



## NOTES ON THE DROSOPHILIDAE (DIPTERA) OF TOWNSVILLE, QUEENSLAND, INCLUDING FOUR NEW AUSTRALIAN SPECIES RECORDS

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### Abstract

In an investigation of the urban drosophilid fauna of Townsville, Queensland, 18 species were collected, 16 of them at household refuse heaps effectively acting as baits. Four of the baited species (*Drosophila bipectinata* Duda, *D. kikkawai* Burla, *D. sp. cf. jambulina* Parshad and Paika, *Sphaerogastrella javana* (de Meijere)) are new records for Australia. The Townsville fauna is to some extent similar in species composition to that of the north Queensland rain forests, although some species abundant in Townsville are considerably rarer in the undisturbed natural forests and, conversely, a few of the most common forest species were not detected in the city. The Townsville urban drosophilid fauna differs substantially from that of southern Australia.

### Introduction

The Drosophilidae are a large family of flies well represented in Australia. The largest genus, *Drosophila* Fallen, has speciated widely within Australia and many endemic species occur in natural habitats (Bock and Parsons 1975, Bock 1976). The genus also possesses eight cosmopolitan species which are scarcely or not established in natural habitats within Australia; these species are largely or entirely restricted to cities and their environs, principally feeding on and breeding in urban refuse. Other drosophilid genera are well represented at least in northern Australia but, with the possible exception of the two species of *Scaptomyza* Hardy which have been recorded in outer suburban orchards of Melbourne (Bock 1977), the species of the other genera (see Bock 1976) have appeared to be confined entirely to natural habitats.

The cosmopolitan *Drosophila* species *D. melanogaster* Meigen and *D. simulans* Sturtevant are the best known of the urban drosophilids and have been collected in all large cities in eastern and southwestern Australia. The urban faunas of southern Australia include few other species. *D. immigrans* Sturtevant and *D. busckii* Coquillett seem, with the above two, to comprise the bulk of these faunas; some of the other cosmopolitans, and a few endemic species which have adapted to introduced fruits, occur in smaller numbers within the southern cities as well.

Systematic information concerning the urban drosophilid faunas of northern Australia is scant. It is known that *D. melanogaster* and *D. simulans* occur in northern cities, and there are isolated records of other species as well (e.g. *D. ananassae* Doleschall, see Bock 1976), but an attempt to investigate the full species composition of the northern faunas has never been made.

Townsville is situated on the central Queensland coast in a relatively dry area surrounded by sparse open forests which harbour very few drosophilids, only *Amiota annulata* Malloch being common (in summer); the nearest natural habitat with a relatively rich drosophilid fauna is the Paluma rain forest, 65 km northwest in a direct line. Townsville's usual daily summer temperature is ca 32°C. Environmentally, Townsville would therefore not appear to favour a large or diverse drosophilid fauna since at least some of the endemic species are known to be very susceptible to heat and desiccation (Parsons 1975); however, fruits (principally bananas and mangoes) are extensively cultivated in suburban gardens and could provide a substantial source of food at certain times of the year.

During the first three months of 1976 an investigation of Townsville Drosophilidae was undertaken by collecting about several backyard refuse heaps which contained quantities of rotting fruits (especially bananas). The results of these collections are summarised and discussed below.

### Results

Several collections were made in each of two Townsville suburbs, Mundingburra and Cranbrook. The species compositions of the collections, and especially the relative

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numbers of the various species present in each collection, varied widely from day to day at each site. Since this report is concerned more with a discussion of the fauna in qualitative terms with some comments on relative abundance than with an attempted analysis of possible reasons for day to day fluctuations of the above nature, the results of all collections have been grouped together for presentation. A total of over 2,500 flies was collected and sorted.

The Table lists the drosophilid species obtained at refuse heaps. Approximate abundance is indicated as follows: + + + + = over 500 specimens collected, + + + = over 200 specimens collected, + + = over 30 specimens collected, + = one or two specimens collected.

In addition to the species listed in the Table, two other drosophilids unattracted to refuse heaps (*Amiota annulata* and *Leucophenga niveifasciata* Malloch) were collected in Townsville; these are discussed below.

Cultures of two of the species (*D. bipectinata* Duda and *D. kikkawai* Burla) hitherto unrecorded from Australia were established and 10 specimens of each sex of these species deposited in the Australian National Insect Collection (ANIC), Division of Entomology, CSIRO, Canberra.

TABLE

DROSOPHILIDAE COLLECTED AT SUBURBAN TOWNSVILLE REFUSE HEAPS AND ROTTING FRUITS\*

Species	Approximate relative abundance
<i>D. (Drosophila) sulfurigaster sulfurigaster</i>	+ + + +
<i>D. (D.) rubida</i>	+
<i>D. (Sophophora) melanogaster</i>	+ + +
<i>D. (S.) simulans</i>	+ +
<i>D. (S.) ananassae</i>	+ + + +
<i>D. (S.) pseudoananassae</i>	+ + + +
<i>D. (S.) bipectinata</i>	+ + +
<i>D. (S.) serrata</i>	+ +
<i>D. (S.) birchii</i>	+ +
<i>D. (S.) kikkawai</i>	+ +
<i>D. (S.) sp. cf. jambulina</i>	+
<i>D. (Scaptodrosophila) bryani</i>	+ + + +
<i>D. (S.) anthemon</i>	+
<i>D. (S.) concolor</i>	+
<i>Zaprionus argentostrigatus</i>	+ +
<i>Sphaerogastrella javana</i>	+

\*Collected otherwise in Townsville: *Amiota annulata* and *Leucophenga niveifasciata*.

*Systematic and distributional notes on species collected*

***Drosophila (Drosophila) sulfurigaster sulfurigaster* (Duda)**

*Spinulophila sulfurigaster* Duda, 1923:48.

Widespread throughout south-east Asia, New Guinea and western Pacific islands. Of the three subspecies recognized, the nominate occurs in rain forests of northern Queensland where, at least in summer, it is abundant and readily attracted to banana baits.

***Drosophila (Drosophila) rubida* Mather**

*Drosophila rubida* Mather, 1960:234.

Restricted to and common in rain forests of New Guinea and north Queensland.

***Drosophila (Sophophora) melanogaster* Meigen**

*Drosophila melanogaster* Meigen, 1830:85.

A cosmopolitan and one of the most abundant *Drosophila* species. *D. melanogaster* occurs throughout eastern, southern and southwestern Australia about cities and farms but is not established in any natural habitats within Australia.

***Drosophila (Sophophora) simulans* Sturtevant**

*Drosophila simulans* Sturtevant, 1919:153.

A cosmopolitan species and sibling of *D. melanogaster*. Within Australia it appears to be almost completely coextensive in distribution with the latter, although microecological preferences may differ substantially (McKenzie and Parsons 1974).

***Drosophila (Sophophora) ananassae* Doleschall**

*Drosophila ananassae* Doleschall, 1858:128.

A cosmopolitan species well established in rain forests of southeast Asia, New Guinea and western Pacific islands. Although it has been collected in rain forests of north Queensland it does not appear to be common. It has, however, also been collected further south in Queensland cities and is evidently restricted to Queensland.

***Drosophila (Sophophora) pseudoananassae* Bock**

*Drosophila (Sophophora) pseudoananassae* Bock, 1971:274.

A rain forest species of southeast Asia, New Guinea and northern Queensland. It is one of the commonest species in New Guinea and has also been collected in suburban Cairns (Bock unpublished).

***Drosophila (Sophophora) bipectinata* Duda**

*Drosophila bipectinata* Duda, 1923:52.

A common rain forest species in southeast Asia, New Guinea and western Pacific islands. It is particularly abundant in New Guinea but has hitherto not been recorded in north Queensland. A few specimens were recently collected at Iron Range but the species has not been found in forests south of Iron Range in spite of intensive collecting.

***Drosophila (Sophophora) serrata* Malloch**

*Drosophila serrata* Malloch, 1927:6.

A species apparently restricted to New Guinea, Australia and Christmas Island, *D. serrata* occurs both in rain forests of northern Queensland and in forests of southern Queensland.

***Drosophila (Sophophora) birchii* Dobzhansky and Mather**

*Drosophila serrata birchii* Dobzhansky and Mather, 1961:462.

*Drosophila birchii*: Ayala, 1965:538.

A sibling species of *D. serrata*, *D. birchii* occurs in rain forests of north Queensland and New Guinea.

***Drosophila (Sophophora) kikkawai* Burla**

*Drosophila kikkawai* Burla, 1954:47.

A widespread rain forest species of the southern hemisphere (Asia, southeast Asia, New Guinea, Pacific islands, South America). The specimens now recorded are a new Australian record.

***Drosophila (Sophophora) sp. cf. jambulina* Parshad and Paika**

*Drosophila jambulina* Parshad and Paika, 1964:240.

*D. jambulina* was described from several localities in India; its known distribution is restricted to India and Cambodia (Bock and Wheeler 1972) and Thailand (recent collection, V. Baimai).

The present species is very similar to *D. jambulina*. In external morphology the two species are virtually inseparable. Reference to the structure of the male genitalia, the most reliable method for distinguishing closely related *Drosophila* species, has also revealed strong similarities, although there are a few small differences in the setation of the genital arch and the structure of the hypandrium. Although zoogeographical considerations suggest the unlikelyhood of the same species having been collected in Asia and Townsville but not between, the above differences are not of sufficient, unequivocal diagnostic value to warrant recognition of the Townsville species as new in the absence of data on sexual isolation. The present species is, however, otherwise unknown from Australia and is thus a third new record.

***Drosophila (Scaptodrosophila) bryani* Malloch**

*Drosophila bryani* Malloch, 1934:310.

One of the more widespread members of its subgenus, ranging from northern Australia (as far south as Brisbane) to southeast Asia, Micronesia and western Pacific islands. It has been collected in north

Queensland in rain forests but, in contrast to its abundance in Townsville, is not common (Bock and Parsons unpublished).

✓ ***Drosophila (Scaptodrosophila) anthemon* Bock**

*Drosophila (Scaptodrosophila) anthemon* Bock, 1976:84.

A single female of this very rare endemic species was recovered in these collections.

✓ ***Drosophila (Scaptodrosophila) concolor* Bock**

*Drosophila (Scaptodrosophila) concolor* Bock, 1976:60.

A little known species recorded previously from two north Queensland rain forests (Bock 1976).

✓ ***Zaprionus argentostratus* (Bock) comb. n.**

*Drosophila argentostrata* Bock, 1966:273.

Described from New Guinea where it has been collected by banana baiting in several rain forest localities; the species is also known from Thailand (recent collection, V. Baimai). Several specimens from north Queensland collections also in ANIC.

✓ ***Sphaerogastrella javana* (de Meijere)**

*Camilla javana* de Meijere, 1911:422.

*Sphaerogastrella javana*: Duda, 1922:159.

Two females of this species were recorded from these collections. The species is widespread in north Queensland rain forests (Bock and Parsons unpublished) and also occurs in south east Asia and New Guinea (Okada 1974). It has not, however, previously been identified in Australia and this report is therefore a new record.

*Other Drosophilidae collected in Townsville*

Two further drosophilid species in addition to those obtained from compost heaps have been found in Townsville.

✓ ***Amiota annulata* Malloch**

*Amiota annulata* Malloch, 1923:612.

This species is not attracted to fruit baits but is common about Townsville and throughout open forests in north Queensland in the summer months. Males are strongly attracted to human eyes and may thus be collected rather easily; the females are not so attracted and are only likely to be found by intensive sweeping. Individuals of the species are not found during winter.

✓ ***Leucophenga niveifasciata* Malloch**

*Leucophenga niveifasciata* Malloch, 1923:614.

Several individuals of this species were collected on the James Cook University campus; the species was described by Malloch on the basis of two specimens collected at Woolgoolga, N.S.W., and Eidsvold, Queensland. No species of *Leucophenga* Mik is known to be attracted to fruit baits.

**Discussion**

Perhaps the most striking conclusion from the present study is the finding that so many species of Drosophilidae—18—occur in a harsh environment which one might intuitively have regarded as likely to yield nothing more than *D. melanogaster* and *D. simulans*, with perhaps a sprinkling of other cosmopolitan species.

Only three of the eight cosmopolitan species of *Drosophila* were found in Townsville and the results are in this respect as interesting for what was not collected as for what was—how cosmopolitan is “cosmopolitan”? While all eight species occur in all six biogeographic zones (Patterson and Stone 1952), they are not necessarily widely distributed within each. The five other species not detected in Townsville (*busckii*, *funebis* (Fabricius), *hydei* Sturtevant, *immigrans*, *repleta* Wollaston) all occur in southern Australia, but of these five only *D. immigrans* is known from north Queensland, and it appears to be very rare (in rain forests). It is possible that the latter five species are more susceptible than the other three to heat/desiccation stress and are unable to tolerate the more extreme conditions of Townsville.

A far more difficult question to answer is why species rare or absent in natural habitats in Queensland, but common in New Guinea rain forests, should be common in Townsville—and indeed two such species (*D. bipectinata* and *D. kikkawai*) were

obtained during this study. Species found in some abundance in Townsville and known to be abundant in New Guinea rain forests might logically be expected to occur in some numbers in the north Queensland rain forests between these extremes. The explanation for their absence could well encompass several ecological factors, possibly including the dryness of Queensland forests at some times of the year and the paucity of native fruits there compared to the New Guinea forests. The abundance of cultivated fruits in Townsville has already been mentioned. Assuming that the New Guinea-Townsville species do not occur in the Australian rain forests, or at least in those south of Iron Range (which is 800 km north of Townsville in a straight line), the question still arises how these species were transported from their area of natural occurrence (and presumable evolutionary origin) to Townsville. Since the species, at least in Townsville, are "domestic", they have most probably been transported from northern regions by human movements or commerce. The alternative explanation—of movement southward unassisted except perhaps by wind—would seem to be excluded by their non-occurrence "along the way".

In contrast to the above phenomenon, there are species known to be abundant in rain forests of northern Queensland which have not been collected in Townsville. Conspicuously absent in Townsville are *D. pseudotakahashii* Mather and *D. dispar* Mather—both species are widespread in eastern Australia and abundant in northern rain forest habitats. A third species, *D. rubida*, is common in north Queensland rain forests but rare in Townsville. All three species are readily attracted to fruit baits placed in rain forests and their absence or rarity in Townsville, in view of the fact that otherwise unknown species are abundant, is surprising.

The north Queensland urban drosophilid fauna is evidently quite different from that of southern Australia. The four species found in greatest abundance in Townsville do not occur at all in southern Queensland (*D. sulfurigaster*, *D. ananassae*, *D. pseudoananassae*) or further south (*D. bryani*). Most of the remaining species are also unknown from more southerly localities; indeed only *D. melanogaster* and *D. simulans* are known south from Queensland. Conversely, the cosmopolitan species not recorded from Townsville together with a few endemics which also do not occur in north Queensland constitute, with *D. melanogaster* and *D. simulans*, the urban fauna of the southern portion of the continent.

Some comments may be made on urban *versus* natural habitats. It has already been remarked that the cosmopolitan species in Australia are restricted to urban environments with the exception of *D. immigrans* which occurs (though it is rare) within north Queensland rain forests. A rain forest has little in common with a city, perhaps the only feature in common being the presence of fermenting fruits (albeit of different types) at some time of the year; in fact, as Townsville possesses various cultivated trees with overlapping fruiting seasons, there is some type of fruit available throughout the year. This feature might be expected to lead to colonisation by some of the rain forest fruit feeders/breeders but, while several northern forest species have clearly become successfully "domesticated", several others (perhaps more resource-specific) which are very successful in the forest have not invaded the urban environment at all. The reverse phenomenon, i.e. invasion of rain forests from cities by the cosmopolitans, has barely occurred, if at all, and it is possible that these species require a more stable and abundant source of food than the forests are able to offer.

### Acknowledgments

I am grateful to Dr H. Marsh, Dr B. Jackes, Warwick Jackes and Mr I. Cook for maintaining collection sites and/or making some collections, to Dr B. Jackes for helpful discussions, and to Prof H. E. Paterson of Witwatersrand University, Johannesburg, who provided African specimens of *Zaprionus* Coquillett for comparison with the Australian ones. Some financial support was received from the Australian Biological Resources Survey.

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[Manuscript received October 11, 1976]