Drosophilidae (Diptera) of Northern Cape York Peninsula

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Abstract *Forty-seven species in ten genera were collected in the study area:* Cacoxenus *(1),* Crincosia *(1),* Drosophila *(26),* Hypselothyrea *(2),* Leucophenga *(7),* Lissocephala *(1),* Microdrosophila *(2),* Mycodrosophila *(4),* Nesiodrosophila *(2), and* Sphaerogastrella *(1) (Drosophilidae: Diptera). The closed forest habitats along Captain Billy and Doublemouth Creeks supported high species diversity. Eleven species are reported for the first time from northern Cape York Peninsula; two species are undetermined and possibly new.*

Introduction

The Australian drosophilid fauna is characterized by very high species diversity in northern Queensland; 192 of Australia's 279 known species occur there. Southwards along Australia's eastern coast the species richness attenuates, in southern Queensland and north-eastern New South Wales 91 species have been reported (McEvey 1992), while Victoria, Tasmania and the rest of Australia has a rather depauperate fauna by comparison. Since drosophilid flies are usually found in rainforests, it is, perhaps, not surprising that four centres of species richness stand out in biogeographic analyses: southern Queensland and northeastern New South Wales (91 species), the Cairns region (133 species), the Cooktown region (80 species), and the Iron Range region of Cape York Peninsula (86 species).

When discussing distributions and evidence for endemicity in Australasia it is important to note that some of the above regions have been surveyed far more intensively than others and that this considerably distorts the picture. The most serious gaps in current knowledge are the drosophilid faunas of Cape York Peninsula and New Guinea. Taxonomists shy away from the enormity of the task in New Guinea; from the small samples that have been available for study, it would seem that the number of species far exceeds 279 and that most are undescribed. However, the situation in northern Australia suggests that the number awaiting description is small compared to the total number already known.

Northern Cape York Peninsula, especially the rainforests around Iron Range in the Mt Tozer, Mt Lamond, and Claudie River areas, have drawn entomologists and other biologists for many years. But only a few collectors have brought out good drosophilid material. McAlpine was the first to do so in May-June 1966. He went in again with Holloway and Sands in December-January 1971-72; Bock and Parsons collected at Iron Range in November 1975; and Bock returned in April 1976. The author collected 54 species near Claudie River in May 1981 and Colless worked the area in June-July 1986. These trips have resulted in a list of 86 species (McEvey & Bock 1982); many of which are not known from further south (only 17 occur in northeastern NSW, 51 occur also in the Cairns region). The islands of Torres Strait have been surveyed only once and few (17) species were found (McEvey 1982; the total number known is 19). Dr Colless collected 80 species on a CSIRO expedition to Cooktown in 1980-81 (Bock 1984). It is worth noting that during the latter four expeditions to remote rainforests of far north Queensland an average of about eight new species have been discovered each time.

In Australia the Drosophilidae are one of the few large groups of rainforest insects that are taxonomically relatively well known (Bock 1976, 1979, 1980, 1982, 1984, 1989; Parsons

& Bock 1977; Bock & Parsons 1979; McEvey 1980, 1982, 1992; McEvey & Bock 1982). This puts them in the forefront in conservation biology. The facility with which some species can be cultured in the laboratory is legendary and has led to very important advances in the study of structure, evolution, behaviour, genetics, and cytology. *Drosophila* models are also finding a significant role to play in conservation strategies (Parsons 1991).

The Heathlands area lies approximately 130 km northwest of Iron Range; it is drier but has small areas of closed forest (Pedley & Isbell 1971) which, during the wet season, could harbour substantial numbers of drosophilid species. The objective of the current work was to compile a species inventory of the Heathlands area.

Methods

Over a two-week period (10-24 March 1992) the Heathlands area near the Jardine River catchment was surveyed using a number of collecting techniques appropriate for sampling drosophilid flies.

Flies were collected using malaise traps, a fine-gauged butterfly net and an aspirator. In the tropics, when conditions are warm and humid, large numbers of drosophilids accumulate at fermenting fruit, fungi (blooming and deliquescing), flowers (for example *Hibiscus* spp., *Eucalyptus* spp. and *Xanthorrhoea* sp.), damp piles of forest debris, and along shaded creek banks. In situations close to human habitation they can be found in food pantries, around vegetable and fruit scraps, at garden composts, and at sources of various strong smells. Drosophilids can be attracted to light in small numbers and use of light sheets has, in the past, yielded species not often encountered using traditional techniques (e.g., Bock 1989).

Taxonomic research objectives are met more satisfactorily if specimens are pinned while fresh. Throughout the present expedition specimens were pinned daily and given a unique registration number. A table of registration numbers and other label data is given for the material collected (Table 2). Numbering individual specimens facilitates discussion and allows unambiguous reference to exceptional material. All specimens registered by the author carry a label reading: "Registered Specimen S F McEvey";; (Reg. hereafter) in addition to the number and data labels. Most material is deposited in the Australian Museum. A small synoptic collection is deposited in the University of Queensland Collection.

As mentioned above most Australian Drosophilidae occur in the wet forests of eastern Australia; distributional variation in degrees longitude is, therefore, considered to be less important than latitudinal variation, because only the latter corresponds to a significant environmental gradient. For this reason it has been considered expedient in the following discussion to annotate distribution records with the approximate latitude.

Results

All drosophilid species collected during the survey are listed below and discussed; those which are new locality records are marked thus only when the range extension exceeds 500 km. New morphological information is given where taxonomically significant. Other fly families were collected incidentally and are referred to in the reports by Margaret Schneider and Greg Daniels.

1 *Cacoxenus perspicax* (Knab, 1914)

One female (Reg. 9509) taken in a malaise trap in upland heath. Although widespread in southeast Asia and Australia (from Ingham at 19°S, to the Hunter Valley at 32°S), it has not previously been recorded from Cape York Peninsula. (New locality.)

2 *Crincosia lawgana* Bock, 1982

This species is known previously only from a handful of specimens: the holotype, collected near Lawgi (25°S) southern Queensland (Bock 1982), and three specimens taken at light near Cooktown 15°S (Bock 1984). A single specimen (Reg. 10153) was collected at light at the 'junction 16 km NE of HS' during the present survey. (New locality.)

3 *Leucophenga albofasciata* (Macquart, 1851)

This species is widespread and common across the north of Australia and appears to be one of the commonest species of *Leucophenga* (Bock 1979). During the present survey 6 males and 15 females were collected at light, in malaise traps, in a food pantry at the

homestead and by sweeping along Bertie and Doublemouth Creeks. After *L. scutellata*, *L. albofasciata* was the most common *Leucophenga* species in the study area.

Three males (Reg. 9477, 9788, 9808) have moderately enlarged setae along the posterodorsal margin of the second tergite and a slightly darkened pteropleurite; while the other males (Reg. 9488, 9550, 9613) have greatly enlarged setae and no pleural darkening. This sort of variability has been previously noted among males of this species by Bock (1979).

4 *Leucophenga argentata* (de Meijere, 1914)

The range of this species is southeast Asia through New Guinea to Australia and Micronesia; it is known in Australia from only a few specimens collected in Queensland (Dunk Island, Bundaberg, Brisbane, Big Mitchell Creek) and Northern Territory (Casuarina Creek). A male (Reg. 9548) was collected at Bertie Creek (malaise trap) during the present survey - this is the first record from Cape York Peninsula. (New locality.)

5 *Leucophenga janicae* Bock, 1979

This species is known from Iron Range (McEvey & Bock 1982), Cooktown (Bock 1984), a number of localities in the Cairns region and the Northern Territory (Bock 1979). It is a species that appears to be restricted to rainforest habitats; in the present survey one male (Reg. 9139) and four females (Reg. 9709, 9859, 9887, 9970) were collected by sweeping in gallery forest along Bertie, Captain Billy, Doublemouth and Gunshot Creeks.

A useful character which distinguishes this species from others with infuscated wings is the presence, in the posterior corners of the third abdominal tergite, of setae (cf. *L. gibbosa*), and the absence of a pleural band (cf. *L. zebra*).

6 *Leucophenga lubrica* Bock, 1979

The single specimen (Reg. 9963) of this rare species differs from the holotype in having tergites 3-4 brown with four large, pale tan, submedian spots (cf. black, with two small pale spots). In all other respects there is close resemblance. Since the size of abdominal markings is known to vary within other species of *Leucophenga*, it is considered probable that this variation is intraspecific.

Only five specimens of *L. lubrica* are known: the type locality is Eungella in Queensland, a paratype and two other specimens (Mooney Mooney and Tooloom Range [Reg. 8625]) are from NSW rainforests, and the present record is for a specimen swept at Captain Billy Creek, a new record for Cape York Peninsula. (New locality.)

7 *Leucophenga regina* Malloch, 1935

This distinctive, patterned-winged species is known from northern and southern Queensland (Bock 1979, 1982) and India (Gupta & Panigrahy 1987). The two specimens collected at Bertie Creek during the present survey (Reg. 9343, 9809) are the first from Cape York Peninsula. The other Australian localities are Mount Molloy (17°S, type locality), Earl Hill, Kuranda, The Boulders near Babinda, Cardstone, Mulgrave River and South Pine River (27°S). (New locality.)

8 *Leucophenga scutellata* Malloch, 1923

Leucophenga scutellata was the most common species of *Leucophenga* in the Heathlands area during the present survey. It was taken in gallery forests along Bertie, Dulhunty, Gunshot, Captain Billy and Doublemouth Creeks, and in malaise traps situated in upland heath, 16 km NE of the homestead; interestingly, none were found in the gardens of the homestead itself (cf. *L. albofasciata*).

The species is widespread throughout northern Australia, with a range in eastern Australia extending as far south as central New South Wales. The species has been recorded from Cape York Peninsula on a number of occasions (Bock 1979, 1984) and it is the only drosophilid species previously reported from the Heathlands area. Bock (1979) examined two ANIC specimens belonging to this species and labelled: "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".

Although it is probable that many, or most, species of *Leucophenga* are fungus breeders, direct evidence for fungivory is available in Australia only for *L. scutellata* (Bock 1979). Different collecting techniques were employed during the current survey; direct aspiration from fungus was relatively successful, 12 (1 male, 11 females) of the total 68

(21 males, 47 females) were taken in this way; sweeping yielded 62%, fruit traps 10%, malaise traps 9% and one fly (male Reg. 9255) was prey to an asilid (Atomosini).

9 *Leucophenga* "species E" (Bock, 1979)

A female specimen (Reg. 9810) of this undescribed species was collected at Bertie Creek. It conforms to the female discussed by Bock (1979), the only other specimen known. The occurrence of this undescribed species near Heathlands extends the known distribution from the Walter Hill Range (18°S) to Cape York Peninsula. Until males are available it is considered best to postpone formal description; there is marked sexual dimorphism in most *Leucophenga* species. (New locality.)

10 *Drosophila (Drosophila) niveifrons* Okada & Carson, 1982

This species was discovered on Mount Adolphus, Thursday and Moa Islands, Torres Strait, in 1979-1980 (McEvey 1982) and at Iron Range in 1981 (McEvey & Bock 1982). Subsequently it was described from material collected in New Guinea (Okada & Carson 1982). No other Australian records exist. At Heathlands (Bertie, Gunshot, Doublemouth and Captain Billy Creeks and along Nixon's Track, 12 km SE of the homestead), *D. niveifrons* was found to be a very common species on fermenting fruit but it was also present in collections from fungus, and from *Syzygium* fruits both on the rainforest floor and floating in creeks. It turned up in swept collections as well.

On Torres Strait islands and at Iron Range this species coexists, in large numbers with another member of the *D. nasuta* subgroup: *D. sulfurigaster* (see below), but around Heathlands *sulfurigaster* was extremely rare and, unexpectedly, was not found with *niveifrons*.

Males of the two species are very similar, they differ in frontal pollinosity: *D. niveifrons* has an entirely white-pollinose front while *D. sulfurigaster* is white-pollinose in the frontal orbits only. No distinguishing feature exists among females. The frontal ornamentation is visible to females when males circle them during courtship. Courtship is complex and very different between species (Lambert 1982). It involves bobbing up and down and rocking from side-to-side when the male's front is visible to females. Males also tap females with forelegs, and signal with pheromones and sound (McEvey 1989).

Seven of the eight species of the *nasuta* subgroup have been used in many evolutionary and genetic studies (Kitagawa *et al.* 1982) but the courtship of *D. niveifrons* has never been described in detail because live cultures have not been available for comparative analysis. The description by Asada and Kitagawa (1983) was a general one and it failed to identify distinguishing characteristics.

Live females were collected during the present survey and several lines were established in Sydney. It was therefore possible to study and describe the *D. niveifrons* courtship behaviour: the male initiates courtship by positioning himself behind the female with his longitudinal axis approximately in line, or slightly at an angle, to that of the female's. At this stage, the male was often observed butting the female, pushing her abdomen upwards. The male then backed off, the female resumed a normal position, and the male extended one wing. Rarely males tap the female with forelegs at this stage. The male may, after a short period of holding the wing out and vibrating it, rapidly flick the wing far forwards. Wing-flicking is immediately followed by circling. The male moved, sideways like a crab, around the anterior end of the female, bobbing as he went, when passing the front of the female bobbing was most pronounced. He occasionally paused anterior to the female, about 7 mm from her. Unreceptive females scissored their wings rapidly. There is also a tendency for males to occasionally open one or both wings slightly during circling.

Drosophila sulfurigaster males initiate courtship from a position in front of females. They open both wings simultaneously and move their heads from side to side (Spieth 1969). The *niveifrons* courtship is visually quite different; it is reminiscent of the *D. kohkoa* courtship which Lambert (1982) described as ancestral.

11 *Drosophila (Drosophila) persicae* Bock & Parsons, 1978

Drosophila persicae is known from a number of north Queensland rainforest sites including Iron Range; it is not known from Torres Strait (McEvey 1982) and the present records are therefore the most northern.

Of particular interest was the observation of this species (occasionally with others) on the fruit of *Syzygium* floating in streams (Bertie, Captain Billy and Doublemouth Creeks and Dulhunty River) but not on the same fruit lying on the ground nearby. Where floating fruit accumulated on the upstream side of fallen logs, flies could be seen sitting in clusters of up to five on a fruit's surface, leaving it if it drifted into turbulent water. The fidelity of this association was tested by screening hundreds of flies collected on nearby *Syzygium* fruits not floating in water. At Bertie Creek an experiment was done: two piles of fruit removed from the creek were placed at short distances from the creek's edge (1 m and 3 m). Flies were collected daily or every second day for ten days from these piles; about 1000 flies were examined, but not a single *D. persicae* was found. The degree to which these insects are attracted to a particular set of environmental signals is astonishing.

12 *Drosophila (Drosophila) sulfurigaster* (Duda, 1923)

During the present survey only one specimen (male Reg. 9423) of *D. sulfurigaster* was collected, on a compost heap at the Heathlands homestead. Its absence elsewhere in the study area, at places where *niveifrons* was common, suggests that *sulfurigaster* is synanthropic and sporadic, at least at this time of year. Interestingly, it was not found with *D. niveifrons*.

It is a common species at rotting fruit in northern Australia, throughout southeast Asia, including New Guinea, and on Pacific Ocean islands as far east as Hawaii. McEvey (1982) reported *sulfurigaster* from several Torres Strait islands and at Iron Range (McEvey & Bock 1982), it is also frequently found at rotting fruit around Cairns (McEvey 1980) and Paluma (Bock 1976).

13 *Drosophila (Hirtodrosophila) hirtominuta* Bächli, 1973

A series of flies (18 males, 17 females) belonging to this species were collected at fungus in gallery forest along Bertie Creek. *Drosophila hirtominuta* has a distribution extending from Java and Sumatra to north and south Queensland (Bock 1982); it is a common species at Iron Range (McEvey & Bock 1982).

14 *Drosophila (Hirtodrosophila) shiptonensis* Bock, 1984

This species was previously known only from the holotype female from Shipton Flats near Cooktown; three specimens (Reg. 9724 male, 9728 female, 9729 male) were collected in a malaise trap during the present survey. The present material is distinctive in having supernumerary scutellar setae not present in the holotype. (New locality. First male specimens.)

15 *Drosophila (Hirtodrosophila) tricolora* Bock, 1976

A small and distinctive species previously known only from a handful of specimens collected at Iron Range (13°S) and near Daintree (16°S) in far north Queensland. The present specimens (Reg. 9506, 9543, 9867, 9986, 10103) were swept at Captain Billy and Doublemouth Creeks and taken from a malaise trap and fungus at the Bamaga-Captain Billy junction 16 km NE of the Heathlands homestead; these records extend the range slightly further north (Bock 1976; McEvey & Bock 1982).

16 *Drosophila (Scaptodrosophila) bryani* Malloch, 1934

Drosophila bryani is known from Japan, Ryukyus, India, Sri Lanka, Samoa, Micronesia and eastern and northern Australia (Okada 1988) and has previously been reported from Torres Strait islands (McEvey 1982) and Iron Range (Bock 1976). During the present survey specimens were taken frequently at the homestead compost heap and in the food pantry but also in places further away from human habitation along Bertie, Captain Billy and Doublemouth Creeks.

17 *Drosophila (Scaptodrosophila) fimbriata* Bock, 1976

Drosophila fimbriata is a large pale species known from northern (Bock 1976) and central (Bock 1982) Queensland. At Iron Range it was collected in rainforest by sweeping and by direct aspiration from fungus (McEvey & Bock 1982). The present collection records are the most northern; eight (1 female, 7 male) specimens were swept from rainforest vegetation along Captain Billy Creek.

18 *Drosophila (Scaptodrosophila) glauca* Bock, 1976

This species is known from southern (Bock 1982) and northern (Bock 1976) Queensland, Torres Strait (McEvey 1982), Iron Range (McEvey & Bock 1982), and Darwin (Bock

1982). The four specimens collected during the present survey were swept from rainforest vegetation along Captain Billy Creek.

19 *Drosophila (Scaptodrosophila) kennedyi* Bock, 1982
This rare species was taken once at Bertie Creek, the specimen (Reg. 9812) is the first available male, the three other known specimens are females from Iron Range (Bock 1982) and Cooktown (Bock 1984). (First male specimen.)

20 *Drosophila (Scaptodrosophila) melanopleura* McEvey & Bock, 1982
This species was described on the basis of three males collected at Iron Range. During the present survey 11 more specimens were collected (Reg. 9222-24, 9226, 9342, 9549, 9943, 9956, 9959-61) including the first female. (First female specimen.)

21 *Drosophila (Scaptodrosophila) metaxa* Bock, 1976
This species was common in the study area in various habitats including open, low open, and closed forests. It is a widespread species having previously been recorded from the Northern Territory, Queensland and New South Wales, usually in association with fungus. On Cape York Peninsula records exist from Iron Range (Bock 1976; McEvey & Bock 1982). It is unknown from Torres Strait (McEvey 1982); the present records are therefore the most northern.

22 *Drosophila (Scaptodrosophila) novoguinensis* (Duda, 1923)
One specimen (Reg. 9469 female) of this species was caught in a malaise trap 16 km NE of the Heathlands homestead. The species ranges from New Guinea (type locality) to north Queensland. It is an unusual drosophilid because it has supernumerary scutellar setae.

23 *Drosophila (Scaptodrosophila) oenops* McEvey & Bock, 1982
This species was described on the basis of a single Iron Range male in good condition, its external anatomy provided a number of useful diagnostic characters allowing description and classification without examination of the terminalia. Four additional specimens were taken at Cooktown in 1980 and 1981. Six specimens were collected during the present survey (Reg. 9225, 9227, 9233, 9242, 9248, 10019, 10083) in the rainforest areas of Captain Billy Creek; the species range is now known to be Cooktown to Heathlands.
Dissection of the terminalia of two males from the above series (Reg. 9242 and 10019) has revealed a remarkable and hitherto completely unexpected morphology. The cerci are extraordinarily long, extending well beyond the epandrium dorsally, although this is not clear in undissected specimens; the length of the cercus is about 1.2 times the width of the epandrium. The primary clasper or surstylus is small and rounded and is evenly covered in the dorsal half with many short, inwardly pointing, spines (or prensisetae). There are no discrete medial rows of spines as is characteristic of many other Australian *Scaptodrosophila* species. Because of the extraordinary male genitalia this species certainly warrants further taxonomic study.

24 *Drosophila (Scaptodrosophila) paracultello* Bock, 1982
This species, and *Drosophila cultello*, have very large aristae but the present species has, among other things, a distinctive colour pattern. Only four specimens of *D. paracultello* were known before the present survey, all were taken at the type locality: Claudie River (Iron Range) in 1971. A fifth specimen (male Reg. 9976) was collected by sweeping in closed forest at Captain Billy Creek.

25 *Drosophila (Scaptodrosophila) sydneyensis* Malloch
Seven specimens of *D. sydneyensis* were collected during the present survey, two at homestead compost and the others at rotting fungus near Bertie Creek. These records represent a considerable extension of the species' range, previously thought to be limited to eastern Australia from Sydney to central (coastal) Queensland (Bock 1982).
In general facies *D. sydneyensis* closely resembles *D. altera* Bock, another blackish *Scaptodrosophila* species not uncommon in north Queensland rainforests. The two species may easily be distinguished by reference to, among other things, the prescutellar acrostichal setae which are enlarged in *D. sydneyensis* and unmodified in *D. altera* and to the ventral part of the male cercus which is strongly spinulose in *D. altera* and inermis in *D. sydneyensis*. The terminalia of the three males collected during the present survey conform closely with Bock's illustrations (1976, his figures 81 and 82) of the *D.*

sydneyensis terminalia. It has also been noticed that the pale marking on the frons anteriorly, resembling a pale, transverse band, is present in *altera*, and absent in *sydneyensis*. The front of *sydneyensis* is entirely dark brown with blackened orbits.
That *D. sydneyensis* has not previously been reported from the well-collected areas around Cairns and Iron Range is curious, so earlier determinations were checked. By sorting Australian Museum specimens on size of prescutellar setae and type of frontal coloration, two specimens of *D. sydneyensis* from north Queensland were found among material labelled "*D. altera*". The label-data for them is as follows: "Mt. Bartle Frere [base], rain forest sweeping, I.R. Bock, 17.viii.1976" (Reg. 10176) and "N. Qld., Goldsborough-Mulgrave Forest Rd., c. 20 km Gillies Hwy., swept rain forest, I.R. Bock Aug. 1976" (Reg. 10177). (New locality.)

26 *Drosophila (Scaptodrosophila)* species A
A female specimen collected at Doublemouth Creek (Reg. 9898) cannot be identified as any known Australian species. It has the following important characters: small black body; legs distinctly pale tan; carina, developed; frons not anteriorly tan or brown; cheek narrow; cephalic macrochaetae normal for *Scaptodrosophila*; arista plumose with 4 dorsal and 2 ventral rays plus terminal fork; propleural present; modified prescutellar acrostichals absent; basal and apical scutellars subequal; scutellum without supernumerary hairs; acrostichals in 8 rows in front of, and 2 rows between, dorsocentrals; *C*-index 1.3; sternopleurals approximately subequal. Formal description must await male specimens.

27 *Drosophila (Sophophora) ananassae* Doleschall, 1858
Collected at Gunshot and Bertie Creeks, but uncommon. This is a widespread species common in other parts of the world (McEvey *et al.* 1987).

28 *Drosophila (Sophophora) bipectinata* Duda, 1923
Closely related to *D. pseudoananassae*, *D. bipectinata* ranges from southeast Asia to Fiji and Samoa. Bock (1977) reported the species from urban Townsville and found it odd (Bock 1982) that it was absent elsewhere in northern Queensland. Recently several Iron Range specimens in the Australian Museum have been identified as *D. bipectinata*, a new locality, and three males (Reg. 9152, 9600 and 10110) were collected at fruit baits at Bertie and Captain Billy Creeks during the present survey. (New localities.)

29 *Drosophila (Sophophora) denticulata* Bock & Wheeler, 1972
Drosophila denticulata occurs in southeast Asia, New Guinea and north Queensland. The species was common at Bertie, Captain Billy and Doublemouth Creeks where specimens were taken from fungus and by sweeping. For label data see batch numbers: 9619, 9925 and 10115 (Table 2).

30 *Drosophila (Sophophora) ironensis* Bock & Parsons, 1978
Iron Range is the type locality; but the species has also been reported from Cooktown, Mossman Gorge and Lake Eacham National Park in north Queensland (Bock and Parsons 1978; Bock 1984) Moa Island in Torres Strait (McEvey 1982) and New Guinea. This species is unusual in the subgenus *Sophophora* because males lack sex combs on the fore tarsi. Five specimens were collected at fruit baits during the present survey at Captain Billy, Doublemouth and Bertie Creek sites.

31 *Drosophila (Sophophora) melanogaster* Meigen, 1830
Many specimens of this cosmopolitan species were collected, but only at the compost heap at the homestead. It is unknown from Iron Range but was collected on a number of Torres Strait islands (McEvey 1982).

32 *Drosophila (Sophophora) pseudoananassae* Bock, 1971
This was a common species at fruit; specimens were taken at Captain Billy, Doublemouth and Bertie Creeks and on homestead compost.

33 *Drosophila (Sophophora) serrata* Malloch, 1927
The presence of this species in the northern Peninsula represents a significant range extension for the Australian mainland although it has been collected before in Torres Strait. *Drosophila serrata* is unknown in Iron Range.

Thirteen *montium* subgroup males were collected (1, Bertie Creek pump; 5, compost at homestead; 7, Captain Billy Creek). These flies have sex combs comprising contiguous teeth, that extend longitudinally along the entire lengths of the metatarsus and 2nd tarsal segment of the foreleg. Six were dissected, and in each specimen the secondary clasper was found to have two medial black bristles (cf. three in *birchii*). The two medial bristles are subequal (cf. unequal in *kikkawai*). The caudal margin of the novasternum has a pair of small (cf. large in *kikkawai*) bristles. However, two dissected males (Reg. 9141 and 10129) have different primary clasper setation and it is likely that a second species is present: see species B below.

34 *Drosophila (Sophophora)* species B
On dissection of a series of *Drosophila montium* subgroup males, two (Reg. 9141, 10129) had primary clasper setation differing from *D. serrata* but not resembling any known Australian species. Many similar species occur in New Guinea and southeast Asia and further taxonomic work is required to establish the status of the present material.

35 *Drosophila (Sophophora) simulans* Sturtevant, 1919
One specimen only (male Reg. 10124) was collected during the present survey (Doublemouth Creek, swept).

36 *Hypselothyrea claudensis* Bock, 1982
Only two species of *Hypselothyrea* are known from Australia; they may be separated easily by reference to the number of pairs of dorsocentral bristles: two in *lanigera* and one in *claudensis*. The genus is characteristic by its having a sharply upturned scutellum which is clearly visible without the aid of a microscope. *Hypselothyrea claudensis* was not uncommon along Doublemouth and Captain Billy Creeks; this is the first record of the two Australian *Hypselothyrea* species occurring sympatrically and the first time that *claudensis* has been collected away from the type locality, the Claudie River area (Iron Range).

37 *Hypselothyrea lanigera* Duda, 1928
Only one specimen of this species was collected during the present survey (swept in rainforest along the Captain Billy track in the vicinity of Captain Billy and Doublemouth Creeks). Previously it has been reported from New Guinea and at a number of sites in the Cairns region, the present record is therefore the first for Cape York Peninsula. (New locality.)

38 *Lissocephala metallescens* (de Meijere, 1914)
The wings of this species are conspicuously darkened along the fore-margin especially basally, making the fly an easily recognizable drosophilid. It has a widespread distribution throughout southeast Asia, Micronesia and New Guinea (Okada 1977). It was found to be very common on Mount Adolphus and Moa Islands in Torres Strait (McEvey 1982) and it is also frequently encountered at Iron Range (Bock 1982) and around Cairns (McEvey 1980). This species was absent at Iron Range when surveyed in May 1981 (McEvey & Bock 1982) but common when surveyed in November 1975 (Bock 1982). Fluctuation in abundance appears to be marked in this species; around Cairns it also fluctuates (McEvey 1980).
During the present survey most specimens were taken on fungus, but several were also collected directly from fruit and malaise traps and by sweeping at random. It was found in the drier western sites at Dulhunty River and Gunshot Creek as well as at the damper Doublemouth, Bertie and Captain Billy Creeks and 12 km SE and 16km NE of the Heathlands Homestead.

39 *Mycodrosophila aqua* Bock, 1980
This species is widespread across northern Australia. The type locality is McArthur River, SW of Borroloola, NT; other localities include Moa Island, Torres Strait (McEvey 1982), Gordon Creek, Iron Range (McEvey & Bock 1982) and Mt Baird, Cooktown (Bock 1984). It has distinctive pale tan and black abdominal markings figured by Bock (1980).

40 *Mycodrosophila gordoni* McEvey & Bock, 1982
Four specimens (Reg. 9843-44, 9946, 9958) of this species were collected; two were swept from damp rainforest leaf litter at Captain Billy Creek and two were aspirated off

a small fungus growing on the track 28km NE of the Heathlands homestead. On the same fungus *M. aqua* and *M. stigma* were also present.

41 *Mycodrosophila grandifrons* McEvey & Bock, 1982
This fly is easily recognized because it has a very wide head, and it lacks a costal lappet. Previously known only from the type locality at Iron Range it now seems likely that it will be found further afield throughout Cape York Peninsula. A single specimen only (Reg. 9805) was collected from fungus growing close to the edge of Bertie Creek.

42 *Mycodrosophila stigma* Bock, 1980
This is a widespread species in eastern Australia; the present record, of two specimens taken together from a small fungal fructification (at 28 km NE of Heathlands HS, Reg. 9839, 9842), is the most northern, a range-extension of some 130 km from Iron Range. One specimen (Reg. 9839) lacks apical infuscation in the wing, a key character for the species, but it agrees with the description and closely resembles other specimens in terms of abdominal and thoracic patterning.

43 *Microdrosophila pleurolineata* Wheeler & Takada, 1964
Two specimens only. (Reg. 10009 10015, Captain Billy Creek) were swept. The arista of this species is distinctive, it has 11 dorsal aristal rays in the male and 8 in the female; most other species have just four or five.

44 *Microdrosophila discrepantia* Bock, 1982
This species is widespread in tropical Australia. Specimens were taken at Captain Billy and Bertie Creeks and at homestead compost (Reg. 9175, 9246, 9418, 9971, 9987, 10085).

45 *Nesiodrosophila pectinata* McEvey & Bock, 1982
An uncommon yet distinctive species previously known only from Iron Range: Reg. 9518 and 9697.

46 *Nesiodrosophila plana* Bock, 1982
This species is known from a number of rainforest sites around Cairns; it has not previously been recorded from Cape York Peninsula; a specimen (Reg. 9947) was taken at Captain Billy Creek. (New locality.)

47 *Sphaerogastrella novoguinensis* Duda, 1926:53
This species was found at a number of different sites throughout the study area: Doublemouth and Captain Billy Creeks; Captain Billy track; Bertie Creek pump and at the homestead compost heap; some specimens were taken at fruit or from fungus but the majority were collected by sweeping above rainforest leaf-litter. This shiny black species has a globose abdomen, it is common in northern Queensland (Bock 1977) and has been reported previously (*S. javana*) from Iron Range, Thursday Island and New Guinea (McEvey 1982; McEvey & Bock 1982).
All Australian records hitherto this have referred to this species as *Sphaerogastrella javana* (de Meijere), a southeast Asian species, but Okada (1983) corrected this error noting that Australian species have a blackened haltere knob (Bock 1982) corresponding more closely to the New Guinean species.

Discussion

The Heathlands area of Cape York Peninsula supports a drosophilid fauna that is less diverse than at Iron Range, Cooktown or Cairns. The total number of species collected at Heathlands (47, Table 1), over a two week period, using all available techniques, is small compared to results in other north Queensland areas. For example, in less than half the time (5 days), and with fewer techniques, the author collected 54 species at Iron Range, the total there is 91 and likely to go higher; Don Colless collected 80 species near Cooktown during October 1980 and May 1981. Over many years the total for the Cairns region has climbed to 133.

Conditions in the survey area were not as wet as they might have been and it remains important that the area is surveyed during and immediately after a long wet season. An important question remains unanswered: to what extent are drier Peninsula habitats effective barriers to dispersal of drosophilids during a wet season? They are clearly unsuitable habitats for many species during the Dry. Table 1 shows that most species were collected in the moist

habitats in the Captain Billy and Doublemouth Creek areas near where they are crossed by the track to Captain Billy landing. Bertie Creek near the pump yielded many species but it was worked much more intensively on a daily basis whereas the former creeks were visited only twice (Table 2). Therefore it is reasonable to suppose that the species totals for Captain Billy and Doublemouth Creeks are well under the actual numbers.

Table 1. Collection sites and number of species.

Location	Latitude & Longitude	No. of Species
Captain Billy and Doublemouth Creeks combined		31
Bertie Creek near pump	1km SE of HS 11°46 142°36	26
Captain Billy Creek	32km NE of HS 11°37 142°50	25
Doublemouth Creek	30km NE of HS 11°37 142°49	18
Captain Billy track	31km NE of HS 11°37 142°49	13
Heathlands Homestead	11°45 142°35	10
Bamaga/Cpt Billy junction	16km NE of HS 11°41 142°42	9
Gunshot Creek	13km NW of HS 11°43 142°29	8
Nixon's Track	12km SE of HS 11°51 142°38	4
Dulhunty River	13km SW of HS 11°50 142°30	4
"Mycodrosophila site"	28km NE of HS 11°36 142°47	3
near Heathlands 3-ways	12km E of HS 11°46 142°41	1
"Jardine source lookout"	22km NE of HS 11°38 142°44	1
Cockatoo Creek	17km NW of HS 11°39 142°27	0
Jardine River at telegraph crossing		0
Heathlands region		**47**

No species were collected where the telegraph line crosses the Jardine River, at Captain Billy landing, at Cockatoo Creek, or along tracks through upland heath, low open forest, and open forest areas (Pedley & Isbell 1971). Pedley and Isbell (1971) identified two very small closed forest patches in the study area. A third, and larger, area lies far away between Bamaga and Cape York. Only one of the two closed forests in the study area (11°37S 142°49E) was surveyed, the other, at 11°38'S 142°44'E, was not accessible. A clear result of the present study is the relationship between high drosophilid species diversity and closed forest.

Eleven species are reported for the first time from northern Cape York Peninsula (i.e. they are absent in the only previous species lists for the region: Iron Range and Torres Strait islands). Two species are probably new, but further research is required before this can be confirmed; they certainly do not correspond to any known Australian taxa. The first males of *Drosophila shiptonensis* and *Drosophila kennedyi*, and the first females of *Drosophila oenops* were collected. The male terminalia of *Drosophila oenops* was examined for the first time and found to be highly unusual. Illustrations of these will be published at a later date. The courtship behaviour of *Drosophila niveifrons*, a *nasuta* subgroup species, has been examined and it was found to be similar to *D. kohkoa*. A very interesting and consistent association between *Drosophila persicae* and *Syzygium* sp. fruit floating in water was demonstrated by some simple field experiments; it appears that this species is particularly sensitive to desiccation stress and that this explains why they are rarely found further than a few centimetres from water.

Table 2. Summary of label data from the author's specimen register and number of drosophilid species in each batch. Abbreviations: **note 1** - prey of asilid fly (Asilidae, Atomosini); **note 2** - on floating *Syzygium* fruit; **note 3** - *Syzygium* fruit on forest floor; collectors: GD, Greg Daniels; MAS, Margaret A. Schneider; SFMcE, Shane F. McEvey.

Batch	No. of Species	Locality	Method	Date	Collector
9134-9169	8	Bertie Creek nr pump	fruit	10 Mar 1992	SFMcE
9170	0	Bertie Creek nr pump	malaise	10 Mar 1992	GD
9171-9254	13	Captain Billy track	swept	11 Mar 1992	SFMcE
9255	1	Doublemouth Creek	*note 1*	11 Mar 1992	GD
9256-9294	4	Nixon's Track	fungus	12 Mar 1992	SFMcE
9295	0	Bamaga/Cpt Billy junction	swept	12 Mar 1992	SFMcE
9296-9340	4	Heathlands HS	compost	12 Mar 1992	SFMcE
9341-9376	9	Bertie Creek nr pump	fruit	13 Mar 1992	SFMcE
9377-9403	4	Bertie Creek nr pump	*note 2*	13 Mar 1992	SFMcE
9404-9424	6	Heathlands HS	compost	13 Mar 1992	SFMcE
9425-9430	1	Bertie Creek nr pump	*note 2*	13 Mar 1992	SFMcE
9431-9466	6	Bertie Creek nr pump	fungus	13 Mar 1992	SFMcE
9467-9491	4	Bamaga/Cpt Billy junction	malaise	13 Mar 1992	SFMcE GD
9492-9497	3	Bertie Creek nr pump	fungus	15 Mar 1992	SFMcE
9498-9506	1	Bamaga/Cpt Billy junction	malaise	15 Mar 1992	GD MAS
9507-9511	1	Jardine source lookout	malaise	15 Mar 1992	GD MAS
9512-9535	3	Bamaga/Cpt Billy junction	swept	15 Mar 1992	SFMcE
9536-9544	4	Bamaga/Cpt Billy junction	fungus	15 Mar 1992	SFMcE
9545-9558	4	Bertie Creek nr pump	malaise	15 Mar 1992	SFMcE GD
9559-9582	5	Bertie Creek nr pump	fungus	15 Mar 1992	SFMcE
9583-9591	2	Bertie Creek nr pump	*note 2*	15 Mar 1992	SFMcE
9592-9600	5	Bertie Creek nr pump	*note 3*	15 Mar 1992	SFMcE
9601-9606	3	Bertie Creek nr pump	*note 3*	15 Mar 1992	SFMcE
9607-9618	1	Bertie Creek nr pump	light	15 Mar 1992	SFMcE
9619-9660	7	Bertie Creek nr pump	fungus	16 Mar 1992	SFMcE
9661-9720	8	Gunshot Creek	swept	16 Mar 1992	SFMcE
9721-9734	2	Bamaga/Cpt Billy junction	malaise	16 Mar 1992	MAS GD SFMcE
9735	1	nr Heathlands 3-ways		16 Mar 1992	MAS GD SFMcE
9736-9738	1	Bertie Creek nr pump	malaise	16 Mar 1992	GD MAS SFMcE
9739-9749	3	Heathlands HS	compost	17 Mar 1992	SFMcE
9750-9763	3	Dulhunty River	swept	17 Mar 1992	SFMcE
9764-9765	1	Dulhunty River	*note 2*	17 Mar 1992	SFMcE
9766-9771	3	Bertie Creek nr pump	fungus	17 Mar 1992	SFMcE
9772-9778	3	Bertie Creek nr pump	*note 3*	17 Mar 1992	SFMcE
9779-9782	0	Bertie Creek nr pump	malaise	17 Mar 1992	SFMcE
9783-9784	1	nr Heathlands 3-ways	malaise	17 Mar 1992	MAS GD SFMcE
9785-9787	0	Bamaga/Cpt Billy junction	malaise	17 Mar 1992	GD MAS SFMcE
9788-9795	3	Heathlands HS	pantry	18 Mar 1992	SFMcE
9796-9800	1	Heathlands HS	compost	18 Mar 1992	SFMcE
9801-9803	3	Bertie Creek pump	swept	18 Mar 1992	SFMcE
9804-9816	6	Bertie Creek pump	swept	18 Mar 1992	SFMcE

Batch	No. of Species	Locality	Method	Date	Collector
9817-9834	2	Heathlands HS	compost	18 Mar 1992	SFMcE
9835-9838	0	Bertie Creek nr pump	swept	18 Mar 1992	GD
9839-9844	3	Mycodrosophila site	fungus	19 Mar 1992	SFMcE
9845-9924	12	Doublemouth Creek	swept	19 Mar 1992	SFMcE
9925-10029	23	Captain Billy Creek	swept	19 Mar 1992	SFMcE
10030-10041	0	Doublemouth Creek	swept	19 Mar 1992	SFMcE
10042-10043	0	Doublemouth Creek	malaise	19 Mar 1992	MAS GD
10044	0	Cockatoo Creek	swept	20 Mar 1992	SFMcE
10045-10059	1	Bertie Creek nr pump	*note 2*	21 Mar 1992	SFMcE
10060	1	Bertie Creek nr pump	fungus	21 Mar 1992	SFMcE
10061-10092	6	Bertie Creek nr pump	swept	21 Mar 1992	SFMcE
10093-10114	8	Captain Billy Creek	swept	22 Mar 1992	SFMcE
10115-10141	12	Doublemouth Creek	swept	22 Mar 1992	SFMcE
10142-10156	2	Bamaga/Cpt Billy junction	light	22 Mar 1992	MAS GD

Four species (*Lissocephala metallescens*, *Drosophila metaxa*, *Leucophenga scutellata*, and *L. albofasciata*) were present at most sites where drosophilids were found. The abundance of *Lissocephala metallescens* and *Leucophenga scutellata* is reminiscent of the situation on Mount Adolphus Island (110 km N) and most unlike the situation at Iron Range (130 km SE) (McEvey 1982; McEvey & Bock 1982). Table 3 shows that 66% of the species found at Heathlands are also found at Iron Range and 68% are also found in the Cairns region; 73% of the species reported from Torres Strait islands were collected during the present survey around Heathlands. Twenty-seven percent of the Heathlands fauna comprises species known to occur in New Guinea but this figure is likely to be much higher in reality; the fauna in New Guinea remains poorly known.

Table 3. The number of species with overlapping distributions in northern Queensland. The number at the bottom of each column is the number of species found in an area; except those marked * which are the number of species occurring in both Australia and southeast Asia (SA) or New Guinea (NG). Abbreviations: TS, Torres Strait; HT, Heathlands; IR, Iron Range; CK, Cooktown; CN, Cairns; SQ, southeastern Queensland and northeastern New South Wales.

	SA	NG	TS	HT	IR	CK	CN	SQ
SA	32*	12	6	10	15	19	28	8
NG		33*	9	13	18	20	28	12
TS			19	13	14	13	16	7
HT				47	31	30	32	14
IR					86	40	51	17
CK						80	57	23
CN							133	42
SQ								91

Table 4. Drosophilidae of the Heathlands area of northern Cape York Peninsula. Abbreviations: *, species found also at Iron Range (McEvey & Bock 1982; Bock 1989); +, species found also on Torres Strait islands (McEvey 1982).

1	*Cacoxenus perspicax* (Knab, 1914:166) *Gitonides*
2	*Crincosia lawgana* Bock, 1982:18
Drosophila sensu strictu	
3	*Drosophila niveifrons* Okada & Carson, 1982:407 *
4	*Drosophila persicae* Bock & Parsons, 1978:99 *
5	*Drosophila sulfurigaster* (Duda, 1923:48) *Spinulophila* *+
subgenus *Hirtodrosophila*	
6	*Drosophila hirtominuta* Bächli, 1974:288 *
7	*Drosophila shiptonensis* Bock, 1984:114
8	*Drosophila tricolora* Bock, 1976:34 *
subgenus *Scaptodrosophila*	
9	*Drosophila bryani* Malloch, 1934:310 *+
10	*Drosophila fimbriata* Bock, 1976:85 *
11	*Drosophila glauca* Bock, 1976:88 *+
12	*Drosophila kennedyi* Bock, 1982:87 *
13	*Drosophila melanopleura* McEvey & Bock, 1982:690 *
14	*Drosophila metaxa* Bock, 1976:82 *
15	*Drosophila novoguinensis* Duda, 1923:46 *
16	*Drosophila oenops* McEvey & Bock, 1982:691 *
17	*Drosophila paracultello* Bock, 1982:75 *
18	*Drosophila sydneyensis* Malloch, 1927:5
19	*Drosophila* species A
subgenus *Sophophora*	
20	*Drosophila ananassae* Doleschall, 1858:128 *+
21	*Drosophila bipectinata* Duda, 1923:52 *
22	*Drosophila denticulata* Bock & Wheeler, 1972:29 *
23	*Drosophila ironensis* Bock & Parsons, 1978:102 *+
24	*Drosophila melanogaster* Meigen, 1830:85 +
25	*Drosophila pseudoananassae* Bock, 1971:274 *+
26	*Drosophila serrata* Malloch, 1927:6 +
27	*Drosophila simulans* Sturtevant, 1919:153
28	*Drosophila* species B
29	*Hypselothyrea claudensis* Bock, 1982:99 *
30	*Hypselothyrea lanigera* Duda, 1928:88
31	*Leucophenga albofasciata* (Macquart, 1851:277) *Drosophila* *
32	*Leucophenga argentata* (de Meijere, 1914:258) *Drosophila*
33	*Leucophenga janicae* Bock, 1979:14 *
34	*Leucophenga lubrica* Bock, 1979:41
35	*Leucophenga regina* Malloch, 1935:90
36	*Leucophenga scutellata* Malloch, 1923:614 *+
37	*Leucophenga* "species E" of Bock, 1979:41
38	*Lissocephala metallescens* de Meijere, 1914:265 *+
39	*Microdrosophila discrepantia* Bock, 1982:113
40	*Microdrosophila pleurolineata* Wheeler & Takada, 1964:217 *
41	*Mycodrosophila aqua* Bock, 1980:295 *+
42	*Mycodrosophila gordoni* McEvey & Bock, 1982:699 *
43	*Mycodrosophila grandifrons* McEvey & Bock, 1982:696 *
44	*Mycodrosophila stigma* Bock, 1980:281 *
45	*Nesiodrosophila pectinata* McEvey & Bock, 1982:693 *
46	*Nesiodrosophila plana* Bock, 1982:131
47	*Sphaerogastrella novoguinensis* Duda, 1926:53 *+

Acknowledgments

I am indebted to Kathryn Berg and Paul Feeney for their administrative and field support and to Greg Daniels and Margaret Schneider for a number of important specimens from their malaise traps and light sheets. I thank The Royal Geographical Society of Queensland.

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