species occurs on Norfolk I. but not in New Zealand suggests that it, too, may be a recent introduction to Norfolk (rather than a survivor of an older, more widespread distribution). *Mycodrosophila rosemaryae* is a little-known Australian species, presumably a fungus feeder–breeder, like all other members of its genus that have been studied ecologically. Finally, *Drosophila inornata* is an Australian native known from north Queensland to Tasmania. If subsequent collections provide specimens which prove to be a sibling species, speciation on Norfolk (? founder event) may be indicated. In some respects the Norfolk I. fauna, therefore, shows clear relationships with the Australian fauna.

In one respect, i.e. the presence of the 'dark' form of *D. ananassae*, the Norfolk fauna also shows a clear relationship with the fauna of Fiji–Samoa. Each of the groups (genera and subgenera)

present on Norfolk has also been recorded on Samoa, although the species concerned are otherwise different. It is of some interest that the genera *Mycodrosophila* and *Leucophenga* are absent in New Zealand; the subgenus *Hirtodrosophila* is also unknown from the latter area.

Of greatest interest are the new species discovered on Norfolk I. in the four genera or subgenera *Scaptodrosophila*, *Hirtodrosophila*, *Scaptomyza* and *Leucophenga*. The subgenus *Scaptodrosophila* is predominantly Asian–Australian; several species are, however, known from Samoa, and two of New Zealand's four native species are members of this group (the other two are *Scaptomyza*). *Hirtodrosophila* species are known from most parts of the world, but as indicated above the new Norfolk species may be related to a complex of Australian species known to be associated with fungi. *Scaptomyza* species are also known world-wide, but the majority are Hawaiian; two species are known from Samoa, three from New Zealand and three from Australia; a few species are more widespread in the Pacific basin. *Leucophenga* species, too, are also known from most parts of the world, but the genus is unknown in Hawaii or New Zealand. Species of the 'dimorphic palp complex' occur in Australia (as well as Asia and Africa), and the single species known from Samoa (on the basis of the holotype male only) also appears to be a member of this complex.

The drosophilid fauna of Norfolk I., although not large, thus shows affinities with the faunas both of Australia and of Fiji–Samoa. The discovery of several new species suggests that a few species have evolved on Norfolk I.

Acknowledgments

Acknowledgments are due to Dr D. H. Colless, Division of Entomology, CSIRO, Canberra, for provision of the Norfolk I. collections.

References

Bock, I. R. (1976). Drosophilidae of Australia I. *Drosophila* (Insecta : Diptera). *Australian Journal of Zoology, Supplementary Series* No. 40.

Bock, I. R. (1977). Drosophilidae of Australia II. *Scaptomyza* (Insecta : Diptera). *Australian Journal of Zoology* **25**, 337–45.

Bock, I. R. (1979). Drosophilidae of Australia III. *Leucophenga* (Insecta : Diptera). *Australian Journal of Zoology, Supplementary Series* No. 71.

Bock, I. R. (1982). Drosophilidae of Australia V. Remaining genera and synopsis (Insecta : Diptera). *Australian Journal of Zoology, Supplementary Series* No. 89.

Carson, H. L., and Yoon, J. S. (1982). Genetics and evolution in Hawaiian *Drosophila*. In 'The Genetics and Biology of *Drosophila*'. (Eds M. Ashburner, H. L. Carson, and J. N. Thompson.) Vol. 3*b*. pp. 297–344. (Academic Press: New York.)

Hackman, W. (1959). On the genus *Scaptomyza* Hardy (Dipt., Drosophilidae) with descriptions of new species from various parts of the world. *Acta Zoologica Fennica* **97**, 3–73.

Parsons, P. A. (1980). A widespread Australian endemic *Drosophila* species in New Zealand. *Search (Sydney)* **11**, 259–60.

Parsons, P. A., and Bock, I. R. (1976). Convergent evolution: lek behaviour in two *Drosophila* subgenera. *Search (Sydney)* **7**, 486.

Parsons, P. A., and Bock, I. R. (1979). Australian endemic *Drosophila*. VII. Lord Howe Island, with description of a new species of the *coracina* group. *Australian Journal of Zoology* **27**, 973–80.

Wheeler, M. R., and Kambysellis, M. P. (1966). Notes on the Drosophilidae (Diptera) of Samoa. Texas University Publication No. 6615, pp. 533–65.

Manuscript received 26 June 1985; accepted 5 September 1985