Wilinggin-West Kimberley Bush Blitz

Hymenoptera

(with a focus on parasitoid wasps)

18-29 July 2022 Submitted: 22 Dec 2022 Dr Erinn Fagan-Jeffries



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

List of contributors to this report.						
Name	Institution/affiliation	Qualifications/area of expertise	Level/form of contribution			
Dr Erinn Fagan- Jeffries	The University of Adelaide (Postdoctoral Fellow)	Parasitoid wasps (particularly the family Braconidae)	Principal Author, survey participant, identification of Hymenoptera to family level or further for the Ichneumonoidea			
Shannon Tetley	The University of Adelaide (undergraduate student)	General wasp taxonomy	Sorting of trap samples, family level identification of some Hymenoptera			
Dr James Dorey	The South Australian Museum (honorary researcher)	Native bees	Identification of several bee specimens			
Dr Ben Parslow	The South Australian Museum (Entomology Collection Manager)	Evanioidea	Identification of the two Gasteruption specimens			
Anthony Broekx	The University of Adelaide (undergraduate student)		Sorting of Malaise trap samples to order level			
Jameson Steinborner	The University of Adelaide (undergraduate student)		Sorting of Malaise trap samples to order level			

Abstract

This report concerns the hymenopteran specimens collected during the Bush Blitz Wilinggin-West Kimberley expedition. The survey used a combination of Malaise traps, sweep netting and LED light trap at 47 different collection sites. There were over 700 specimens collected, with most identified to family level, with 31 different families collected. Five named species were identified to species level, with several others identified as a distinct species based on DNA barcoding data. There are several significant range expansions, including new records for the state. Several putative new species within the groups of expertise of the report authors have already been identified from the collections, and it is likely that many more are present. The material will be made available to other researchers once the specimens are deposited at the Western Australian Museum.

1. Introduction

The aim of the survey was to do general collecting of the order Hymenoptera, but with a focus on wasps simply due to the expertise of the survey participant (E. Fagan-Jeffries). The order Hymenoptera includes ants (family Formicidae), bees (several families within the superfamily Apoidea) and wasps (all remaining families, and the greatest proportion of the diversity). Hymenopterans are critical components of all ecosystems, providing pollination, predation, decomposition and parasitoid services. Many groups are vastly understudied in Australia, with less than 30% of Australia's estimated 44,000 species described (Chapman, 2009).

In the survey area represented by the polygon on the map (Fig. 1), there are currently 273 records on the Atlas of Living Australia database for Hymenoptera. The vast majority (85%) of

those records are of bees or ants (68% and 16% respectively). The location has therefore not been well surveyed for hymenopterans, with particularly sparse information on the diversity of wasps. Given the time of year and the reported dryness of the area, with minimal flowering resources, it was expected that there would be wasps present but that they would be in low numbers and that a large collecting effort would be needed to sample the fauna properly. However, with so few records publicly available before the survey, all data are expected to greatly enhance the amount of material available for researchers into the future from a remote and generally inaccessible location.



Fig. 1: Atlas of Living Australia records for the search term 'Hymenoptera' on the 2/12/2022, with a polygon approximately representing the survey area.

2. Methods

2.1 Site selection

The selection of sites (Fig. 3) used for surveying included:

- Standard survey sites
- Sites that achieve a broad geographical coverage of the Bush Blitz survey area
- Sites covering a broad variety of habitats (including lakes, river banks, seeps, higher elevation outcrops)
- Sites where water may be present (increasing the chances of floral resources)



Fig. 3: Site locations for hymenopteran collections during the expedition

2.2 Survey techniques

• **Malaise traps:** eight Malaise traps (four EZ-Malaise Trap, Townes Style (Fig. 2 C-D) and four Sea Land Air Malaise (SLAM) traps (Fig. 2 A-B)) were placed in eight different sites during the first few days of the expedition and kept out for as long as possible (Table 1). Traps were brought in at the end of the expedition, or in the case of distant sites, the last date on which a team was visiting that site.



Fig. 2: Examples of Malaise traps run during the Bush Blitz. A-B: SLAM traps, C-B: Townes Malaise traps (C: Dr Mark Harvey assisting with set-up of a trap near the lab).

Trap #	Description	Latitude	Longitude	Elevation	Location
MT1	SLAM trap, dates 19-27 July 2022	-16.6631515	125.4273516	419	Charnley River Artesian Range Sanctuary, Wilinggin Country
MT2	Malaise trap, dates 19-27 July 2022	-16.6371173	125.383785	392	Charnley River Artesian Range Sanctuary, Wilinggin Country, over Plain Creek
MT3	Malaise trap, dates 20-27 July 2022	-16.7167799	125.4604209	403	Charnley River Artesian Range Sanctuary, Wilinggin Country, near homestead over creek
MT4	Malaise trap, dates 20-27 July 2022	-16.71579	125.460273	407	Charnley River Artesian Range Sanctuary, Wilinggin Country, near homestead
MT5	SLAM trap, dates 20-27 July 2022	-16.3692511	125.2098797	165	Charnley River Artesian Range Sanctuary, Wilinggin Country, near river in vine thicket
MT6	SLAM trap, dates 21-24 July 2022	-17.0490796	125.2357508	310	Wunaamin Conservation Park, SSS3
MT7	Malaise trap, dates 21-27 July 2022	-16.489167	125.351944	431	Charnley River Artesian Range Sanctuary, Wilinggin Country, SSS1
MT8	SLAM trap, dates 21-27 July 2022	-16.5025	125.359722	441	Charnley River Artesian Range Sanctuary, Wilinggin Country, SSS2

Table 1: Details of the eight Malaise traps run during the Bush Blitz survey

- Sweep netting of vegetation, particularly of any flowering plants. This included using 1.5m nets between ground and ~3m above ground, and using canopy (6m) nets to sample flowers and vegetation in higher stories.
- **Direct visual searching** and collection, particularly of ground-based wasps (e.g., spider wasps, velvet ants).
- A LepiLED light with a white sheet was run for three nights for several hours each time near the base camp, and any hymenopterans were hand collected from the white sheet.

All specimens were collected into 95-100% ethanol.

2.2.1 Methods used at standard survey sites

At each Standard Survey Site, a Malaise trap was deployed for as long as possible (minimum of 6 days). Additionally, each site was visited and continuously collected in using vegetation sweeping and direct search methods for at least one hour. There were not large numbers of plants in flower at any of the standard survey sites, and all three were visited on days with similar weather.

2.3 Identifying the collections

Bulk sweep and Malaise samples were sorted first to order level. Specimens of orders other than Hymenoptera are retained as bulk vials that will be deposited in the Western Australian Museum. Hymenopteran specimens were then identified to family level (with the exception of some Chalcidoidea and Platygastroidea, which were left as superfamily-level collections due to being outside the area of expertise of the report authors). Family level identifications were mostly based on the Lucid key 'What Wasp is That?: An Interactive Identification Guide to the Australasian Families of Hymenoptera' (Stevens et al., 2007).

Three student researchers, Jameson Ellis-Steinborner, Anthony Broekx and Shannon Tetley (The University of Adelaide) assisted with sorting traps to order level, and Shannon also identified some of the hymenopterans to family level. The rest of the family level identifications were done by Erinn Fagan-Jeffries (The University of Adelaide), with James Dorey (SA Museum) contributing to some of the bee identifications, and Ben Parslow (SA Museum) identifying the two *Gasteruption* species.

Within the Ichneumonoidea, 95 specimens were DNA barcoded for the standard *COI* marker, with 86 samples successfully sequenced and matched against the Barcode of Life Database

identification engine. Sequences were assigned subfamily, genus or species identifications based on these barcodes, and morphological congruence with the DNA identification was confirmed.

3. Results and Discussion

Appendix 1 lists all Hymenoptera recorded during the Bush Blitz. Collections made during this Bush Blitz will result in at least 784 specimens of Hymenoptera ('at least' because some bulk vials contain approximate numbers) being added to public collections and an equivalent number of records added to publicly accessible databases. In addition, an unquantified number of specimens of other insect orders will also be added to public collections.

In total, there were 31 different families of hymenopterans identified amongst the collected material. Only five species were identified from the material, whilst all other specimens were left at genus, subfamily, family or superfamily level and are included in the 'not formalised' section below.

- Chelonus blackburni was identified using COI barcoding data, although this should be treated with some caution as it relies on the identification on the Barcode of Life Database (the sequence+specimen to which the Bush Blitz specimen matched) being correct. However, the identification of at least one specimen of *Chelonus blackburni* on BOLD is listed as being completed by Mike Sharkey, who is a braconid taxonomist, and is therefore likely to be reliable. *Chelonus blackburni* was suggested to possibly be an erroneous record for Australia (Kittel & Austin, 2014) and therefore if the record from this Bush Blitz is correct, it will confirm the presence of this species in Australia.
- *Hylaeus husela* was identified using morphology by J. Dorey, and the record is a small range extension.
- *Pycnobraconoides mutator* was identified using COI barcoding data, and if a correct identification, would be the first record for Western Australia. However, it is not included in the range extension section below as the identification this DNA match is based on is questionable and there are likely many undescribed species within this genus.
- *Gasteruption angusticeps* was identified using morphology by B. Parslow and is included in the range extension section below.
- *Glyptapanteles goodwinnoakes* was identified using COI barcoding data and is included in the range extension section below.

3.1 Un-named or not formalised taxa

The taxa below have not been identified to species level, nor sorted to morphospecies.

Table 1. Putatively un-named or not formalised taxa, not identified to species level					
Taxon	Comment				
Hymenoptera: Ichneumonoidea: Braconidae: Euphorinae: ?Aridelus sp.	DNA barcoded				
Hymenoptera: Apoidea: Apidae: Apinae: Austroplebeia sp.	DNA barcoded				
Hymenoptera: Apoidea: Crabronidae: Bembicinae: Bembix sp.	DNA barcoded				
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Bracon_BBCR_sp01	DNA barcoded				
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Bracon_BBCR_sp02	DNA barcoded				
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Bracon_BBCR_sp03	DNA barcoded				
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Bracon_BBCR_sp04	DNA barcoded				
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp01	DNA barcoded				

Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp02	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp03	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp04	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp05	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Braconinae: Braconinae_BBCR_sp06	DNA barcoded
Hymenoptera: Apoidea: Apidae: Xylocopinae: Braunsapis sp.	DNA barcoded
Hymenoptera: Ichneumonoidea: Ichneumonoidae: Cryptinae: Ceratomansa_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Cheloninae: Chelonus_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Agathidinae: Coccygidium_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Ichneumonoidae: Cremastinae: Cremastinae_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Doryctinae: Doryctinae_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Doryctinae: Doryctinae_BBCR_sp02	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Doryctinae: Doryctinae_BBCR_sp03	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Doryctinae: Doryctinae_BBCR_sp04	DNA barcoded
Hymenoptera: Apoidea: Colletidae: Euryglossinae: <i>Euryglossula</i> sp.	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Gnamptodontinae: Gnamptodontinae_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Gnamptodontinae: Gnamptodontinae_BBCR_sp02	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Gnamptodontinae: Gnamptodontinae_BBCR_sp03	DNA barcoded
Hymenoptera: Apoidea: Colletidae: Hylaeinae: Hylaeus (Rhodohylaeus) sp.	DNA barcoded
Hymenoptera: Apoidea: Colletidae: Hylaeinae: <i>Hylaeus</i> sp.	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Ichneutinae: Ichneutinae_BBCR_sp01	DNA barcoded
Hymenoptera: Apoidea: Megachilidae: Megachilinae: Megachile sp.	DNA barcoded
Hymenoptera: Apoidea: Colletidae: Hylaeinae: <i>Meroglossa</i> sp.	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Euphorinae: Meteorus_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Euphorinae: <i>Microctonus_</i> BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Opiinae: Opiinae_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Ichneumonidae: Cryptinae : Paraphylax sp. BFS-2018 / Paraphylax sp. Oz423	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Cheloninae: Phanerotoma_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Cheloninae: Phanerotoma_BBCR_sp02	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Cheloninae: Phanerotoma_BBCR_sp03	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Cheloninae: Phanerotoma_BBCR_sp04	DNA barcoded
Hymenoptera: Vespoidea: Formicidae: Formicinae: <i>Polyrhachis_</i> BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Doryctinae: Spathius_BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Braconidae: Agathidinae: <i>Therophilus_</i> BBCR_sp01	DNA barcoded
Hymenoptera: Ichneumonoidea: Ichneumonoidae: Pimplinae: Xanthopimpla_BBCR_sp01	DNA barcoded
Hymenoptera: Apoidea: Apiformes	>1 species
Hymenoptera: Chalcidoidea	>1 species
Hymenoptera: Platygastroidea/Chalcidoidea - unsorted	>1 species
Hymenoptera: Platygastroidea	>1 species
Hymenoptera: Apoidea: Ampulicidae	one species
Hymenoptera: Apoidea: Apidae	one species
Hymenoptera: Apoidea: Bethylidae	>1 species
Hymenoptera: Ichneumonoidea: Braconidae	>1 species

Hymenoptera: Ichenumonoidea: Braconidae: Cheloninae	>1 species
Hymenoptera: Chalcidoidea: Chalcididae	>1 species
Hymenoptera: Chrysidoidea: Chrysididae	one species
Hymenoptera: Apoidea: Crabronidae	>1 species
Hymenoptera: Apoidea: Crabronidae: Crabroninae	one species
Hymenoptera: Diaprioidea: Diapriidae	>1 species
Hymenoptera: Chrysidoidea: Dryinidae	>1 species
Hymenoptera: Chalcidoidea: Encyrtidae	>1 species
Hymenoptera: Chalcidoidea: Eucharitidae	>1 species
Hymenoptera: Chalcidoidea: Eulophidae	>1 species
Hymenoptera: Chalcidoidea: Eupelmidae	>1 species
Hymenoptera: Chalcidoidea: Eurytomidae	>1 species
Hymenoptera: Chalcidoidea: Figitidae	>1 species
Hymenoptera: Vespoidea: Formicidae	>1 species
Hymenoptera: Ichneumonoidea: Ichneumonoidae	>1 species
Hymenoptera: Vespoidea: Mutilidae	>1 species
Hymenoptera: Chalcidoidea: Perilampidae	>1 species
Hymenoptera: Vespoidea: Pompilidae	>1 species
Hymenoptera: Chalcidoidea: Pteromalidae	>1 species
Hymenoptera: Vespoidea: Scoliidae	one species
Hymenoptera: Apoidea: Sphecidae	one species
Hymenoptera: Vespoidea: Thynnidae	>1 species
Hymenoptera: Chalcidoidea: Torymidae	>1 species
Hymenoptera: Vespoidea: Vespidae	>1 species
Hymenoptera: Vespoidea: Vespidae: Polistinae	>1 species
Hymenoptera: Ichneumonoidea: Braconidae: Microgastrinae	>1 species
Acariformes/Parasitiformes	>1 species
Lepidoptera	>1 species
Mantodea	>1 species
Neuroptera	>1 species
Odonata	two species
Orthoptera	>1 species
Psocodea	>1 species
Thysanoptera	>1 species
Arachnida	>1 species
Araneae	>1 species
Blattodea	>1 species
Coleoptera	>1 species
Coleoptera: Dytisctidae	one species
Collembola	>1 species
Diptera	>1 species
Hemiptera	>1 species

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. It is highly likely that many of the hymenopterans collected are new to science, as the area has not been surveyed extensively before. However, it will be difficult to confirm this until experts on each of the different families have access to the specimens.

Table 2. Putative new species (new to science)					
Species	Comment				
<i>Gasteruption</i> sp. nov.	Ben Parslow has confirmed he believes this specimen to represent a new species of parasitoid wasp in the genus <i>Gasteruption</i> (Gasteruptiidae)				
Coccygidium_BBCR_sp01	This genus has been recorded from Australia but no species are formally described. A different species has been reared from Fall Army Worm and is being described currently, which will place this genus well for a full revision.				
Dolichogenidea_BBCR_sp01					
Dolichogenidea_BBCR_sp02					
Dolichogenidea_BBCR_sp04	All of these putative new species are parasitoid wasps within the subfamily Microgastrinae				
Dolichogenidea_BBCR_sp03	(Braconidae). Whilst morphological comparison				
Apanteles_BBCR_sp01	the molecular data confirms that none of them				
Cotesia_BBCR_sp01	are recently described species. Additionally, due to the remote location and most historical				
Diolcogaster_BBCR_sp01	microgastrines being described from NSW/VIC, it				
Diolcogaster_BBCR_sp02					
Microplitis_BBCR_sp01					

3.3 Exotic and pest species

Absent during the survey were any records of European wasps (*Vespula germanica*) or European honeybees (*Apis mellifera*). Whilst is it possible they are active at the site but absent from the collections due to timing, it is a good sign that these species are not present.

3.4 Threatened species

No specimens identified to species level are listed as endangered, however it should be noted that most of the material collected is only identified to higher taxonomic groups. It is highly likely that many of the undescribed or unidentified species collected may be threatened, but at this stage it is impossible to understand which species may require conservation action.

3.5 Range extensions

For the specimens identified to family, subfamily and genus level, the records from Bush Blitz are some of the first formal records of hymenopterans for the area. For those specimens

identified to species level, the record of *Gasteruption angusticeps* is the first record of the species from Western Australia and expands the known distribution of the species significantly. Additionally, the collection of *Glyptapanteles goodwinnoakes* is the first record of the species for Western Australia and is evidence for the usefulness of uploading COI barcodes to BOLD when undertaking modern species descriptions, as this allowed the quick identification of this species amongst the material.

Table 5. Range extensions or significant infill in distribution records for species					
Species	Location sighted/observed	Distance from nearest known record (km)	Comments		
Gasteruption angusticeps	-16.3117193, 125.8580903	~680km	Up until recently, this species was only known from Queensland. Around the time of the bush blitz, a specimen was collected by photographer Nick Volpe in the Northern Territory (near Darwin, B. Parslow pers. comm.) and identified by Ben Parslow. The specimen collected on Bush Blitz is the first formal record of the species in WA.		
Hylaeus husela	-16.3715697, 125.2087894	190km	Nearest record on ALA is E3417 (WAM) but it is likely there are other non-databased records (-17.3494, 123.7406)		
Glyptapanteles goodwinnoakes	-17.0490099, 125.2361226	2052km	Species described in 2022 from records in QLD and NSW, this is the first formal record for the state of Western Australia, and dramatically expands the distribution.		

3.6 Genetic information

There were 95 specimens DNA barcoded for the standard ~680bp *COI* marker (94 ichneumonoids and a single ant specimen). Of these, 86 were successfully sequenced and are available on the Barcode of Life Database with the SampleIDs CRex01-95.

4. Information on species lists

The order Hymenoptera is one of the most diverse orders of animals, and most species in Australia are undescribed. The approach taken on this expedition was to collect broadly so that as many possible specimens were available from this remote location for future research. However, this then means that identifications beyond family are time-consuming and often outside the area of expertise of the survey participant. As such, most specimens have only been identified to family level and the species list is therefore limited and representative of the true diversity.

5. Information for land managers

The location known to AWC staff as 'sundew spring' was particularly impressive in terms of the abundance and diversity of insect life, with many insects near the water seeps and the

neighbouring flowering vegetation. It was one of the few sites with multiple different species of plant still in flower, and had a very large number of bees and wasps foraging.

6. Other significant findings

There was bycatch of other orders of insects, particularly from the Malaise traps (e.g. Diptera, Hemiptera, Coleoptera) which have been labelled and databased, and will be deposited in the Western Australian Museum so that they are available for other researchers into the future. These are included in the point data.

7. Conclusions

This Bush Blitz expedition was one of the first extensive, broad-scope Hymenoptera surveys of the area. Whilst most specimens have not been identified past family level, they will be extremely valuable to many researchers completing taxonomic revisions in coming years. Just from the small group of specimens identified to species level and DNA barcoded, there are already 11 putative new species identified, and two new records for the state of Western Australia.

Acknowledgements

The report authors would like to thank the traditional owners of Wilinggin land, the Ngarinyin People, for allowing us to survey on their lands. We'd particularly like to thank the traditional owners who participated in the Bush Blitz, and the ranger teams who assisted us when visiting sites. We thank the Australian Wildlife Conservancy team who hosted the Bush Blitz, and in particular the team members who assisted with site collection, Malaise traps and specimen collection. E. Fagan-Jeffries would like to thank James, Ben, Anthony, Jameson and Shannon for their assistance with sorting and identifications, and is grateful to the rest of the Bush Blitz team for the help with Malaise trap set-up and pack down during the expedition. Finally, extensive thanks to the expedition leaders Helen and Courtney, and the entire Bush Blitz team for a fantastic and safe expedition.

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OFFICIAL

Appendix 1. List of Hymenoptera recorded during the Wilinggin-West Kimberley Bush Blitz						
Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State /Territory)	Exotic/ pest
Braconidae (Microgastrinae)	Apanteles_BBCR_sp01	microgastrine wasp	yes	no	no	no
Braconidae (Braconinae)	Bracon_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Bracon_BBCR_sp02	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Bracon_BBCR_sp03	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Bracon_BBCR_sp04	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp02	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp03	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp04	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp05	braconid wasp	unknown	no	no	no
Braconidae (Braconinae)	Braconinae_BBCR_sp06	braconid wasp	unknown	no	no	no
Ichneumonoidae (Cryptinae)	Ceratomansa_BBCR_sp01	ichneumonid wasp	unknown	no	no	no
Braconidae (Cheloninae)	Chelonus ?blackburni	braconid wasp	no	no	no	no
Braconidae (Cheloninae)	Chelonus_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Agathidinae)	Coccygidium_BBCR_sp01	braconid wasp	yes	no	no	no
Braconidae (Microgastrinae)	Cotesia_BBCR_sp01	microgastrine wasp	yes	no	no	no
Ichneumonoidae (Cremastinae)	Cremastinae_BBCR_sp01	ichneumonid wasp	unknown	no	no	no
Braconidae (Microgastrinae)	Diolcogaster_BBCR_sp01	microgastrine wasp	yes	no	no	no
Braconidae (Microgastrinae)	Diolcogaster_BBCR_sp02	microgastrine wasp	yes	no	no	no
Braconidae (Microgastrinae)	Dolichogenidea_BBCR_sp01	microgastrine wasp	yes	no	no	no
Braconidae (Microgastrinae)	Dolichogenidea_BBCR_sp02	microgastrine wasp	yes	no	no	no
Braconidae (Microgastrinae)	Dolichogenidea_BBCR_sp03	microgastrine wasp	yes	no	no	no
Braconidae (Microgastrinae)	Dolichogenidea_BBCR_sp04	microgastrine wasp	yes	no	no	no
Braconidae (Doryctinae)	Doryctinae_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Doryctinae)	Doryctinae_BBCR_sp02	braconid wasp	unknown	no	no	no
Braconidae (Doryctinae)	Doryctinae_BBCR_sp03	braconid wasp	unknown	no	no	no
Braconidae (Doryctinae)	Doryctinae_BBCR_sp04	braconid wasp	unknown	no	no	no
Colletidae (Euryglossinae)	Euryglossula_BBCR_sp01	native bee	unknown	no	no	no
Gasteruptiidae (Gasteruptiinae)	Gasteruption angusticeps	ghost wasp	no	no	no	no
Gasteruptiidae (Gasteruptiinae)	Gasteruption_BBCR_sp01	ghost wasp	yes	no	no	no

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Family	Species	Common name	Putative new	Threatened (EPBC Act)	Threatened (State	Exotic/ pest
Bracopidao (Microgastripao)	Chuntanantolos goodwinnoakos	microgastrino wash	species		/ l erritory)	no
Braconidae (Microgastiniae)	Champtedentines BBCD and	hreeenid ween			no	10
Braconidae (Gnamptodontinae)		braconid wasp	unknown	no	no	no
Braconidae (Gnamptodontinae)	Gnamptodontinae_BBCR_sp02	braconid wasp	unknown	no	no	no
Braconidae (Gnamptodontinae)	Gnamptodontinae_BBCR_sp03	braconid wasp	unknown	no	no	no
Colletidae (Hylaeinae)	Hylaeus (Rhodohylaeus)_BBCR_sp01	native bee	unknown	no	no	no
Colletidae (Hylaeinae)	Hylaeus husela	native bee	no	no	no	no
Colletidae (Hylaeinae)	Hylaeus_BBCR_sp01	native bee	unknown	no	no	no
Braconidae (Ichneutinae)	Ichneutinae_BBCR_sp01	braconid wasp	unknown	no	no	no
Megachilidae (Megachilinae)	Megachile_BBCR_sp01	native bee	unknown	no	no	no
Colletidae (Hylaeinae)	Meroglossa_BBCR_sp01	native bee	unknown	no	no	no
Braconidae (Euphorinae)	Meteorus_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Euphorinae)	Microctonus_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Microgastrinae)	Microplitis_BBCR_sp01	microgastrine wasp	yes	no	no	no
Braconidae (Opiinae)	Opiinae_BBCR_sp01	braconid wasp	unknown	no	no	no
lebroumonidae (Cruntinae)	Paraphylax sp. BFS-2018 / Paraphylax	ichnoumonid wasn	unknown	20	no	20
Braceridee (Choleninee)	Sp. 02423	hreenrid ween			10	110
Braconidae (Cheloninae)	Phaneroloma_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Cheloninae)	Phanerotoma_BBCR_sp02	braconid wasp	unknown	no	no	no
Braconidae (Cheloninae)	Phanerotoma_BBCR_sp03	braconid wasp	unknown	no	no	no
Braconidae (Cheloninae)	Phanerotoma_BBCR_sp04	braconid wasp	unknown	no	no	no
Formicidae (Formicinae)	Polyrhachis_BBCR_sp01	spiny ant	unknown	no	no	no
Braconidae (Braconinae)	Pycnobraconoides ?mutator	braconid wasp	no	no	no	no
Braconidae (Doryctinae)	Spathius_BBCR_sp01	braconid wasp	unknown	no	no	no
Braconidae (Agathidinae)	Therophilus_BBCR_sp01	braconid wasp	unknown	no	no	no
Ichneumonoidae (Pimplinae)	Xanthopimpla_BBCR_sp01	ichneumonid wasp	unknown	no	no	no