Nanda Country Bush Blitz

Diptera - focusing on lower Brachycera and acalyptrate flies

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Abstract

The results of sampling true flies (Diptera) during the Nanda Country Bush Blitz expedition are detailed in this report. Working closely with other insect researchers in the field, flies were sampled with sweep netting, three types of malaise traps, and three types of light traps. Nearly five hundred specimens were collected and identified to family level, representing at least 280 species. At least one specimen of fifty-one fly families were collected, and genus and species level identifications were performed for members of 38 of these families. Sixty-two species are putatively new to science, peppered throughout 19 families. Twenty-two species represent significant range extensions. This demonstrates the scant biodiversity data available for acalyptrate Diptera from Western Australia. Other than groups currently being studied by the primary author, all material will be made available to the taxonomic research community once it is deposited in the Western Australian Museum.

1. Introduction

This survey studied the Diptera of the Kalbarri area, as defined by the Bush Blitz. The focus was on acalyptrate Diptera, an assemblage of generally small-bodied but ecologically diverse flies. A secondary focus was on lower Brachycera, which are often larger and more colourful as adults, and predominantly predators and parasitoids as larvae. Lower Brachycera are comparatively better known at the species level in Western Australia, as several groups have been the subject of recent thorough revisions. Acalyptrate Diptera by contrast are very poorly known. However, their known diversity is centred in less arid environments, suggesting that their diversity in Western Australia may be limited. Alternately, this could be an artefact of prior collecting efforts. Many acalyptrates are plant feeders or parasitoids, so the diversity of other organisms in the Kalbarri area would likely translate to a diversity of Diptera species. Coastal Diptera are also diverse, tend to have restricted ranges, and are poorly known in Western Australia, so that was another focal area. The total expected diversity of acalyptrate Diptera was unclear before the expedition based on their known distribution and ecology.

For the Kalbarri area, in the Australian National Insect Collection database, only 9 Diptera accessions are present, and only 409 for all Insecta. In the Atlas of Living Australia, in the Bush Blitz survey area, which includes Kalbarri, Eurardy, and pastoral land near Tamala for which gazettal is in progress, there are 275 Diptera records. Among these, 86 represent unique values, while the others are repeated, e.g. family level identifications. Only 28 Diptera records in the ALA for the Kalbarri area were identified to species. The expectation was that the knowledge of Diptera in the area would be greatly expanded by sampling multiple habitats with a diversity of methods.

2. Methods

2.1 Site selection

The standard survey sites were determined beforehand. They were rich in floral resources. For Diptera, coastal sites were prioritised as there tends to be endemism in semi-marine habitats. Coastal habitats offer various larval substrates that support diverse fly lineages. Along with that, areas where streams reach the ocean, and cliff faces, offer additional refugia and micro habitats for Diptera. As most flying insects require some access to water, sites near fresh water were also prioritised. These included localities along the Murchison River and also smaller streams, gullies, and wetlands.

Sites with varied vegetation types were prioritised. This included a few areas with mallee. While most vegetation is low, many insects fly upwards, so trees and other stratified habitats may house more species. Some mallee eucalypts were in flower, which also facilitates the

collection of flies seeking nectar resources. Areas with different soil types, from rocky to sandy, were prioritised. Many Diptera larvae live in soil and have narrow abiotic niches. Lastly, sites with high vantage points were prioritised for light traps. The broader area that a light trap can reach, the more species will be attracted to the trap.

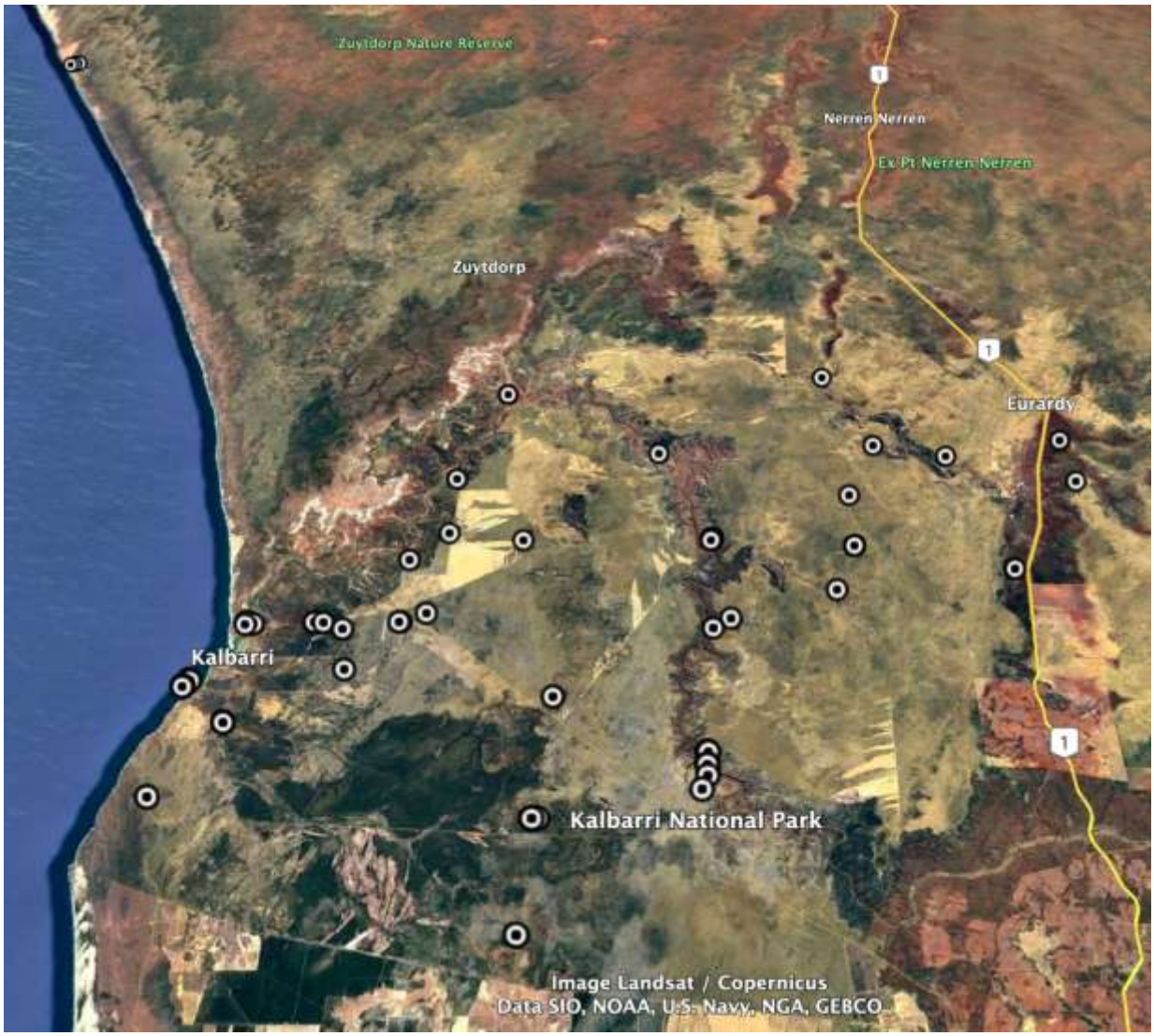


Figure 1. Sites in which Diptera were collected during the Nanda Country Bush Blitz indicated by black and white circles. All were part of Kalbarri National Park, Eurardy station, or Nanda land for which gazettal is in progress

2.2 Survey techniques

The following techniques were used to survey Diptera:

-Malaise traps- These are tent like structures that capture flying insects by hijacking their tendency to fly upwards towards light. Three types of malaise traps were used in this expedition:

Bugdorm style malaise with poles, pegged down and more free-standing than other malaise trap types



Figure 2 Townes style soft 2m malaise traps, tied to nearby vegetation, rocks, and pegs



Figure 3. Six-meter diameter malaise traps with two collecting heads, also tied to nearby vegetation

-Sweeping- A wooden, aluminium, or fibreglass handled net with a fine mesh bag was gently dragged through plants and along features like streams and rock overhangs. Damage to vegetation was minimal. The nets were also used to obtain insects observed through visual inspeciction in the air or as they alight on vegetation. An aspirator was used to move living insects into collecting tubes

-Funnel nets attached to vehicles. The vehicle is driven slowly down a track and insects flying above the car are collected in the net

-Light traps- at night, LED, mercury vapor, regular cabin lights interfere with insect's circadian rhythm and navigation, leading some to be attracted near the lights. Flies were either collected with aspirators, directly into collecting vials, or with a sweep net. Generally, lights at higher vantage points will be more visible and attract more insects.

Specimens were collected into 80% ethanol, or frozen and pinned.

2.2.1 Methods used at standard survey sites

A malaise trap was run for the duration of the expedition at each standard survey site. This was a Bugdorm style trap with poles. Timed sweep netting was also performed at each

standard survey site. The entire site was traversed, as far as possible, in 30 minutes, focusing on all flowering plants available. Sweeping also varied from along the ground to the higher tips of vegetation. Hymenoptera and Hemiptera collected at the standard survey sites were shared with the respective teams. Standard survey site 1 had a patch of Mallee in which many Diptera specimens were found. Standard survey site 2 had a diversity of flowering plants.

2.3 Identifying the collections

All Diptera specimens were identified to family level. Most families were separated into morphospecies, except some small lower Diptera which need to be slide mounted. For selected families (and selected subfamilies of Asilidae and Bombyliidae) the identification was continued as far as possible. This generally was possible to the genus level. Identification resources are scattered and of varying age and quality. We expect that even more of these species could be new to science beyond the ~60 putative new species indicated in this report. Some of these identifications are putative as species identity is usually confirmed by dissection and examination of male genitalia, in many cases supported by DNA sequence data. The putative new species here designated have unambiguous morphological characters that support their assignment as different from any scientifically formally described species. Additionally, many of the putative new species are the first representatives of their genera known from Western Australia or even the continent. Some undescribed species are known to be present in the literature but have not been formally described, for example Asteiidae and Chyromyidae in Western Australia. In this report, these new species were not repeated in Table 3.5.

Focal groups, i.e. identified as far as possible, usually genus:

Lower Brachycera: Acroceridae, Apioceridae, Asilidae: Leptogastrinae, Bombyliidae: Mythicomyiinae, Mydidae, Pipunculidae, Scenopinidae, Stratiomyidae, Tabanidae

Acalyptratae: Agromyzidae, Asteiidae, Australimyzidae, Canacidae, Chamemyiidae, Chloropidae (ID resources poor), Chyromyidae, Coelopidae, Conopidae, Cryptochetidae, Drosophilidae, Ephydridae (ID resources poor), Fergusoninidae, Heleomyzidae, Helosciomyzidae, Lauxaniidae, Lonchaeidae, Milichiidae (ID resources poor), Platystomatidae, Pyrgotidae, Sphaeroceridae (ID resources poor), Tephritidae, Ulidiidae.

These identification resources were used for each group-

Overall Diptera: Colless & McAlpine 1994, Marshall et al 2016

Acroceridae- Winterton 2012

Apioceridae- Yeates & Oberprieler 2013

Asilidae: Leptogastrinae (Australian ID resources poor) Dikow 2009

Bombyliidae: Mythicomyiinae- Hull 1973, Lambkin et al 2003, Evenhuis 2025

Mydidae- Papavero & Wilcox 1974

Pipunculidae- Skevington & Yeates 2001, Motamedinia et al 2025

Scenopinidae- Kelsey 1970, Kelsey 1975, Winterton & Gharali 2011

Stratiomyidae- White 1914, Lessard et al 2021

Tabanidae- Mackerras 1956, González & Miranda-Esquivel 2025

Agromyzidae- Spencer 1963, Lonsdale 2014

Asteiidae (Australian ID resources poor) Sabrosky 1963, Freidberg & Friedman 2021

Australimyzidae- Brake & Mathis 2007

Canacidae- McAlpine 2007a, Munari & Mathis 2010

Chamaemyiidae- Tanasijtshuk 1996, Gaimari & Havill 2021

Chloropidae (Australian ID resources poor) Malloch 1940, Spencer 1986

Chyromyidae (Australian ID resources poor) Ebejer 2009

Coelopidae- McAlpine 1991

Conopidae- Schneider 2010

Cryptochetidae (Australian ID resources poor) Malloch 1927

Drosophilidae- Bock 1982, Bock 1989

Ephydridae (Australian ID resources poor) Mathis et al 2021, Mathis & Zatwarnicki 2023

Fergusoninidae (Australian ID resources poor) Davies et al 2018

Heleomyzidae- McAlpine 1985, McAlpine 2007b

Helosciomyzidae- Mcalpine 2012

Lauxaniidae (Australian ID resources poor) Malloch 1925, Kim 1994,

Lonchaeidae (Australian ID resources poor) McAlpine & Steyskal 1982, MacGowan & Rotheray 2021

Milichiidae (Australian ID resources poor) Brake 2000, Swann & Sinclair 2021

Paraleucopidae (Australian ID resources poor) Wheeler & Sinclair 2019

Platystomatidae- McAlpine 1973, McAlpine & Kim 1977, McAlpine 2001,

Pyrgotidae (Australian ID resources poor) Paramonov 1958, McAlpine 1978

Sphaeroceridae (Australian ID resources poor) Richards 1973

Tephritidae- Permkam & Hancock 1994, Hardy & Drew 1996

Ulidiidae- Daniels 1976

3. Results and Discussion

Appendix 1 lists all Diptera recorded during the Bush Blitz. Collections made during this Bush Blitz will result in 484 specimens being added to public collections and 484 records being added to publicly accessible databases.

3.1 Un-named or not formalised taxa

These highly diverse but small bodied fly lineages could not be sorted to morphospecies. Some need to be slide mounted. These groups likely contain additional undescribed species. Many are collected in abundance in malaise traps and also at light traps and in sweep net samples

Table 1. Putatively un-named or not formalised taxa

Taxon	Comment
Cecidomyiidae	10+ specimens from various samples
Ceratopogonidae	10+ specimens from various samples
Chironomidae	10+ specimens from various samples
Phoridae	10+ specimens from various samples
Psychodidae	10+ specimens from various samples
Sciaridae	10+ specimens from various samples

3.2 Species new to science

In this report, ‘species new to science’ means species that were not recognised by Western science before this Bush Blitz. Some of these undescribed species likely range beyond the study area. Some also may be represented by additional specimens in museums or have been collected in other surveys and ecological studies. Information concerning representatives of these species may exist via DNA sequence OTUs or morphospecies codes but have not been indicated to be new species.

Some major findings include:



Figure 4. Asteiidae*: Phlebosotera* sp10033



Figure 5. Chyromyidae*: Aphaniosoma* sp10093



Figure 6. Conopidae*: Stenoconops* sp10099



Figure 7. Cryptochetidae*: Cryptochetum* sp10103



Figure 8. Ephydridae*: Donaceus* sp10116



Figure 9. Fergusoninidae*: Fergusonina* sp10135



Figure 10. Paraleucopidae sp10260

Table 2. Species new to science	
Species	**Comment**
Asilidae: *Leptogaster* sp10018	Australian species of these gracile predatory grass flies have never been revised and many undescribed species occur in Western Australia. Unlike other assassin flies, they can capture prey on vertical surfaces including spider webs.
Asilidae: *Leptogaster* sp10019	
Asilidae: *Stichopogon* sp10022	Many undescribed species occur throughout Western Australia, often with apparently narrow ranges related to sandy larval substrate. Adults are often smaller than other assassin flies.
Asilidae: *Stichopogon* sp10023	
Asteiidae: *Phlebosotera* sp10033	The genus has been previously recorded from Western Australia but all Australian species are undescribed. Another undescribed species occurs in *Banksia* heath near Perth. It was found at several localities in Kalbarri.
Canacidae: *Dasyrhicnoessa* sp10067	Beach flies from Western Australia are poorly known and this is one of the more diverse genera. *Dasyrhicnoessa* species are apparently restricted to particular coastal plant communities
Ceratopogonidae: *Clinohelea* sp10069	This group of biting midges are predatory on other insects. They are poorly studied, particularly in Australia. Ceratopogonidae is a megadiverse and neglected fly family
Chamaemyiidae: *Pseudoleucopis* sp10071	These flies are parasitoids of aphids and adelgids. A large portion of the ~40 species in Australia are known from Black Mountain (ACT), suggesting that the true diversity is much higher. This species is externally distinct from the two known *Pseudoleucopis* from Western Australia
Chloropidae: *Pseudopachychaeta* sp10073	Most Chloropidae collected on this expedition are likely to be undescribed. This report focuses on two for which the genus can be assigned This taxon is different from the widespread *Pseudopachychaeta sexta*, also collected on this expedition
Chloropidae: *Semaranga* sp10074	Another chloropid that can be attributed to genus based on its distinctive antenna. This is different from *S. dorsocentralis,* known from Queensland
Chyromyidae: *Aphaniosoma* sp10092	Only one species of Chyromyidae is described from Australia, a *Gymnochiromyia* from Victoria. African chyromyids were recently revised and are diverse. The chyromyids of WA seem to be similarly diverse but all are undescribed. Unlike many other acalyptrates, these flies appear to prefer dry habitat. Some African species are coastal, which may be true for species in WA. Additional undescribed Aphaniosoma are known from northern and souther WA
Chyromyidae: *Aphaniosoma* sp10093	
Chyromyidae: *Notiochyromya* sp10094	This species is assigned to *Notiochyromya* based on another undescribed species from the Kimberley which was suggested to be *Notiochyromya* by Ebejer (specimen in Australian

	Museum, Sydney). The genus is primarily African but undescribed species are known from Asia and South America. Some African species are associated with caves. The genus level assignment of this taxon is not settled.
Conopidae: *Heteroconops* sp10095	Conopids, thick-headed flies, are wasp parasitoids as larvae and pollinators as adults. Some are large and colourful but Australia has seen a radiation of small brown Conopinae in semiarid Australia. Australian conopids were recently and thoroughly revised by Schneider (2010). Her study included four species from the Kalbarri area, of which one was rediscovered during this expedition- *Smartiomyia obscura*. Many thick-headed fly speices are known from few localities and specimens, suggesting that the true diversity will grow with further focused collecting efforts.
Conopidae: *Heteroconops* sp10096	
Conopidae: *Pleurocerina* sp10097	
Conopidae: *Smartiomyia* sp10098	
Conopidae: *Stenoconops* sp10099	This genus was previously known only from the type material. This was a significant discovery.
Cryptochetidae: *Cryptochetum* sp10102	Three species of these scale insect parasitoid relatives of *Drosophila* are described from Australia, none from WA. *Cryptochetum* are known from throughout the continent and appear to be more diverse in semi-arid environments. The group is currently being revised by the principal author. Fifty undescribed species are known, including these two, known now from a single specimen each.
Cryptochetidae: *Cryptochetum* sp10103	
Ephydridae: *Athyroglossa* (*Athyroglossa*) sp10113	Larvae of Ephydridae are saprophagous in damp soil, and can have narrow niches within the substrate. Many are tolerant to saline environments and live in coastal habitats. The Ephydridae of Australia are very poorly known to the species level but the worldwide genus level taxonomy is comparatively well resolved. Many specimens were collected in coastal habitats but also inland, for instance in malaise traps along streams. Some also visit flowers.
Ephydridae: *Atissa* sp10114	
Ephydridae: *Ceropsilopa* sp10115	
Ephydridae: *Donaceus* sp10116	*Donaceus* is not recorded from Australia but there are also undescribed species in New South Wales
Ephydridae: *Nostima* sp10119	There are many undescribed species of these small-bodied ephydrids throughout Australia
Ephydridae: *Stratiothyrea* sp10123	This genus is recognisable by distinctive antennal morphology and undescribed species are known from additional localities in Northern Australia
Ephydridae: *Zeros* sp10124	*Zeros* is easily diagnosed by the patterned wings with reduced wing venation. This is not conspecific with the known *Zeros* species in Australia.
Fergusoninidae: *Fergusonina* sp10135	These flies form galls on myrtaceous host plants, aided by symbiotic nematodes. Each species forms galls of a specific configuration on a

Fergusoninidae: *Fergusonina* sp10136	particular host tissue, for instance leaf buds or stems. One *Eucalyptus* species can be the host of up to seven species of *Fergusonina*. Forty *Fergusonina* species are known in Australia but the total diversity may exceed one thousand. They are more easily obtained through rearing them from host plant tissue.
Milichiidae: *Desmometopa* sp10143	Although most records are ascribed to the synanthropic *Desmometopa m-nigrum*, in fact there are multiple undescribed species endemic to Western Australia
Milichiidae: *Stomosis* sp10144	Several undescribed species of this genus are known from Australia. Some are colourful- yellow and black, and have long proboscides for nectar feeding
Milichiidae: sp10145	These tiny flies tend to be kleptoparasites and larvae develop in rotting vegetation. However, many visit flowers and may be quite specific in their pollination range. There is a practically unknown radiation of Milichiidae in Western Australia, likely including multiple undescribed genera. Six different such morphospecies were found on this expedition, mostly represented by singletons. Resolving the true diversity of this group will require extensive effort as the thorough field work of the Kalbarri Bush Blitz uncovered few specimens of each undescribed species
Milichiidae: sp10146	
Milichiidae: sp10147	
Milichiidae: sp10148	
Milichiidae: sp10149	
Milichiidae: sp10150	
Paraleucopidae: sp10260	Occasionally indicated in the literature as *Mallochianamyia* or *Gayomyia*, this is a representative of an undescribed genus in a family only described in 2019. All Australian species are undescribed. This is the first specimen and speices of the group from Western Australia. This was a significant finding.
Phoridae: *Megaselia* sp10175	This is one of the most diverse genera in Diptera, with thousands of undescribed species worldwide. These two are clearly not attributable to the five described species from WA. Additional undescribed species are expected in the region.
Phoridae: *Megaselia* sp10176	
Pipunculidae: *Tomosvaryella* sp10178	These are parasitoids of leafhoppers and relatives. Motamedina et al 2025 recently described 100 species of *Tomosvaryella* from Australia but included no material from Kalbarri or surrounds. These species can't easily be assigned to described species but investigation into their status should be followed up with examination of dissected genitalia and COX1 DNA barcode data
Pipunculidae: *Tomosvaryella* sp10179	
Pipunculidae: *Tomosvaryella* sp10180	
Platystomatidae: *Duomyia* sp10181	This endemic Australian genus includes 84 described species. McAlpine 2007 estimated another 30 undescribed species based on museum specimens, and he had limited material from Western Australia. It seems the group is diverse in semiarid WA, and many species are known from narrow geographic ranges
Platystomatidae: *Duomyia* sp10182	

Platystomatidae: *Rivellia* sp10183	This genus occurs worldwide. The larvae attack nitrogen-fixing root nodules of legumes including *Acacia*. Eight species are described from Australia, one from WA, but McAlpine 2007 estimates 45 undescribed species. Based on morphospecies sorting of pinned collections, and samples in public COX1 barcode databases, the diversity in Australia probably exceeds 200 species. These four species are clearly distinct from the described fauna but may have larger ranges beyond Kalbarri
Platystomatidae: *Rivellia* sp10184	
Platystomatidae: *Rivellia* sp10185	
Platystomatidae: *Rivellia* sp10186	
Pyrgotidae: *Cardiacera* sp10187	These colourful scarab beetle parasitoids are often collected at light traps. Paramonov 1958 circumscribed 32 species in Australia, 4 in WA, all from south WA, south of Perth. Many undescribed species are present in collections. Unclear limits between genera also stymies progress in biodiversity discovery of this group
Pyrgotidae: *Cardiacera* sp10188	
Pyrgotidae: *Cardiacera* sp10189	
Scenopinidae: *Neopseudatrichia* sp10199	The larvae of these flies are predators in sandy soil, thus they tend to be more diverse in dry environments. This expedition found 9 species of scenopinids in the study site, compared to 82 currently known from Australia. Additional species of e.g. *Riekella* from this Bush Blitz may be undescribed, but ascertaining that requires dissection, literature reviews, and comparison with type specimens housed outside of Australia. This species has an affinity with *Neopseudatrichia*, otherwise known from Eastern Australia and SA, and is certainly new
Sphaeroceridae: Limosininae sp10216	This is another neglected megadiverse group of saprophagous flies. Only one sphaerocerid lineage- flightless soil inhabiting *Howickia*- have been thoroughly revised including specimens from WA. These species are distinctive and are not covered in Richards 1973. Genus limits are under flux considering Asian and African genera, so these undescribed species are left unassigned to genus.
Sphaeroceridae: Limosininae sp10217	
Stratiomyidae: *Damaromyia* sp10224	These are black pachygastrine soldier flies whose larvae may be predators in rotting wood. Many pachygastrine species have been overlooked, historically, due to their small body size. Described species of this genus are only known from Eastern Australia but more than 10 undescribed species are known. The group is currently being studied by Dr. Bryan Lessard
Stratiomyidae: *Odontomyia* sp10225	This is probably the most diverse genus of soldier flies in Australia, considering undescribed species. They are often seen visiting flowers and many are bee mimics. Few are known from WA and but other undescribed species are known from narrow ranges in semi-arid habitats. The genus is in need of revision (Lessard et al 2020)
Stratiomyidae: *Odontomyia* sp10226	
Tabanidae: *Dasybasis* sp10259	The revision of this march fly genus by Mackerras was never completed. Dozens of

	undescribed species are known from WA and NT, including this distinctively patterned species
Tephritidae: *Austrotephritis* sp10247	While Western Australia is recognised as a hotspot of floral diversity, the diversity of some plant feeding fly lineages is unaligned in the published literature. This is true of tephritid fruit flies, for which few species are known from WA. This is likely an artifact of undersampling, as nine species were collected during this expedition, including these three putative new ones. The larvae of other species of *Austrotephritis* develop inside inflorescences, mainly Asteraceae. Additional data on host plants would improve any formal description of these taxa
Tephritidae: *Austrotephritis* sp10248	
Tephritidae: *Austrotephritis* sp10249	

3.3 Introduced species



Figure 11. Heteromyzidae: *Prosopantrum flavifrons*. Female

Table 3. Introduced species recorded

Introduced species	Location sighted/observed	Indication of abundance	Comments
Heteromyzidae: *Prosopantrum flavifrons*	Meanarra Hill light (-27.6984, 114.2159)	*Low (1 specimen)*	This species, originally from Chile, is also invasive in New Zealand, South Africa, and Great Britain. The first Australian observation was in Tasmania and it is slowly spreading. It is associated with coastal habitats and its impact on native ecosystems has not been measured

Lonchaeidae: *Lamprolonchaea brouniana*	Multiple localities in Kalbarri NP	*Medium (4 specimens from 3 sites)*	While there are native species of *Lamprolonchaea*, this species is synathropic and associated with gardens. There are records on iNaturalist from Geraldton
Tephritidae: *Ceratitis capitata*	PCYC Cabin lights (-27.6993, 114.1715)	*Low (1 specimen)*	This is not exactly a pest sighting, and is in fact a good sign, as this fruit fly is part of a sterile male release to suppress potential biosecurity threats. The male specimen obtained is part of that intentional controlled release

3.4 Threatened species

No Diptera species of gazetted conservation concern were collected or observed during the expedition.

3.5 Range extensions

This table does not overlap with Table 2 or Table 3. Some of undescribed species also represent significant range extensions for the family or genus to which they belong.

Major:



Figure 12. Australimyzidae: *Australimyza* sp10034



Figure 13. Canacidae: *Thitena cadaverina*



Figure 14. Tephritidae: *Paraceratitella eurycephala*

Table 5. Range extensions or significant infill in distribution records for species			
Species	**Location sighted/observed**	**Distance from nearest known record (km)**	**Comments**
Australimyzidae: *Australimyza* sp10034	Tamala: Kalbarri-Nanda Res. 20km SE Womerangee Hill; beach rocks and vegetation (-27.0544, 113.8572)	230	The furthest north *Australimyza* record from WA
Bombyliidae: Mythicomyiinae: *Tolkunia* sp10043	Belties Crossing to Corner Rd to Harris Rd Vehicle Net (-27.4968, 114.3212)	2500	Known from Alice Springs. Likely a described species but needs to be confirmed with genitalic dissection
Canacidae: *Chaetocanace* sp10065	Wittecara creek mouth, beach (-27.7395, 114.1458)	1000	The furthest south *Chaetocanace* known from WA. Likely *Chaetocanace*

			flavipes but needs confirmation
Canacidae: *Thitena cadaverina*	Red Bluff (-27.7445, 114.1437)	1000	Previously known only from the type collecting event on Barrow Island. This was a significant finding
Conopidae: *Heteroconops gracilis*	along Wittecara creek; sweep flowers and dense vegetation (-27.7701, 114.1742)	2700	Previously known from Kununurra
Drosophilidae: *Scaptomyza* sp10110	Multiple locations	550	
Ephydridae: *Notiphila fuscimana*		4000	First documented Australian record. The species is broadly distributed in Asia and Oceania
Helosciomyzidae: *Helosciomyza fuscinevris*		700	
Platystomatidae: *Lenophila nila*		550	
Syrphidae: *Chalcosyrphus* sp10228		1800	Likely a described species but the group needs revisionary work
Tephritidae*: Paraceratitella eurycephala*		550	
Ulidiidae*: Physiphora clausa*	PCYC Cabin lights (-27.6993, 114.1715)	400	

3.6 Genetic information

DNA COX1 barcodes for all putative new species will be sequenced. Short read shotgun genome sequencing on an Illumina NovaSeq XPlus, PE 150, 8gb raw data is in progress for the following taxa, which are new species and/ or had no previous genetic data available.

Asteiidae: *Phlebosotera* sp10033

Canacidae: *Thitena cadaverina*

Chyromyidae: *Aphaniosoma* sp10093

Chyromyidae: *Notiochyromya* sp10094

Ephydridae: *Athyroglossa* (*Athyroglossa*) sp10113

Ephydridae: *Donaceus* sp10116

Fergusoninidae: *Fergusonina* sp10135

Tephritidae: *Paraceratitella eurycephala*

Tephritidae: *Paraspathulina eremostigma*

Additional Diptera species from the Nanda Country Bush Blitz will undergo genome sequencing soon.

4. Information on species lists

Diptera are highly diverse and provide many ecosystem services. As many species are small-bodied, and fast fliers, a thorough account of their diversity is only possible through consistent effort with various methods over a period of time. Very little was previously known about the flies of the area as there hadn't been a previous targeted survey. The species list for Kalbarri Diptera from ALA was exceeded by nearly ten times. Still, some species previously recorded were not found again, potentially due to seasonality and differences in methodology.

Diptera, the order, is so diverse that not all lineages could be curated and identified for this report. The expectation is that the total diversity of groups like gall midges will bring the count of undescribed species even higher. Many groups have not been revised, so identification is challenging, and additional undescribed species even within the study groups are expected to be discovered in concert with additional genitalic examinations and DNA barcoding data. There are certainly additional undescribed species of small-bodied flies including Dolichopodidae and tachydromiine Hybotidae. Similarly, some larger flies require genitalic dissections to be identified, and this expedition likely collected additional undescribed species, including Tachinidae and miltogrammine Sarcophagidae.

For several groups, the literature and existing collections are so poor that it is currently not possible to assess the genus placement of some morphospecies. This was primarily true for Chloropidae, Ephydridae, Milichiidae, and Sphaeroceridae. Keys to Australian genera are absent or incomplete for these families. With more thorough study, we expect new species and genera of these acalyptrate groups to be present in Western Australia and be represented by material collected during this Bush Blitz. For instance, in Chloropidae, although 20 morphospecies could be differentiated, only three species could be clearly assigned to genus level, and two of those are putative new species within those genera. Milichiidae is a much smaller family, so comparison to known species is more feasible. All eight morphospecies differentiated are putative new species and only two could be unequivocably assigned to genus, suggesting a high ratio of undescribed to described species of Milichiidae in Australia. In Ephydridae, 13 of the 22 morphospecies could be assigned to genus, as the worldwide genus limits are clearer. However, the placement of some undetermined Ephydridae will need additional verification in context with other Australian taxa.

5. Information for land managers

Three notable locations for Diptera diversity were Red Bluff (-27.7445, 114.1437), Wittecara Creek (-27.7693, 114.1738), and 20 km south of Womerangie Hill (-27.0533, 113.8658) - inside the area currently being gazetted. Generally, flies are easier to find in proximity to water resources, and there is a diversity of species restricted to coastal areas. In Red Bluff, the cliff area south of the car park was a refugia for many species. In between the cliffs was a freshwater stream, a combination of resources and refugia that led to a diversity of Diptera being collected at this site. At Wittecara creek, the soil was muddy and a wetland formed along the ill-defined creek margins. Vegetation was dense and some was in flower. Not only semi-aquatic Diptera were collected here, as the flowers and water brought in some arid tolerant groups like Conopidae. The most distinctive site was to the north, 20 km south of Womerangie Hill. Here, there was an assemblage of coastal Diptera different from those collected at Red Bluff. Inland, up the sandy gully, there was an area with caves and dense *Acacia* bushes. These damp, dark refuges held an abundance and diversity of Diptera. While very remote, there were fishing nets washed on the rocky beach, and some evidence of non-native species including honey bees and goats. This locality was the most distinctive that was surveyed, and fortunately will soon be incorporated into national park land.

An example of a rich microhabitat for collecting small Diptera was a small patch on the edge of Eurardy (-27.547, 114.5876). Here, a small Callitris was growing with a flowering *Allocasuarina*. The *Allocasuarina* was much taller, the flowers spreading outwards. The Callitris plant was small but dense, with moist soil at its base. Insects would arrive to obtain nectar resources from the *Allocasuarina*, then shelter inside the dense *Callitris* and also obtain water. This is an example of a rare growth pattern throughout the landscape in which a large diversity of flies were collected.



Figure 15. An *Allocasuarina* growing with a small *Callitris* offered a combination of floral resources, space to hide, and damp soil that attracted many Diptera species

6. Other significant findings

Based on the current species lists for various families of Diptera, it would have been difficult to predict that the high species diversity of Chloropidae and Ephydridae obtained on the expedition. Chloropidae is ecologically diverse, including plant feeders, parasitoids, and saprophages. Most species of Ephydridae are saprophagous in semi-aquatic habitats, however some are also plant feeders or predators. The diversity of Ephydridae in the area may be explained by the high salt tolerance and narrow niches in many species. Many species are coastal but ephydrid diversity continues inland. Chloropidae are very poorly known in Australia but appear to be diverse in both mesic and semi-arid environments. Malaise traps are an effective method to collect a diversity of Chloropidae as their ecological is so labile. As malaise trapping usage increases, the undescribed diversity of the group in Australia will continue to grow. Both groups are in need of revision in Australia to further quantify and contextualise their diversity.

Western Australia is a well-known hotspot of plant diversity and endemism. However, the diversity of some lineages of plant-feeding Diptera in Western Australia are comparatively lower. One of these is Tephritidae, a group of fruit flies, the most diverse family of acalyptrates. As nine species were found during the expedition, including range extensions and undescribed species, this suggests that the paucity of fruit flies in WA is a historical artefact of collecting efforts. To more thoroughly sample the group, a more prolonged effort with plant rearing is needed.



Figure 16. Tephritidae: *Paraspathulina eremostigma*, a widespread but rare species obtained during the expedition

7. Conclusions

This expedition was the first targeted study of Diptera biodiversity in the Nanda-Kalbarri area. Its success in terms of discovering undescribed species was facilitated by the ideal seasonality- peak flowering after a rainy winter. Each sampling methodology was instrumental to discover different facets of the diversity of flies in the survey area. The DNA of several species is being sequenced and incorporated into current systematic research projects.

Several surprising findings may warrant new projects to share findings in peer-reviewed journals. Some new species are known from only one specimen, so additional field work may be needed to more accurately circumscribe the fly diversity of the area.

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Appendices

Appendix 1. List of Diptera and Embioptera recorded during the Nanda Country Bush Blitz

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Flies						
Acroceridae	*Ogcodes* sp10001	small headed fly	No	No	No	no
Agromyzidae	Agromyzidae sp10008	leaf mining fly	No	No	No	no
Agromyzidae	Agromyzidae sp10009	leaf mining fly	No	No	No	no
Agromyzidae	Agromyzidae sp10010	leaf mining fly	No	No	No	no
Agromyzidae	*Liriomyza* sp10002	leaf mining fly	No	No	No	no
Agromyzidae	*Liriomyza* sp10003	leaf mining fly	No	No	No	no
Agromyzidae	*Liriomyza* sp10004	leaf mining fly	No	No	No	no
Agromyzidae	*Melanagromyza* sp10005	leaf mining fly	No	No	No	no
Agromyzidae	*Melanagromyza* sp10006	leaf mining fly	No	No	No	no
Agromyzidae	*Ophiomyia* sp10007	leaf mining fly	No	No	No	no
Apioceridae	*Apiocera* sp10011	flower-loving fly	No	No	No	no
Apioceridae	*Apiocera* sp10012	flower-loving fly	No	No	No	no
Apioceridae	*Apiocera* sp10013	flower-loving fly	No	No	No	no
Asilidae	*Amphisbetetus* sp10020	assassin fly	No	No	No	no
Asilidae	Asilidae sp10024	assassin fly	No	No	No	no
Asilidae	Asilidae sp10025	assassin fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Asilidae	Asilidae sp10026	assassin fly	No	No	No	no
Asilidae	Asilidae sp10027	assassin fly	No	No	No	no
Asilidae	Asilidae sp10028	assassin fly	No	No	No	no
Asilidae	Asilidae sp10029	assassin fly	No	No	No	no
Asilidae	Asilidae sp10030	assassin fly	No	No	No	no
Asilidae	Asilidae sp10031	assassin fly	No	No	No	no
Asilidae	Asilidae sp10032	assassin fly	No	No	No	no
Asilidae	Asilinae sp10014	assassin fly	No	No	No	no
Asilidae	Asilinae sp10015	assassin fly	No	No	No	no
Asilidae	Dasypogoninae sp10016	assassin fly	No	No	No	no
Asilidae	Dasypogoninae sp10017	assassin fly	No	No	No	no
Asilidae	*Leptogaster* sp10018	grass fly	Yes	No	No	no
Asilidae	*Leptogaster* sp10019	grass fly	Yes	No	No	no
Asilidae	*Ommatius* sp10021	assassin fly	No	No	No	no
Asilidae	*Stichopogon* sp10022	assassin fly	Yes	No	No	no
Asilidae	*Stichopogon* sp10023	assassin fly	Yes	No	No	no
Asteiidae	*Phlebosotera* sp10033	asteiid fly	Yes	No	No	no
Australimyzidae	*Australimyza* sp10034	australimyzid fly	No	No	No	no
Bombyliidae	*Acreotrichus* sp10046	bee fly	No	No	No	no
Bombyliidae	Anthracinae sp10035	bee fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Bombyliidae	Anthracinae sp10036	bee fly	No	No	No	no
Bombyliidae	Anthracinae sp10037	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10052	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10053	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10054	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10055	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10056	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10057	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10058	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10059	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10060	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10061	bee fly	No	No	No	no
Bombyliidae	Bombyliidae sp10062	bee fly	No	No	No	no
Bombyliidae	Bombyliinae sp10038	bee fly	No	No	No	no
Bombyliidae	Bombyliinae sp10039	bee fly	No	No	No	no
Bombyliidae	Bombyliinae sp10040	bee fly	No	No	No	no
Bombyliidae	Bombyliinae sp10041	bee fly	No	No	No	no
Bombyliidae	*Comptosia* sp10048	bee fly	No	No	No	no
Bombyliidae	*Geron* sp10049	bee fly	No	No	No	no
Bombyliidae	*Glabellula* sp10042	bee fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Bombyliidae	Mythicomyiinae sp10044	micro bee fly	No	No	No	no
Bombyliidae	Mythicomyiinae sp10045	micro bee fly	No	No	No	no
Bombyliidae	*Neosardus* sp10050	bee fly	No	No	No	no
Bombyliidae	Phthiriinae sp10047	bee fly	No	No	No	no
Bombyliidae	*Tolkunia* sp10043	bee fly	No	No	No	no
Bombyliidae	*Villa* sp10051	bee fly	No	No	No	no
Calliphoridae	*Calliphora* sp10063	blow fly	No	No	No	no
Canacidae	*Chaetocanace* sp10065	beach fly	No	No	No	no
Canacidae	*Dasyrhicnoessa* sp10067	beach fly	Yes	No	No	no
Canacidae	*Tethina ochracea*	beach fly	No	No	No	no
Canacidae	*Tethina* sp10066	beach fly	No	No	No	no
Canacidae	*Thitena cadaverina*	beach fly	No	No	No	no
Cecidomyiidae	Cecidomyiidae sp10068	gall midge	No	No	No	no
Ceratopogonidae	*Clinohelea* sp10069	biting midge	Yes	No	No	no
Ceratopogonidae	*Forcipomyia* sp10070	biting midge	No	No	No	no
Chamaemyiidae	*Leucopis formosana*	silver fly	No	No	No	no
Chamaemyiidae	*Pseudoleucopis* sp10071	silver fly	Yes	No	No	no
Chironomidae	Chironomidae sp10072	midge	No	No	No	no
Chloropidae	Chloropidae sp10075	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10076	frit fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Chloropidae	Chloropidae sp10077	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10078	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10079	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10080	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10081	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10082	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10083	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10084	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10085	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10086	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10087	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10088	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10089	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10090	frit fly	No	No	No	no
Chloropidae	Chloropidae sp10091	frit fly	No	No	No	no
Chloropidae	*Pseudopachychaeta sexta*	frit fly	No	No	No	no
Chloropidae	*Pseudopachychaeta* sp10073	frit fly	Yes	No	No	no
Chloropidae	*Semaranga* sp10074	frit fly	Yes	No	No	no
Chyromyidae	*Aphaniosoma* sp10092	chyromyid fly	Yes	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Chyromyidae	*Aphaniosoma* sp10093	chyromyid fly	Yes	No	No	no
Chyromyidae	*Notiochyromya* sp10094	chyromyid fly	Yes	No	No	no
Coelopidae	*Coelopella popeae*	kelp fly	No	No	No	no
Coelopidae	*Gluma nitida*	kelp fly	No	No	No	no
Coelopidae	*This canus*	kelp fly	No	No	No	no
Conopidae	Conopidae sp10100	thick-headed fly	No	No	No	no
Conopidae	Conopidae sp10101	thick-headed fly	No	No	No	no
Conopidae	*Heteroconops gracilis*	thick-headed fly	No	No	No	no
Conopidae	*Heteroconops* sp10095	thick-headed fly	Yes	No	No	no
Conopidae	*Heteroconops* sp10096	thick-headed fly	Yes	No	No	no
Conopidae	*Pleurocerina similis*	thick-headed fly	No	No	No	no
Conopidae	*Pleurocerina* sp10097	thick-headed fly	Yes	No	No	no
Conopidae	*Smartiomyia obscura*	thick-headed fly	No	No	No	no
Conopidae	*Smartiomyia* sp10098	thick-headed fly	Yes	No	No	no
Conopidae	*Stenoconops* sp10099	thick-headed fly	Yes	No	No	no
Cryptochetidae	*Cryptochetum* sp10102	scale parasitoid fly	Yes	No	No	no
Cryptochetidae	*Cryptochetum* sp10103	scale parasitoid fly	Yes	No	No	no
Dolichopodidae	Dolichopodidae sp10104	long-legged fly	No	No	No	no
Dolichopodidae	Dolichopodidae sp10105	long-legged fly	No	No	No	no
Dolichopodidae	Dolichopodidae sp10106	long-legged fly	No	No	No	no

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Dolichopodidae	Dolichopodidae sp10107	long-legged fly	No	No	No	no
Dolichopodidae	Dolichopodidae sp10108	long-legged fly	No	No	No	no
Drosophilidae	*Scaptodrosophila* sp10109	pomace fly	No	No	No	no
Drosophilidae	*Scaptomyza* sp10110	pomace fly	No	No	No	no
Empididae	Empididae sp10111	dance fly	No	No	No	no
Empididae	Empididae sp10112	dance fly	No	No	No	no
Ephydridae	*Athyroglossa* sp10113	shore fly	Yes	No	No	no
Ephydridae	*Atissa* sp10114	shore fly	Yes	No	No	no
Ephydridae	*Ceropsilopa* sp10115	shore fly	Yes	No	No	no
Ephydridae	*Donaceus* sp10116	shore fly	Yes	No	No	no
Ephydridae	*Ephydrella* sp10117	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10125	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10126	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10127	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10128	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10129	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10130	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10131	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10132	shore fly	No	No	No	no
Ephydridae	Ephydridae sp10133	shore fly	No	No	No	no

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Ephydridae	*Hydrellia* sp10118	shore fly	No	No	No	no
Ephydridae	*Nostima* sp10119	shore fly	Yes	No	No	no
Ephydridae	*Notiphila fuscimana*	shore fly	No	No	No	no
Ephydridae	*Ochthera* sp10120	shore fly	No	No	No	no
Ephydridae	*Paralimna* sp10121	shore fly	No	No	No	no
Ephydridae	*Scatella* sp10122	shore fly	No	No	No	no
Ephydridae	*Stratiothyrea* sp10123	shore fly	Yes	No	No	no
Ephydridae	*Zeros* sp10124	shore fly	Yes	No	No	no
Fergusoninidae	*Fergusonina* sp10134	nematode gall fly	No	No	No	no
Fergusoninidae	*Fergusonina* sp10135	nematode gall fly	Yes	No	No	no
Fergusoninidae	*Fergusonina* sp10136	nematode gall fly	Yes	No	No	no
Helosciomyzidae	*Helosciomyza fuscinevris*	helosciomyzid fly	No	No	No	no
Heteromyzidae	*Prosopantrum flavifrons*	chilean sun fly	No	No	No	Yes
Hybotidae	Tachydromiinae sp10137	hybotid dance fly	No	No	No	no
Hybotidae	Tachydromiinae sp10138	hybotid dance fly	No	No	No	no
Lauxaniidae	*Homoneura* sp10139	lauxaniid fly	No	No	No	no
Lauxaniidae	*Homoneura* sp10140	lauxaniid fly	No	No	No	no
Lonchaeidae	*Lamprolonchaea brouniana*	Metallic-green tomato fly	No	No	No	Yes
Lonchaeidae	*Lamprolonchaea* sp10141	lance fly	No	No	No	no
Lonchaeidae	*Silba* sp10142	lance fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Milichiidae	*Desmometopa* sp10143	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10145	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10146	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10147	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10148	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10149	jackal fly	Yes	No	No	no
Milichiidae	Milichiidae sp10150	jackal fly	Yes	No	No	no
Milichiidae	*Stomosis* sp10144	jackal fly	Yes	No	No	no
Muscidae	*Lispe* sp10151	house fly	No	No	No	no
Muscidae	*Musca vetustissima*	bush fly	No	No	No	no
Muscidae	Muscidae sp10152	house fly	No	No	No	no
Muscidae	Muscidae sp10153	house fly	No	No	No	no
Muscidae	Muscidae sp10154	house fly	No	No	No	no
Muscidae	Muscidae sp10155	house fly	No	No	No	no
Muscidae	Muscidae sp10156	house fly	No	No	No	no
Muscidae	Muscidae sp10157	house fly	No	No	No	no
Muscidae	Muscidae sp10158	house fly	No	No	No	no
Mycetophilidae	Mycetophilidae sp10159	fungus gnat	No	No	No	no
Mycetophilidae	Mycetophilidae sp10160	fungus gnat	No	No	No	no
Mycetophilidae	Mycetophilidae sp10161	fungus gnat	No	No	No	no

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Mycetophilidae	Mycetophilidae sp10162	fungus gnat	No	No	No	no
Mydidae	*Diochlistus* sp10163	mydas fly	No	No	No	no
Mydidae	*Diochlistus* sp10164	mydas fly	No	No	No	no
Mydidae	*Mitrodetus* sp10165	mydas fly	No	No	No	no
Mydidae	*Neorhaphiomidas* sp10166	mydas fly	No	No	No	no
Paraleucopidae	Paraleucopidae sp10260	bobo fly	Yes	No	No	no
Phoridae	*Megaselia* sp10175	scuttle fly	Yes	No	No	no
Phoridae	*Megaselia* sp10176	scuttle fly	Yes	No	No	no
Phoridae	Phoridae sp10168	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10169	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10170	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10171	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10172	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10173	scuttle fly	No	No	No	no
Phoridae	Phoridae sp10174	scuttle fly	No	No	No	no
Pipunculidae	*Claraeola* sp10177	big-headed fly	No	No	No	no
Pipunculidae	*Tomosvaryella* sp10178	big-headed fly	Yes	No	No	no
Pipunculidae	*Tomosvaryella* sp10179	big-headed fly	Yes	No	No	no
Pipunculidae	*Tomosvaryella* sp10180	big-headed fly	Yes	No	No	no
Platystomatidae	*Duomyia* sp10181	signal fly	Yes	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Platystomatidae	*Duomyia* sp10182	signal fly	Yes	No	No	no
Platystomatidae	*Lenophila nila*	signal fly	No	No	No	no
Platystomatidae	*Rivellia* sp10183	signal fly	Yes	No	No	no
Platystomatidae	*Rivellia* sp10184	signal fly	Yes	No	No	no
Platystomatidae	*Rivellia* sp10185	signal fly	Yes	No	No	no
Platystomatidae	*Rivellia* sp10186	signal fly	Yes	No	No	no
Pyrgotidae	*Cardiacera* sp10187	scarab fly	Yes	No	No	no
Pyrgotidae	*Cardiacera* sp10188	scarab fly	Yes	No	No	no
Pyrgotidae	*Cardiacera* sp10189	scarab fly	Yes	No	No	no
Rhiniidae	*Stomorhina* sp10064	nose fly	No	No	No	no
Sarcophagidae	Miltogramminae sp10190	satellite fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10191	flesh fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10192	flesh fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10193	flesh fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10194	flesh fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10195	flesh fly	No	No	No	no
Sarcophagidae	Sarcophagidae sp10196	flesh fly	No	No	No	no
Scatopsidae	Scatopsidae sp10197	flesh fly	No	No	No	no
Scatopsidae	Scatopsidae sp10198	flesh fly	No	No	No	no

Family	Species	Common name	Species new to science	Threatened species (EPBC Act)	Threatened species (Biodiversity Conservation Act 2016)	Introduced species
Scenopinidae	*Neopseudatrichia* sp10199	window fly	Yes	No	No	no
Scenopinidae	*Riekiella* sp10200	window fly	No	No	No	no
Scenopinidae	*Riekiella* sp10201	window fly	No	No	No	no
Scenopinidae	*Riekiella* sp10202	window fly	No	No	No	no
Scenopinidae	Scenopinidae sp10204	window fly	No	No	No	no
Scenopinidae	Scenopinidae sp10205	window fly	No	No	No	no
Scenopinidae	Scenopinidae sp10206	window fly	No	No	No	no
Scenopinidae	*Scenopinus* sp10203	window fly	No	No	No	no
Sciaridae	Sciaridae sp10207	dark-winged fungus gnat	No	No	No	no
Sciaridae	Sciaridae sp10208	dark-winged fungus gnat	No	No	No	no
Sciaridae	Sciaridae sp10209	dark-winged fungus gnat	No	No	No	no
Sepsidae	*Australosepsis frontalis*	black scavenger fly	No	No	No	no
Sepsidae	Sepsidae sp10210	black scavenger fly	No	No	No	no
Sepsidae	Sepsidae sp10211	black scavenger fly	No	No	No	no
Simuliidae	*Austrosimulium* sp10212	black fly	No	No	No	no
Simuliidae	*Austrosimulium* sp10213	black fly	No	No	No	no
Sphaeroceridae	Limosininae sp10214	small dung fly	No	No	No	no
Sphaeroceridae	Limosininae sp10215	small dung fly	No	No	No	no
Sphaeroceridae	Limosininae sp10216	small dung fly	Yes	No	No	no
Sphaeroceridae	Limosininae sp10217	small dung fly	Yes	No	No	no

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Sphaeroceridae	Sphaeroceridae sp10218	small dung fly	No	No	No	no
Sphaeroceridae	Sphaeroceridae sp10219	small dung fly	No	No	No	no
Sphaeroceridae	Sphaeroceridae sp10220	small dung fly	No	No	No	no
Sphaeroceridae	Sphaeroceridae sp10221	small dung fly	No	No	No	no
Sphaeroceridae	Sphaeroceridae sp10222	small dung fly	No	No	No	no
Stratiomyidae	*Antissella kalbarriensis*	soldier fly	No	No	No	no
Stratiomyidae	Clitellariinae sp10223	soldier fly	No	No	No	no
Stratiomyidae	*Damaromyia* sp10224	soldier fly	Yes	No	No	no
Stratiomyidae	*Odontomyia* sp10225	soldier fly	Yes	No	No	no
Stratiomyidae	*Odontomyia* sp10226	soldier fly	Yes	No	No	no
Syrphidae	*Chalcosyrphus* sp10228	flower fly	No	No	No	no
Syrphidae	*Psilota* sp10229	flower fly	No	No	No	no
Syrphidae	*Psilota* sp10230	flower fly	No	No	No	no
Syrphidae	Syrphidae sp10231	flower fly	No	No	No	no
Syrphidae	Syrphidae sp10232	flower fly	No	No	No	no
Syrphidae	Syrphinae sp10227	flower fly	No	No	No	no
Tabanidae	*Dasybasis* sp10233	march fly	No	No	No	no
Tabanidae	*Dasybasis* sp10259	march fly	Yes	No	No	no
Tachinidae	Exoristinae sp10234	bristle fly	No	No	No	no
Tachinidae	Phasiinae sp10235	bristle fly	No	No	No	no

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Tachinidae	*Rutilia* sp10236	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10237	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10238	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10239	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10240	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10241	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10242	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10243	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10244	bristle fly	No	No	No	no
Tachinidae	Tachinidae sp10245	bristle fly	No	No	No	no
Tephritidae	*Austrotephritis* sp10246	fruit fly	No	No	No	no
Tephritidae	*Austrotephritis* sp10247	fruit fly	Yes	No	No	no
Tephritidae	*Austrotephritis* sp10248	fruit fly	Yes	No	No	no
Tephritidae	*Austrotephritis* sp10249	fruit fly	Yes	No	No	no
Tephritidae	*Bactrocera* sp10250	fruit fly	No	No	No	no
Tephritidae	*Ceratitis capitata*	fruit fly	No	No	No	Yes
Tephritidae	*Dioxyna hyalina*	fruit fly	No	No	No	no
Tephritidae	*Paraceratitella eurycephala*	fruit fly	No	No	No	no
Tephritidae	*Paraspathulina eremostigma*	fruit fly	No	No	No	no

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Therevidae	*Acupalpa melanophaeos*	stiletto fly	No	No	No	no
Therevidae	Agapophytinae sp10251	stiletto fly	No	No	No	no
Therevidae	*Agapophytus* sp10252	stiletto fly	No	No	No	no
Therevidae	Therevidae sp10254	stiletto fly	No	No	No	no
Therevidae	Therevidae sp10255	stiletto fly	No	No	No	no
Therevidae	Therevidae sp10256	stiletto fly	No	No	No	no
Therevidae	Therevidae sp10257	stiletto fly	No	No	No	no
Therevidae	Therevidae sp10258	stiletto fly	No	No	No	no
Ulidiidae	*Physiphora clausa*	picture-winged fly	No	No	No	no
Webspinners (Embioptera)						
Oligotomidae	Oligotomidae sp10167	webspinner	No	No	No	Yes