Rungulla Bush Blitz

Odonata (damselflies and dragonflies); Papilionoidea (butterflies); Formicidae (ants); Diptera (flies) Asilidae (robber flies), Bombyliidae (bee flies), Syrphidae (hover flies), Therevidae (stiletto flies); Scarabaeidae (scarab beetles); Megachilidae (leafcutter/mason bees); Aradidae (flat bugs)

02-13 May 2022

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Nomenclature and taxonomy used in this report is consistent with:

The Australian Faunal Directory (AFD)

http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home

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List of contributors

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Abstract

The Rungulla National Park Bush Blitz generated 1,186 registered insect specimens for the Queensland Museum, including dragonflies and damselflies, butterflies, flies, ants, beetles, bees, moths, cockroaches and katydids.

An additional 91 unique photographic records (submitted to iNaturalist) and 2 visual observations of dragonflies and damselflies, butterflies and moths, and flies, were also recorded during the Bush Blitz (see list below).

Material was collected from 10 broad-based sites throughout Rungulla National Park.

Many collecting methods were used including day hand collecting, hand netting, night hand collecting, Malaise traps, light traps, pitfall traps, dung-baited pitfall traps, bark sprays (pyrethrum knockdowns), and coloured pan traps. In addition to hand netting, dragonflies and damselflies, and to a lesser extent butterflies, were surveyed by photographing specimens.

A total of 230 species and 1 species-group were recorded from Rungulla National Park, including dragonflies and damselflies (29 species), butterflies (31 species), moths (4 species), flies (35 species), ants (90 species and 1 species-group), bees (16 species), vespid wasps (6 species), true bugs (3 species), beetles (13 species), cockroaches (1 species) and katydids (1 species).

Several species collected were un-named but known from other collections, including 16 species of flies (11 bee flies, 5 robber flies) and 1 species of mason bee.

The few species new to science that were collected included 4 species of bee flies, 1 species of robber fly, and 1 species of ant.

Eight exotic or pest species were collected and identified, including 2 exotic ants, 5 African dung beetles, and 1 pest species of scarab beetle. The dung beetles were deliberately introduced to help bury cattle dung and pose no ecological risk. Of the exotic ants, the Black Crazy Ant, *Paratrechina longicornis*, is of most concern but unlikely to pose a serious ecological threat.

Many range extensions were recorded, including dragonflies (4 species), damselflies (3 species), butterflies (5 species), bee flies (7 species), ants (7 species), scarab beetles (1 species), mason and leafcutter bees (3 species), and flat bugs (1 species). Most range extension were minor to moderate inland range extensions around the latitude of Rungulla National Park demonstrating the park's importance as habitat for more coastally distributed species.

Number of unique records of insect species and species-groups generated during the Rungulla Bush Blitz (2-14 May 2022) categorised by insect order and family. 'Registered spms' are specimens that have been assigned unique registration numbers, databased and deposited in the entomology collection of the Queensland Museum. 'Unique photo obs' comprise specimens that were photographed only and for which the photographed have been submitted to the citizen science platform iNaturalist. 'Unique visual obs' comprise specimens that were observed only, and not collected or photographed.

Order/Family	Family	Registered spms	Unique photo obs	Unique visual obs	Total records	Total spp. - species grps
Blattodea		**3**	**-**		**3**	**1**
	Blattidae	3	-		3	1
Coleoptera		**35**	**-**		**35**	**13**
	Dytiscidae	5	-		5	2
	Scarabaeidae	30	-		30	11
Hemiptera		**4**	**-**		**4**	**3**
	Aradidae	3	-		3	2

	Cicadidae	1	-		1	1
Diptera		**223**	**1**		**224**	**35**
	Asilidae	31	-		31	9
	Bombyliidae	167	1		168	17
	Syrphidae	6	-		6	4
	Therevidae	19	-		19	5
Hymenoptera		**741**	**-**		**741**	**112+1***
	Apidae	10	-		10	4
	Formicidae	687	-		687	90+1*
	Megachilidae	21	-		21	12
	Vespidae	23	-		23	6
Lepidoptera		**101**	**9**	**1**	**111**	**35**
	Arctiidae	1	-		1	1
	Hesperiidae	2	-		2	2
	Lycaenidae	41	1		42	11
	Nymphalidae	24	5	1	30	10
	Papilionidae	6	1		7	2
	Pieridae	18	1		19	6
	Sphingidae	9	1		10	3
Odonata		**77**	**85**	**1**	**163**	**29**
	Aeshnidae	4	3		7	3
	Coenagrionidae	12	17		29	6
	Corduliidae	2	3		5	2
	Isostictidae	2	5		7	1
	Lestidae	5	3		8	3
	Libellulidae	45	52	1	98	13
	Platycnemididae	7	2		9	1
Orthoptera		**2**			**2**	**1**
	Tettigoniidae	2			2	1
ALL INSECTS		**1186**	**91**	**2**	**1279**	**229+1***

1. Introduction

The Queensland Museum was invited to collaborate with the Australian Tropical Herbarium, Queensland Herbarium and individuals from a selection of other institutions to undertake a Bush Blitz field survey of Rungulla National Park and Resources Reserve located in far north Queensland, within the lands of the Ewamian People who have an ongoing connection with and play an active role in caring for Country. The survey was undertaken 02–14 May 2022.

Rungulla is located approximately 116 km south-west of Forsayth, was relatively recently acquired as a national park in 1997 and was formally gazetted on 27 November 2015. Rungulla National Park covers 118,500 hectares in size, and the Resources Reserve is a further 11,007 hectares. The area contains rugged sandstone country, dissected by the Gilbert River and straddles 2 bioregions: the Gulf Plains and Einasleigh Uplands. Rungulla has significant natural values including springs and spring-fed watercourses, plateau lagoons, and varied refugia habitats, along with a wide range of sandstone landforms. The diverse habitat types, such as woodlands with perennial grasses, provide habitat for species of conservation significance such as the Gouldian Finch and Koala. The Gilbert River is the main

waterway through the park, which along with significant wetlands and waterway areas such as sedge lagoons on plateau surfaces, contribute significantly to the biodiversity of the park.

Prior to the Rungulla Bush Blitz survey there were virtually no records of insects from the park available through the Atlas of Living Australia (ALA) apart from two observations of a single species of butterfly, the Common Crow, *Euploea corinna*. Thus, it was expected that our insect surveys would contribute substantially to the inventory of insect species from the park. The timing of the survey in mid-May is typically a period of low activity and abundance of adult insects and consequently we expected our surveys to substantially underestimate the diversity of the park. This was particularly the case for some families of true flies (bee flies, robber flies, stiletto flies) and butterflies that were particular targets for our surveys. However, the presence of a variety of aquatic habitats in the park, including permanent springs, suggested that the parks fauna of dragonflies and damselflies might be larger that expected given its inland location.

2. Methods

2.1 Site selection

Sites were selected with a view to sampling a wide range of habitat types and the widest geographic range possible in the short time allocated. As dragonflies and damselflies were one of the main insect groups targeted, sites were selected to encompass a range of freshwater habitats ranging from flowing rivers and streams, riverine pools and billabongs, and swamps and boggy seepages. Butterflies and many groups of flies (Diptera) are known to hilltop, a breeding strategy where males congregate at the tops of hills. Consequently, some of the selected survey sites were prominent high points in the landscape.

Most insect collections were made at 10 broad-based sites within Rungulla National Park.

- Rungulla Bush Blitz base camp and surrounds. This site included the QPWS shed and the surrounding area, the banks and pools along the channel of the Gilbert River near the QPWS shed and a short distance along the track to Dead Horse Creek.
- Rungulla Standard Survey Site 1 (SSS1).
- Rungulla Standard Survey Site 2 (SSS2).
- Carsons Spring.
- Green Ant Spring.
- A creek line approximately 2.2 km ENE of the QPWS shed near SSS2
- The Gilbert River approximately 23.5 km NNW of the QPWS shed. Collections were concentrated along the northern and southern banks of the river and on a hilltop on the escarpment above the northern bank of the river.
- A creek line 16.3 km NNE of the QPWS shed. Collections were made along the creek line itself and on a hilltop above and to the west of the creek line.
- A tributary of the Gilbert River approximately 19.2 km NNW of the QPWS shed. Collections were made along the creek line both upstream and downstream and on a hilltop above and to north of the creek line.
- A hilltop approximately 32km SSE of the QPWS shed. Collections were made on the hilltop and on its eastern slopes and along an ephemeral creek line at its eastern base.

At these broad-based collection sites, Malaise traps and/or coloured pan traps were installed at locations with their latitude and longitude co-ordinates recorded. Wider ranging general hand collecting was conducted at one to three locations per broad-based site. For these collections, a central latitude and longitude coordinate was recorded and combined with a degree of precision that encompassed the area in which collections were made. At each of the broad-based sites, wide ranging searches were made for dragonflies, damselflies and butterflies, often along creek lines and rivers. The locations of specimens collected and photographed during these searches were individually georeferenced.

Some insects collected by other participants on the Rungulla Bush Blitz have been identified and incorporated into this report.

Figure 1. Rungulla Bush Blitz insect collection sites. A, B, Carsons Spring; C, D, Green Ant Spring with Susan Wright and Katherine Taske hand collecting insects (C) and Chris Burwell photographing dragonflies (D); E, Rungulla Bush Blitz Standard Survey Site 1 with vertebrate pitfall trap line and coloured pan traps; F, Creek line 2.2 km ENE of the QPWS shed near SSS2, with Malaise trap. Images Susan Wright (A, E, F), Chris Lambkin (B-D), Queensland Museum.

Figure 2. Rungulla Bush Blitz insect collection sites. A-C, Tributary of the Gilbert River approximately 19.2 km NNW of the QPWS shed. A, Hilltop to the north of the creek line with Louise Edwards and Monica Lilley installing coloured pans; B, Main creek line with rock substrate; C, Side branch of creek line with sandy substrate. D-F, Creek line 16.3 km NNE of the QPWS shed. D, Helicopter landing site on hilltop to west of creek line; E, Malaise trap amongst spinifex on hilltop; F, Shallow pool along creek line. Images Susan Wright (A-B, D-E), Chris Lambkin (C, F), Queensland Museum.

Figure 3. Rungulla Bush Blitz insect collection sites. A, Rungulla Bush Blitz Standard Survey Site 2 showing placement of Malaise Trap; B-E, Gilbert River approximately 23.5 km NNW of the QPWS shed. B, C, Escarpment on the northern bank of the river showing placement of Malaise trap (C); D-E, South bank of the river showing placement of Malaise trap (D) and coloured pans (E). Images Chris Lambkin (A, C), Susan Wright (D, E), Jenny Beard (B), Queensland Museum.

2.2 Survey techniques

A wide range of collecting methods was used to survey the target groups of insects. Not all methods were employed at all survey sites; however, the majority of collecting methods detailed below were carried out at the two Rungulla Bush Blitz Standard Survey Sites (RGBB SSS1 and RGBB SSS2). Collecting methods included the following:

Day hand collecting. Insects were actively searched for during the day. Flying insects (for example the target groups flies, butterflies, and dragonflies and damselflies) were collected using insect nets (hand netting; nets with 40 cm internal diameter hoop size). Foraging worker

ants were searched for on the ground and on tree trunks and foliage. Ant nests were searched for under rocks, in and under fallen logs and in dead branches and twigs on trees. Butterflies, some moths, dragonflies and damselflies were kept in papers until returned to the lab, when a selection were pinned along with a selection of flies and larger specimens etc. Dragonflies and damselflies were kept papered.

Night hand collecting. Insects, mainly foraging ants were searched for during the night.

Malaise traps. Sharkey (Sante Traps) type Malaise traps, 1m high x 2 m long with black walls and a white roof (Figs 1F, 2E, 3A, C, D) were erected within 50 m of the central georeferenced point. Designed to capture flying insects, the traps were tied to vegetation and pegged out across insect flight paths, for example across dry creek beds, near drying pools of water or within flowering vegetation. These traps operated at some sites for 1 to 6 days depending on when the sites could be revisited to retrieve the traps.

Light trapping. Light trapping was conducted only in close proximity to the Queensland Parks and Wildlife shed. Two mercury vapour lamps (mv lamps) powered by a portable generator were suspended from an aluminium framework in front of either side of a vertical white sheet. Selected insects attracted to the sheets were collected by hand and transferred to ethanol-filled vials or to ethyl acetate charged killing jars and then pinned or papered. Insects attracted to the lights of the shed itself were also collected over the duration of the survey.

Insect pitfall traps. Pitfall trapping for insects consisted of installing a total of 10 120ml cylindrical plastic vials, with an opening of 43mm in diameter, at a site. The 10 traps were located along a more or less straight line transect with traps separated by around 5 metres. Each trap was supplied with a square, black plastic cover, suspended above the opening by nails. Traps were half-filled with 70% ethanol and operated for 5 days. Insect pitfall traps were employed only at the two Rungulla Bush Blitz Standard Survey Sites (RGBB SSS1 and RGBB SSS2).

Bark sprays (pyrethrum knockdowns). Bark spray samples were collected only at the 2 Rungulla Bush Blitz Standard Survey Sites (RGBB SSS1 and RGBB SSS2). At each site the trunks of 10 large living trees (at least 20 cm diameter at breast height (DBH)) were sprayed using cans of Mortein® Fast Knockdown (synthetic pyrethroid) insecticide and the jet directed from the base to as far as possible up the trunk. Invertebrates falling from the trunks were collected on sheets of ripstop nylon placed at the bases of the trunks. After 15 minutes the sheets were collected and their catches transferred to an ethanol filled vial using a suspended fabric funnel.

Coloured pan traps. Coloured pan traps (Figs 1E, 2A, 3E) were employed at the two Rungulla Bush Blitz Standard Survey Sites (RGBB SSS1 and RGBB SSS2). At each site a total of 12 coloured pan traps, 3 each of blue, yellow and white, with an approximate internal upper diameter 14 cm, were deployed. They were arranged in a more or less straight line transect with traps separated by approximately 1 metre. Each bowl was with filled with around 250 ml of a weak detergent solution (4 litres of water with a couple of drops of detergent). Traps were operated for 24 hours. Catches from the 4 pans of the same colour at each site were sieved and combined and transferred to 70% ethanol. Thus, 3 coloured pan samples were collected from each site, 1 each from blue, yellow and white pans. Pan traps of various colours and in various numbers were also deployed at a number of other sites.

Dung-baited pitfall traps. Pitfall traps baited with fresh cattle dung, specifically to target dung beetles (family Scarabaeidae, subfamily Scarabaeinae), were installed at 2 sites along Dead Horse Creek Road close to the QPWS shed. At each site around 10 traps were installed. Traps were plastic drinking cups sunk into the ground with the tops flush with the soil surface and half-filled with a weak detergent solution (4 litres of water with a couple of drops of detergent). Each trap was baited with a ball of cattle dung wrapped in kitchen cloth and suspended on tent peg over the trap opening. Traps were operated for 1 day and the catches sieved and transferred to ethanol filled vials. The catches from the 10 traps at each site were pooled.

Odonata surveys. In addition to hand netting of specimens, dragonflies and damselflies (order Odonata) were surveyed by photographing specimens. Dedicated searches for dragonflies and damselflies were made by Chris Burwell. Specimens were photographed using a Canon EOS 5D Mark III DSLR camera with a Canon 600EX II-RT Speedlite flash unit and attached MagSphere diffuser mounted on the hot shoe. In some instances, photographed specimens were also collected. Latitude and longitude coordinates were recorded, using a handheld GPS, for all photographed specimens which were then submitted as observations to the iNaturalist citizen science platform under the user name 'christopherburwell'.

2.2.1 Methods used at standard survey sites

The following collecting methods were employed at each of the two Rungulla Bush Blitz standard survey sites (RGBB SSS1 and RGBB SSS2).

Hand collecting. Two timed bouts of hand collecting were conducted at each standard site; 1 person hour of hand netting, targeting flies, butterflies, and 1 person hour of hand collecting targeting ants.

Pitfall trapping. Insect pitfall trapping was conducted at each standard site; 10 insect pitfalls were operated for 5 days.

Bark sprays. The trunks of 10 large trees were sprayed with synthetic pyrethroid insecticide at each standard site.

Malaise traps. One Sharkey-type Malaise trap was operated for 5 days at each standard site.

Coloured pan traps. Twelve coloured pan traps, 4 each of blue, yellow and white, were operated for 1 day at each of the standard sites.

Night hand collecting. Night hand collecting (by one person) was conducted for 1 person hour at each of the standard sites, specifically targeting foraging ants.

2.3 Identifying the collections

Dragonflies and damselflies (Odonata) were identified by **Dr Chris Burwell** (Senior Scientist and Curator of Entomology, Queensland Museum) using Theischinger & Endersby (2009). Butterflies (Lepidoptera: Hesperioidea, Papilionoidea) were identified by Dr Chris Burwell using Braby (2000) and by reference to specimens in the Queensland Museum. Ants (Formicidae) were identified to genus and described species, where possible, by Dr Chris Burwell using relevant literature (Bolton, 1977; Bolton, 2000; Bolton, 2007; Heterick, 2001; Heterick & Shattuck, 2011; Kohout, 2009; McArthur, 2000; Ogata & Taylor, 1991; Schmidt & Shattuck, 2014; Schödl, 2007; Shattuck, 1999; Shattuck & Marsden, 2015; Shattuck & Slipinska, 2012; Ward, 2001) and by reference to specimens in the Queensland Museum. In particular, ant species that could not be identified to named species were compared with those species collected on the Olkola Bush Survey. Where a species was collected on both the Rungulla and Olkola surveys it was given the original Olkola (OKBB) species code. Un-named species that were unique to the current survey were given Rungulla (RGBB) species codes.

Identifications of Bombyliidae (bee flies) and Therevidae (stiletto flies) were completed by **Dr Christine Lambkin** (previously Curator of Entomology now Honorary Research Associate, Queensland Museum) to genus and species where possible, using relevant literature as outlined here, and through referencing the relevant collections in the Queensland Museum. Where species identification was not possible, the morphospecies were given an RGBB identification number e.g. *Bonjeania* RGBB sp. 1.

Bombyliidae: Evenhuis, 1979; Irwin & Yeates, 1995; Lambkin *et al.*, 2003; Li & Yeates, 2018; Roberts, 1928; Yeates, 1991, 1994, 1996; Yeates & Lambkin, 1998.

Therevidae: Winterton *et al.*, 2001; Winterton, 2000, 2007, 2011.

For Bombyliidae and Therevidae, Lambkin assumed that the term “un-named taxa” refers to taxa without a published scientific name. Therefore, taxa that have been determined to genus but cannot be determined further (e.g. Hymenoptera: Formicidae: *Pheidole* sp.), and taxa that have been identified to genus and morphospecies (e.g. Hymenoptera: Formicidae: *Calomyrmex* RGBB sp. 1), have been included within that section.

The identifications of Syrphidae flies were completed by **Susan Wright**; the Asilidiae flies by **Greg Daniels** using Daniels 1987 and Daniels 2017; the Scarabaeidae: Scarabaeinae by **Dr Geoff Monteith** using Matthews 1972, Edwards *et. al.* 2015; Scarabaeidae: Rutelinae and Melolonthinae by **Dr Peter Allsopp** using Britton 1957, Britton 1986, Carne 1958; the Megachilidae bees by **Dr Judy King**; and the Aradidae by **Dr Geoff Monteith** using Monteith 1997.

3. Results and Discussion

Appendix 1 lists all Insects recorded during the Bush Blitz. Collections made during this Bush Blitz will result in 1,186 specimens being added to public collections and an equivalent number of records added to publicly accessible *databases*. An additional 91 unique records (photos; 109 photos in total) were submitted to iNaturalist.

ODONATA REPORT: Chris Burwell

A total of 29 species of Odonata (Figs 4–9), all described, were recorded on the Rungulla Bush Blitz; 11 species of damselflies (Figs 4–5) from 4 families and 18 species of dragonflies (Figs 6-9) from 3 families. A total of 163 unique records of dragonflies and damselflies from Rungulla National Park was generated. Of these, 77 consisted of specimens, representing 19 species, that have been deposited in the Queensland Museum, of which 24 were also photographed alive and submitted as observations to iNaturalist. A further 109 individuals were photographed alive and submitted as observations to iNaturalist. One additional record included in this report consisted of an individual of *Rhyothemis braganza* that was only observed and not collected or photographed. Live individual/s of all species recorded on the survey were photographed, except for *Diplacodes bipunctata* which was represented by a single hand-netted specimen.

Prior to this survey there were no records of any species of Odonata from Rungulla National Park available through the Atlas of Living Australia, so all species are newly recorded from the park. Most of the species are within their known distributions, but a number represent significant range extensions (Table 5) or interesting records as follows:

Agriocnemis rubricauda (Fig. 4A) is known from Kakadu National Park in the Northern Territory and eastern coastal Australia from Cape York Peninsula to north-east New South Wales, with an outlying population at Carnarvon Gorge. Records of *A. rubricauda* from Rungulla NP represent a significant inland range extension of the species in northern Queensland with the nearest records being 325 km to the NW.

Nosoticta solitaria (Fig. 4F) is known from coastal eastern Queensland from Cape York to south-east Queensland and narrowly extending into north-east New South Wales. Specimens of *N. solitaria* from Rungulla National Park are some of the most inland records of the species. There are comparable inland records only from White Mountains National Park west of Townsville and Toomba in the Great Basalt Wall area west of Charters Towers.

Austrosticta frater (Fig. 5A) is patchily distributed in northern Queensland with records from Boojamulla National Park, from several locations between Lakeland and Mount Carbine and

the Dugald River, 317 km south of Normanton (Theischinger 1997 and records sourced via the Atlas of Living Australia). Records of the *A. frater* from Rungulla NP are the most southerly for the species with the nearest from west of Georgetown 95 km to the NNE.

Records of *Gynacantha nourlangie* (Fig. 6C) from the park represent a significant 'infilling' of the species' range with the nearest records from Porcupine Gorge, 175 km to the SW, and Mt Garnet, 235 km to the NE.

Although *Hemicordulia tau* (Fig. 6E) occurs almost Australia wide, it is uncommon and patchily distributed in the far north. The nearest record of *H. tau* available on the ALA is from Toomba in the Great Basalt Wall area, 240 km to the ESE.

Neurothemis stigmatizans (Fig. 7D) occurs from north-eastern WA across the Top End of the Northern Territory and from Cape York Peninsula south along eastern Queensland to about Rockhampton. The records of the species from Rungulla NP represent a substantial inland range extension of the species in eastern Queensland. The nearest records of *N. stigmatizans* available on the ALA are at Mt Garnet about 230 km to the NE.

Notolibellula bicolor (Fig. 7E, F) is patchily distributed in north-eastern Western Australia, northern Northern Territory and northern Queensland. Records of the species from Rungulla National Park represent a significant range extension. In Queensland, *N. bicolor* was previously known from only two localities, one north of Boojamulla National Park near the Qld-NT border 550km to the west, and the other a tributary of Isabella Creek near Hopevale at the base of Cape York Peninsula, 440 km to the NNW.

Figure 4. Damselflies in the family Coenagrionidae (A-E) and Platycnemididae (F) recorded from Rungulla National Park. A, *Agriocnemis rubricauda* male (Red-rumped Wisp); *Argiocnemis rubescens* male (Red-tipped Shadefly); C, *Ischnura aurora* female (Aurora Bluetail); D, *Pseudagrion microcephalum* male (Blue Riverdamsel); E, *Pseudagrion aureofrons* male (Gold-fronted Riverdamsel); F, *Nososticta solitaria* male (Fivespot Threadtail). Images Chris Burwell, Queensland Museum.

Figure 5. Damselfly species in the families Isostictidae (A) and Lestidae (B-D) recorded from Rungulla National Park. A, *Austrosticta frater* male (Eastern Pondsitter); B, *Austrolestes leda* male (Wandering Ringtail); C, *Austrolestes insularis* female (Northern Ringtail); *Lestes concinnus* female (Dusky Spreadwing). Images Chris Burwell, Queensland Museum.

Figure 6. Dragonfly species in the families Aeshnidae (A-C) and Corduliidae (D-E) recorded from Rungulla National Park. A, *Austrogynacantha heterogena* male (Australian Duskhawker); B, *Anax papuensis* male (Australian Emperor); C, *Gynacantha nourlangie* male (Cave Duskhawker); D, *Hemicordulia intermedia* male (Yellow-spotted Emerald); E, *Hemicordulia tau* male (Tau Emerald). Images Chris Burwell Queensland Museum.

Figure 7. Dragonfly species in the family Libellulidae recorded from Rungulla National Park. A, *Crocothemis nigrifrons* male (Black-headed Skimmer); B, *Diplacodes haematodes* male (Scarlet Percher); C, *Nannodiplax rubra* female (Pygmy Percher); D, *Neurothemis stigmatizans* male (Painted Grasshawk); E, F, *Notolibellula bicolor* male (E) and female (F) (Bicoloured Skimmer). Images, Queensland Museum.

Figure 8. Dragonfly species from the family Libellulidae recorded from Rungulla National Park. A, *Orthetrum caledonicum* male (Blue Skimmer); B, *Orthetrum villosovittatum* male (Fiery Skimmer); C, D, *Orthetrum migratum* male (C) and female (D) (Rosy Skimmer). Images Chris Burwell, Queensland Museum.

Figure 9. Dragonfly species in the family Libellulidae recorded from Rungulla National Park. A, *Pantala flavescens* male (Wandering Glider); B, *Rhyothemis braganza* (Iridescent Flutterer); C, *Tholymis tillarga* male (Twister); D, *Tramea loewii* male (Common Glider). Images Chris Burwell, Queensland Museum.

PAPILIONOIDEA REPORT: Chris Burwell

A total of 30 species of butterflies (Papilionoidea) (Figs 10–11), all described, were recorded on the Rungulla Bush Blitz; 2 species of Hesperiidae, 10 species of Lycaenidae (Figs 11C, D), 10 species of Nymphalidae (Figs 10A–D), 2 species of Papilionidae (Fig. 11A) and 6 species of Pieridae (Fig. 11B).

A total of 100 unique records of butterflies from Rungulla National Park was generated from the Rungulla Bush Blitz survey. Of these, 91 consisted of specimens, representing all 30 species, and these have been deposited in the Queensland Museum. One of these specimens was also photographed alive and submitted as an observation to iNaturalist. A further 8 individuals were photographed alive and submitted as observations to iNaturalist. One additional record included in this report consisted of an individual of *Acraea terpsicore* that was only observed and not collected or photographed.

Prior to this survey, the only butterfly species recorded from Rungulla National Park was *Euploea corinna*, Common Crow, based on records available via the Atlas of Living Australia. Thus 29 butterfly species are newly recorded from the park as a result of the survey. Most of the species are within their known distributions, but a number represent significant range extensions or interesting records. Records of 4 species, *Arhopala eupolis*, *Candalides xanthospilus*, *Ypthima arctous* (Fig. 10D) and *Eurema birigitta*, represent inland range

extensions at the latitude of the park (Table 5). Records of *Junonia hedonia* (Fig. 10A) from the park are also noteworthy inland records as there is only one other comparable inland record of the species at that approximate latitude (Table 5).

Figure 10. Butterfly species in the family Nymphalidae recorded from Rungulla National Park. A, *Junonia hedonia*; B, *Junonia orithya* (Blue Argus); C, *Junonia villida* (Meadow Argus); D, *Ypthima arctous* (Dusky Knight). Images Chris Burwell, Queensland Museum.

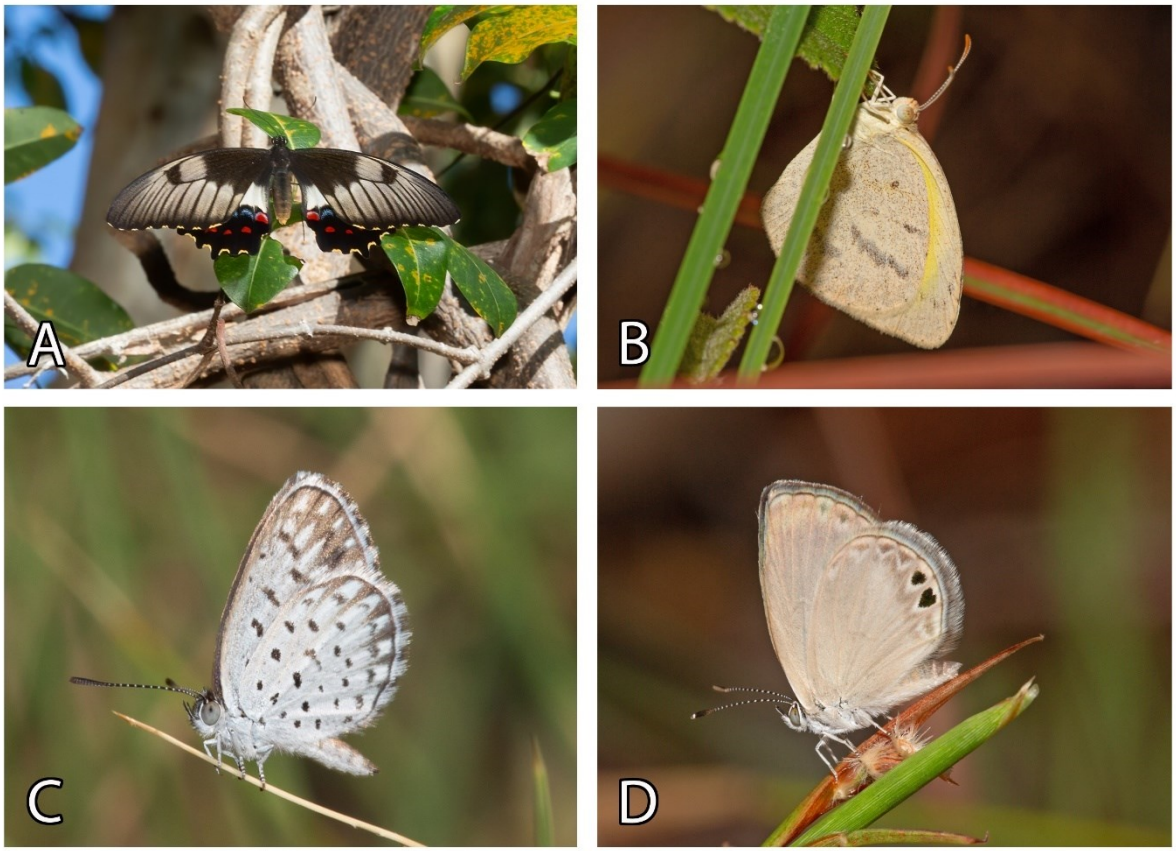

Figure 11. Butterfly species in the families Papilionidae (A), Pieridae (B) and Lycaenidae (C-D) recorded from Rungulla National Park. A, *Papilio aegeus* (Orchard Swallowtail); B, *Eurema herla* (Macleay's Grass-yellow); C, *Erina delospila* (Spotted Dusky-blue); D, *Famegana alsulus* (Black-spotted Grass-blue). Images Chris Burwell, Queensland Museum.

FORMICIDAE REPORT: Chris Burwell

A total of 90 species (at least 20 described) and 1 species-group of ants (Formicidae) (Figs 12–13) from 27 genera and 7 subfamilies were recorded during the Rungulla Bush Blitz; 14 species of Dolichoderinae, 9 species of Ecatomminae, 34 species and 1 species-group of Formicinae, 1 species of Myrmeciinae, 27 species of Myrmicinae, 4 species of Ponerinae and 1 species of Pseudomyrmecinae. Due to time constraints, not all ants from the Rungulla Bush Blitz were processed and some additional species and possibly genera will be present in the unprocessed material. All samples collected from the 2 standard survey sites were processed. In addition, specimens of selected genera and species-groups that could be identified to species were processed from samples collected at other sites. These included specimens of *Polyrhachis*, *Rhytidoponera*, *Tetraponera*, the *diversus*-group of *Meranoplus*, the *purpureus*-group of *Iridomyrmex*, *Dolichoderus*, *Technomyrmex* and *Paratrechina*.

Also due to time constraints, identification of specimens to described species was only attempted for selected genera and species-groups; the subgenus *Hagiomyrma* of *Polyrhachis*, the *diversus*-group of *Meranoplus*, the *purpureus*-group of *Iridomyrmex*, *Chelaner*, *Dolichoderus*, *Oecophylla*, *Paratrechina*, *Technomyrmex*, *Tetraponera* and some distinctive species of *Iridomyrmex*, *Rytidoponera* and *Polyrhachis* in other subgenera. For other genera, specimens were sorted to morphospecies and assigned species codes that were, in the main, unique to the Rungulla Bush Blitz survey. In a few instances morphospecies were compared with and assigned species codes used in other Bush Blitz survey reports, specifically the Olkola Bush Blitz. Some of the morphospecies assigned species codes are likely named species, while others are likely un-named.

A total of 687 unique records of ants from Rungulla NP was generated from the Rungulla Bush Blitz survey, all consisting of specimens.

Prior to this survey there were no records of any ant species from Rungulla NP available through the Atlas of Living Australia. Consequently, all ant species and species-groups are newly recorded from the park. Most of the species are within their known distributions, but a few represent range extensions or interesting records. Records of a number of these species from Rungulla NP represent inland range extensions at around the latitude of the park (Table 5): *Dolichoderus scrobiculatus*, *Polyrachis (Chariomyrma) schoopae*; *Polyrhachis (Hagiomyrma) melanura*; *Polyrhachis (Hagiomyrma) trapezoidea* and *Polyrhachis (Hagiomyrma) lachesis*. Records of *Meranoplus diversoides* from the park likely represent a substantial northern range extension for the species. Collections of *Chelaner bifidus* (previously included in the genus *Monomorium*) from the park represent a significant infilling of the distribution of the species (Table 5). It has been recorded from only 1 other location in Queensland near Dimbulah, but is otherwise known from the Top End of the Northern Territory and far north-west Western Australia.

A species of *Strumigenys* collected in pitfall traps at Standard Survey Site 1, represented by 4 worker specimens, is a putative new species first discovered on the Rungulla Bush Blitz (Fig. 13, Table 2). The Australian species of *Strumigenys* were comprehensively revised in 2000 by Bolton (Bolton 2000). The new species is a member of *emmae*-group of species which, in Australia, contains 7 described species. The species from Rungulla NP is most similar to *Strumigenys bibis* (Bolton), which is known only from the unique holotype that was collected 9 km NW of the Adelaide River in the Northern Territory. The new species differs from *S. bibis* in several characters, including the length of the mandibles (Fig. 13B, C), the form and density of setae on the head (Fig. 13B) and gaster (Fig. 13A), and the extent of the spongiform tissue on the ventral surface of the postpetiole (Fig. 13A).

Two exotic ant species were collected on the survey, *Paratrechina longicornis* and *Technomyrmex difficilis* (Table 3).

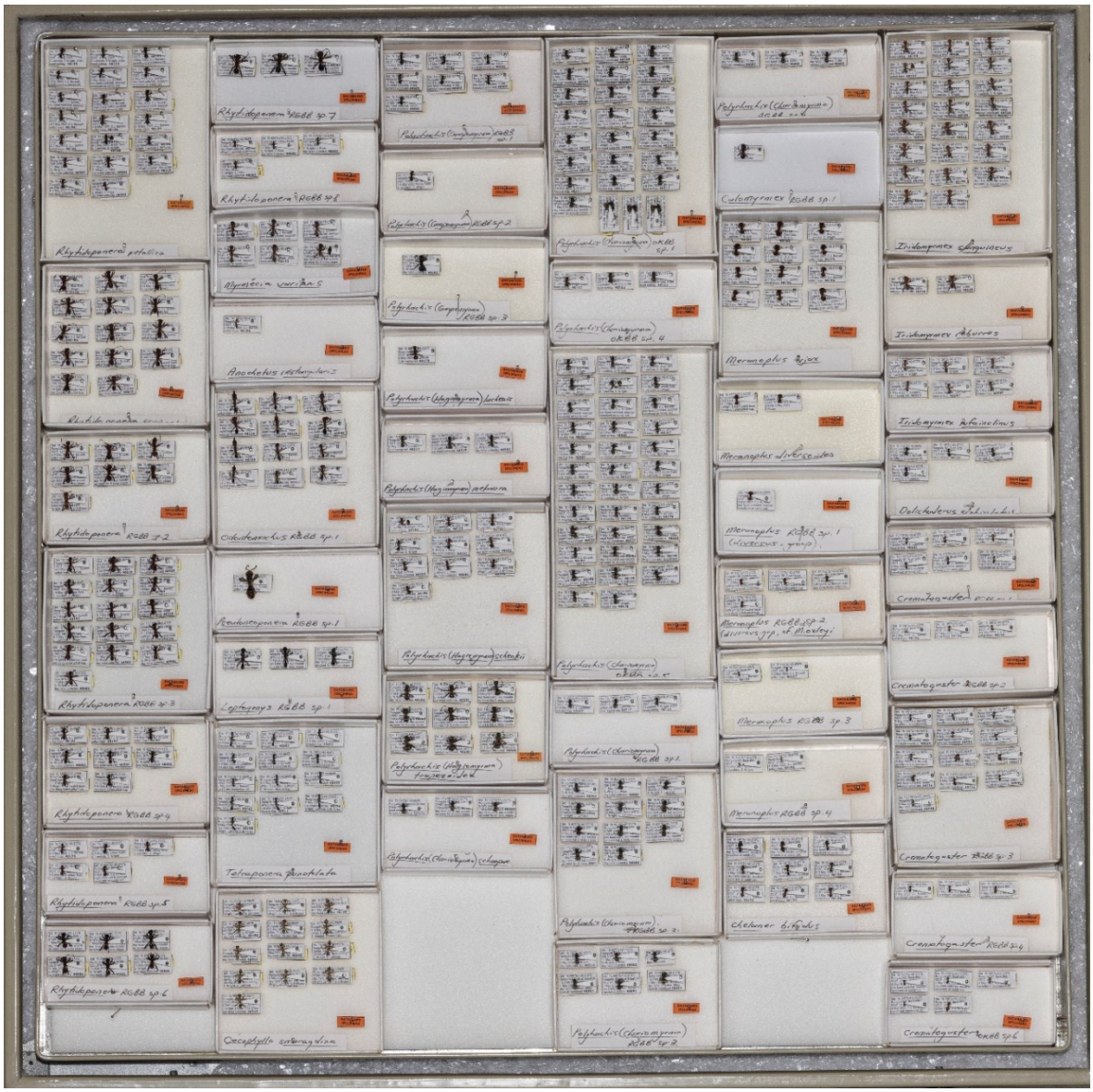

Figure 12. Drawer of identified and registered specimens of ants (family Formicidae) collected during the Rungulla Bush Blitz. Image Chris Burwell, Queensland Museum.

Figure 13. *Strumigenys* RGBB sp. 1, a putative new species of trap-jaw ant collected at Rungulla Standard Survey Site 1. A, lateral habitus; B, Head, frontal view; C, Detail of clypeus and mandibles. Images Lily Kumpe and Geoff Thompson, Queensland Museum.

BOMBYLIIDAE REPORT: Chris Lambkin

Beeflies (Bombyliidae) representing 17 species (only 7 described) from 11 genera (2 not officially recorded for Australia, 1 undescribed) from 10 tribes and 6 subfamilies were collected on the Rungulla Bush Blitz. This is not as many as collected on the early March Quinkan Bush Blitz (31 species (13 described) from 13 genera (1 undescribed)), but it is more than that reported from the Olkola Bush Blitz (12 species (7 described) from 7 genera) which occurred

around the same time of year as the Rungulla trip. As no collection of flies had been previously reported for the area, these all represent new records for Rungulla National Park.

All bombyliid subfamilies, except 1, were collected in low numbers and the diversity was unremarkable. The one exception, the Mythicomyiinae, were collected in remarkably high numbers – see below for further discussion. However, as there had been no bee flies previously recorded for the area, there were range extensions for all 7 described species collected (Table 5). One species collected here in Rungulla NP, *Thraxan ebenus*, was also recently collected on the Quinkan Bush Blitz, 400 km to the NNE (Table 5). Prior to the Quinkan collection (2 specimens), only 3 specimens of this species were known to exist, with the nearest locality being Isla Gorge, over 900 km away (Yeates & Lambkin, 1998). None of the other described Bombyliid species collected during this expedition are considered rare.

Figure 14. Bombyliidae recorded during the Rugulla Busk Blitz. A, B, Gen. B RGBB sp. 1 on *Hibiscus setulosus* at Carsons Spring. C, *Anthrax incomptus*. Images Chris Lambkin (A), Susan Wright (B), Chris Burwell (C), Queensland Museum.

Most bombyliid specimens collected on this trip are in the subfamily Mythicomyiinae; however, there are conflicting opinions regarding the taxonomic status of the Mythicomyiinae within the family Bombyliidae. Here, as in the AFD, they are treated as a subfamily of the Bombyliidae, whereas others (especially Evenhuis, but including iNaturalist) consider them to have family level status. A recent paper from late September 2022 (Evenhuis) described a new genus of mythicomyiine bee flies in the Psiloderoidini/Psiloderoidinae from Western Australia; and key to the other genera is also provided, including *Acridophagus* Evenhuis, and the 3 new genera A, B and C (here referred to as Psiloderoidini Genus A, B, C). Several undescribed species in the

Psiloderoidini Genus B (Evenhuis 2022) (previously considered to be *Acridophagus*) were collected during the Rungulla Bush Blitz, and these are discussed further below.

A remarkable 215 specimens of an undescribed but previously known species in the Psiloderoidini Genus B (Evenhuis 2022), Gen. B RGBB sp. 1 (see Table 1), were collected at 9 different localities during the Rungulla Bush Blitz (especially so in blue coloured pans). Since these flies are so tiny (2.5–3mm long), their capture in mid-flight with a hand net by both Chris Lambkin and Susan Wright is incredible. Images of these beautiful mythicomyiid bee flies pollinating *Hibiscus setulosus* flowers (identified by Tony Bean, vouchered by Nick Cuff) were also taken independently by both Lambkin and Wright (Fig. 14). Of the 215 specimens of Gen. B RGBB sp. 1, 120 have been registered and reported here (T250029–T250149). These registered specimens include both males and females (when possible) from all 20 samples and from all 9 localities. Evenhuis is in the process of describing Genus B, and is including a description of this reasonably common psiloderoidine (Evenhuis pers. comm.), but is not including the specimens collected at Rungulla NP.

Three other species in the Psiloderoidini Genus B (Evenhuis 2022) were recognised from the collections from the Rungulla Bush Blitz: 2 specimens of Gen. B RGBB sp. 2; 1 specimen of Gen. B RGBB sp. 3; and 12 specimens of Gen. B RGBB sp. 4. These are reported here as putative new species, as they have not been seen before (Table 2). There is the potential for them to be described in the future, following the publication by Evenhuis.

Of much more significance, however, was the collection of 6 female specimens of *Empidideicus* RGBB sp. 1 from Standard Survey Site 2, a mythicomyiine bee fly from the Empidideicini/Empidideicinae. This genus is currently not recorded from Australia, although Lambkin has previously identified specimens in this genus from Barrow Island Western Australia as *Empidideicus* barr 12, with help from Evenhuis (see https://www.padil.gov.au/barrow-island/pest/143127); and another *Empidideicus* specimen was collected during the Insect Investigators program in Newman, Western Australia, and was sent to Lambkin following sequencing.

Following consultation with Evenhuis, the species collected in Rungulla NP, *Empidideicus* RGBB sp. 1, appears to be previously unseen and we propose to describe it as a new species from Queensland (Table 2). *Empidideicus* RGBB sp. 1 will be described, together with the Insect Investigators specimen as a separate new species for Western Australia, and a species from Flores Island, Indonesia. This is a very rare group, with the total number of specimens known world-wide numbering less than 20.

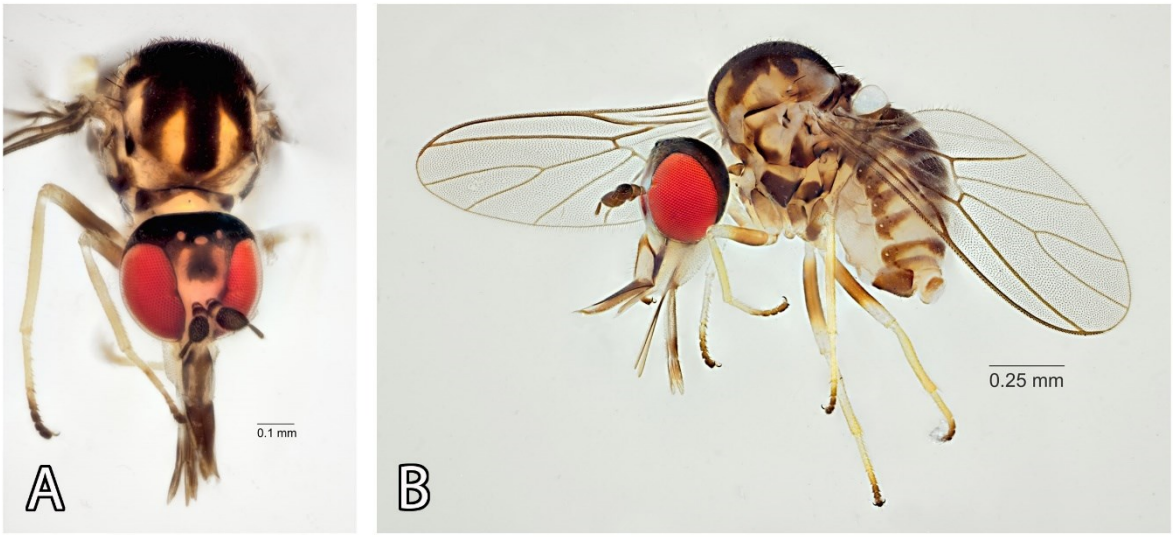

Figure 15. *Empidideicus* RGBB sp. 1 from Standard Survey Site 2, Rungulla NP. Images Geoff Thompson, Queensland Museum.

Additionally, 2 female specimens of the already known *Petrorossia* RGBB sp. 1 (Anthracinae: Xeromoebini) were collected (Table 1). Another specimen of *Petrorossia* RGBB sp. 1 was collected during the Insect Investigators program by students at the North Tom Price Primary School in Tom Price, Western Australia, and was sent to Lambkin following sequencing. David Yeates (Australian National Insect Collection) and Lambkin have agreed to describe this very variable species.

THEREVIDAE REPORT: Chris Lambkin

Five species (none described) of stiletto flies (Therevidae) from 3 genera were collected on the Rungulla Bush Blitz (Table 1). The low number of specimens (19) and species collected during the Rungulla Bush Blitz probably reflects the timing of the survey. Normally, the highest numbers of stiletto flies are collected via Malaise traps near drying pools of water. As none of the genera are currently under study, the potential for describing the new species is low.

ASILIDAE REPORT: Greg Daniels

Only 31 specimens were collected during the Rungulla NP Bush Blitz, representing 9 different species in 6 genera and 5 subfamilies. Only 3 samples collected could be identified to known species, *Reburrus bancrofti* and *Zosteria illingworthi* both in the subfamily Asilinae, and *Ommatius imaginis* in the Ommatiinae. There were 5 known un-named species collected and 1 of these was also in a known un-named genus (Table 1). There was 1 putative new species collected, *Ommatius* RGBB sp. 1 (Figure 16; Table 2) from a hilltop 32 km SSE of the QPWS shed. This new *Ommatius* species belongs to a group of about 12 species distributed across northern Australia that are all undescribed. Species of this particular group of robber flies are always found on bare slabs of rock; while all other known Australian *Ommatius* species perch mainly on twigs, and rarely on grasses. There were also 2 females of a different *Ommatius* sp. collected, each from a different site that was near a creek or the Gilbert River. These cannot be identified further without males. There were no known range extensions for robber fly species recorded.

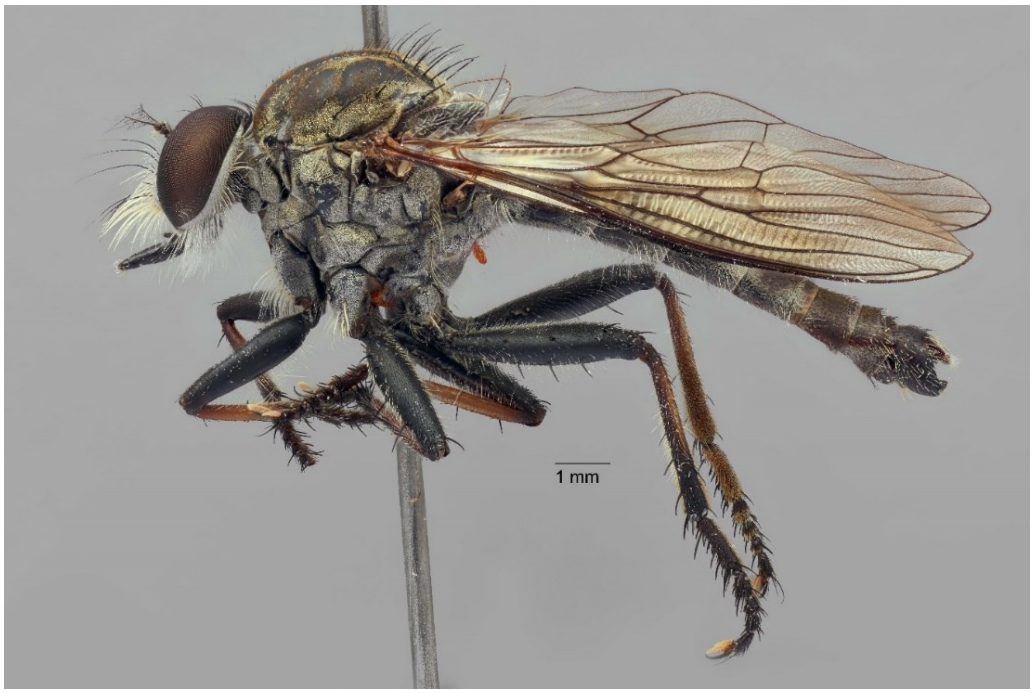

Figure 16. *Ommatius* RGBB sp. 1 (T257486), collected by hand netting on a hilltop 32 km SSE of the QPWS shed.

The small number of species collected within Rungulla NP certainly does not indicate the true diversity of robber flies that would be in the area, mainly because the two very speciose subfamilies that are known to frequent northern Australia, the Laphriinae and Dasypogoninae, were not even collected on this trip.

SCARABAEIDAE: SCARABAEINAE REPORT: Geoff Monteith

Eight species of dung beetle (Scarabaeinae) from 6 genera were collected during the Bush Blitz at Rungulla NP, 5 species of which are introduced (Table 3). Three species of native dung beetles were collected, all in the genus *Onthophagus*: *O. consentaneus* (18 specimens from 1 sample), *O. desectus* (1 specimen from 1 sample), and indetermined species. *Onthopagus consentaneus* is Australia's most common and widespread native dung beetle. It is a diurnal species which feeds on both dung and carrion in open forests, and penetrates further into desert areas than most other native species. This species occurs from northern NSW, throughout Queensland and Northern Territory and to the NW part of Western Australia, and Rungulla NP is within its known range. The second species, *O. desectus* is a nocturnal species which feeds on dung in open forests. This species occurs from the NE corner of NSW up the eastern half of Queensland and into northern NT, and Rungulla NP is within its known range. While the third species was interesting small, black, glabrous native dung beetle represented by just one single female which cannot be placed to species-group without a male.

SCARABAEIDAE: RUTELINAE & MELOLONTHINAE REPORT: Peter Allsopp

Two Rutelinae scarab species in 1 genus and 5 Melolonthinae species in 3 genera were collected on the Rungulla NP Bush Blitz. The ruteline species *Calloodes grayanus* was collected at the QPWS basecamp at light and by hand. This species is known from Brisbane north to the Cairns area and across northern Australia, including the Einsleigh Uplands, the broad bioregion in which Rungulla National Park is located. One of the records is from 'Geraldton' that has been attributed to the place in Western Australia, but this record undoubtably refers to an old name for Innisfail. The other ruteline species, *C. rayneri*, also collected at light at the QPWS basecamp, is known from Brisbane north to Heathlands on Cape York Peninsula, including the Gilbert River in Einsleigh Uplands bioregion. Rungulla NP does not represent a range extension.

The 5 Melolonthinae genera represent 3 different tribes. Two species of *Colpochila* in tribe Liparetrini were collected. One specimen of *C. obesa* was collected during the day by hand. The larvae of this species are known to be minor pests of lawn grass, and adults have been implicated in feeding on eucalypt trees (Table 3). This is a widely distributed species in south-eastern Australia, with 1 record from Forty Mile Scrub and 1 from near Alice Springs in the Northern Territory. This Rungulla National Park collection represents a significant infill in distribution, being 185 km SW of Forty Mile Scrub and 1,100 km NE of Alice Springs (Table 5). The second *Colpochila* species is represented by a single hand-collected specimen and has been identified as *C. scutalis*, however it should be noted that the antennae are missing, and these are generally required for confident species identification. This is the most abundant species of *Colpochila* in Australia, and is widely distributed across northern Australia. In Queensland, it occurs as far south as Carnarvon Gorge, including the Einsleigh Uplands. Rungulla NP does not represent a range extension.

One specimen of *Maechidius charaxus* (Melolonthinae: Maechidiini) (Fig. 17A) was collected at light at the QPWS basecamp. Prior to this Rungulla National Park Bush Blitz collection, this species was known only from the type locality of Cloncurry, Queensland. This record represents a 355 km range extension to the northeast (Table 5). The larvae of this species are thought to live in the nests of ants or termites and may be predaceous on ant larvae or immature termites.

Two species of Melolonthinae: Heteronycini were collected at the QPWS basecamp. However, this is a very difficult genus of small scarabs represented by 206 known species (including many undescribed species) in Australia, and another group of species mostly from north of Australia including Papua New Guinea, New Caledonia and eastern Indonesia. These 2 species have not been identified beyond genus, *Heteronyx* sp. 1 (one specimen) and *Heteronyx* sp. 2 (three specimens).

Figure 17. A, *Maechidius charaxus* (Scarabaeidae: Melolonthinae); B, *Arictus motheithi* (Aradidae).

ARADIDAE REPORT: Geoff Monteith

Only 2 species of flat bug (Aradidae) were collected from the same site on a hilltop 32 km SSE of the QPWS shed during the Rungulla NP Bush Blitz. Two specimens of *Arictus monteithi* (Fig. 17B) is a common, subcortical, winged, species of bark bug that occurs in open forest. This species is known from coastal and subcoastal areas from southern NSW to northern Queensland and into northern NT. Rungulla NP represents a minor range extension to the west, as it is a little further inland than previous records of this species in that part of Queensland (Table 5). One specimen of *Brachyrhynchus australis* is an uncommon, subcortical, winged species of bark bug that occurs in open forest. It occurs mainly in inland areas from southern NSW through most of Queensland to northern NT, and Rungulla NP is within the known range for this species.

MEGACHILIDAE REPORT: Judy King

Megachilids are solitary bees, the females of which build and provision their own nest cells, and do not build or live in hives. The larvae are fed on “bee bread” which the females make

from pollen moistened with nectar. A total of 12 species of megachilid bees were collected on the Rungulla NP Bush Blitz - 3 species of leafcutter bee and 9 species of mason bees. Leafcutter bees use soft pliable pieces of leaves to build nest cells, and leave characteristic oval or circular cuts and holes on the margins of leaves. Mason bees, on the other hand, use plant resins, mud or very fine gravel to build their nest cells. Ten of the 12 of the megachilid species collected on this trip were described species. A single male of the un-named *Megachile* RGBB sp. 1 was collected. This is a known undescribed species with other specimens present in the QM collection (Table 1). A species of the genus *Lithurgus* was also collected, but could not be identified further. Females in this genus excavate nesting tunnels into dry timber, often of *Banksia* spp. (Proteaceae).

Significantly, three collections on the Bush Blitz represent range extensions or a significant infill in distribution for 3 rare megachilid bee species (Table 5). Four females of the rare species of mason bee *Megachile dinognatha* were collected on this Rungulla NP Bush Blitz at SSS1 and the QPWS shed. This species was previously known from Hughenden (200 km SSE of Rungulla NP) and further south in Carnarvon Gorge in QLD, from Nitmiluk (Katherine Gorge) in NT, and from northern WA. Three females of another rare mason bee *Megachile macleayi* were collected 2.5 km ENE of the QPWS shed. No males are known of this species, and it was previously known from Port Denison (510 km ESE Rungulla NP) and Collinsville (485 km SE of Rungulla NP) in QLD, along with unspecified localities in NSW. The third range extension is for the rare leafcutter bee *Megachile leucopogon*. Only a few specimens are known for this species, and 1 male and 1 female were collected on this Bush Blitz from 2.5 km ENE of the QPWS shed. The type specimen and 1 other were collected in Darwin NT, and 4 further specimens have been collected from QLD — Mt Garnet (240 km NE of Rungulla NP), Mareeba (320 km NE of Rungulla NP), and as far south as Taroom.

The records for the other species collected all fall within their known ranges: *Megachile macularis* is very common Australia wide; *M. obtusa* is widely distributed from Katherine NT across northern and western QLD through to Victoria; *M. paracallida* is known from hot inland areas of QLD, NT and WA and from coastal northern WA; *M. apicata* is known from all states and territories except Tasmania; *M. micrerythrura* is widespread across northern Australia from Rockhampton QLD to the Kimberley WA; *M. turneri* is known only from males and is distributed across norther Australia in hot areas with summer rainfall; *M. aurifrons* is common Australia wide except Tasmania.

3.1 Un-named or not formalised taxa

Table 1. Putatively un-named or not formalised taxa

Taxon	Comment
Bombyliidae (bee flies)	
Anthracini: possibly *Thraxan* RGBB sp. 1	Female specimen.
Lepidanthrax RGBB sp. 1	
Petrorossia RGBB sp. 1	Widespread across Northern Australia, being described as single variable species by Lambkin & Yeates, also collected and sequenced in Insect Investigators program, previously sequenced through BOLD via the late Graeme Cocks.
Cryomyia RGBB sp. 1	
Genus B (Evenhuis 2022) RGBB sp. 1	Was initially considered to be an undescribed *Acridophagus*, widespread across Australia, often found on Hibiscus flowers; keys to new Genus B in Evenhuis 2022; this species is currently being described by Evenhuis in this new genus (specimens from Rungulla NP not

	included); there are ongoing discussions regarding family level placement – Bombyliidae or Mythicomyiidae. 215 specimens collected on this trip; 120 specimens registered from all 20 samples and all 9 localities.
Docidomyia RGBB sp. 1	This species is nr *albifrons*.
Acraspisa RGBB sp. 1	
Acupalpa RGBB sp. 1	
Bonjeania RGBB sp. 1	
Bonjeania RGBB sp. 2	
Bonjeania RGBB sp. 3	
Asilidae (robber flies)	
Ommatius RGBB sp. 2	Only one specimen was collected.
Ommatius RGBB sp. 3	Several specimens from four different localities were collected.
Asilinae RGBB sp. 4	Only 2 specimens were collected from one locality.
Leptogaster RGBB sp. 5	Three specimens were collected from two localities.
Stichopogon RGBB sp. 6	Only one specimen was collected.
Megachilidae (leafcutter/mason bees)	
Megachile RGBB sp. 1	One male of this known but un-named species was collected - further specimens are present in the QM collection.

3.2 Putative new species (new to science)

In this report, 'putative new species' means an unnamed species that, as far as can be ascertained, was identified as a new species as a direct result of this Bush Blitz.

Table 2. Putative new species (new to science)	
Species	**Comment**
Bombyliidae (bee flies)	
Empidideicus RGBB sp. 1	Collected from Standard Site 2; a mythicomyiine bee fly from the Empididеicini/Empididеicinae. This is a rare group, and the genus is not currently recorded from Australia. Other species were known from WA, NT, Indonesia. This QLD species was previously unknown and is currently being described by Evenhuis & Lambkin.
Genus B (Evenhuis 2022) RGBB sp. 2	Considered to be *Acridophagus*; keys to Genus B in Evenhuis 2022; there are ongoing discussions regarding family level placement – Bombyliidae or Mythicomyiidae; differs from Genus B RGBB sp. 1
Genus B (Evenhuis 2022) RGBB sp. 3	Considered to be *Acridophagus*; keys to Genus B in Evenhuis 2022; there are ongoing discussions regarding family level placement –

	Bombyliidae or Mythicomyiidae; differs from Genus B RGBB sp. 1.
Genus B (Evenhuis 2022) RGBB sp. 4	Considered to be *Acridophagus*; keys to Genus B in Evenhuis 2022; there are ongoing discussions regarding family level placement – Bombyliidae or Mythicomyiidae; differs from Genus B RGBB sp. 1.
Asilidae (robber flies)	
Ommatius RGBB sp. 1	This species was collected by hand netting on a hilltop 32 km SSE of the QPWS shed. This *Ommatius* species belongs to a group of about 12 species distributed across northern Australia, all are undescribed and all are found on bare slabs of rock. All other known Australian *Ommatius* species perch mainly on twigs, and rarely on grasses.
Formicidae (ants)	
Strumigenys RGBB sp. 1	Australian species of *Strumigenys* were comprehensively revised by Bolton (2000). Four specimens from pitfall traps at SSS1 represent an undescribed species in the *emmae*-group (sensu Bolton 2000) nearest to *Strumigenys bibis* which is known only from the holotype from 9 km NW Adelaide River, NT. Bush Blitz specimens have been compared with description of *S. bibis* and images of holotype on Antweb and they differ in numerous characters and clearly represent a previously unknown, undescribed species.

3.3 Exotic and pest species

Formicidae

Two exotic species of ants were collected on the Rungulla Bush Blitz survey: *Paratrechina longicornis* and *Technomyrmex difficilis*.

The native range *of Paratrechina longicornis* (Black Crazy Ant or Longhorn Crazy Ant) is uncertain. It has often been suggested to be Asian in origin (Wetterer, 2008, LaPolla *et. al.*, 2013) as it is known to inhabit natural forests in that region. However, recent revisionary work on *Paratrechina* (LaPolla *et. al.*, 2014) indicates the centre of diversity of the genus is in the Afrotropical and Malagasy regions, where 4 of the 5 species of *Paratechina* are native. Therefore, an Asian origin *of P. longicornis* is questionable. Regardless, *P. longicornis* is now pantropical and is introduced to Australia where it is widely distributed across the northern tropics and subtropics. It is typically associated with disturbed habitats such as agricultural, periurban and urban areas and rarely penetrates native forests (Wetterer, 2008). A small number of specimens were collected in coloured pan and Malaise traps at Rungulla Bush Blitz SSS1 and on the south bank of the Gilbert River, 23.3km NNW of the QPWS shed. Rungulla SSS1 is relatively close to the location of the QPWS shed which might explain its presence, but the occurrence of the species at the Gilbert River site to the NNW is of some concern and follow up surveys for *P. longicornis* using attractant baits are suggested.

Technomyrmex difficilis is a very widespread tramp ant species that is considered to be introduced to Australia (Bolton, 2007). In Australia, there are reliable records of the species from northern coastal Queensland and the Top End of the Northern Territory. Its likely ecological impacts in Australia are unknown. The species was only recorded from Standard

Survey Site 1 where numerous specimens were collected from a trail on a tree at night and 2 further specimens were collected in a Malaise trap.

Scarabaeidae

Five species of introduced dung beetles were collected during the Rungulla Bush Blitz. All were introduced into Australia as part of a CSIRO led project to import dung beetles species able to bury cattle dung.

One minor pest scarab was collected during the Rungulla Bush Blitz. Larvae of *Colpochila obesa* (Melolonthinae: Liparetrini) are known to be pests of lawn grasses, and the adults have been implicated in causing damage to eucalyptus leaves.

Table 3. Exotic and pest species recorded

Exotic/pest species	Location sighted/observed	Indication of abundance	Comments
Formicidae (ants)			
Paratrechina longicornis	Rungulla Bush Blitz Standard Survey Site 1 (SSS1) Gilbert River south bank, 23.3km NNW QPWS shed	Single worker collected in a coloured pan Single worker collected in a coloured pan, and 13 workers collected in a Malaise trap	Occurrence of the species at the Gilbert River site is of some concern and follow up surveys of for *P. longicornis* using attractant baits are suggested.
Technomyrmex difficilis	Rungulla Bush Blitz Standard Survey Site 1 (SSS1)	Numerous workers collected from trail on one tree trunk at night and 2 workers collected in a Malaise trap	
Scarabaeidae: Scarabaeinae (dung beetles)			
Digitonthophagus gazella (Fabricius, 1787)	Bush Blitz basecamp at QPWS shed (2 samples) Dead Horse Creek track Gilbert River, south bank, 23.3 km NNW of QPWS shed	28 specimens from 4 samples	Formerly *Onthophagus gazella*. Native to Africa and widespread there south of the Sahara. Introduced to Australia where it occurs in all mainland states except Victoria. Rungulla NP is within known range.
Euoniticellus intermedius (Reiche, 1849)	Dead Horse Creek track Gilbert River, south bank, 23.3 km NNW of QPWS shed	2 specimens from 2 samples	Native to Africa and widespread there south of the Sahara. Introduced to Australia where it occurs in all mainland states except Victoria. Rungulla NP is within known range.
Liatongus militaris (Castelnau, 1840)	Dead Horse Creek track	5 specimens from 2 samples	Native to southern and eastern parts of Africa south of Sahara.

	Gilbert River, south bank, 23.3 km NNW of QPWS shed		Introduced to Australia where it occurs in northern parts of NT and eastern parts of Queensland. Rungulla NP is within known range.
Onitis viridulus Boheman, 1857	Bush Blitz basecamp at QPWS shed (2 samples) Gilbert River, south bank, 23.3 km NNW of QPWS shed	6 specimens from 3 samples	Native to Africa from Ethiopia to northern part of South Africa. Introduced to Australia where it occurs in northern part of NT and eastern part of Queensland. Rungulla NP is within known range.
Sisyphus rubrus Paschalidis, 1974	Gilbert River, south bank, 23.3 km NNW of QPWS shed	1 specimen from 1 sample	Native to southern Africa. Introduced to Australia where it occurs in eastern half of Queensland and the NE corner of NSW. Rungulla NP is within known range.
Scarabaeidae: Melolonthinae			
Colpochila obesa	Gilbert River, 19 km NNW QPWS shed	1 specimen	Larvae are known to be pests of lawn grass; adults are implicated in feeding damage to eucalypt trees

3.4 Threatened species

No threatened insect species (under Commonwealth or State legislation) were recorded during the Rungulla Bush Blitz.

Table 4. Threatened species

Species	Listing status and level (EBPC, State/Territory)	Location sighted/observed	Indication of abundance
Nil	-	-	-

3.5 Range extensions

Table 5. Range extensions or significant infill in distribution records for species

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
Odonata (dragonflies and damselflies			
Agriocnemis rubricauda	Green Ant Spring; creek line, 16.2 km	325 km to the NE	Significant inland range extension in

	NNW QPWS shed; tributary of Gilbert River, 19.4 km NNW QPWS shed		northern Queensland. Nearest record from Station Creek west of Mount Molloy
Austrosticta frater	creek line 2.3 km ENE QPWS shed	95 km to NNE	Records from Rungulla NP are most southerly for the species. Nearest record from west of Georgetown
Nososticta solitaria	Green Ant Spring; Carsons Spring; tributary of Gilbert River, 19.1 km NNW QPWS shed;	210 km SE	Inland range extension at that latitude. Comparable inland records only from White Mountains NP west of Townsville and Toomba in Great Basalt Wall area west of Charters Towers.
Gynacantha nourlangie	0.5 km W QPWS shed; 19.3 km NNW QPWS shed; tributary of Gilbert River, 19.1 km NNW QPWS shed	175 km NE	Infilling of range. Nearest records from Porcupine Gorge, 175 km SW and Mt Garnet, 235 km NE.
Hemicordulia tau	Gilbert River nr QPWS shed; Rungulla Bush Blitz basecamp at QPWS shed	240 km ESE	Uncommon and patchily in far northern Australia. Nearest record from Toomba in Great Basalt Wall area.
Neurothemis stigmatizans	Carsons Spring; Green Ant Spring; Gilbert River, 23.1 km NNW QPWS shed; tributary of Gilbert River, 19.1 km NNW QPWS shed	230 km NE	Inland range extension in eastern Qld. Nearest records at Mt Garnet about 230 km NE.
Notolibellula bicolor	Green Ant Spring; creek line 16.8 km NNW QPWS shed; creek line, 16.2 km NNW QPWS shed	440 km NNE	Significant range extension. In Qld previously known from only two localities, north of Boojamulla NP 550km W and tributary of Isabella Ck near Hopevale 440 km NNE.
Papilionoidea (butterflies)			
Arhopala eupolis	Carsons Spring; creek line 16.7 km NNW QPWS shed	235 km NE	Inland range extension at that latitude. Nearest

			record from Chillagoe about 235 km NE.
Candalides xanthospilus	Green Ant Spring	225 km NE	Inland range extension at that latitude. Nearest record from Almaden to NE and closest record at same latitude from west Hervey Range W of Townsville (Braby 2000)
Junonia hedonia	23.7km NNW QPWS shed; tributary of Gilbert River, 23.1 km NNW QPWS shed	70 km N	Significant inland record at that latitude. Only comparable record from Cumberland Dam west of Georgetown
Ypthima arctous	Carsons Spring; creek line 2.2 km ENE QPWS shed; 23.1 km NNW QPWS shed	175 km NE	Inland range extension at that latitude. Nearest record from Forty Mile Scrub
Eurema brigitta	creek line 16.3 km NNE QPWS shed	165 km NE	Inland range extension at that latitude. Nearest records on western edge of Wet Tropics at Ravenhoe and Watsonville.
Formicidae (ants)			
Chelaner bifidus (Heterick 2000) *(formerly Monomorium bidfidum)*	SSS1	285 km NE	Significant infill of range. Only other Qld record from nr Dimbulah. Otherwise known from Top End of NT and far north-east WA.
Dolichoderus scrobiculatus	SSS1, SSS2, Green Ant Spring	270 km NE	Inland range extension at that latitude. Nearest records at Herberton and to NE and Paluma to west
Meranoplus diversoides	airstrip, 0.3km S QPWS shed; Dead Horse Creek track	355 km WSW	Likely a northern range extension. Nearest record from Cloncurry.
Polyrhachis (Chariomyrma) schoopae	32 km SSE QPWS shed; Carsons Spring	195 km W	Inland range extension at that latitude. Nearest record from Gregory Development Road,

			14 km NW Clarke River
Polyrhachis (Hagiomyrma) melanura	SSS1; hilltop 32 km SSE QPWS shed; tributary of Gilbert River, 19.1 km NNW QPWS shed	235 km ESE	Inland range extension at that latitude. Nearest record from Red Falls, Great Basalt Wall
Polyrhachis (Hagiomyrma) trapezoidea	32 km SSE QPWS shed	175 km NE approx.	Inland range extension at that latitude. Nearest record from Road to Lynd 80 km S Mount Garnet
Polyrhachis (Hagiomyrma) lachesis	SSS2	335 km W approx..	Inland range extension at that latitude. Nearest records around Townsville.
Bombyliidae (bee flies)			
Anthrax crenatus	Rungulla NP, hilltop 16.3km NNW QPWS shed	Jowalbinna Homestead, 400 km NNE	Yeates & Lambkin 1998
Anthrax dolabratus	Rungulla NP, creekline 16.3km NNE QPWS shed	Laura, 400 km NNE	Yeates & Lambkin 1998
Anthrax incomptus	Rungulla NP, creekline 16.3km NNW QPWS shed; Gilbert River, south bank, 23.3km NNW QPWS shed; hilltop 19.2km NNW QPWS shed	Gordonvale, 300 km NE; iNaturalist Chillagoe 240km NNE	Yeates & Lambkin 1998
Comptosia praeargentata	Rungulla NP, hilltop 19.2km NNW QPWS shed	Cardwell, 280 km ENE	Yeates 1991
Geron nigrocciput	Rungulla NP, Rungulla Bush Blitz SSS1	Ravenshoe, 260 km NE	Evenhuis 1979
Thraxan ebenus	Rungulla NP, creekline 2.2km ENE QPWS shed; Green Ant Spring	Laura, 400 km NNE	Quinkan Bush Blitz
Pseudopenthes fenestrata	Rungulla NP, Gilbert River, south bank, 23.3km NNW QPWS shed	Laura, 400 km NNE	Lambkin, Yeates & Greathead 2003
Scarabaeidae: Melolonthinae			
Maechidius charaxus	Rungulla NP, QPWS shed	Cloncurry, 355 km NE	Previously known only from type locality of Cloncurry.

			Northern and eastern range extension.
Megachilidae (leafcutter/mason bees)			
Megachile dinognatha	Rungulla NP, QPWS shed Bush Blitz SSS1	200 km NNW of Hughenden QLD; 1,300 km SE Nitmiluk NT	Four females of this rare species were collected. A northern and western range extension for QLD, and a significant in-fill in national distribution.
Megachile leucopogon	Rungulla NP, 2.5 km ENE of the QPWS shed	240 km SW Mt Garnet	One male and one female of this rare species were collected. Western range extension.
Megachile macleayi	Rungulla NP, 2.5 km ENE of the QPWS shed	485 km NW of Collinsville; 510 km NNW Port Denison	Three females were collected of this rare species. Northern and western range extension.
Aradidae (flat bugs)			
Arictus monteithi (Fig. 17B)	Rungulla NP, hilltop 32 km SSE QPWS shed		Minor inland range extension

3.6 Genetic information

Genetic samples (legs) of three specimens of the damselfly species *Agriocnemis rubricauda* (T257249, T257252, T257258) were added to the Queensland Museum Tissue Collection (A020876–A020878).

4. Information on species lists

As noted in the introduction, as far as we are aware, there have been no surveys of insects previously conducted on the Rungulla National Park. Interrogation of the Atlas of Living Australia (ALA) revealed only 2 previous observational records of 1 butterfly species, *Euploea corinna* (Common Crow) from the park.

As outlined in the Formicidae report above, due to time constraints, identification of ant specimens to described species was only attempted for selected genera and species-groups: the subgenus *Hagiomyrma* of *Polyrhachis*, the *diversus*-group of *Meranoplus*, the *purpureus*-group of *Iridomyrmex*, *Dolichoderus*, *Oecophylla*, *Paratrechina*, *Technomyrmex*, *Tetraponera* and some distinctive species of *Iridomyrmex*, *Monomorium*, *Rytidoponera* and *Polyrhachis* in other subgenera. For other genera, specimens were sorted to morphospecies and assigned species codes there were, in the main, unique to the Rungulla Bush Blitz survey. In a few instances morphospecies were compared with and assigned species codes used in other Bush Blitz survey reports, specifically the Olkola Bush Blitz. Some of the morphospecies that were assigned species codes are likely named species while others are likely un-named.

Specimens of a few distinctive species of insects in other orders and families ((Blattodea (Blattidae), Orthoptera (Tettigoniidae), Hymenoptera (Vespidae), Lepidoptera (Arctiidae,

Sphingidae)), were identified and included in the supplied point data but were not included and discussed in the reports above. These species are included in the species list (Appendix 1).

5. Information for land managers

Insect collections from Rungulla National Park, particularly of dragonflies, damselflies and butterflies, highlighted the importance of wetland habitats in the park. Spring-fed swamps, creeks and boggy seepages were particularly significant as several species associated with these habitats represented inland range extensions at latitude of the park. Based on our limited surveys of the park, the creek arising from Green Ant Spring, the swamp associated with Carson's Spring and the boggy seepage associated with the creek line and16.2 km NNW QPWS shed were high quality habitats.

Of the exotic insects recorded on the park, of most concern is the Black Crazy Ant, *Paratrechina longicornis*, which was collected at Standard Survey Site 1 and the south bank of the Gilbert River, 23.3km NNW QPWS shed. Although this species is unlikely to pose a significant ecological threat, follow up surveys for the species, especially in the vicinity of the QPWS shed are suggested. If the species is associated with the QPWS infrastructure at the shed, it could potentially be spread elsewhere in the park.

6. Other significant findings

Nil.

7. Conclusions

The Rungulla National Park Bush Blitz generated 1,186 registered insect specimens for the Queensland Museum, including dragonflies and damselflies, butterflies, flies, ants, beetles, bees, moths, cockroaches and katydids. An additional 91 unique photographic records (submitted to iNaturalist) and 2 visual observations of dragonflies and damselflies, butterflies and moths, and flies, were also recorded during the Bush Blitz. All represent new species for the park apart from the butterfly *Euploea corinna* (Common Crow).

A total of 230 species and 1 species-group were recorded from Rungulla National Park, including dragonflies and damselflies (29 described species, all described), butterflies (30 described species), moths (4 described species), flies (33 species, 14 described), ants (90 species, including 20 described, and 1 species-group), bees (16 species), vespid wasps (9 descried species), true bugs (3 described species), beetles (13 described species), cockroaches (1 described species) and katydids (1 described species). Several species collected were un-named but known from other collections, including 16 species of flies (11 bee flies, 5 robber flies) and 1 species of mason bee. The few putative species new to science that were collected for the first time on the Rungulla Bush Blitz included 4 species of bee flies, 1 species of robber fly, and 1 species of ant.

Eight exotic or pest species were collected and identified, including 2 exotic ants, 5 African dung beetles, and 1 pest species of scarab beetle. The dung beetles were deliberately introduced to help bury cattle dung and pose no ecological risk. Of the exotic ants, the Black Crazy Ant, *Paratrechina longicornis*, is of most concern but unlikely to pose a serious ecological threat.

Many range extensions were recorded, including dragonflies (4 species), damselflies (3 species), butterflies (5 species), bee flies (7 species), ants (7 species), scarab beetles (1

species), mason and leafcutter bees (3 species), and flat bugs (1 species). Most range extension were minor to moderate inland range extensions around the latitude of Rungulla National Park demonstrating the parks importance as important habitat for more coastally distributed species.

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Appendix 1. List of insects recorded during the Rungulla Bush Blitz							
Group	**Family**	**Species**	**Common name**	**Putative new species**	**Threatened (EPBC Act)**	**Threatened (State Act)**	**Exotic/ pest**
Blattodea	Blattidae	*Megazosteria patula*		No	No	No	No
Coleoptera	Dytiscidae	*Austrodytes insularis*		No	No	No	No
Coleoptera	Dytiscidae	*Eretes australis*		No	No	No	No
Coleoptera	Scarabaeidae	*Calloodes grayianus*	Golden bordered beetle	No	No	No	No
Coleoptera	Scarabaeidae	*Calloodes rayneri*	a christmas beetle	No	No	No	No
Coleoptera	Scarabaeidae	*Colpochila obesa*		No	No	No	No
Coleoptera	Scarabaeidae	*Digitonthophagus gazella*		No	No	No	No
Coleoptera	Scarabaeidae	*Euoniticellus intermedius*		No	No	No	No
Coleoptera	Scarabaeidae	*Liatongus militaris*		No	No	No	No
Coleoptera	Scarabaeidae	*Maechidius charaxus*		No	No	No	No
Coleoptera	Scarabaeidae	*Onitis viridulus*		No	No	No	No
Coleoptera	Scarabaeidae	*Onthophagus consentaneus*		No	No	No	No
Coleoptera	Scarabaeidae	*Onthophagus desectus*		No	No	No	No
Coleoptera	Scarabaeidae	*Sisyphus rubrus*		No	No	No	No
Diptera	Asilidae	*Leptogaster* RGBB sp. 5	a robber fly	No	No	No	No
Diptera	Asilidae	New Genus New Species RGBB sp. 4	a robber fly	No	No	No	No
Diptera	Asilidae	*Ommatius imaginis*	a robber fly	No	No	No	No
Diptera	Asilidae	*Ommatius* RGBB sp. 1	a robber fly	No	No	No	No
Diptera	Asilidae	*Ommatius* RGBB sp. 2	a robber fly	No	No	No	No
Diptera	Asilidae	*Ommatius* RGBB sp. 3	a robber fly	No	No	No	No
Diptera	Asilidae	*Ommatius* sp.	a robber fly	No	No	No	No
Diptera	Asilidae	*Reburrus bancrofti*	a robber fly	No	No	No	No
Diptera	Asilidae	*Stichopogon* RGBB sp. 6	a robber fly	No	No	No	No
Diptera	Asilidae	*Zosteria illingworthi*	a robber fly	No	No	No	No
Diptera	Bombyliidae	*Anthrax crenatus*		No	No	No	No
Diptera	Bombyliidae	*Anthrax dolabratus*		No	No	No	No
Diptera	Bombyliidae	*Anthrax incomptus*		No	No	No	No
Diptera	Bombyliidae	*Comptosia praeargentata*		No	No	No	No
Diptera	Bombyliidae	*Cryomyia* RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	*Docidomyia* RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	*Empidideicus* RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	Genus B (Evenhuis 2022) RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	Genus B (Evenhuis 2022) RGBB sp. 2		No	No	No	No
Diptera	Bombyliidae	Genus B (Evenhuis 2022) RGBB sp. 3		No	No	No	No

Group	Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State Act)	Exotic/ pest
Diptera	Bombyliidae	Genus B (Evenhuis 2022) RGBB sp. 4		No	No	No	No
Diptera	Bombyliidae	*Geron nigrocciput*		No	No	No	No
Diptera	Bombyliidae	*Lepidanthrax* RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	*Petrorossia* RGBB sp. 1		No	No	No	No
Diptera	Bombyliidae	*Pseudopenthes fenestrata*		No	No	No	No
Diptera	Bombyliidae	*Thraxan ebenus*		No	No	No	No
Diptera	Bombyliidae	*Thraxan?* RGBB sp. 1		No	No	No	No
Diptera	Syrphidae	*Austalis smaragdi*	a hoverfly	No	No	No	No
Diptera	Syrphidae	*Ischiodon scutellaris*	a hoverfly	No	No	No	No
Diptera	Syrphidae	*Paragus (Paragus) crenulatus*	a hoverfly	No	No	No	No
Diptera	Syrphidae	*Simosyrphus grandicornis*	a hoverfly	No	No	No	No
Diptera	Therevidae	*Acraspisa* RGBB sp. 1		No	No	No	No
Diptera	Therevidae	*Acupalpa* RGBB sp. 1		No	No	No	No
Diptera	Therevidae	*Bonjeania* RGBB sp. 1		No	No	No	No
Diptera	Therevidae	*Bonjeania* RGBB sp. 2		No	No	No	No
Diptera	Therevidae	*Bonjeania* RGBB sp. 3		No	No	No	No
Hemiptera	Cicadidae	*Thopha sessiliba*	Northern Double Drummer	No	No	No	No
Heteroptera	Aradidae	*Arictus monteithi*	a flatbug or bark bug	No	No	No	No
Heteroptera	Aradidae	*Brachyrhynchus australis*	a flatbug or bark bug	No	No	No	No
Hymenoptera	Apidae	*Amegilla (Notomegilla) aeruginosa*	a blue-banded bee	No	No	No	No
Hymenoptera	Apidae	*Apis (Apis) mellifera*	European Honey Bee	No	No	No	Yes
Hymenoptera	Apidae	*Thyreus caeruleopunctatus*	a cuckoo bee	No	No	No	No
Hymenoptera	Apidae	*Thyreus nitidulus*	a cuckoo bee	No	No	No	No
Hymenoptera	Formicidae	*Anochetus rectangularis*		N	N	N	N
Hymenoptera	Formicidae	*Calomyrmex* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Camponotus ephippium* -group		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.10		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.6		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.7		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.8		N	N	N	N
Hymenoptera	Formicidae	*Camponotus* RGBB sp.9		N	N	N	N
Hymenoptera	Formicidae	*Cardiocondyla* RGBB sp.1		N	N	N	N

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Hymenoptera	Formicidae	*Chelaner bifidum*		N	N	N	N
Hymenoptera	Formicidae	*Crematogaster* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Crematogaster* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Crematogaster* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Crematogaster* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Crematogaster* RGBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Dolichoderus scrobiculatus*		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex reburrus*		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.6		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex* RGBB sp.7		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex rufoinclinus*		N	N	N	N
Hymenoptera	Formicidae	*Iridomyrmex sanguineus*		N	N	N	N
Hymenoptera	Formicidae	*Leptogenys* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Melophorus* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Melophorus* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Melophorus* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus ajax*		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus diversoides*		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Meranoplus* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Monomorium* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Monomorium* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Monomorium* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Monomorium* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Myrmecia varians*		N	N	N	N
Hymenoptera	Formicidae	*Nylanderia* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Odontomachus* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Oecophylla smaragdina*		N	N	N	N
Hymenoptera	Formicidae	*Opisthopsis* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Paratrechina longicornis*		N	N	N	Y

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Hymenoptera	Formicidae	*Pheidole* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.6		N	N	N	N
Hymenoptera	Formicidae	*Pheidole* RGBB sp.7		N	N	N	N
Hymenoptera	Formicidae	*Plagiolepis* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Campomyrma)* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Campomyrma)* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Campomyrma)* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* OKBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* OKBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* OKBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma)* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Chariomyrma) schoopae*		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Hagiomyrma) lachesis*		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Hagiomyrma) melanura*		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Hagiomyrma) schenkii*		N	N	N	N
Hymenoptera	Formicidae	*Polyrhachis (Hagiomyrma) trapezoidea*		N	N	N	N
Hymenoptera	Formicidae	*Pseudoponera* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera metallica*		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.2		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.3		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.4		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.5		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.6		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.7		N	N	N	N
Hymenoptera	Formicidae	*Rhytidoponera* RGBB sp.8		N	N	N	N
Hymenoptera	Formicidae	*Solenopsis* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Strumigenys* RGBB sp.1		Y	N	N	N
Hymenoptera	Formicidae	*Tapinoma* RGBB sp.1		N	N	N	N
Hymenoptera	Formicidae	*Tapinoma* RGBB sp.2		N	N	N	N

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Hymenoptera	Formicidae	*Technomyrmex difficilis*		N	N	N	Y
Hymenoptera	Formicidae	*Tetramorium thalidum*		N	N	N	N
Hymenoptera	Formicidae	*Tetraponera punctulata*		N	N	N	N
Hymenoptera	Megachilidae	*Lithurgus*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Eutricharaea) leucopogon*	a leafcutter bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Eutricharaea) macularis*	a leafcutter bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Eutricharaea) obtusa*	a leafcutter bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) apicata*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) aurifrons*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) dinognatha*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) macleayi*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) micrerythrura*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) paracallida*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile (Unplaced to Subgenus) turneri*	a mason bee	N	N	N	N
Hymenoptera	Megachilidae	*Megachile* RGBB sp. 1	a mason bee	N	N	N	N
Hymenoptera	Vespidae	*Abispa ephippium*	a potter wasp	No	No	No	No
Hymenoptera	Vespidae	*Delta latreillei*	a potter wasp	No	No	No	No
Hymenoptera	Vespidae	*Polistes schach*	a paper wasp	No	No	No	No
Hymenoptera	Vespidae	*Polistes stigma*	a paper wasp	No	No	No	No
Hymenoptera	Vespidae	*Ropalidia revolutionalis*	a paper wasp	No	No	No	No
Hymenoptera	Vespidae	*Ropalidia romandi*	a paper wasp	No	No	No	No
Lepidoptera	Erebidae	*Amerila rubripes*	Walker's Frother	No	No	No	No
Lepidoptera	Hesperiidae	*Hesperilla crypsigramma*	Wide-brand Sedge-skipper	No	No	No	No
Lepidoptera	Hesperiidae	*Pelopidas lyelli*	Lyell's Swift	No	No	No	No
Lepidoptera	Lycaenidae	*Arhopala eupolis*	Purple Oak-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Candalides xanthospilus*	Yellow-spotted Blue	No	No	No	No
Lepidoptera	Lycaenidae	*Catochrysops panormus*	Pale Pea-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Erina delospila*	Spotted Dusky-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Erina erina*	Small Dusky-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Famegana alsulus*	Black-spotted Grass-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Lampides boeticus*	Long-tailed Pea-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Leptotes plinius*	Plumbago Blue	No	No	No	No
Lepidoptera	Lycaenidae	*Theclinisthes miskini*	Wattle Blue	No	No	No	No
Lepidoptera	Lycaenidae	*Zizina otis*	Common Grass-blue	No	No	No	No
Lepidoptera	Lycaenidae	*Zizula hylax*	Dainty Grass-blue	No	No	No	No
Lepidoptera	Nymphalidae	*Acraea andromacha*	Glasswing	No	No	No	No
Lepidoptera	Nymphalidae	*Acraea terpsicore*	Tawny Coster	No	No	No	No

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Lepidoptera	Nymphalidae	*Danaus petilia*	Lesser Wanderer	No	No	No	No
Lepidoptera	Nymphalidae	*Euploea corinna*	Common Crow	No	No	No	No
Lepidoptera	Nymphalidae	*Euploea sylvester*	Two-brand Crow	No	No	No	No
Lepidoptera	Nymphalidae	*Hypolimnas bolina*	Varied Eggfly	No	No	No	No
Lepidoptera	Nymphalidae	*Junonia hedonia*	Chocolate Argus	No	No	No	No
Lepidoptera	Nymphalidae	*Junonia orithya*	Blue Argus	No	No	No	No
Lepidoptera	Nymphalidae	*Junonia villida*	Meadow Argus	No	No	No	No
Lepidoptera	Nymphalidae	*Ypthima arctous*	Dusky Knight	No	No	No	No
Lepidoptera	Papilionidae	*Cressida cressida*	Clearwing Swallowtail	No	No	No	No
Lepidoptera	Papilionidae	*Papilio aegeus*	Orchard Swallowtail	No	No	No	No
Lepidoptera	Pieridae	*Catopsilia pomona*	Lemon Migrant	No	No	No	No
Lepidoptera	Pieridae	*Catopsilia scylla*	Orange Migrant	No	No	No	No
Lepidoptera	Pieridae	*Cepora perimale*	Caper Gull	No	No	No	No
Lepidoptera	Pieridae	*Eurema brigitta*	No-brand Grass-yellow	No	No	No	No
Lepidoptera	Pieridae	*Eurema hecabe*	Large Grass-yellow	No	No	No	No
Lepidoptera	Pieridae	*Eurema herla*	Macleay's Grass-yellow	No	No	No	No
Lepidoptera	Sphingidae	*Agrius godarti*	Godart's Hawk Moth	No	No	No	No
Lepidoptera	Sphingidae	*Hippotion scrofa*	Coprosma Hawk Moth	No	No	No	No
Lepidoptera	Sphingidae	*Hyles livornicoides*	Australian Striped Hawk Moth	No	No	No	No
Odonata	Aeshnidae	*Anax papuensis*	Australian Emperor	No	No	No	No
Odonata	Aeshnidae	*Austrogynacantha heterogena*	Australian Duskhawker	No	No	No	No
Odonata	Aeshnidae	*Gynacantha nourlangie*	Cave Duskhawker	No	No	No	No
Odonata	Coenagrionidae	*Agriocnemis rubricauda*	Red-rumped Wisp	No	No	No	No
Odonata	Coenagrionidae	*Argiocnemis rubescens*	Red-tipped Shadefly	No	No	No	No
Odonata	Coenagrionidae	*Ischnura aurora*	Aurora Bluetail	No	No	No	No
Odonata	Coenagrionidae	*Pseudagrion aureofrons*	Gold-fronted Riverdamsel	No	No	No	No
Odonata	Coenagrionidae	*Pseudagrion jedda*	Dusky Riverdamsel	No	No	No	No
Odonata	Coenagrionidae	*Pseudagrion microcephalum*	Blue Riverdamsel	No	No	No	No
Odonata	Corduliidae	*Hemicordulia intermedia*	Tau Emerald	No	No	No	No
Odonata	Corduliidae	*Hemicordulia tau*	Yellow-spotted Emerald	No	No	No	No
Odonata	Isostictidae	*Austrosticta frater*	Eastern Pondsitter	No	No	No	No
Odonata	Lestidae	*Austrolestes insularis*	Northern Ringtail	No	No	No	No
Odonata	Lestidae	*Austrolestes leda*	Wandering Ringtail	No	No	No	No
Odonata	Lestidae	*Lestes concinnus*	Dusky Spreadwing	No	No	No	No
Odonata	Libellulidae	*Crocothemis nigrifrons*	Black-headed Skimmer	No	No	No	No
Odonata	Libellulidae	*Diplacodes bipunctata*	Wandering Percher	No	No	No	No
Odonata	Libellulidae	*Diplacodes haematodes*	Scarlet Percher	No	No	No	No

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Odonata	Libellulidae	*Nannodiplax rubra*	Pygmy Percher	No	No	No	No
Odonata	Libellulidae	*Neurothemis stigmatizans*	Painted Grasshawk	No	No	No	No
Odonata	Libellulidae	*Notolibellula bicolor*	Bicoloured Skimmer	No	No	No	No
Odonata	Libellulidae	*Orthetrum caledonicum*	Blue Skimmer	No	No	No	No
Odonata	Libellulidae	*Orthetrum migratum*	Rosy Skimmer	No	No	No	No
Odonata	Libellulidae	*Orthetrum villosovittatum*	Fiery Skimmer	No	No	No	No
Odonata	Libellulidae	*Panatala flavescens*	Wandering Glider	No	No	No	No
Odonata	Libellulidae	*Rhyothemis braganza*	Irridescent Flutterer	No	No	No	No
Odonata	Libellulidae	*Tholymis tillarga*	Twister	No	No	No	No
Odonata	Libellulidae	*Tramea loewii*	Common Glider	No	No	No	No
Odonata	Platycnemididae	*Nososticta solitaria*	Fivespot Threadtail	No	No	No	No
Orthoptera	Tettigoniidae	*Chlorobalius leucoviridis*	Spotted Predatory Katydid	No	No	No	No