

Tjiwarl Bush Blitz
Native Bees and Stygofauna

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Remko Leijds

Nomenclature and taxonomy used in this report is consistent with:
The Australian Faunal Directory (AFD)

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List of contributors

List of contributors to this report.			
Name	Institution/affiliation	Qualifications/area of expertise	Level/form of contribution
<i>Dr. Remko Leijs</i>	<i>SA-Museum</i>	<i>PhD, native bees, stygofauna, field collection, taxonomy and expertise in molecular biology</i>	<i>Principal author. Field collection, specimen sorting, identifications</i>

Abstract

Native bees: Ninety (90) species of native bees (233 specimen records) were collected with representatives of all 5 families occurring in Australia. Nine identified species were recorded from the area before. At least 10 species are undescribed/unpublished new species, but this number is likely to increase with further identification of the collected specimens.

Stygofauna: Two new genera and species of stygofauna amphipods were found and one new species of Bathynellidae. A subterranean waterbeetle species, *Limbodessus mirandae* was recollected.

1. Introduction

Native bees: An ALA-area search using the approximate boundaries of the Tjiwarl area Sites resulted in 353 records for the five native bee families combined. These contained 11 genera, 14 subgenera and but only 9 identified species. Of these *Megachile semiluctuosa*, *Thyreus waroorensis*, *Amegilla (Notomegilla) chlorocyanea* were also encountered on the Tjiwarl survey.

Stygofauna: The Tjiwarl area has been extensively surveyed by Bill Humphreys and co-workers (Western Australian Museum) for stygofauna species during the last 23 years. Stygofauna particularly exist in aquifers associated with calcrete deposits. Calcrete aquifers each have a unique fauna because they are isolated waterbodies with lots of water filled spaces (high hydrological conductivity) to harbour unique aquatic ecosystems. The high hydrological conductivity also means that they are a valuable resource for mining activities. Water extraction from these calcrete aquifers may cause extinction of stygofauna species.

2. Methods

2.1 Site selection

Native bees: Sites for collecting native bees were selected based on two rationales: (1) we sampled as many different vegetation types and areas with different fire history as possible; (2) native bees are generally collected on flowering plants where they collect pollen and nectar for provisioning of their brood. Many native bee species have strict relationships with particular flowering plants. Therefore, we focussed on sites with flowering plants and attempted to collect on a large variety of flowering plant species.

Stygofauna: Site selection for stygofauna involves finding access to the groundwater, such as pastoral wells, mineral exploration bores, monitoring bores or water extraction bores. Most suitable are bores/wells that are uncased or cased with sufficient large slots, so that stygofauna can migrate from the aquifer into the bore. Access to the groundwater was sought at calcrete deposits.

2.2 Survey techniques

Native bees: Native bees were mostly collected individually using a hand net, by sweep netting of specific plants, using blue vane traps, and using a vehicle net. Plant species on which the bees were collected were recorded.

Stygofauna: Bores and wells were sampled using weighted plankton nets, by filtering the water column several times. Samples were taken back to the laboratory for sorting under a dissecting microscope. Fauna was preserved in absolute ethanol.

2.2.1 Methods used at standard survey sites

Native bees: Methods used for collecting native bees at the standard survey sites were: blue vane traps and hand netting of flowering plants.

Stygofauna: Standard survey sites were not close to suitable stygofauna sampling sites.

2.3 Identifying the collections

Native bees: For identification of native bees, the following publications were used: Michener, C.D. (1965, 2007) was used for identification of genera and subgenera within the families. Specific generic and subgeneric revisions were used to identify the specimens to species level. These are: Batley and Houston (2012) for *Trichocolletes*; Exley (1976) for *Euryglossa*; Houston (1975, 1981) for *Hylaeus*; Maynard (2013) for *Leioproctus*; Walker (1995) for *Lasioglossum* (*Chilalictus*); and Walker (1986) for *Homalictus*.

Identified specimens were also compared to the Padil website <https://www.padil.gov.au>, which provides diagnostic images of many Australian native bees.

Stygofauna: Initial identifications were made in the laboratory during sorting of the samples at order or family level. For the subterranean water beetles the keys in Watts & Humphreys (2006) were used.

3. Results and Discussion

Native bees: Two hundred and thirty-three (233) native bee specimens were collected from 18 species of flowering plants. The bee specimens belong to all five Australian bee families, 14 genera (20 identified subgenera) and an estimated 90 species (Appendix 1). Of these only 5 were recorded based on an ALA search. Twenty species were identified to species level and 73 as morpho species. Of these 10 were recognised as new species, because they did not key out with existing identification tools, but this number is likely to increase with further identification of the collected specimens.

Stygofauna: Stygofauna were successfully collected at five out of 17 visited sites across the Tjiwarl area. At Boundary well, Yakabindie Station, South of Lake Miranda, blind water beetles *Limbodessus mirandae* (Dytiscidae), undescribed species of paramelitid amphipods and copepoda, ostracoda and oligochaetes were collected. At Gums Well, Depot Springs Station, undescribed chiltoniid amphipods were found along with some copepods, oligochaetes, and flat worms. Some wells on calcrete deposits (eg. Townsend well, Henrys Well) were found dry, but used to have stygofauna species. Several bores on calcretes at Albion Downs and Depot Springs appeared to be deep, possibly intersecting the calcrete deposit, while entirely cased. These bores did not contain fauna.

Appendix 1 lists all native bees, jewel beetles and stygofauna recorded during the Bush Blitz. Collections made during this Bush Blitz will result in 239 specimens being added to public collections and 239 records being added to publicly accessible databases.

3.1 Un-named or not formalised taxa

Table 1. Putatively un-named or not formalised taxa

Taxon	Comment
<i>Callohesma</i> sp.WJRL 45	

<i>Callohesma</i> sp.WJRL 46	
<i>Callohesma</i> sp.WJRL 47	
<i>Callohesma</i> sp.WJRL 48	
<i>Euhesma</i> sp.WJRL 49	
<i>Euhesma</i> sp.WJRL 50	
<i>Euriglossine</i> sp.WJRL 44	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 57	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 59	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 61	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 63	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 64	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 65	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 66	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 67	
<i>Hylaeus (Prosopisteron)</i> sp.WJRL 69	
<i>Hylaeus (Pseudhylaeus)</i> sp.WJRL 51	
<i>Hylaeus (Pseudhylaeus)</i> sp.WJRL 52	
<i>Hylaeus (Pseudhylaeus)</i> sp.WJRL 53	
<i>Hylaeus (Pseudhylaeus)</i> sp.WJRL 58	
<i>Hylaeus (Pseudhylaeus)</i> sp.WJRL 68	
<i>Hylaeus (Rhodohylaeus)</i> sp.WJRL 54	
<i>Hylaeus (Rhodohylaeus)</i> sp.WJRL 55	
<i>Hylaeus (Rhodohylaeus)</i> sp.WJRL 56	
<i>Leioproctus</i> sp. WJRL 16	
<i>Leioproctus</i> sp. WJRL 17	
<i>Leioproctus</i> sp. WJRL 18	
<i>Leioproctus</i> sp. WJRL 19	
<i>Leioproctus</i> sp. WJRL 20	
<i>Leioproctus</i> sp. WJRL 21	
<i>Leioproctus</i> sp. WJRL 22	
<i>Leioproctus</i> sp. WJRL 23	
<i>Leioproctus</i> sp. WJRL 24	
<i>Leioproctus</i> sp. WJRL 26	
<i>Leioproctus</i> sp. WJRL 28	
<i>Trichocolletes</i> sp.WJRL 15	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 31	

<i>Lasioglossum (Chilalictus)</i> sp.WJRL 32	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 33	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 34	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 35	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 36	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 37	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 38	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 39	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 40	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 41	
<i>Lasioglossum (Chilalictus)</i> sp.WJRL 42	
<i>Lasioglossum (Homalictus)</i> sp.WJRL 43	
<i>Lipotriches (Austronomia)</i> sp.WJRL 29	flavoviridis group
<i>Lipotriches (Austronomia)</i> sp.WJRL 30	flavoviridis group
<i>Megachile</i> sp.WJRL 06	
<i>Megachile</i> sp.WJRL 09	
<i>Megachile</i> sp.WJRL 10	
<i>Megachile</i> sp.WJRL 11	
<i>Megachile</i> sp.WJRL 12	
<i>Megachile</i> sp.WJRL 13	

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 expected that there will be several other undescribed species in Table 1, especially in the genera *Leioproctus*, *Hylaeus (Prosopistemon)*, and *Hylaeus (Pseudhylaeus)*. There are no, or complete identification keys for the species in these groups. Eg. for *Hylaeus (Pseudhylaeus)* none of the images in Padil-pollinators matched the species collected at the survey.

Species	Comment
<i>Euhesma</i> n.sp.WJRL 25	
<i>Hylaeus (Hylaeteron)</i> n.sp.WJRL 60 cf. riekianus	
<i>Hylaeus (Hylaeteron)</i> n.sp.WJRL 61 cf. riekianus	
<i>Leioproctus</i> n.sp. WJRL 27	

<i>Leioproctus</i> (unplaced) n.sp. cf.sexmacularus	
<i>Megachile</i> (<i>Austrochile</i>) n.sp. ACD1291	
<i>Megachile</i> (<i>Austrochile</i>) n.sp. AEC1404	
<i>Megachile</i> (<i>Austrochile</i>) n.sp. AEC2785	
<i>Megachile</i> (<i>Austrochile</i>) n.sp. AEC5850	
<i>Megachile</i> (<i>Spinitala</i>) <i>rieki</i> n.sp. unpublished	
Paramelitid amphipod (new genus, new species)	Boundary Well, Yakabindie Station
Chiltoniid amphipod (new genus, new species)	Gums Well, Depot Springs Stn
Bathynellidae (new genus?, new species)	PVC bore, Depot Springs Stn

3.3 Exotic and pest species

Native bees: Native bees are not considered pest species. However, the honeybee, *Apis mellifera*, which is an introduced species, although it is not listed as a pest species, may act as a pest species in certain circumstances. During the time of the survey no honeybees were found. Feral colonies of honeybees may take over or occupy nesting hollows that otherwise are used by hollow breeding birds such as parrots, lorikeets, and cockatoos. Honeybees may also compete with native bees, birds and small mammals for nectar and pollen especially when these resources are scarce.

Stygofauna: Stygofauna are not considered pest species.

Exotic/pest species	Location sighted/observed	Indication of abundance	Comments
n/a			

3.4 Threatened species

Native bees: There are no native bees currently listed under the Environment Protection and Biodiversity Conservation Act 1999 (Cwth) and/or State or Territory legislation.

Stygofauna: Stygofauna as a group is currently not listed under the Environment Protection and Biodiversity Conservation Act 1999 (Cwth) and/or State or Territory legislation, neither are individual stygofauna species. However, because of the short range endemism of the species, they are extremely vulnerable to water extracting of aquifers.

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

3.5 Range extensions

Native bees: Data on range extensions (eg. as result of climate change) of individual native bee species will only be possible with the availability of fine scale distributional data that include time-series, which are hardly available for native bees in Australia.

Stygofauna: Stygofauna are restricted to individual aquifers and cannot disperse, therefore it is highly unlikely to find range extensions for stygofauna species.

Table 5. Range extensions or significant infill in distribution records for species			
Species	Location sighted/observed	Distance from nearest known record (km)	Comments
n/a			

3.6 Genetic information

Native bees: No genetic sampling was undertaken. However, identified specimens of species currently not present in the DNA barcode reference library at the South Australian Museum, may be sampled for DNA barcoding. Similarly, a selection of the unidentified morphospecies may be sampled for DNA barcoding. This may result in the recognition of additional new species, and/or matching morphospecies from other Bush Blitz surveys.

Stygofauna: No genetic sampling was undertaken, but DNA barcoding may be applied in the future to find out the phylogenetic relationship with other (un)described taxa.

4. Information on species lists

Native bees: Several specimens especially in the Colletidae and Megachilidae, could not be identified to species level because identification keys for these groups do not exist. These specimens were identified to species morphospecies level and were given a unique species identifier (eg. sp.WJRL ##) for this survey. Further work would be necessary to identify these specimens. This work will consist of comparing specimens with identified species in museum collections, or comparing DNA barcodes of the collected specimens with a DNA reference database of Australian bee species once such a database becomes available. Some specimens that were recognised as new species and matched earlier barcoded species were given the unique barcode identification number (BIN), eg. ACD 1404. Reliable records for native bees in the area can be found doing a spatial search in the Atlas of Living Australia (ALA) <https://doi.ala.org.au>.

Stygofauna: Most of the stygofauna, with the exception of stygofauna waterbeetles (Dytiscidae) and some syncarids are still undescribed.

5. Information for land managers

n/a

6. Other significant findings

n/a

7. Conclusions

Native bees: During the survey 90 native bee species were found in the Tjiwarl area. Several species are confirmed to be undescribed, but it is expected that several others will be undescribed as well, after further identifications and careful comparison with museum specimens. The native bee biodiversity in the area turned out to be much higher than assessed in the field. Because most species were only encountered in low numbers and collected during a short period, the findings are just a snap-shot of the potential bee biodiversity of the area. The fact that most species were collected in low numbers may be because of the dry conditions that the area experienced in the past number of years. Although several areas had many wildflowers, especially Albion Downs and Wanjarri Nature Reserve, native bee numbers were unexpectedly low there, possible because of low population sizes as a result of the previous drought.

Stygofauna: Stygofauna collecting was below expectation, because of difficulties to access the groundwater at several calcrete deposits due to lower water levels resulting from lack of rainwater recharge and/or water extraction.

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References

- Batley, M & Houston, T.F. (2012). Revision of the Australian bee genus *Trichocolletes* Cockerell (Hymenoptera: Colletidae: Paracolletini). *Records of the Australian Museum* 64(1): 1–50.
- Exley, E.M. (1976). Revision of the Subgenus *Euryglossa* Smith (Apoidea: Colletidae: Euryglossinae). *Australian Journal of Zoology Supplementary Series* Series No. 41: 1-72.
- Houston, T.F. (1981). A Revision of the Australian Hylaeine Bees (Hymenoptera : Colletidae) . II. *Australian Journal of Zoology Supplementary Series* 80.
- Houston, T.F. (1975). A Revision of the Australian Hylaeine Bees (Hymenoptera : Colletidae) I. Introductory material and the Genera *Heterapoides* Sandhouse, *Gephyrohylaeus* Michener, *Hyleoides* Smith, *Pharohylaeus* Michener, *Hemirhiza* Michener, *Amphylaeus* Michener and *Meroglossa* Smith. *Aust. J. Zool., Suppl. Ser.* 36: 1-135.
- Maynard, G.V. (2013). Revision of *Goniocolletes* and seven Australian subgenera of *Leioproctus* (Hymenoptera: Apoidea: Colletidae), and description of new taxa. *Zootaxa* 3715: 001–114.
- Michener, C.D. (1965). A classification of the bees of the Australian and South Pacific regions. *Bull. Am Mus. Nat Hist.* 130:1-362.
- Michener, C.D. (2007). *The bees of the world*. John Hopkins University Press.
- Walker, K.L. (1986). Revision of the Australian species of the genus *Homalictus* Cockerell (Hymenoptera: Halictidae). *Mem. Mus Victoria* 47:105-200.
- Walker, K.L. (1995). Revision of the Australian native bee subgenus *Lasioglossum* (*Chilalictus*) (Hymenoptera: Halictidae). *Mem. Mus. Victoria* 55:1-423.
- Watts, C.H.S. & Humphreys, W.F. (2006). Twenty-six new dytiscidae (Coleoptera) of the genera *Limbodessus* Guignot and *Nirripirti* Watts & Humphreys, from underground waters in Australia. *Transactions of the Royal Society of South Australia* 130(1): 123-185 [150-152].

Appendix 1. List of native bees recorded during the Tjiwarl Bush Blitz						
Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (WA)	Exotic/ pest
Apidae	Amegilla (Asaropoda) scoparia	teddy bear bee	no	no	no	no
Apidae	Amegilla (Notomegilla) chlorocyanea	blue banded bee	no	no	no	no
Apidae	Thyreus waroonensis	checkered bee	no	no	no	no
Colletidae	Callohesma sp.WJRL 45		no	no	no	no
Colletidae	Callohesma sp.WJRL 46		no	no	no	no
Colletidae	Callohesma sp.WJRL 47		no	no	no	no
Colletidae	Callohesma sp.WJRL 48		no	no	no	no
Colletidae	Euhesma n.sp.WJRL25		yes	no	no	no
Colletidae	Euhesma sp.WJRL 49		no	no	no	no
Colletidae	Euhesma sp.WJRL 50		no	no	no	no
Colletidae	Euhesma (Euhesma) newmanensis		no	no	no	no
Colletidae	Euhesma (Euhesma) pantoni		no	no	no	no
Colletidae	Euhesma (Euhesma) sybilae		no	no	no	no
Colletidae	Euhesma (Euhesma) symmetra		no	no	no	no
Colletidae	Euriglossine sp.WJRL 44		no	no	no	no
Colletidae	Euryglossina (Euryglossina) atra		no	no	no	no
Colletidae	Hylaeus (Euprosopis) elegans		no	no	no	no
Colletidae	Hylaeus (Hylaeteron) n.sp.WJRL 60 cf. riekianus		yes	no	no	no
Colletidae	Hylaeus (Hylaeteron) n.sp.WJRL 61 cf. riekianus		yes	no	no	no
Colletidae	Hylaeus (Hylaeteron) semirufus		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 57		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 59		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 61		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 63		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 64		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 65		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 66		no	no	no	no
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 67		no	no	no	no

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (WA)	Exotic/ pest
Colletidae	Hylaeus (Prosopisteron) sp.WJRL 69		no	no	no	no
Colletidae	Hylaeus (Pseudhylaeus) sp.WJRL 51		no	no	no	no
Colletidae	Hylaeus (Pseudhylaeus) sp.WJRL 52		no	no	no	no
Colletidae	Hylaeus (Pseudhylaeus) sp.WJRL 53		no	no	no	no
Colletidae	Hylaeus (Pseudhylaeus) sp.WJRL 58		no	no	no	no
Colletidae	Hylaeus (Pseudhylaeus) sp.WJRL 68		no	no	no	no
Colletidae	Hylaeus (Rhodohylaeus) sp.WJRL 54		no	no	no	no
Colletidae	Hylaeus (Rhodohylaeus) sp.WJRL 55		no	no	no	no
Colletidae	Hylaeus (Rhodohylaeus) sp.WJRL 56		no	no	no	no
Colletidae	Leioproctus n.sp.WJRL27		yes	no	no	no
Colletidae	Leioproctus sp. WJRL 16		no	no	no	no
Colletidae	Leioproctus sp. WJRL 17		no	no	no	no
Colletidae	Leioproctus sp. WJRL 18		no	no	no	no
Colletidae	Leioproctus sp. WJRL 19		no	no	no	no
Colletidae	Leioproctus sp. WJRL 20		no	no	no	no
Colletidae	Leioproctus sp. WJRL 21		no	no	no	no
Colletidae	Leioproctus sp. WJRL 22		no	no	no	no
Colletidae	Leioproctus sp. WJRL 23		no	no	no	no
Colletidae	Leioproctus sp. WJRL 24		no	no	no	no
Colletidae	Leioproctus sp. WJRL 26		no	no	no	no
Colletidae	Leioproctus sp. WJRL 28		no	no	no	no
Colletidae	Leioproctus (Colletelus) altispinosus		no	no	no	no
Colletidae	Leioproctus (unplaced) n.sp. cf.sexmacularus		yes	no	no	no
Colletidae	Neopasiphae mirabilis		no	no	no	no
Colletidae	Trichocolletes sp.WJRL 15		no	no	no	no
Colletidae	Euhesma newmanensis		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) pachycephalum		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) platytilum		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 31		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 32		no	no	no	no

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (WA)	Exotic/ pest
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 33		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 34		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 35		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 36		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 37		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 38		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 39		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 40		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 41		no	no	no	no
Halictidae	Lasioglossum (Chilalictus) sp.WJRL 42		no	no	no	no
Halictidae	Lasioglossum (Homalictus) sp.WJRL 43		no	no	no	no
Halictidae	Lipotriches (Austronomia) sp.WJRL 29 flavoviridis group		no	no	no	no
Halictidae	Lipotriches (Austronomia) sp.WJRL 30 flavoviridis group		no	no	no	no
Megachilidae	Megachile sp.WJRL 06		no	no	no	no
Megachilidae	Megachile sp.WJRL 09		no	no	no	no
Megachilidae	Megachile sp.WJRL 10		no	no	no	no
Megachilidae	Megachile sp.WJRL 11		no	no	no	no
Megachilidae	Megachile sp.WJRL 12		no	no	no	no
Megachilidae	Megachile sp.WJRL 13		no	no	no	no
Megachilidae	Megachile sp.WJRL 14		no	no	no	no
Megachilidae	Megachile (Austrochile) n.sp. ACD1291		yes	no	no	no
Megachilidae	Megachile (Austrochile) n.sp. AEC1404		yes	no	no	no
Megachilidae	Megachile (Austrochile) n.sp. AEC2785		yes	no	no	no
Megachilidae	Megachile (Austrochile) n.sp. AEC5850		yes	no	no	no
Megachilidae	Megachile (Coorooa) aurifrons		no	no	no	no
Megachilidae	Megachile (Eutricharaea) sp.WJRL 01		no	no	no	no
Megachilidae	Megachile (Eutricharaea) sp.WJRL 02		no	no	no	no
Megachilidae	Megachile (Eutricharaea) sp.WJRL 03		no	no	no	no
Megachilidae	Megachile (Notomegachile) semiluctuosa		no	no	no	no
Megachilidae	Megachile (Spinitala) rieki n.sp. unpublished		yes	no	no	no

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (WA)	Exotic/ pest
Megachilidae	Megachile (Thaumatosa) remeata		no	no	no	no
Stenotritidae	Ctenocolletes centralis		no	no	no	no
Appendix 1. List of jewel beetles recorded during the Tjiwarl Bush Blitz						
Buprestidae	Castiarina browningi	jewel beetle	no	no	no	no
Buprestidae	Castiarina lepida	jewel beetle	no	no	no	no
Buprestidae	Castiarina sp.	jewel beetle	no	no	no	no
Appendix 1. List of stygofauna recorded during the Tjiwarl Bush Blitz						
Paramelitidae	undescribed genus and species RL2877		yes	no	no	no
Chiltoniidae	undescribed genus and species RL2887		yes	no	no	no
Bathynellidae	undescribed genus and species RL2889		yes	no	no	no
Dytiscidae	Limbodessus mirandae		no	no	no	no