Bee Aware of Your Native Bees

A Community Based Project

The Bee Hotel ID Guide

A guide to help identify Australian native bees associated with artificial nest substrate, within Greater Western Sydney and Lithgow area

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University of Western Sydney

NSW GOVERNMENT

NSW Environmental TRUST

About the Bee Aware Project

Bee Aware of Your Native Bees is funded by the NSW Government Environmental Trust. Bee Aware is a experiential learning, environmental education program based across Greater Western Sydney (GWS) and Lithgow.

Project Objectives and Activities:

- To educate the community about the existence of native bee species and their importance in the environment.
- To promote the conservation of native bees through habitat preservation and installation.
- To prepare a Bee Aware of Your Native Bees resource pack. This includes the provision of artificial nesting substrate, in the form of a native bee 'hotel' (Fig. 1), and an ID Guide booklet to help in the identification and monitoring of bees at the site.
- To help community members develop the necessary skills to identify indigenous species in each local government area (LGA) and assess their diversity, distribution and habitat preference.
- To build information, through education and citizen science, and to communicate this information through social media.

Why is This Project Important?

Worldwide, bees are under threat. This is because, as we urbanise our environments:

- we remove the natural habitat of our native bees;
- we create ‘flowerless landscapes’ when we substitute concrete and grass for flowering trees and shrubs; and
- our agricultural practices, such as monoculture, remove the variety of floral resources that bees need for good health.

The future of our bees is looking bleak. By simply raising the awareness of the importance of bees in our ecosystem, we may have a chance of improving their future. We can also improve their future by:

- conserving their natural habitat;
- providing additional habitat;
- planting bee-attracting plants; and
- reducing or ceasing the use of pesticides.

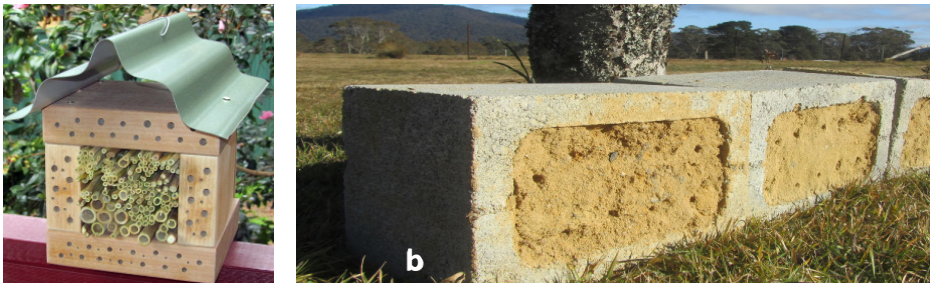

Figure 1) Artificial nesting substrate a) Drilled hardwood blocks with bamboo and lantana fill and b) rammed earth blocks (Photo Bees Business)

All organisms are driven to reproduce and because plants are not mobile, they require animal vectors to aid this process. Through pollination, ovules are fertilised and seeds develop. Almost 90% of flowering plants rely on animals for pollination. Pollination is the driving force behind plant reproduction. This, in turn, enhances biodiversity which promotes ecological stability.

The most effective animal pollinators are bees. The honey bee (*Apis mellifera*) is the most researched and understood bee in history; however, in Australia the honey bee is an introduced species. Australia is home to over 1,600 species of native bee. Although most of these bees are semi-social or solitary and do not produce honey, they play an integral part in providing pollination services to exotic and native plants, including food crops (Fig. 2).

Over the last 100 million years, bees have evolved alongside flowering plants and, as such, both organisms have adapted so as to maximise the benefits. Bees are experts at gathering and transporting pollen and nectar to their nests, to rear their offspring, and the flowers provide these food 'rewards' to facilitate their own reproduction. The economic benefits provided by bees are also substantial and effective pollination can improve fruit yield and quality, as well as increasing seed set and germination quality.

Figure 2) Blue banded bee pollinating tomato flower (Photo Aussie Bee)

Solitary Bee Life Cycle

Solitary bees do not make honey and live their lives independent of other bees (Fig. 3). Once a female has mated, she must find a safe place to produce her brood. She then finds a suitable nest site and flies out to find food; foraging on flowers for nectar (carbohydrate) and pollen (protein). She swallows the nectar and stores it in her crop and packs the dry pollen grains into her scopa. On returning to her nest, she 'unpacks' the pollen and regurgitates the nectar, combining it into 'bee bread'. She then lays an egg on top of these provisions, seals up the brood cell and leaves the egg to develop alone. She then starts the process all over again. As she collects her precious cargo of pollen and nectar she pollinates many of the flowers along the way. Solitary bees are capable of stinging, but as they have no brood mass, food stores or a queen to protect they are not aggressive.

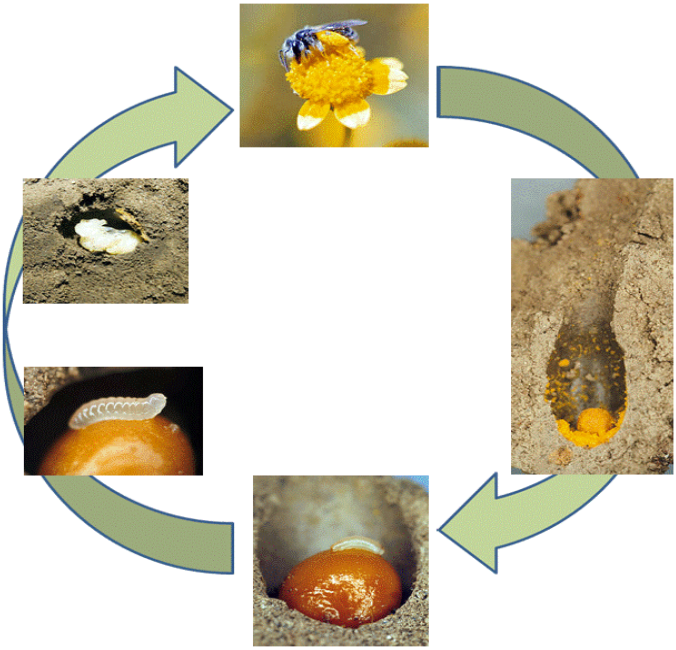

Figure 3) Lifecycle of a solitary bee (Photo D. Briggs, R. Thorp)

This booklet is not an extensive guide. It will help users identify some of the bee species known to inhabit pre-existing cavities, such as those within artificial habitat (Fig. 1). It also gives information on ways to broaden the user's knowledge in the area of bee identification, of all types, including those not featured in this guide.

Bee classifications – Kindgom: Animalia, Phylum: Arthropoda. Class: Insecta, Order: Hymenoptera, then Family, *Genus, Subgenus, species.*

PaDIL has an extensive collection of pinned specimen images which help identify morphological characteristics needed to identify the genus and species (Fig. 4). Visit www.padil.gov.au

Australian Living Atlas (ALA) has links to live bee images and maps of recorded specimen collection. Visit www.ala.org.au

Native bee group has useful photos for comparing live bee images. Visit www. australiannativebees.com

Figure 4) PaDIL webpage showing species morphology

The observation sheets provided at the back of this guide are for recording species data. This information will be used to help understand the diversity and distribution of our native bees. This is only possible with the support of the citizen scientists within our community.

Glossary of Terms and Morphological Structures

Abdomen	Hind body segment
Anterior	Before or in front of
Apex (apical)	Tip
Basitarus	First of the five tarsal segments
Brood	Developing young, offspring
Clypeus	Face, between the eyes and above the mouth parts
Distal margin	Edge furthest from the centre
Highly social	Colony containing a laying queen and sterile workers
Integument	Cuticle that forms the outer skeleton of the bees
Lateral margin	Along the outside edge
Mandibles	Jaws
Metanotum	Shoulders
Metasoma	Hind body segments. It consists of segments called terga and sterna
Morphology structure	Body shape and structure
Scopa (pl. scopae)	Modified hair structures used to transport pollen. Some species have stiff hairs others have plumose hairs. Abdominal scopa, found on the underside (ventral) of the abdomen. Tibial scopa, found on the hind leg.
Semi-social	Small colony that cooperatively supports brood production but is not entirely dependent on any particular member
Solitary	Fertile female that lives and completes her life cycle alone
Tarsus (pl. tarsi)	Foot, consisting of the last five segments of each leg.
Thorax	Middle body section, chest
Tibia	Middle of the larger sections of the leg

When trying to identify different species, it is important to know what features to compare. Many bees can be differentiated by facial markings, hair colour and hair patterns. One important area to look is the metasoma. For simplicity, the dorsal metasomal segments will be referred to as T (terga) and descriptions will refer to their anatomical placement, namely T1, T2 etc (Fig. 5). There is an equivalent number of ventral segments called sterna. Characteristics found on the face are also important in species identification (Fig. 6 & Fig. 7).

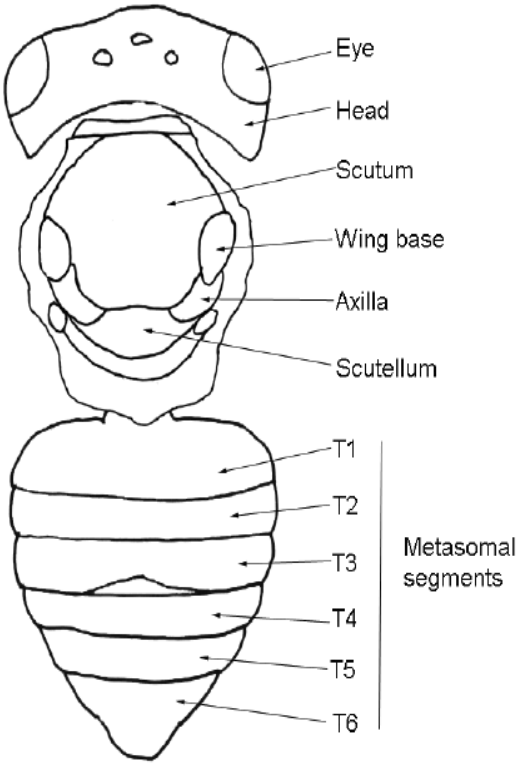

Figure 5) Bee body

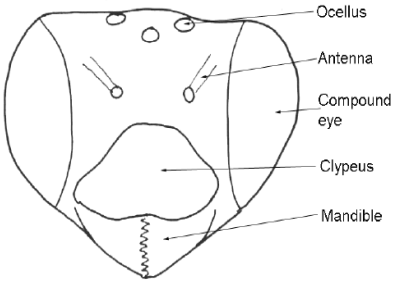

Figure 6) Bee face

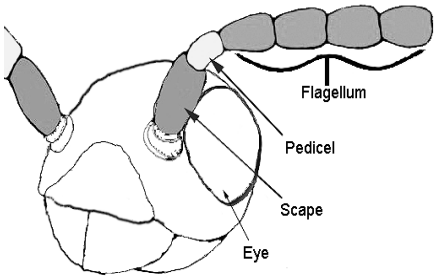

Figure 7) Flagellum (antennal) segments

Comparing Males and Females

When trying to identify males and females there are a few key differences. There are some exceptions to this but this is a good guide.

- Number of visible metasomal (T) segments: males have seven and females have six (Fig. 5)
- Number of antennal flagellum segments: males have eleven and females have ten (Fig. 7)
- Males genital capsule is sometimes visible (Fig. 8)
- Females have a stinging apparatus (Fig. 9)
- Abdominal or tibial scopa in females, except in hylaeine and euryglossine (Fig. 10)

Figure 8) Male genital capsule

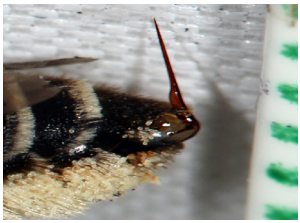

Figure 9) Female stinger

Depending on the species:

- Some male and female facial markings or hair colours and patterns may differ.
- Males may be observed foraging for nectar but don't carry pollen loads.
- Males also fly fast around flowers, pausing to inspect the blossom without landing. The behaviour is quite characteristic.
- Most males don't usually return to the nest, so most of the specimens observed at the nests will be female.
- Males often congregate at dusk in 'aggregations'. They may roost on small twigs or hang amongst leaves.

Figure 10) Different scopa types a) tibial scopa, without pollen, b) tibial scopa, with pollen, c) abdominal scopa, with pollen (Photos E. Siegel)

Different Types of Natives Bees

There are over 350 species of native bee recorded in the GWS and Lithgow areas. These species can be broken down into four main family groups, all of which have different features.

Megachilidae: make up 10% of Australian species. Species include the introduced African Carder Bee, Leafcutter Bees and Resin Bees. A number of these bees are likely to inhabit artificial habitats.

A Resin bee, *Megachile punctata* species (Photo Aussie Bee)

Apidae: make up 10% of Australian species. Species include Stingless Honey Bees (social), Carpenter Bees, Reed Bees, Cuckoo Bees and Blue Banded Bees. A number of these bees are likely to inhabit artificial habitats.

A Reed bee, *Exoneurella lawsoni* species (Photo M. Newman)

Colletidae: make up 50% of Australian species. Species include *Leioproctus* and hylaeine (masked) bees. A number of these bees are likely to inhabit artificial habitats.

A Masked bee, *Hyledoides concinna* species (Photo M. Newman)

Halictidae: make up 20% of Australian species. Species include *Homalictus, Lasioglossum* and *Nomia*. These bees are ground dwelling and are highly unlikely to inhabit artificial habitats.

A Halictidae bee, *Homalictus punctatus* species

Section 1: Megachilidae Family

Genus: *Megachile*

Megachilids are solitary, sometimes nesting in aggregations. There are three species of Leafcutter Bee recorded in the GWS and Lithgow area. The female usually has a flattened, leaf-shaped abdomen (Fig. 11) and alights on flower with her wings spread (Fig. 18). Females usually nest in pre-existing cavities such as old wood-borer holes, rock crevices or dried plant stems. The female cuts discs of plant leaf (Fig. 12), and weaves them together to construct her brood cells (Fig 13 and Fig 14).

Figure 11) Female Leafcutter Bee, *M. serricauda*, showing her flattened leaf-shaped abdomen (Photo Bees Business).

Figure 12) Leafcutter Bee cutting a section of leaf (Photo E. Siegel)

Common morphological characteristics: Leafcutter Bees have long tongues for feeding on deep flowers but will feed on shallow flowers as well. Their large jaws are used to cut and collect plant leaves. The female has an abdominal scopa and alight on flowers with open or spread wings. The hairs on clypeus are usually long and may be coloured. The female abdomen ends in blunt point, while the males' abdomen is rounded and curled under. The integument is black unless otherwise stated. Males may or may not have expanded forelegs.

Figure 13) Leafcutter Bee nest constructed from discs of leaf (Photo Bees Business)

Figure 14) Leafcutter Bee nest in bamboo (Photo Aussie Bee)

Fig. 15

Fig. 16

Species

Megachile maculariformis (formerly confused with *M. chrysopyga*)

Size (length)

- Female: 12mm
- Male: 10mm

Distinguishing features:

Light orange hairs cover T5 and fringe distal margin of T4. Four white hair patches on dorsal surface of thorax.

Female colouring and features:

- Facial hair: orange, thick
- Scopa: white

Male colouring and features:

- Facial hair: orange, thick
- Forelegs: modified

Figure 15) Male *M. maculariformis* showing modified forelegs (Photo T. Latty & J. Makinson)

Figure 16) Female *M. maculariformis* (Photo M. Batley)

Fig. 17

Fig. 18

Species

Megachile macularis

Size (length)

- Female: 11mm
- Male: 11mm

Distinguishing features:

T6 with dense white hair. T2, T3, T4 and T5 with complete, relatively broad, white hair bands. Six white hair patches on dorsal surface of thorax.

Female colouring and features:

- Facial hair: white
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: modified

Figure 17) Female *M. macularis* (Photo M. Batley)

Figure 18) Male *M. macularis* foraging on a flower (Photo L. Sanders).

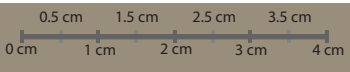

Fig. 19

Fig. 20

Species

Megachile serricauda

Size (length)

- Female: 9mm
- Male: 9mm

Distinguishing features:

White hair fringe lateral margins of T1 and distal margins of T2, T3, T4 and T5. Thin line of white hair along lower edge of the dorsal surface of the thorax.

Female colouring and features:

- Facial hair: white, thick
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: modified

Figure 19) Male *M. serricauda* showing modified leg (Photo T. Latty & J. Makinson)

Figure 20) Female *M. serricauda* (Photo M. Batley)

Overview - Resin Bees

Genus: *Megachile*

Megachilids are solitary, sometimes nesting in aggregations. There are 23 species of Resin Bee recorded in the GWS and Lithgow area. The female usually has long, cylindrical abdomen (Fig. 21). Females usually nest in pre-existing cavities such as old wood-borer holes or dried plant stems. The female uses resin (Fig. 22) and chewed leaf (Fig. 23) to construct her brood cells (Fig. 24) and sometimes incorporates pebbles.

Figure 21) Female Resin bee, *M. aurifrons* (Photo Bees Business)

Figure 22) Resin bee collecting resin (Photo Aussie Bee)

Common morphological characteristics: Resin Bees have long tongues and will feed on deep or shallow flowers but favour foraging on pea flowers (Fig. 47). Their large jaws are used to cut and collect plant resins and leaves. The female has an abdominal scopa and may have protruding structures on the clypeus. The hairs on clypeus are usually long and may be coloured. The female abdomen ends in blunt point, while the males' abdomen is rounded and curled under. The integument is black unless otherwise stated. Males may or may not have expanded forelegs.

Figure 23) *M. aurifrons* sealing the nest entrance with chewed leaf (Photo L. Sanders)

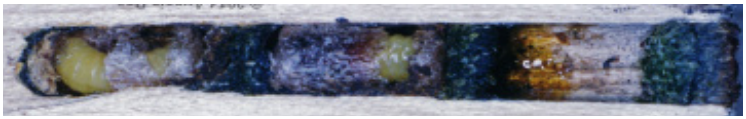

Figure 24) Resin bee nest in bamboo (Photo Aussie Bee)

Fig. 25

Figure 25) Female *M. apicata* (Photo M. Batley)

Species: *Megachile apicata*

Size (length): Female: 7mm. Male: 6mm

Distinguishing features:
Orange hairs cover T5 and T6. White fringes on distal margins of T1, T2, T3 and T4. Four patches of white hair on scutum.

Female colouring and features:
- Facial hair: white, thick
- Scopa: white

Male colouring and features:
- Facial hair: white, sparse
- Forelegs: modified

Fig. 26

Figure 26) Female *M. canifrons* (Photo M. Batley)

Species: *Megachile canifrons*

Size (length): Female: 12mm. Male: 9mm

Distinguishing features:
Large circular patch of bright orange hair on T5 and T6. Incomplete white fringes on T1, T2 and T3. Sides of thorax with noticeable long, white hair.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: not modified


Fig. 26


Fig. 27


Fig. 28

Species

Megachile aurifrons

Size (length)

- Female: 12mm
- Male: 10mm

Distinguishing features:

Red eyes, large protrusion from clypeus. Thick white hairs on T1 and sides of thorax. Complete white hair bands on T1, T2 and T3. Close white hair on T6.

Female colouring and features:

- Facial hair: bright orange
- Scopa: white, abdominal

Male colouring and features:

- Facial hair: orange
- Forelegs: modified

Figure 26) *M. aurifrons* female, showing large protrusion from clypeus (Photo Bees Business)

Figure 27) *M. aurifrons* at nest entrance (Photo M. Newman)

Figure 28) Female *M. aurifrons* (Photo M. Batley)

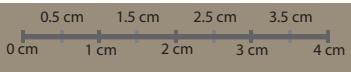

Fig. 29

Fig. 30

Species

Megachile erythropyga

Size (length)

- Female: 15mm
- Male: 11mm

Distinguishing features:

Round spot of bright orange hair on T6.

Female colouring and features:

- Facial hair: bright orange
- Scopa: orange

Male colouring and features:

- Facial hair: bright orange
- Forelegs: not modified

Figure 29) Female *M. erythropyga* (Photo M. Batley)

Figure 30) *M. erythropyga* female lateral (Photo T. Latty & J. Makinson)

Fig. 31

Fig. 32

Species

Megachile ferox

Size (length)

- Female: 12mm
- Male: 11mm

Distinguishing features:

Orange hairs cover T5 and T6. Complete white hair bands T2 and T3. Lateral white hair T1. Tip of flagellum flattened in male.

Female colouring and features:

- Facial hair: white, open to dense
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: modified, with two black dots

Figure 31) *M. ferox* female lateral (Photo T. Latty & J. Makinson)

Figure 32) Female *M. ferox* (Photo M. Batley)

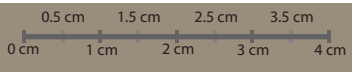

Fig. 33

Figure 33) Female *M. hackeri* (Photo M. Batley)

Species: *Megachile hackeri*

Size (length): Female: 8mm. Male: 6.5mm

Distinguishing features:
Pale orange hairs cover T5 and T6. Complete white hair bands on T2, T3 and T4. Lateral white hair on T1. Integument of T6 either black or orange. Two small white hair patches just behind scutum.

Female colouring and features:
- Facial hair: white, sparse
- Scopa: whie

Male colouring and features:
- Facial hair: white, thick
- Forelegs: not modified

Fig. 34

Figure 34) Female *M. heliophilia* (Photo M. Batley)

Species: *Megachile heliophilia*

Size (length): Female: 13mm. Male: 13mm

Distinguishing features:
Light orange hairs openly cover T5 and T6. Complete white hair bands on T2 and T3. Lateral white hair on T1.

Female colouring and features:
- Facial hair: white, sparse
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: modified with one large black spots

Fig. 35

Figure 35) Female *M. heriadiformis* (Photo M. Batley)

Species: *Megachile heriadiformis*

Size (length): Female: 9mm. Male: 7mm

Distinguishing features:
Orange hairs cover T5 and T6 and distal edge of T4. Incomplete white fringes laterally on T1, T2 and T3. Two white hair patches just behind scutum. Mandibles long and narrow.

Female colouring and features:

- Facial hair: white, two patches next to antennal base
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: not modified, but all tarsi brown

Fig. 36

Figure 36) Female *M. leucopyga* (Photo M. Batley)

Species: *Megachile leucopyga*

Size (length): Female: 9.5mm. Male: 9.5mm

Distinguishing features:
Round orange hair spot on T5 and T6. Short bars of orange hair located laterally on T2 and T3. Two white hair patches behind the scutum.

Female colouring and features:

- Facial hair: white
- Scopa: white

Male colouring and features:

- Facial hair: white
- Forelegs: modified, with one oval black spot; all legs orange-brown

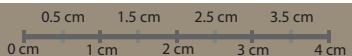

Fig. 37

Figure 37) Female *M. modesta* (Photo M. Batley)

Species: *Megachile modesta*

Size (length): Female: 11mm. Male: 11mm

Distinguishing features:
Gold hairs cover T5 and T6. Complete white fringes on T2, T3 and T4. Incomplete on T1. Two white hair patches behind the scutum.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: modified with one small black spot

Fig. 38

Figure 38) Female *M. semiluctuosa* (Photo M. Batley)

Species: *Megachile semiluctuosa*

Size (length): Female: 16mm. Male: 16mm

Distinguishing features:
Long white hairs densely cover T1 and openly cover T2. Complete white fringes on T1 and T2. Incomplete on T3. Under surface of clypeus exposed.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white, thick
- Forelegs: modified

Fig. 39

Fig. 40

Fig. 41

Species

Megachile lucidiventris

Size (length)

- Female: 16mm
- Male: 14mm

Distinguishing features:

Long white hairs cover T1. Anterior margin of T2. Sparse white hair on T6. Wings darkened

Female colouring and features:

- Facial hair: white, dense adjacent to eyes; open, long, black on clypeus
- Scopa: white

Male colouring and features:

- Facial hair: orange, thick
- Forelegs: modified, with one black spot

Figure 39) Male *M. lucidiventris* showing modified forelegs and thick orange facial hair (Photo Bees Business).

Figure 40) *M. lucidiventris* working her nest entrance (Photo L. Sanders)

Figure 41) Female *M. lucidiventris* (Photo M. Batley)

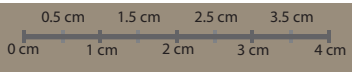

Fig. 42

Fig. 43

Species
Megachile mundifica

Size (length)

- Female: 10mm
- Male: 8mm

Distinguishing features:
Gold hairs entirely cover T5, T6, and apically cover T4. Complete white fringes T1, T2, T3 and T4.

Female colouring and features:

- Facial hair: white
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: modified, with large oval black spot

Figure 42) Female *M. mundifica* (Photo M. Batley)

Figure 43) *M. mundifica* male's modified foreleg (Photo M. Batley)

Fig. 44

Figure 44) Female *M. oblonga* (Photo M. Batley)

Species: *Megachile oblonga*

Size (length): Female: 9mm. Male: 8mm

Distinguishing features:
Central patch of bright orange hair on T5 and T6. Complete white fringes T2 and T3. Lateral white hair T1. Two white hair patches behind the scutum.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: not modified

Fig. 45

Figure 45) Female *M. ordinaria* (Photo M. Batley)

Species: *Megachile ordinaria*

Size (length): Female: 10mm. Male: 10mm

Distinguishing features:
Pale gold hairs cover T5 and T6. Complete white fringes on T2, T3 and T4. Lateral white hair on T1. Two white hair patches behind the scutum.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: modified, with one large black spot

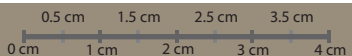

Fig. 46

Fig. 47

Fig. 48

Species

Megachile punctata

Size (length)

- Female: 13mm
- Male: 13mm

Distinguishing features:

White hairs openly cover T6. Sides and rear of thorax with dense white hair. Four small white hair patches just behind scutum. Wings darkened.

Female colouring and features:

- Facial hair: white
- Scopa: white, abdominal

Male colouring and features:

- Facial hair: bright orange
- Forelegs: not modified

Figure 46) Female *M. punctata* (Photo M. Batley)

Figure 47) *M. punctata* foraging on a Darling pea flower (Photo E. Siegel)

Figure 48) Female *M. punctata* sealing her nest entrance (Photo Aussie Bee)

Fig. 49

Fig. 50

Species

Megachile rhodura

Size (length)

- Female: 11mm
- Male: 11mm

Distinguishing features:

Pale gold hairs cover T5 and T6. Complete white fringes T2, T3 and T4. Lateral white hair T1. Two white hair patches behind the scutum.

Female colouring and features:

- Facial hair: white, sparse
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: not modified

Figure 49) *M. rhodura* male aggregation at night (Photo R. Luttrell).

Figure 50) Female *M. rhodura* (Photo M. Batley)

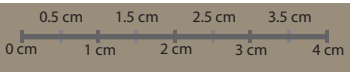

Fig. 51

Figure 51) Female *M. tasmanica* (Photo M. Batley)

Species: *Megachile tasmanica*

Size (length): Female: 8.5mm. Male: 8.5mm

Distinguishing features:
Pale gold hairs sparsely cover T5 and T6. Complete white fringes on T2, T3 and T4. Lateral white hair on T1. Two white hair patches behind the scutum.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white
- Forelegs: modified with one large black spot

Fig. 52

Figure 52) Female *M. tosticauda* (Photo M. Batley)

Species: *Megachile tosticauda*

Size (length): Female: 8mm. Male: 6.5mm

Distinguishing features:
Dense orange hair covers T5 and T6. Complete white fringes T2 and T3. Incomplete on T1. Two white hair patches behind the scutum.

Female colouring and features:
- Facial hair: white
- Scopa: white

Male colouring and features:
- Facial hair: white, thick
- Forelegs: not modified, all legs largely orange-brown

Fig. 53

Species
Megachile ustulata

Size (length)
- Female: 17mm
- Male:

Distinguishing features:
Entire abdomen covered in orange hair. Hairs are longer than in *M. mystaceaca* (Fig. 56) and anterior part of T1 without black hair.

Female colouring and features:
- Facial hair: white
- Scopa: orange

Male colouring and features:
- Facial hair: unknown
- Forelegs: not modified

Figure 53) Female *M. ustulata* (Photo M. Batley)

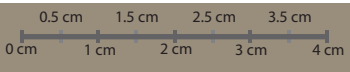

Fig. 54

This species has not been formally described but has been included here because it is an interesting and distinctive species, found in the GWS and Lithgow areas.

Species

Megachile (Austrochile) sp. (undescribed)

Size (length)

- Female: 10mm
- Male:

Distinguishing features:

Females with two pointed projections from clypeus. White hairs cover T6 and apical part T5. Complete white fringes on T2, T3 and T4. Incomplete on T1. Two white hair patches behind scutum.

Female colouring and features:

- Facial hair: white
- Scopa: white

Male colouring and features:

- Facial hair: white, thick
- Forelegs: Slightly expanded; apical half of all legs largely orange-brown

Figure 54) *Megachile (Austrochile)* sp. (undescribed) (Photo M. Batley)

Fig. 55

Fig. 56

Species

Megachile mystaceana

Size (length)

- Female: 15mm
- Male: 12mm

Distinguishing features:

Entire abdomen, except front edge of T1, is covered in a mat of thick orange hair.

Female colouring and features:

- Facial hair: white, sparse
- Scopa: orange

Male colouring and features:

- Facial hair: white, thick
- Forelegs: not modified

Figure 55) *M. mystaceana* closing her nest entrance with resin (Photo M. Berkery)

Figure 56) Female *M. mystaceana* (Photo M. Batley)

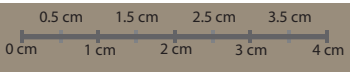

Fig. 57

Fig. 58

Species

Megachile deanii

Size (length)

- Female: 8mm
- Male: 8mm

Distinguishing features:

Entire abdomen integument is orange, with scant hair. Four white hair patches behind the scutum.

Female colouring and features:

- Facial hair: white
- Scopa: white

Male colouring and features:

- Facial hair: white
- Forelegs: not modified

Figure 57) Female *M. deanii* (Photo M. Batley)

Figure 58) *M. deanii* collecting resin for her nest (Photo R. Luttrell)

Megachilidae - African Carder Bee

The African Carder Bee is an **introduced species** and is well established in GWS. First recorded in 2006 in Brisbane, QLD, it has since migrated and spread down to the southern regions around Sydney, NSW.


Fig. 59


Fig. 60


Fig. 61

Species: *Afranthidium repetitum*

Size (length): Female: 7mm. Male: 7mm

Distinguishing features:
Females legs, basitarsal segments (above foot) are covered in thick, short, cream hairs. Distal margin of metasomal segments are white. Bands are part of exoskeleton, not hair bands like native megachilids.

Female colouring and features:

- Facial hair: white, dense
- Scopa: orange

Male colouring and features:

- Facial hair: white, thick with hairless cream coloured clypeus and jaw

Figure 59) Female *A. repetitum* (Photo University of Sydney)

Figure 60) Male *A. repetitum* (Photo University of Sydney)

Figure 61) *A. repetitum* female foraging (Photo E. Siegel)

Section 2: Apidae Family

Overview - Reed Bees

Subfamily: Xylocopinae. **Tribe:** Allodapini

Reed Bees are semi-social insects and live in small colonies within the cavities of dried plant stems. They rear their brood in a single brood chamber, progressively feeding the developing larvae. There may be several females and a small number of males within the colony at any one time. Reproductive females share the tasks of egg laying, brood rearing, nest guarding and foraging. One of the favoured nesting places for Reed Bees is the woody weed Lantana (Fig. 62). They will also nest in hollow stems and pre-drilled holes (Fig. 63). There are three genera of Allodapine bees, including two subgenera; *Braunsapis*, *Exoneura (Brevineura), Exoneura (Exoneura)* and *Exoneurella*.

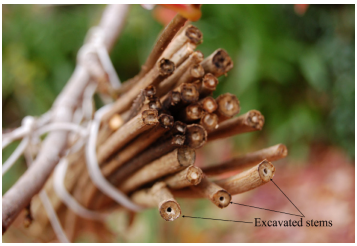

Figure 62) Reed bee nesting in Lantana stems (Photo Bees Business)

Figure 63) *Exoneura* entering her drilled hardwood nest (Photo Bees Business)

Common morphological characteristics: Allodapine bees have long tongues but will forage on deep or shallow flowers. They have a long, clypeus and weak jaws, which are used to chew out the centre of pithy stems, such as Lantana. They have slender bodies and short inconspicuous hairs, and the last three metasomal segments are flattened (Fig. 64) and are used to block the nest entrance against predators. The female has tibial scopae.

Figure 64) A Reed Bee, *Exoneura sp.*, showing the flattened metasomal segments (Photo R. Luttrell)

Fig. 65

Fig. 66

Genus
Branusapis

Common Species
Braunsapis unicolor

Size (length)

- Female: 7mm
- Male: 7mm

Distinguishing features:
Broad white markings on clypeus.

Colouring and features:
Black in colour.

Figure 65) Female *Branusapis* (Photo M. Batley)

Figure 66) *Branusapis* (Photo R. Luttrell)

Fig. 67

Fig. 68

Genus
Exoneura (Brevineura) and Exoneura (Exoneura)

Common Species
Exoneura nigrescens

Size (length)

- Female: 6.5mm
- Male:

Distinguishing features:
Abdomen red, often with dark suffusions. Female clypeus with "T-shaped" cream marking.

Colouring and features:
Black head and thorax with orange or brown abdomen. A few species are completely black.

Figure 67) Female *Exoneura*, possibly *E. nigrescens* (Photo Bee Business)

Figure 68) Female *Exoneura*, possibly *E. nigrescens* (Photo M. Batley)

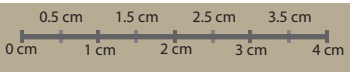

Fig. 69

Fig. 70

Genus
Exoneurella

Common Species
Exoneurella lawsoni

Size (length)

- Female: 5mm
- Male: 5mm

Distinguishing features:
Female clypeus with “T-shaped” cream marking.

Colouring and features:
Black in colour with red legs. Most species in this genus are black with pale markings on the abdomen, except *Exoneurella lawsoni.*

Figure 69) Female *E. lawsoni* (Photo M. Batley)

Figure 70) *E. lawsoni* foraging on a flower (Photo M. Newman)

Overview - Blue Banded Bees

Genus: *Amegilla*

Blue Banded Bees are ground-dwelling insects. They dig burrows into the banks of rivers and dams, and will also nest in soft mortar and mud bricks (Fig. 72). They prefer the company of others and nest in aggregations. Blue Banded Bees are important 'buzz' pollinators, sonicating (vibrating) the flower's anthers in order to release the pollen. Studies have shown that this bee has great potential as a valuable greenhouse tomato crop pollinator (Fig. 2). There are two species of Blue Banded Bees, including *Amegilla asserta* and *Amegilla pulchra*.

Figure 71) Blue Banded Bee showing different darker facial markings a) female *A. asserta,* b) male *A. asserta* (Photo Bees Business)

Common morphological characteristics: Like many bee species, the male and female face markings are quite different (Fig. 71). In the GWS and Lithgow areas, both species of Blue Banded Bee look very similar. There are small differences in the colour of the thoracic hair and face markings, as well as differences in the shape of the male face markings (Fig. 73 & Fig. 74).

Figure 72) Blue banded bee entering a rammed earth block (Photo Bees Business)

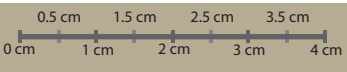


Fig. 73


Fig. 74

Genus
Amegilla

Common Species
Amegilla asserta and *Amegilla pulchra*

Size (length)
- Female: 15mm
- Male: 15mm

Distinguishing features:
Black integument with thick reddish-brown hair covering the head and thorax. Bright blue, thick hairs along the distal edge of T1, T2, T3 and T4 in females and T1, T2, T3, T4 and T5 in males.

Female colouring and features:
- Facial hair: yellow with black markings on clypeus

Male colouring and features:
- Facial hair: yellow

Figure 73) *A. pulchra* male, showing dark markings on the face (Photo M. Berkery)

Figure 74) *A. asserta* male, showing mostly yellow colouring of the face (Photo M. Berkery)

Overview - Cuckoo Bees

Genus: *Thyreus*

Little is known about our Australian Cuckoo Bees. Like the Cuckoo Bird, the Cuckoo Bee is a parasitic animal, called cleptoparasites. In the genus *Thyreus*, these bees parasitise nests of *Amegilla* Bees (Blue Banded Bees and Teddy Bear Bees). The adult female lays her eggs in the nest of other bees (host), thus the female does not need to collect pollen and has no scopa. The Cuckoo Bee larvae may either; consume all of the host larva's food provisions, kill and eat the host larva, or both.

Figure 75) *T. caeruleopunctatus* (Photo R. Luttrell)

Figure 76) *T. lugubris* (Photo M. Berkery)

Common morphological characteristics: The Cuckoo Bee is covered in thick black hairs, with striking blue or white markings. They have thick hard exoskeletons to help protect them against attack from the adult host bees.

Figure 77) *T. nitidulus* (Photo L. Sanders)

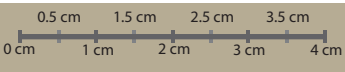

Fig. 78

Figure 78) Light-blue circular hair patterns of *T. caeruleopunctatus* male (Photo M. Batley)

Species: *Thyreus caeruleopunctatus*

Size (length): Female: 11mm. Male:

Distinguishing features:
Four light-blue, circular hair patterns on T1, T2, T3 and T4. T5 with two hair patterns. Two distinct blue hair patches on distal edge of scutum.

Female features:

- Female has no scopal hairs

Fig. 79

Figure 79) Blue hair patterns of *T. lugubris* female (Photo M. Batley)

Species: *Thyreus lugubris*

Size (length): Female: 15mm. Male: 12mm

Distinguishing features:
Four white, circular hair patterns on T1, T2 and T3 (smaller than *T. caeruleopunctatus*). Two white hair patterns on T4 and T5.

Female features:

- Female has no scopal hairs

Fig. 80

Figure 80) Blue hair patterns of *T. nitidulus* (Photo M. Batley)

Species: *Thyreus nitidulus*

Size (length): Female: 10mm. Male: 10mm

Distinguishing features:
Incomplete 'neon'-blue hair covering located laterally on T1, T2, T3, T4 and T5. Female has no scopal hairs.

Female features:

- Female has no scopal hairs

Section 3: Colletidae Family

Overview - Masked Bees

Group: Hylaeine Bees
Genus: *Hyleoides, Hylaeus* and *Amphylaeus*

There are 70 species of hylaeine bees recorded in the GWS and Lithgow area. They secrete a cellophane-like substance from the head or abdominal glands, to encase the developing offspring, which is applied with their tongue. The cellophane sets like a film and acts as a barrier against moisture, fungi and bacteria. The preferred habitat is unknown. Most hylaeine bees nest in ground burrows but some nest in grass tree spikes, tree fern fronds, bamboo, *Tristania* stems and other hollow stems. There is a small number that have been reported to use artificial nesting substrate (Fig. 81).

Figure 81) Male *Hylaeus euxanthus* (Photo L. Sanders)

Figure 82) Male *Hylaeus nubilosus* (Photo R. Luttrell)

Common morphological characteristics: Masked bees are mostly black in colour and have bright markings on their face and thorax (Fig. 82 & Fig. 83), which can help identify species. Hylaeine bees have little hair and don't have a scopa for carrying pollen. Instead, they swallow the pollen and nectar they need to transport to their nest. This is then regurgitated to make up the food provisions, which are quite liquid in consistency, for the developing larvae. They have short tongues and prefer to forage on shallow flowers.

Figure 83) Female wasp-mimic bee, *Hyleoides concinna* (Photo M. Newman)

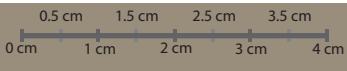

Fig. 84

Fig. 85

Fig. 86

Species

Hyleoides concinna

Size (length)

- Female: 14mm
- Male: 11mm

Distinguishing features:

The wasp-mimic bee colouration and wing shape make it look like a wasp. Body covered with very little hair. Distal edge of T1 cover with orange hairs, as well as T3, T4, T5 and T6. Shading on wings, appearing as though they are folded away.

Female colouring and features:

- Facial: medial clypeus orange

Male colouring and features:

- Facial: yellow clypeus

Figure 84) Female *H. concinna* (Photo M. Batley)

Figure 85) *H. concinna* female facial markings (Photo M. Batley)

Figure 86) *H. concinna* male facial markings (Photo M. Batley)

Fig. 87

Fig. 88

Fig. 89

Species

Amphylaeus morosus

Size (length)

- Female: 12mm
- Male:

Distinguishing features:

Black in colour with a yellow scutellum and metanotum. Yellow spot in front of wings.

Female colouring and features:

- Facial: yellow clypeus and between antennae

Male colouring and features:

- Facial: cream, entire face expect the 'forehead'
- Legs: cream markings

Figure 87) *A. morosus* female facial markings (Photo M. Batley)

Figure 88) *A. morosus* male facial markings (Photo M. Batley)

Figure 89) Female *A. morosus* (Photo M. Batley)

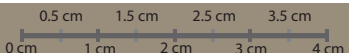

Fig. 90

Fig. 91

Fig. 92

Species

Hylaeus alcyoneus

Size (length)

- Female: 15mm
- Male: 15mm

Distinguishing features:

Head and thorax black. Abdomen metallic dark blue. Yellow spot in front of wings.

Female colouring and features:

- Facial: yellow, lateral margin of paraocular area. Medial line on clypeus yellow

Male colouring and features:

- Facial: yellow, paraocular area and clypeus

Figure 90) Female *H. alcyoneus* (Photo M. Batley)

Figure 91) *H. alcyoneus* female facial markings (Photo M. Batley)

Figure 92) *H. alcyoneus* male facial markings (Photo M. Batley)

Fig. 93

Fig. 94

Fig. 95

Species

Hylaeus euxanthus

Size (length)

- Female: 4.5mm
- Male: 4.5mm

Distinguishing features:

Black with yellow metanotum.

Female colouring and features:

- Facial: yellow, paraocular area

Male colouring and features:

- Facial: yellow, entire face and antennal scape
- Legs: yellow

Figure 93) *H. euxanthus* female facial markings (Photo M. Batley)

Figure 94) *H. euxanthus* male facial markings (Photo M. Batley)

Figure 95) Female *H. euxanthus* (Photo M. Batley)

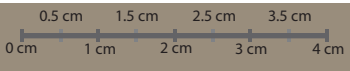

Fig. 96

Fig. 97

Fig. 98

Species

Hylaeus honestus

Size (length)

- Female: 6mm
- Male: 6mm

Distinguishing features:

Black. Medial scutellum and metanotum yellow. Yellow spot in front of wings.

Female colouring and features:

- Facial: yellow, paraocular area

Male colouring and features:

- Facial: yellow, entire face below antennael

Figure 96) Female *H. honestus* (Photo M. Batley)

Figure 97) *H. honestus* female facial markings (Photo M. Batley)

Figure 98) *H. honestus* male facial markings (Photo M. Batley)

Fig. 99

Fig. 100

Fig. 101

Species

Hylaeus nubilosus

Size (length)

- Female: 12mm
- Male: 12mm

Distinguishing features:

Black with yellow spot in front of wings.

Female colouring and features:

- Facial: cream, lateral margin of paraocular area. Yellow, scutellum and metanotum

Male colouring and features:

- Facial: cream, entire paraocular area and clypeus. Some yellow on antennal scape. Yellow metanotum

Figure 99) *H. nubilosus* female facial markings (Photo M. Batley)

Figure 100) *H. nubilosus* male facial markings (Photo M. Batley)

Figure 101) Female *H. nubilosus* (Photo M. Batley)

Artificial nests will attract other insects (Fig. 104). Solitary wasps, such as the Solitary Potter Wasp, have no brood mass, food stores or queen to protect, so they are not aggressive (Fig. 102). Wasps are a beneficial insect and help to control pests such as caterpillars, aphids, cockroaches and root eating beetle larvae.

Figure 102) Solitary Potter Wasp entering her artificial nest (Photo Bee Business)

The *Gastruption* wasp (Fig. 103) is an enemy of the solitary bees and will frequent areas inhabited by them. This wasp has a specially adapted ovipositor (egg laying structure) that is long enough to reach into the long burrows. The female lays her eggs in the nests of bees and other wasps, parasitising the host larvae.

Figure 103) *Gastruption* Wasp resting near nesting site, taking note of the long ovipositor (Photo Bee Business)

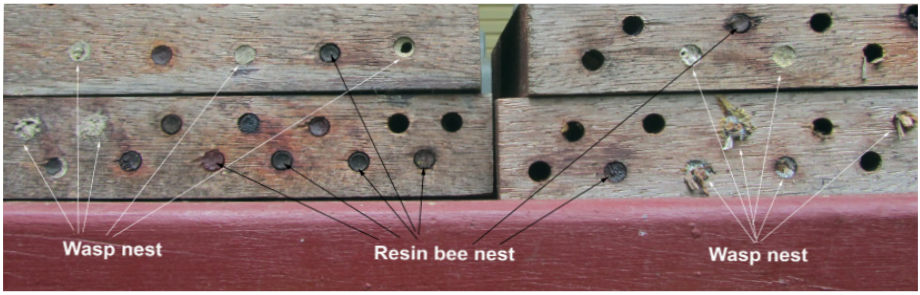

Figure 104) Drilled hardwood blocks showing different nests of various insects (Photo Bee Business)

Further Readings

Aussie Bee Bulletin of the Australian Native Bee Research Centre series, available online at www.aussiebee.com.au

Michener C.D. (2007) The Bees of the World. Johns Hopkins University Press, Baltimore, USA

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- Tanya Latty and James Makinson, The University of Sydney

Australian museum
RESEARCH INSTITUTE

Observation Sheet Information

The observation sheets provided are for recording species data. This information will be used to help understand the diversity and distribution of our native bees.

Collecting the right information

When filling out the data sheet, please enter all of the data fields and follow the information below, using BLUE or BLACK pen.

- Site name (including address and nearest cross street)
- Date and time of your data recording
- Weather conditions (options): *hot, windy, overcast, warm, calm, sunny, cool, cold, other*
- Temperature, if known
- Location of sighting (options): *nest, flowers, other*
- Number of bees observed (total)
- Behaviours (options): *enter/leave artificial nest, enter/leave ground nest, enter/leave natural hollow, guard/rest in nest, sealing nest, emerging (nest debris found), other*
- Possible genus or species, noting any morphological characteristics (page guide)
- Other comments, if any
- Name of observer

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