



15 December 2017 Ken Walker (kwalker@museum.vic.gov.au) Museums Victoria. Edition 55.

Hi All – In edition 53 of the Bugle I mentioned that I was part of a team putting together a document to be presented to government to request a significant increase in funding for taxonomy over the next decade. This document is called the “Taxonomy Decadal Plan”. In a nutshell, it’s a chicken and egg problem. We want more students to take undergraduate entomology courses and then follow through to post graduate studies such as Masters or PhDs and then possibly to do PostDoc studies. The problem is that for most student who do these studies find at the end there is no job for them so consequently fewer students are embarking on such studies.

The first draft of the Taxonomy Decadal Plan will be released soon. We have recently written the introduction which portrays some of the activities that we want to be possible by 2028. I thought I would share with you these opening scenarios. Is this where you would like to see taxonomy going?

“The year is 2028

The year is 2028. A high school class is combing the shoreline of a tidal inlet near their school, part of a biodiversity learning module developed by a nearby museum and university. The

students are documenting recovery of the estuary following streamside revegetation programs in the upper catchment. Some collect water and sediment samples while others sample seaweeds and benthic fauna from an inshore reef. Any living creatures are carefully photographed and returned, then the photographs uploaded to a project app.

By the time they get back to school, many of the photographed species have been identified by a deep-learning AI (artificial intelligence) bot. The students genome-sequence their water and sediment samples using the school's new automated eDNA sequencer, and identify their seaweeds using a local field guide app and online resources. Within a few hours, they have compiled a complete listing of all organisms sampled that morning. The good news is that phylogenetic diversity in the estuary is steadily increasing. One of the eDNA records though has been flagged by the national biosecurity agency as matching a serious invasive mussel. The students resolve to head back out next week to try to confirm this.

The year is 2028. A researcher at a major biomimetics (that means - relating to or denoting synthetic methods which mimic biochemical processes) start-up in a high-technology hub is trying to solve a problem involving the best strategy for autonomous bomb-detecting robots to crawl through confined spaces. The researcher trawls a database of organisms with unusual morphologies, looking for ones that best match the design requirements. She finds a good target – a cave-dwelling arachnid described just that year by taxonomists documenting subterranean faunas in prospective mining tenements.

Contacting the relevant expert taxonomists via a clearing-house for taxonomic enquiries, she learns that the species is a member of a new family of arachnids, and that several related

species have not yet been formally named. After negotiating a collaborative benefit-sharing arrangement for her research, she receives high-resolution CT-scans of specimens in the taxonomists' collection. Immediately recognising a potential solution to her problem, she starts to work designing a robotic replica of one of the cave-dwelling arachnids.

The year is 2028. A quarantine officer inspecting a shipment of horticultural propagation material from an overseas port finds a small infestation of thrips. Running them through a bench-top DNA sequencer shows that they belong to a family that includes several serious pests of grape vines. The DNA sequence also shows that the insects carry several viruses and other pathogens. However, the analysis is unable to identify the thrips to species. Checking an online identification key to genera in the family, the officer matches the specimens to one genus, which occurs both within and outside Australia. Comparison with online images of all known Australian species indicates that the thrips are not native. The shipment is quarantined for extra fumigation, then allowed to proceed.

The year is 2028. A new class of antibiotics has just been discovered in a rare family of deep-sea sponges, recently described from specimens collected thirty years previously. The antibiotic is highly effective against all known multi-drug-resistant “superbug” bacteria, but also produces dangerous side-effects in patients. A careful analysis of all species in the family, along with closely related sponges, provides a breakthrough – a related compound combines the antibiotic effectiveness with a low side-effects profile. The discovery is timely, as the latest highly drug-resistant tuberculosis strain is beginning to spread rapidly.

The year is 2028. The number of species of organisms recognised in Australia and New Zealand has doubled in the past decade, with major increases in all groups of organisms particularly marine invertebrates, insects, fungi and bacteria. Australia and New Zealand are the only countries in the world to have achieved such a major increase, and the so-called “Australasian model” is being rolled out in other countries, particularly those that are biologically megadiverse. Analyses show that improved taxonomic documentation has had direct economic benefits, to industry, government, science and the community. Big-science biodiversity initiatives are having a real impact, by reducing uncertainty in biosecurity, opening opportunities in agriculture and industry, and significantly improving conservation efforts and international commitments to reduce the impacts of global change and extinction. A decadal plan for southern-hemisphere taxonomy and biosystematics 2028-2037 is nearly ready for release...

The year is 2018. The vision of this decadal plan is to make all these possible.”

Well – I hope that has whet your appetite for where taxonomy could go over the next 10 years with adequate funding but we will only get there if we can provide full time jobs and careers to attract new students prepared to spend up to 10 years getting the necessary qualifications to do good taxonomy.

What’s in a name? Good taxonomy leads me into what taxonomy I am doing at present. As most of you know, I work on the taxonomy of native Australian bees. Due to its physical isolation and the predominance of the most primitive plant family in the world (Myrtaceae – eucalyptus and related plants), Australia has the most unique bee fauna in the world. So

understanding what our bee fauna is and what these bees pollinate is my research topic.

Currently, I am revising the second largest subgenus of the *Lasioglossum* bees called *Parasphecodes*. What does “revising” mean? The earliest descriptions of new species of Australian *Parasphecodes* was first published by Frederick Smith in 1853 and the last description of a new species was published by Charles Michener in 1965. Between 1853 and 1965, 92 species of *Parasphecodes* have been described. Job done perhaps – not quite as many questions now arise!

The original descriptions of Smith were significantly less informative than the final description by Michener. The morphological attributes of various species (which we call characters) that we now know are important in defining species changed enormously from the first description in 1853. Most often only one sex, usually the female, was described so there are few to no descriptions for many of the opposite sex. The original descriptions usually only noted the location of where the specimens used to describe the new species were collected but where else does the species occur and what plants does it visit is not recorded. Between, 1853 and 1965, the authors of new species did not have access to investigative tools such as the internet or montage photography and so sometimes the same species or the opposite sex was described as a new species.

At present, the only way for someone to understand the *Parasphecodes* bees is to sources all of the original descriptions. Each of these descriptions is different so it is impossible to compare descriptions to help separate species. There is also no way of knowing what is a valid species and what is not; or getting a species distribution map; no way to

associate the sexes; there are few diagrams and no images of species; and finally, there is no key to species. That makes it very difficult for anyone to confidently identify any species of *Parasphecodes* bee in Australia. A “revision” of the subgenus will resolve all of the issues and problems I listed above.

So where to start? Take a deep breath and commit to at least a 5 year project. You begin by gathering specimens from all museums and other collections in Australia and overseas and of course you go out collecting yourself over many years. Once you have amassed these disparate collections into a single collection you begin sorting them using the old tried and tested formula of “matching like with like”. As you sort like with like, you begin to see differences between species and what characters you use to separate them. This is a very time consuming process but eventually you finish up with a set of sorted bees with code names like LP1, LP2, LP3, SP1, NP2SA, BP6 and so on. This process also is the beginning of sex association. Usually it is based on what we call “coincident collecting data” – in other words these males and females were collected on the same tree at the same time. Fortunately with *Parasphecodes*, the males have similar colour markings and sculpture patterns to those of the females so the task is not too difficult. There are other groups of bees in which the species are called “dimorphic” which means the sexes look totally different to each other – that makes association more difficult.

Once you have completed your sorting, the time comes to replace codes names with described names. This is also a very time consuming task. The original specimens that Smith used in 1853 to name his new species of *Parasphecodes* are still available in the Natural History Museum of London. We call these original specimens “types” and they form the cornerstones of taxonomy and everything we name. The type is

the only true source of the name and any other specimen named is simply a presumed representative of that species. If a type is lost (as happened when the Berlin Museum was bombed in WWII) then it can never be replaced. So, I can write and request to loan of specimens or I could visit the museum. The 92 types of *Parasphecodes* species are distributed between Australian museums as well as museums in America, Europe and Britain. I visited some of the American museums and the British Museum and I borrowed many other types. Slowly, you are able to replace code species names with described names by comparing the types with your sorted specimens. Only when you see the types do you begin to appreciate where naming errors have occurred either where the same species was named multiple times or different sexes described as different species. We have a rule that the first described name become the valid name and any other named species described at a later date that is the same species we call a synonymy.

From my studies, the final wash up from sorting thousands of unnamed specimens, then examining types for all of the named species was that there are only 38 valid species of Australian *Parasphecodes* – remember, there are currently 92 named species. That number includes 63 synonymised names and 18 new species names. Ha! I wrote that in two sentences but those figures represent about 4 years of long hours looking down the microscope and taxonomic endeavour.

So what's next – Science is about documentation. The famous biologist and taxonomist E.O. Wilson once wrote: "Knowledge does not become science until it is shared." My next job was to document the 38 valid species which included 18 new species and 63 synonymies. That requires me to write complete descriptions for both sexes (where known) for all species using

the same set of characters between each species and to adequately illustrate each species that will facilitate others being able to make confident identifications based on my revision.

This documentation work is called “taxonomy”. But I also want to develop a hypothesis in which I infer which species are more closely related to other species and which once are distantly related – that’s called “systematics”. It is an attempt to find the evolutionary pathway these bees took several million years ago. Which bees had a common ancestor and how did they diverge.

Interestingly, both taxonomic and systematic use and work on character analysis but in two different ways.

Systematics is about finding characters that species share in common while taxonomy is about finding characters that can be used to separate species.

Characters to link and character to separate – cool hey! Of course, it is never as easy as that. In systematics, decisions have to be made about the nature of a character. Let’s take eyes. Squid have well developed single lens eyes somewhat like ours. However, that does not mean that squid and humans had a common ancestor. It just means that evolution came up with the same solution independently to solve the same problem – we call such similar characters “convergent evolutionary characters”. Before we do any character analysis, we also need to decide whether a character represents the ancestral state, called the plesiomorphic state, or whether the character represents a new evolutionary trait which we call “derived” and we call that character an “apomorphic” state. We only use apomorphic characters to infer a common ancestor.

Of course, these decisions were human made and that's where errors or different opinions can occur which is why we call our evolutionary tree a "hypothesis".

Perhaps you are beginning to appreciate what is involved in doing a "revision". It's like going down a dark, rabbit-hole whose length and complexity you do not know until you come out the other end – the old saying "How long is a piece of string?". To travel this rabbit-hole requires you to know how to do "good science" and also how to scientifically document the knowledge you have gained throughout the length of the rabbit-hole. That takes a lot of training and mentorship which is why it is so frustrating to get a student to the end of this training and mentorship and then to lose them because there are no available jobs. Fortunately, many of these students take on ecological work where they can use their acquired skills in jobs such as conservation, flora and fauna management, surveys etc.

So let me show you an example of some characters that I found which can be used to separate and link species. Below are dorsal and lateral views of two superficially similar looking *Parasphecodes* species called *Lasioglossum (Parasphecodes) hilactus* and *Lasioglossum (Parasphecodes) hiltacus*. These species were first coined by Smith in 1853 and the names of many of his new species of bees in this paper were anagrams of the word "Halictus" which was a generic name for most Halictidae bees. Smith really took his anagram naming to the extreme and here are the anagram names he erected in his 1853 publication: *L. altichus*, *L. hilactus*, *L. hiltacus*, *L. lacthius*, *L. lichatus*, *L. lithusca*, *L. stuchila*, *L. sulthica*, *L. talchius*, *L. taluchis*, *L. tilachus* and *L. tuchilas*.



Dorsal and lateral view of *L. hilactus* and *L. hiltacus*.

The difference between these two species is not readily apparent in these full body images – this explains why sometimes it is not possible to identify BowerBird images down to species easily or sometimes not at all.

If you look on the underneath of the abdomen of both sexes of *L. hilactus* you will see a raised “boss”, “bump” or “keel” on the middle of the second sternite (S2). This keel does not occur on either sex of *L. hiltacus*. As well in both sexes of *L. hilactus*, the lateral margins of the propodeum each have a large, rounded protrusion. These lateral propodeum projections do not occur on *L. hiltacus*. And finally, the male genital capsule is a combination of the 9th and 10th sterna. Across the middle of this capsule lies the 7th and 8th sterna. In *L. hilactus* the medial,

apical margin is a narrowed, elongate projection whereas in *L. hiltacum* the apical margin apically rounded. These are three great characters to separate these two species.



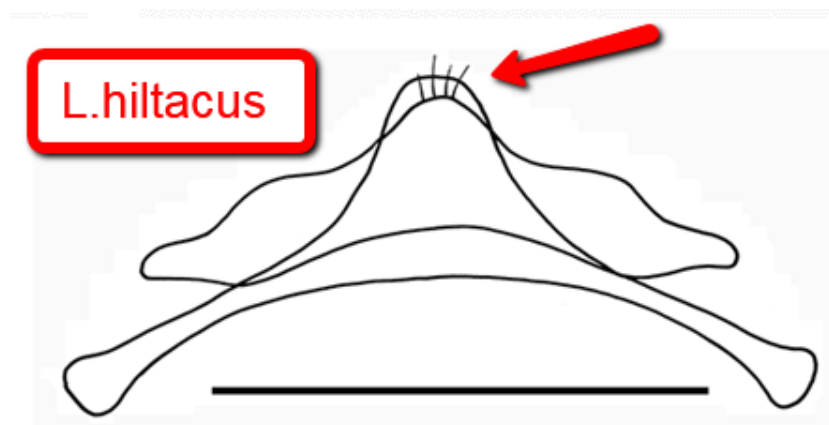
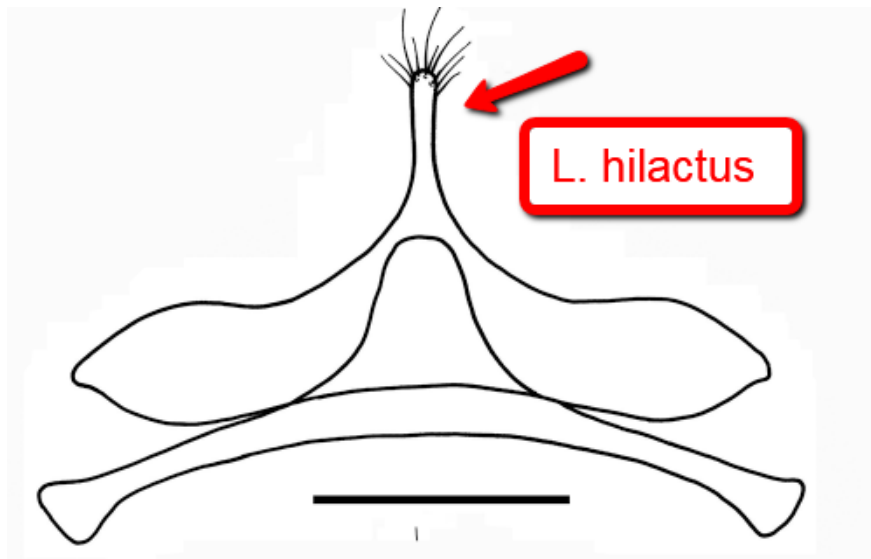
L. hilactus female showing S2 medial protrusion



L. hilactus male showing S2 medial protrusion



L. hilactus female showing lateral bosses on propodeum



7th & 8th sternal diagrams for *L. hilactus* and *L. hiltacus* – black line scale bar equals 0.5mm

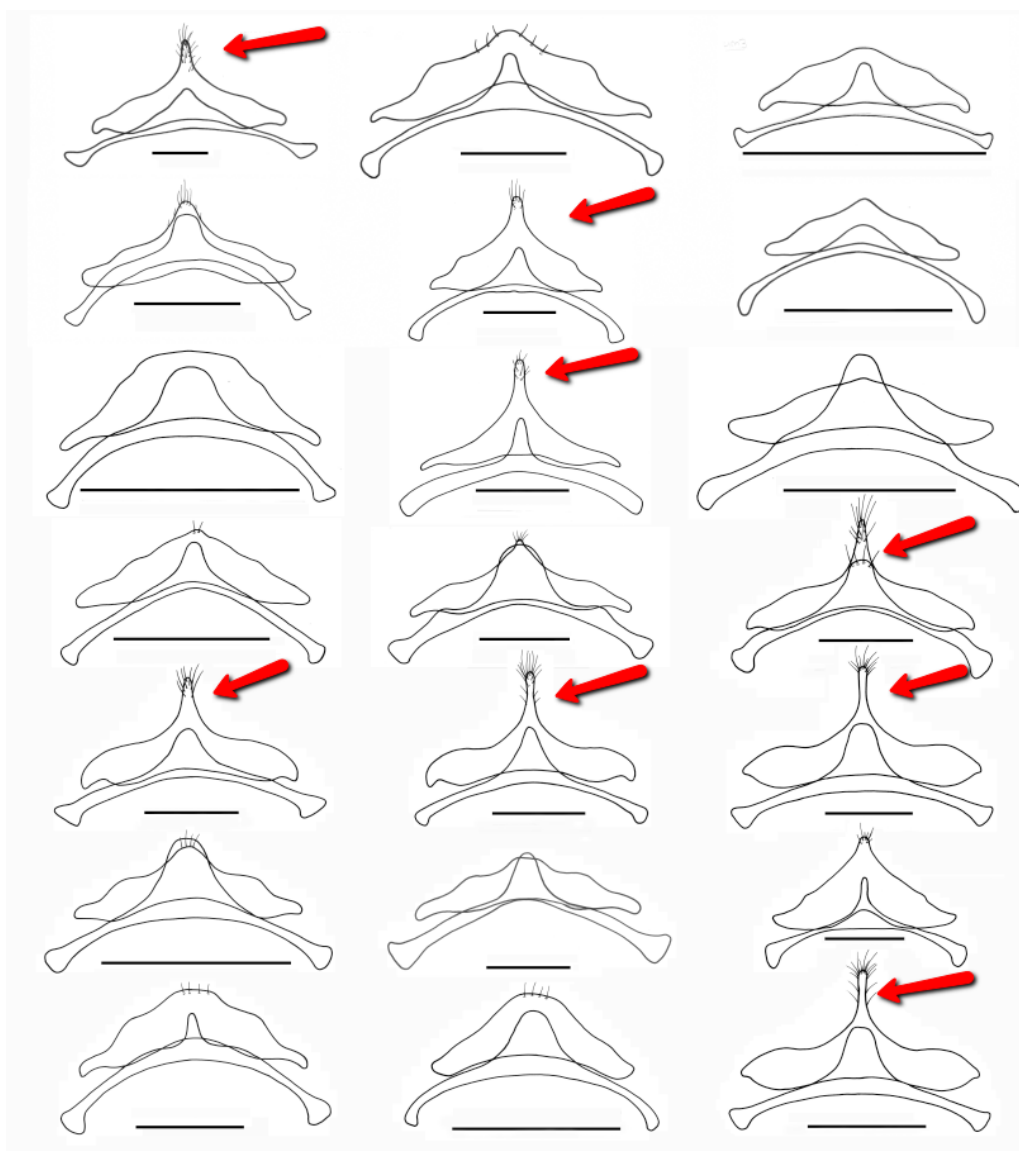
So, I can use any or all of these characters to **separate** *L. hilactus* from *L. hiltacum*:

- Propodeum with/without lateral bosses
- Metasomal S2 with/without median, raised keel
- Metasomal sterna 7 with/without narrow, apical, elongate projection

I document these characters in my species descriptions as well using them as separator characters in my key to species. This is what we call “alpha-taxonomy” where you look for character on the basis of enabling you to distinguish a species and to separate it from other species. There are many other unique characters to both of these bee species in particular the sculpture on the head, thorax and abdomen which all make up species specific characters.

Systematics is the process of looking where the same character(s) is replicated across a range of different species. Character replication implies that species with shared characters had a shared common ancestor and are more closely related to each other than to species that lack such a character or characters. The value of systematic analysis are many fold. For example, two groups of species are linked by different shared characters. One group is known to contain major pest species while the other group contains species that are not known to be pests. If a new species is discovered it is valuable to be able to predict whether the new species belongs to the pest group or the non pest group. Funding decisions on the potential pest status of the new species can be assessed based on the new species systematic assessment. There are many other ways to use systematics for conservation assessment and predicting how a species will react to change based on previous experience with closely related species.

Below is a plate I have produced showing the 7th and 8th sterna for 21 *Parasphecodes* species. Eight of these 21 species have the 7th sterna with a narrowed, apical, elongate projection. I can predict that these eight species will also have the characters of lateral projections on the propodeum and a raised keel on S2 – and I would be right. Systematic analysis will show these eight species form part of a species-complex that we call “monophyletic”. We can then look to see if they all visited similar plants or occurs within similar rainfall patterns or altitudes. Systematics allows us to look at species within a genus as a whole rather than a taxonomic analysis where we look only at individual species.



Here are some other plates I have produced in preparation for my publication. This plate below shows the male genital capsule for six species. There are two views per species – left view is half ventral and half dorsal and the right view is a left only lateral view. The scale bar between each image equals 0.5mm. Notice how the genitalia for each species is totally unique. This is the basis of the Biological Species Concept where mating barriers define species. Our botanical colleagues often tease us entomologists saying that we have an “unusual fascination” with male genitalia. I say the botanists are just jealous that plants don’t have something similar!



Here are the dorsal and lateral views for three species: (Note – Black scale bar equals 5mm)



The plate below shows the dorsal thorax (ie. mesoscutum) and propodeum for the above three species – (Note: the white scale bar equals 1mm). I cannot provide names for these three species as two of them are new species. I can only use their names after they have been formally named and described them else the new species names would become what called

“nomen nudums” which means a new species name with no description or formal designation and the name becomes forever invalid and unavailable to use ever again – there are so many taxonomic and nomenclatural rules to learn. You also must present the paper using objective rather than subjective terminology which is why scientific paper can appear rather dry.



My descriptions begin with a chronology history for each species and what synonymies I have discovered. As you can see below, the species *L.hilactus* was subsequently described as a new species a total of 12 times – all incorrect!

Lasioglossum (Parasphecodes) hilactus (Smith)

(Figs.)

Parasphecodes hilactus Smith, 1853: 39.

Parasphecodes tuchilas Smith, 1853: 41. **syn. nov.**

Parasphecodes tilachus Smith, 1853: 41. **syn. nov.**

Halictus warburtoni Cockerell, 1906: 58. **syn. nov.**

Parasphecodes hybodinus Cockerell, 1912: 227. **syn. nov.**

Parasphecodes arciferus Cockerell, 1914: 142. **syn. nov.**

Parasphecodes atrorufescens Cockerell, 1914: 145–146. **syn. nov.**

Parasphecodes leptospermi Cockerell, 1916: 202. **syn. nov.**

Parasphecodes lichatinus Cockerell, 1922: 260. **syn. nov.**

Halictus fulviventris Friese, 1924: 240. **syn. nov.**

Halictus leucorhinus Cockerell, 1926: 226. **syn. nov.**

Parasphecodes anhybodinus Cockerell, 1930: 30. **syn. nov.**

Parasphecodes testaciventris Rayment, 1953: 30. **syn. nov.**

I then list each of the types for each of the species, valid and invalid. I note where the types are lodged, the location data and importantly I note the condition of the type and if any body parts are missing. It is interesting to note that Smith first called this species “hilactus” based on a male specimen from Adelaide but then described two additional new species from female specimens found in “New Holland” and Tasmania. I then go on to list the sex and location/date details for every specimen I have identified as *L. hilactus*.

Material examined. Holotype of *hilactus* ♂, Swan River, Adelaide, South Australia. 43.14, B.M. Type Hym. 17.a.610, (BMNH, right hind leg missing distal three tarsal segments and glued to body, left mid and hind distal three tarsal segments and distal nine segments of left antenna missing.)

Holotype of *tuchilas* ♀, Australia (as New Holland). F. Sm. coll., B.M. Type Hym. 17.a.616, (BMNH, missing distal nine segments of left antenna, left mid leg, left hind distal three tarsal segments, right mid distal tarsal segment and right hind wing, metasoma glued to body, labrum torn with distal half missing).

Holotype of *tilachum* ♀, Tasmania (description has Van Diemens Land). F. Sm. Coll. 403.293, B.M. Type Hym. 17.a.617, (BMNH, missing distal nine segments of right antenna, left mid and left hind distal two tarsal segments, metasoma removed and stored in plastic vial on pin, hole in frons, labrum and mouth parts missing).

Holotype of *warburtoni*. ♂, Hobart, Tasmania. 91–155, J.J Walker, 3215, B.M. Type Hym. 17 a.924. (BMNH, left antenna missing distal ten segments, wings torn distally).

Holotype of *hybodinum* ♂, Victoria, Windsor, French 1909. (ANIC right antenna missing distal twelve flagellum segments, mid leg with distal tarsal segment missing, right fore and hind legs missing distal two tarsal segments, whole in left anterior corner of mesoscutum, genitalia exposed).

Holotype of *arciferum* ♀, Victoria, Mordialloc, 29 Jan 1906, F.P. Spry, 256. (ANIC, left fore leg glued to body, left hind leg missing distal tarsal segment, right hind tarsi missing).

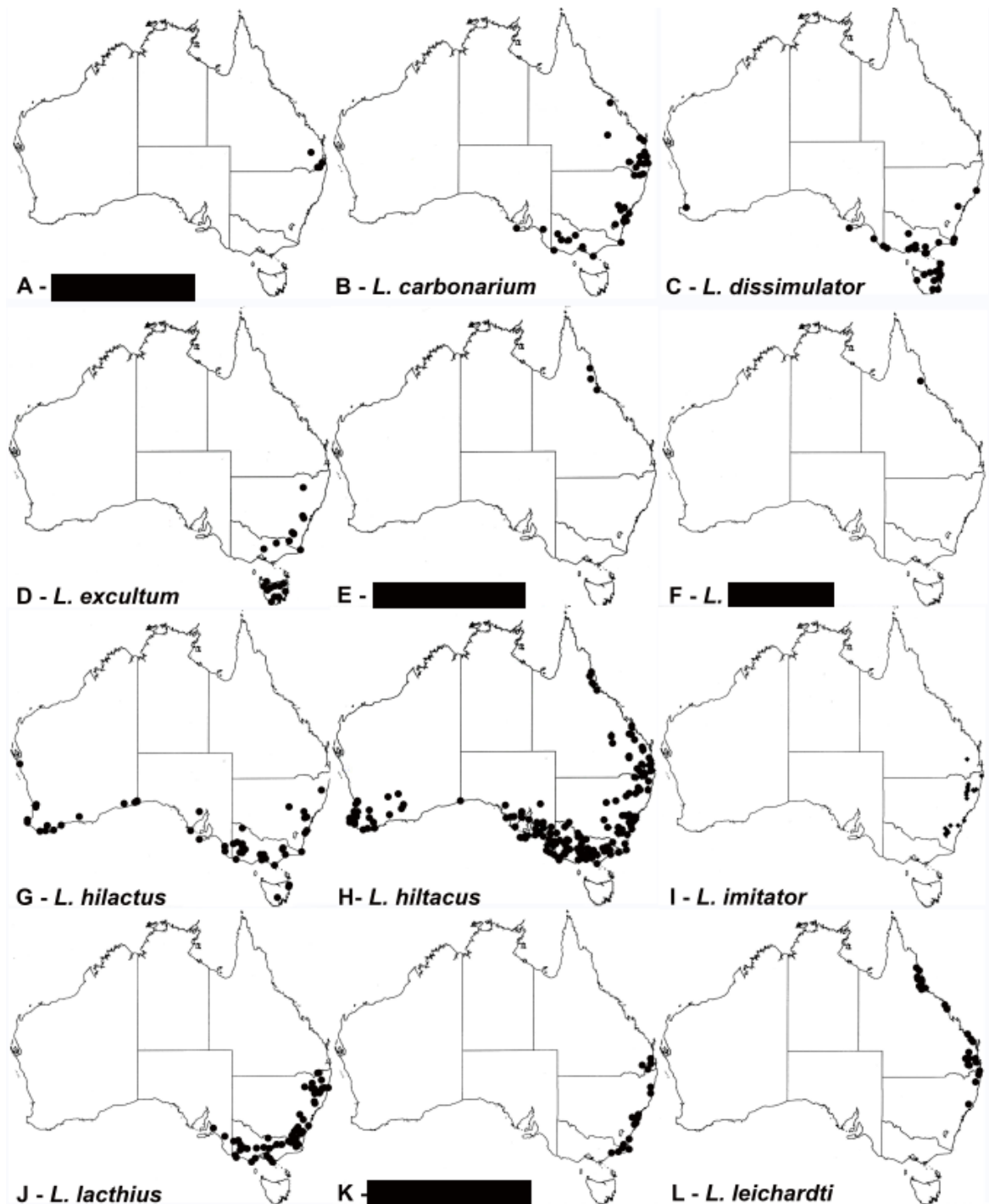
Other specimens examined. (274♀♀; 172♂♂)
(19♀, 2♂) locality unknown.

QUEENSLAND: (1♀) Qld. Queensland. (AM).

NEW SOUTH WALES & AUSTRALIAN CAPITAL TERRITORY: (1♀) Sandringham. (ANIC); (1♀) Nadgee Reserve, 7km S Newtons Beach, 20 Dec 1985, E.A. Sugden. (AM); (1♀) Nadgee Reserve, Merrika Lodge, 11 Jan 1987, E.A. Sugden. (AM); (2♀) Nadgee Reserve, 8 Sep 1985, E.A. Sugden. (AM); (1♂) Nadgee Reserve, 7km N Newtons Beach, 21 Dec 1985, E.A. Sugden, on *Kunzea*. (AM); (1♀) Nadgee Reserve, 7km S Newtons Beach, 7 Dec 1985, E.A. Sugden. (AM); (1♀) Nadgee Reserve, Merrika Lodge, 14 Jan 1987, E.A. Sugden. (AM); (4♀) Nadgee Reserve, 7km N Newtons Beach, 7 Sep 1985, R.W. Thorpe. (AM); (1♀) 12mls NW Milton, 1600ft, 5 Nov 1968, D.H. Colless. (ANIC); (1♀) Lake Windemere, Jervis Bay, C.T., 19 Sep 1951, T.G. Campbell. (ANIC); (2♀) Murray Beach, Jervis Bay, 18 Feb 1987, N.W. Rodd. (AM); (1♀) Jervis Bay C.T., 18 Sep 1951, T.G. Campbell. (ANIC); (1♀) Mt Victoria, 26 Oct 1930, A.N. Burns. (NMV); (1♀) Bilpin, Blue Mtns., 26 May 1978, N.W. Rodd. (AM); (1♀) Bilpin, Blue Mtns, 2 Oct 1978, N.W. Rodd. (AM); (1♀) Nullo Mt., 1 Dec 1951, T.G. Campbell. (ANIC); (3♀) 15mls E Naromine, 30 Jan 1971, T.F. Houston, on *Angophora*. (SAM); (1♀) Cathedral Rock N.P. 10km SW Ebor, 11 Dec 1984, D.K. Yeats. (QM).

VICTORIA: (1♀) Wilsons Promontory, 13 Nov 1986, Walker * McPhee, on *Leptospermum laevigatum*. (NMV); (1♀) Wilsons Prom, 31 Jan 1954, A.N. (NMV); (1♂) Wilsons Promontory, 5 mile beach road, 29 Jan 1996, KLW, on *Melaleuca*. (NMV); (1♂) Wilsons Promontory, Barry Creek, 26 Feb 1996, KLW, on *Eucalyptus*. (NMV); (1♀) Gunnamatta, Rye, Jan 1996, D.I. Stewart on *Dinlotaxis tenuifolia* (NMV); (2♂) Dromana 3 Nov 1931 A R (NMV); (1♂)

Below is a plate of distribution maps for 12 *Parasphcodes* species – note I have blacked out the names of new species.



Then I took a range of measurement for the body and wing lengths for *L. hilactus* as well as a range of measurement of the head (HW – Head width; HL – Head length; UID – Upper interorbital distance; LID – Lower interorbital distance; AOD – Antennocellar distance; etc Then a detailed character description for all important body parts as well as colour and vestiture (or hairiness).

Description of female. Body length: 7.3–8.96–10.51 mm (SD=0.83, n=10); forewing length: 2.47–2.83–3.41 mm (SD=0.28, n=10); head width: 2.47–2.83–3.41 mm (SD=0.28, n=10). Relative head measurements: HW: 100, HL: 81–83, UID: 58–59, LID: 55–56, AOD: 21, IAD: 8–9, OAD: 21–22, IOD: 16–17, OOD: 13–14, CL: 22, GW: 22–23, EW: 26–27, SL: 43–44, FL: 78–80. *Head.* (Fig.) Inner orbits converging below; median frontal carina not reaching median ocellus; clypeus polished and smooth, anterior half sparsely punctate with large rounded deep punctures, midline with shallow, broad, longitudinal groove, posterior half with smaller, shallow, rounded punctures, supraclypeal area dull, covered with a fine reticulate pattern, closely to densely punctate with small, shallow, rounded punctures; frons sculpture above antennal bases reticulate/punctate, sculpture weakens laterally though remains reticulate to inner margins of eyes, extends vertically to at least anterior margin of lateral ocelli; labrum median basal area raised and roughened, distal process broadly triangular with setae originate on margin, median keel not spatulate distally, reaches distal margin, lateral ridges weak, curved distally towards median keel. *Mesosoma.* Pronotum dorsolateral angles obtuse; mesoscutum (Fig.) surface dull, densely punctate, across entire surface except mesially where closely to densely punctate; scutellum length greater than dorsal surface of propodeum, (2.75 x), scutellum closely to densely punctate except on either side of median line openly punctate; propodeum acarinate (Fig.), with weak, rounded, raised rim across posterior dorsal margin, rim dips mesially, lateral margins with raised boss, posterovertical surface finely reticulate with erect branched and fine adpressed setae over surface, dorsal surface sculpture ruguloso-striolate, sculpture reaches posterior rim; mesepisternum rugose, metepisternum striate on upper half. *Metasoma and legs.* Metasomal T1 openly to closely punctate; S2 with a median boss; inner hind tibial spur finely serrate.

Colour. Body black, antennae dark brown above, brown underneath, metasoma red-brown, T1-T6 with black transverse infuscations, increasing in size from T1-T6, legs dark brown to black.

Vestiture. Head with moderate cover of erect, plumose hair, mesosoma with moderate cover of erect plumose hair.

Similarly, the male is also described in detail. Note – The set of characters I use to describe this species are the same set of characters I use to describe every species so descriptions can be compared character by character. You can only do this when you know all species of a group and you know what the diagnostic characters are that differ between species.

Description of male: Body length (Fig.) : 7.58–9.33–9.84 mm (SD=0.66, n=10). Forewing length: 2.28–2.71–3.05 mm (SD=0.21, n=10). Head width: 2.23–2.74–2.98 mm (SD=0.20, n=10). Relative head measurements: HW: 100, HL: 84–86, UID: 57, LID: 42, AOD: 14–15, IAD: 11–12, OAD: 19–20, IOD: 18–20, OOD: 13–14, CL: 27–28, GW: 19–20, EW: 31–32, SL: 24–25, AS4/AS2+3 (22/16) 1.4, FL: 163–163, FL/AS4: 7.4. *Differs from female as.* Median frontal carina not reaching median ocellus; frons sculpture above antennal bases reticulate; scape reaches to below level of median ocellus; clypeus with entire surface polished, anterior half variously sculptured with sparse punctures and broad, shallow, median

Finally, I described the distribution and made some remarks about the species.

Distribution. (Fig. XX) Occurs across southern Australia, predominantly in SE and SW Australia. There are several records from the coastal regions of the Nullarbor Plain.

Remarks: *Lasioglossum hilactus* belongs to the species group characterised by lateral projections on the propodeum and a small, mesially raised keel on S2. These characters combined with a densely punctate mesoscutum and a broad, rounded rim extending across the posterior margin of the propodeum uniquely define this species. The dorsal propodeum rim has a diagnostic dip in the middle rather than being straight.

My key to species first uses characters to separate out groups of species:

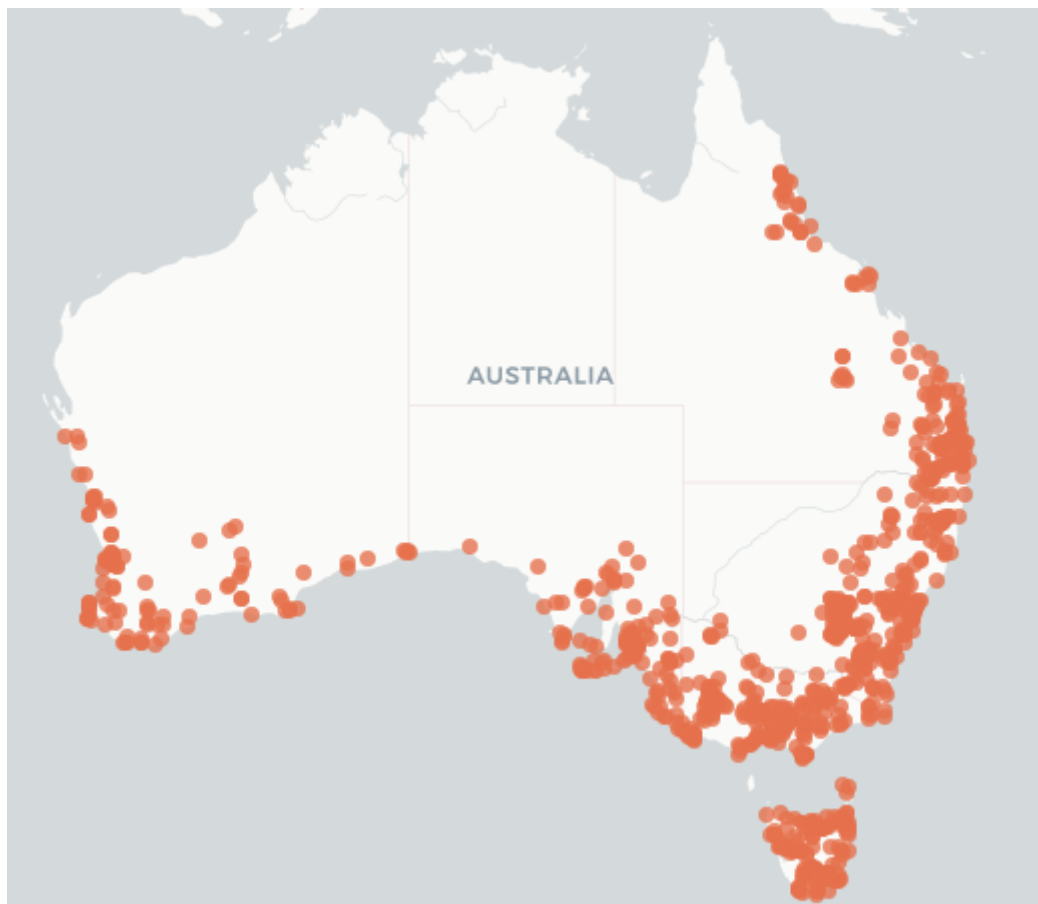
- 3(1) Propodeum lateral margins with a raised boss (Fig. XX); S2 with mesial process 4
- Propodeum lateral margins without a raised boss (Figs. XX); S2 without mesial process 11

And then separates out the species within each group:

-
- 4(3). Mesoscutum coarsely reticulate *L. lichatus* (Smith)
 - Mesoscutum punctate 5
 - 5(4). Mesoscutum entirely orange-red 6
 - Mesosoma entirely black 7
 - 6(5). Propodeum dorsal surface sculpture striate (Fig. XX) XXXXXXXXXX sp. nov.
 - Propodeum dorsal surface sculpture porcate (Fig. XX) XXXXXXXXXX sp. nov.
 - 7(5). Mesoscutum densely punctate between median and parapsidal lines, ie. distance between punctures less than diameter of puncture. *L. hilactus* (Smith)
 - Mesoscutum openly to closely punctate between median and parapsidal lines punctate, ie. distance between punctures greater than or equal to diameter of puncture 8
 - 8(7). Metasoma entirely black 9
 - Metasoma red-brown except T5-T6 black 10
 - 9(8). Mesoscutum anterior half and scutellum shining ie. mesoscutum with interspaces between punctures wide (greater than 2 x diameter of puncture) and with a high lustre; scutellum mesially with similar puncture interspace width and lustre and doubly punctate (with two distinct diameter puncture sizes) *L. carbonarium* (Smith)

Finally, on a broad scale, once you have designated valid species you can then look at the distribution for all species in the subgenus. Below is the distribution map for over 10,000 specimens representing almost 4,000 different locations for all known species of *Lasioglossum* (*Parasphecodes*). Clearly the subgenus is predominately a southern Australian group of bees that very closely follows the coastal 500mm or more rainfall isohyet. That's fascinating and valuable information in itself.

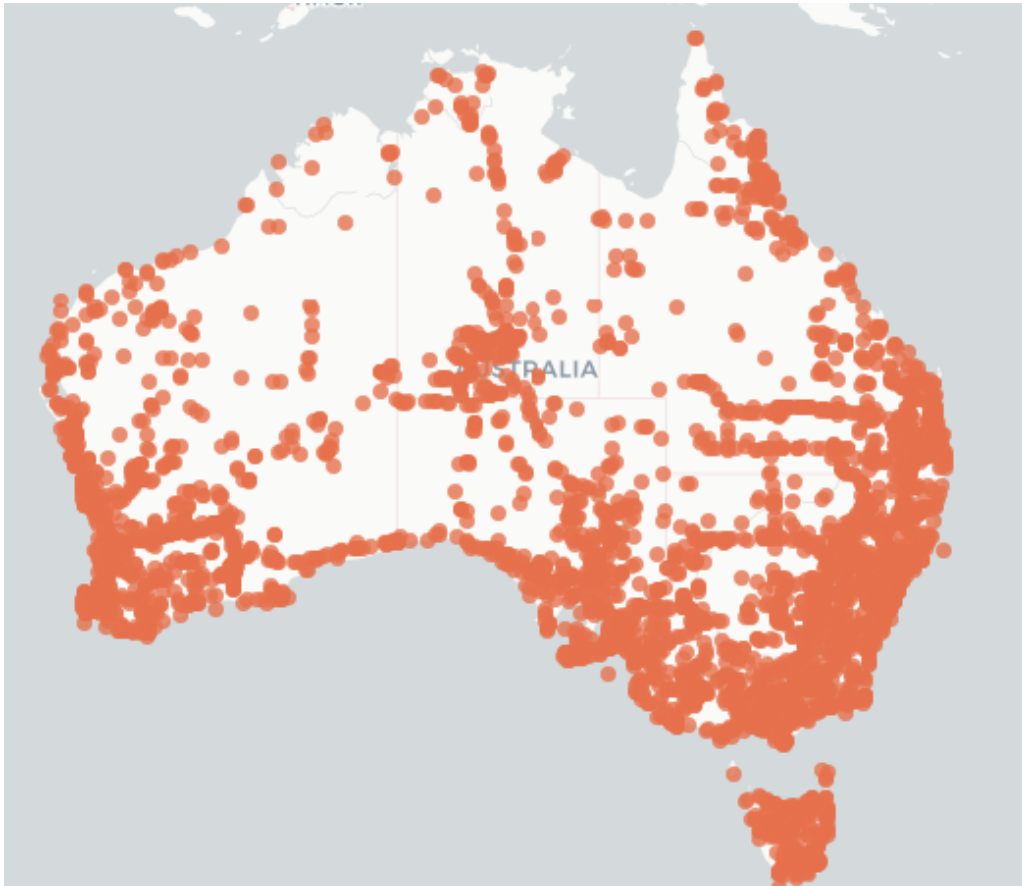
***Lasioglossum* (*Parasphecodes*) Smith, 1853**



There are currently eight *Lasioglossum* subgenera known to occur in Australia. The largest of these subgenera is *Lasioglossum* (*Chilalictus*) which has 139 valid species (I also revised this subgenus as well – a glutton for punishment!). Below is the distribution map for *Chilalictus* made up of over 40,000 specimens representing over 30,000 different locations. It is the only *Lasioglossum* subgenus that has successfully

exploited the resources of the dry interior of Australia. That raises so many questions? How did they make this transition to a dry environment which different dry flora plants do they visit compared to the flora typical of the wetter, coastal region of Australia?

***Lasioglossum (Chilalictus)* Michener, 1965**

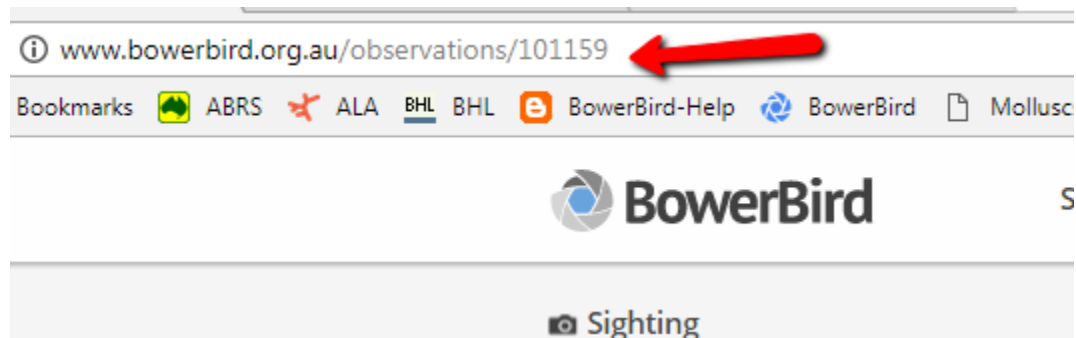


Major revisions, combining alpha taxonomy and systematics, allow us to look at individual species and then where those species fit within the entire subgenus or genus and what relationships do they have with other species within their group. We receive a fulsome picture for these Australian animals. Well – back to my *Parasphcodes* ever deepening rabbit-hole I intend to publish this revision in 2018 and then I will begin another revision – madness but it’s what I do – Confucius once wrote – “*The beginning of wisdom comes by calling things by their right names.*” I make “right” names.

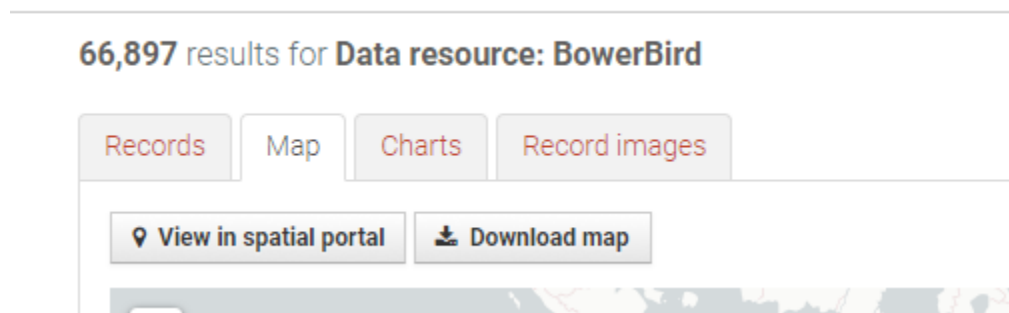
Well, I hope that you enjoyed reading about what it takes to put correct names on BowerBird images. It is no trivial process and we seem to expect that there to be a name for every animal and plant but hopefully you will now appreciate a bit more what is involved in naming organisms. Is the name valid? Is it a named species? Let's look at some recent and wonderful BowerBird records.

First up – let's crunch the BowerBird numbers!

Yeah – We have cracked the 100,000 mark which includes records and comments.



And on ALA – we now have almost 67,000 identified records.



That's a great effort and a serious contribution to the knowledge of Australian Biodiversity. Congratulations everyone!

What better place to start looking at BowerBird new records than with a cicada that has a “crazy” set of wings! Obviously, this cicada has just crawled out of its nymphal skin and is beginning to inflate its wings. Wonderful capture. I have asked Max Moulds for an ID which we may have before I have finished writing this Bugle – update from Max - *Psaltoda moerens*.



Cicada – Location: Wollongong, NSW Photo by Jeannie.

Speaking of newly emerged – Ken Harris captured this newly emerged Mantispidae also stretching its wings.



Ditaxis meridiei Location: Morwell National Park, Vic. Photo by Ken Harris



Freshly shed cockroach Location: Sunnybank, Qld Photo by Jenny Thynne

I can never get enough images of the male Superb Fairywren.



Malurus cyaneus Location: Parkville. Photo by Anna Lanigan

Double trouble – what an image !



Dictyochrysa peterseni Location: Round Hill, Tasmania Photo by Alan Melville

I very much liked these isopod image.



Armadillidium vulgare Location: Round Hill TAS Photo by Alan Melville

Euchromia are spectacular and rare Arctiidae moths. They occur along the east coast of North Queensland and up into Cape York Peninsula. ALA has only 50 records for this genus and the below image became the third record for this species – *E. aemulina* - and the first live photo for this species.



Euchromia aemulina Location: Mooroolool QLD Photo by Graham Winterflood

Another Facebook “rescue” As I have previously noted, I am on Facebook to primarily provide bee and other insect identifications and also to “rescue” valuable images and data. Unfortunately, Facebook does not on-share any of its data so valuable data records remain lost and trapped inside Facebook alone. Occasionally, I see images that I considered are just too good not to be shared outside of Facebook, in particular when I know that such images are not available outside of Facebook.

I performed one such “rescue” in early November when John McInerney posted images and asked for an identification. I recognised the images as flies belonging to the weird and not often seen Hunch-back flies or Acroceridae. Usually I see images of these flies when they lay their black eggs on clothes lines. The eggs hatch and the maggots parasitise spiders.

The often photographed genus of Acroceridae is *Ogcodes* but I recognised this was not that genus. After a bit of hunting I identified the images as belonging to *Pterodontia mellii*. I checked ALA which had only four records for this fly and two of these records were from the Encyclopaedia of Life and had no location data. But the amazing aspect of these images was that they showed a mating pair. Seeing or collecting species “in cop” is a great way of associating the sexes especially as in this case the sexes are dimorphic meaning the two sexes have different colour markings.

This was too good to leave just in Facebook so I replied to the Facebook post with an identification and a request for the record owner to contact me to send me the images and provide permission for me to add his images to BowerBird so they can be shared to ALA and other image sharing platforms (eg. Google Image).

Fortunately, I received a quick reply from John with both attached images, a detailed location/date and permission to post the images onto BowerBird. I created a login for John so that his name is created on the photos. John’s images are record are now on ALA provided added the second known location for this fly species. Enjoy John’s images:



Pterodontia mellii Location: Koorawatha NSW Photos by John McInerney

As I have said many times before, the BowerBird live images show me behaviour details that I have often never seen or even heard of before. Although this image is poor, you can still make out what is happening as explained by John Eichler.

“While watching holes being used by large *Megachile* bees (<http://www.bowerbird.org.au/observations/100812>) a *Gasteruption* wasp arrived and, after probing a hole with its long ovipositor, it backed in, disappearing from sight. Shortly after a *Megachile* bee arrived, entered the hole and dragged out the wasp. I only managed to get this one poor image of the encounter.”



Megachile erythropyga burrowing into wood and evicting a *Gasteruption* wasp.

Location: Black Rock VIC Photos by John Eichler.

Graceful and elegant are the only words to use for this wonderful image of a damselfly. I learnt something new the other day about damselflies and dragonflies – they cannot walk! Their legs are well adapted to grasp and hold on but are not designed to walk. I had never thought of it before but I have never seen an adult Odonata walking. I recently had a discussion with a student about insects that have completely different life stages. The nymphs of damselflies and dragonflies are fully aquatic and yet the adult forms of these insects are fully terrestrial - Why? The reason I think has to do with dispersal. The two main functions of an adult insect are to mate and reproduce viable offspring but also to disperse and find new sources of food. A restricted life style of only living underwater would severely restrict the ability to disperse and find new water courses so the best way to do that is for the adult form to live above water. What do you think?



Agriocnemis pygmaea Location: Mount Molloy QLD Photo by Graham Winterflood

I remember scanning through this set of images and wondering whether or not the bee “got away” ? What do you think?





Phew! The bee flew away !! Too much tension ...

Lasioglossum bee and lynx spider interaction Location: Ballandean QLD Photos by Marc Newman

Another story of escape or just lust?

Janet Grevillea uploaded a series of cowboy beetle and spider images and told a fascinating story. Janet wrote: “There were five cowboy beetles flying and buzzing around a spider web, where one of their number had been caught by the spider and wrapped in silk. The five were set on rescuing their companion. One of the rescuers was caught by a thread of silk, but escaped and worked to free itself (upside down image). Human interference followed and the wrapped up beetle was on the ground, being rescued by two of its number who pulled at the silk, attempting an unwrapping. Unfortunately, the rescue was unsuccessful. The spider consoled herself by catching another flying creature and the cowboy beetles flew off. Is this communal behaviour commonly seen?”

Linda Rogan posted this follow up comment: “Or was the captured beetle a female and the 'rescuers male'.”

I think Linda has explained the story correctly. To my knowledge, non social insects do not exhibit any forms of companionship other than when mating. Social insects are a different story though. I read somewhere that less than 3% of insects are social (wasps, bees, ants, termites etc) but these species make up almost 95% of the biomass of insects. The interconnections between social insects inside a colony/hive can be so detailed and complex that behaviourists now often refer to the entire colony as like a single organism which they term a “Super Organism”.

Is anyone a Star Trek fan and does this remind you of the Borg? (:->! I wonder where the story writers got the idea to invent the Borg – again a Super Organism of the collective.

Live long and prosper





Chondropyga sp. Location: Lake Macquarie NSW Photos by Janet Grevillea

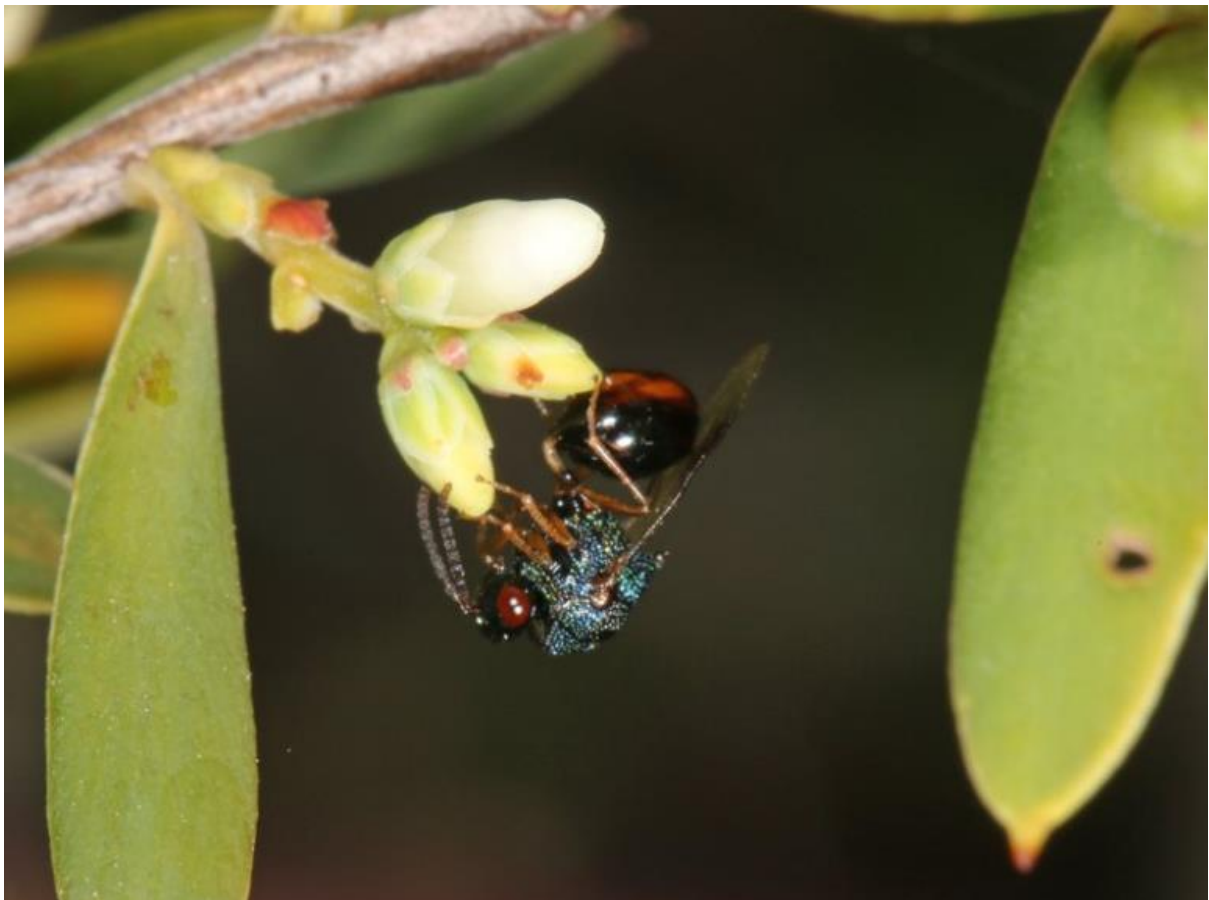
Smiley face eggs of a stink bug



Pentatomidae Location: Sunnybank QLD Photos by Jenny Thynne

Such a cool tiny wasp but not if you are an ant.

Female eucharitids wasp oviposit rows of eggs into plant tissue, such as leaves and stems, away from ant colonies. The eggs are a translucent white and are elliptical and flat on one side and after about 10 days the wasp larvae hatch. It is the larval task to find and enter an ant colony so they wait on the plant until an ant walks past and then hitch a ride on the ant back into the ant colony. Once inside the ant colony, the wasp larva attaches to an ant host larva but it does not do much feeding until the ant larva pupates after which the wasp larvae consumes most of the ant pupa obviously killing it. The wasp larva takes on the smell of the ant colony and is actually aided and protected by the worker ants. Parasites really do have amazing life histories.



Eucharitidae Location: Sunnybank, Qld Photo by Jenny Thynne

I loved the title of Jenny's record – "Triple decker". Three lycid beetles – probably one female and two males. These beetles are most likely *Porrostoma (Porrostoma) rhipidium*. Their antennae are most remarkably serrated. If you look hard you can see that only two of these beetles have their antenna serrated while the bottom beetle's antennae is simple. Remember an insect's antennae is its nose so the bigger the nose the better to smell a female from a distance.



Porrostoma sp. Location: Sunnybank, Qld. Photo by Jenny Thynne.

As a side note – A Frenchman named Laporte was the person who first described and named the beetle family Lycidae. Laporte was the first part of his name under which he produced scientific literature otherwise he was a diplomat using his last part of this name. His full name was François Louis de la Porte, comte de Castelnau (1810-1880). LaPorte was the French consul to Melbourne in 1860 and donated a two cabinet drawer of beetles to Museums Victoria.

Some images remain a mystery

Steve Young posted this wonderful image of a something and commented: “two cm long almost transparent little creature grazing among the moss on a sodden log in rainforest.- ..any help in ID'ing it will be appreciated.” We still do not have any answers. I do not think it an insect as all insects show signs of segmentation – although sometimes the signs of segmentation can be difficult to see.



Unknown Location: Korora NSW Photo by Steve Young

Natasha commented that it somewhat resembled the Pear and Cherry slug that shreds the leaves of pear and cherry trees. It's not actually a “slug” but rather the larva of a sawfly called *Caliroa cerasi*. The larvae of this wasp do indeed look very slug-like and it is near impossible to see signs of body segmentation. Below are images of both larva and adult of this wasp



Caliroa cerasi Location: Won Wron VIC Photo by David Akers



Caliroa cerasi Location: Buckland TAS Photo by Tony D.

Most mammals are active mainly at night so often the best way to know what's in an area is from finding their skull bones.

Here is the lower jaw of a ringtail possum – who obviously brushed his/her teeth often as they look to be in perfect condition.



Pseudocheirus peregrinus Location: Lake Macquarie NSW Photo by Janet Grevillea

There are many species of wasp-mimicking flies. They take on the shapes and colours of wasps to fool predators into thinking the predator will get stung if they try to eat the insect. Some of the mimics are just so good. Let's have a look at some recent BowerBird examples.

The first is a syrphid mimic called *Ceriana ornata*. The colour markings on this fly resemble those of a potter wasp and the abdomen even has a wasp like waist. These flies lays their eggs into worm farms and sugarbag (Tetragonula) bee hives.



Ceriana ornata with extended ovipositor Location: Wollongong NSW Photo by Jeannie



Ceriana ornata Location: Sunnybank, Qld Photo by Jenny Thynne

The sighting and taking of BowerBird images can sometimes play funny tricks. On the same day, 14 November 2017, two different people from northern and southern Queensland both photographed images of a Stratiomyidae wasp mimic. It took a bit of effort to get them identified. I initially sent the images to my Diptera expert at the Australian Museum who placed them to family and he then forwarded the images to an expert in that family in America. Eventually we had a name and a story.

The north Queensland images showed a magnificent fly with a classic wasp shape and colour markings.





Lagenosoma sp. Location: Airlie Beach QLD Photos by Steven Pearson

The next set of images came from Rose Robin and her now “famous” wire fence that seems to attract a wide range of amazing insects. I have seen, heard of and used many different types of insect traps but no one has ever advised me to use a wire fence to attract insects.

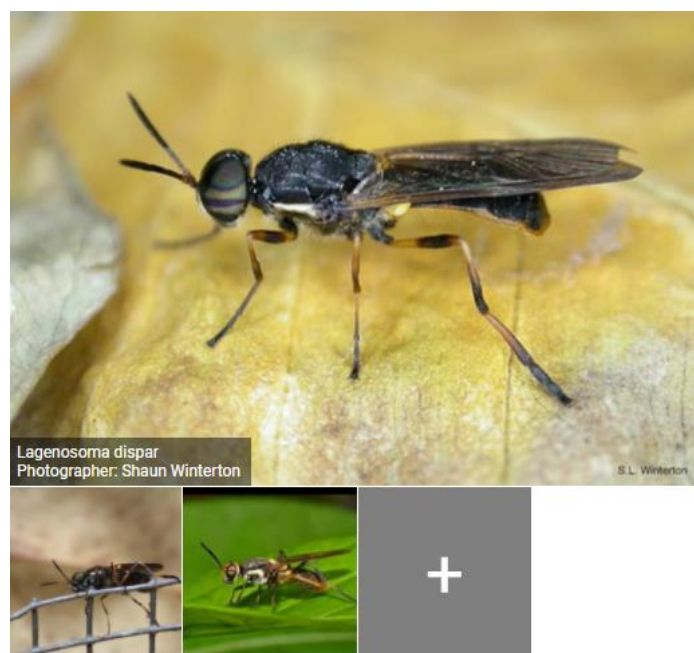


Rose initially thought this was a wasp so I pointed out to her that a classic sign of a fly was a pair of halteres clearly seen in this photo as the yellow, knob projections.



Lagenosoma dispar Location: Tamborine Mountain QLD Photos by Rose Robin

A check on ALA showed two of the three available images for this genus are from BowerBird.



Another excellent fly-wasp mimic – a Stiletto fly



Pipinnipons fascipennis Location: Lobethal SA Photo by Ellura Sanctuary

And, flies are fighting back!

I have seen European wasps attacking and killing so many native insects that I enjoyed seeing the tables turned in this photo showing a Robberfly eating a European wasp.



Asilidae Location: Wonga Park Photo by Reiner Richter

This record was simply titled: “Breakfast”



Daptolestes limbipennis Location: Emerald VIC Photo by Torbjorn von Strokirch

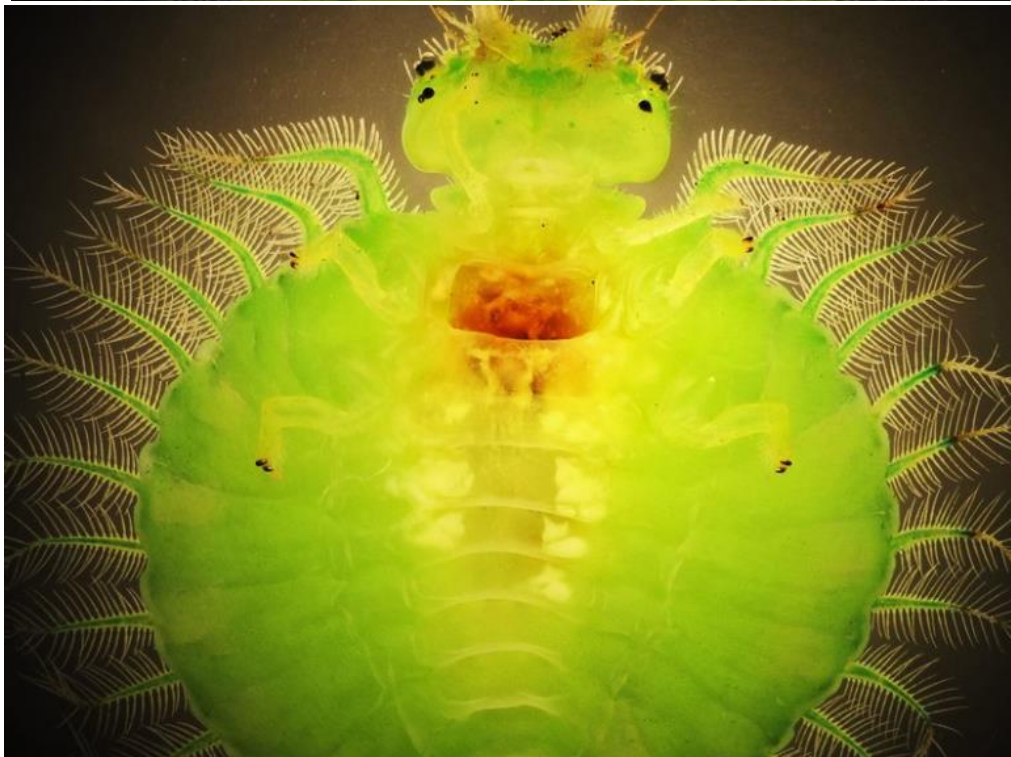
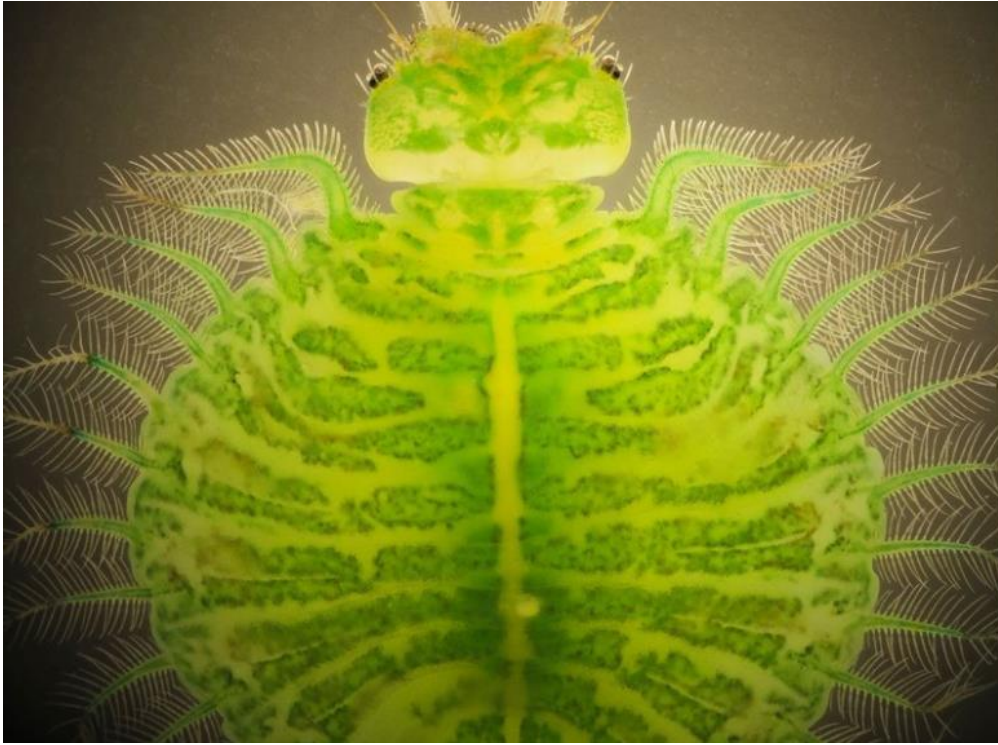
This record was simply titled: “Afternoon tea”



Daptolestes limbipennis Location: Won Wron VIC Photo by David Akers

What's that??

The nymphs or larvae of lacewings are the weirdest of animals I think. Unfortunately the images below do not show the oversized jaws often associated with these nymphs.



Nymphidae Location: Mount Lofty QLD Photos by Mike Ford

This bee had me beat – so I asked the expert in that group.

Tamara Leitch uploaded two images of a lovely masked bee that had me stumped. I checked it against all of the known hylaeine bees recorded from Victoria drew a blank. So, I asked the expert in this group – Dr Terry Houston at the WA Museum.

Terry replied: “This is a female and is the first instance I have come across of the species in Victoria. It has previously been recorded only from high rainfall areas of SE Qld and eastern NSW.”

Tamara’s record is now on ALA and you see what a massive range extension her record has delivered. I remained amazed at the citizen science records that BowerBird delivers. Thanks all.





Hemirhiza melliceps Location: Traralgon VIC Photos by Tamara Leitch

Another Victorian Bee first record !

Not long after Tamara's Victorian first bee record, Rudie Kuitert, the orchid pollinator expert (along with Mitch Smith) sent me an image of a mating pair of bees. I thought I knew this species and it was confirmed by Terry. Terry has just submitted the text for the definitive book on Australian bees which should be published by mid 2018 so I like to keep him up to date with all of these new finds. While not as a significant range extension as was Tamara's find, this adds another species to the Victoria bee fauna. The below arrow shows where the new find was made.



Notice in the image below, the swollen base of the antennae – which are called the scapes. The bee on top is the male with the female below. Also notice the lack of much yellow colouration on this species of masked bee.



Hylaeus Xenohylaeus leptospermi Location: Killawarra VIC Photo by Rudie Kuitert

Rudie sent me another photo that he had already identified and it is the first known live image for this species and only the second record on ALA.

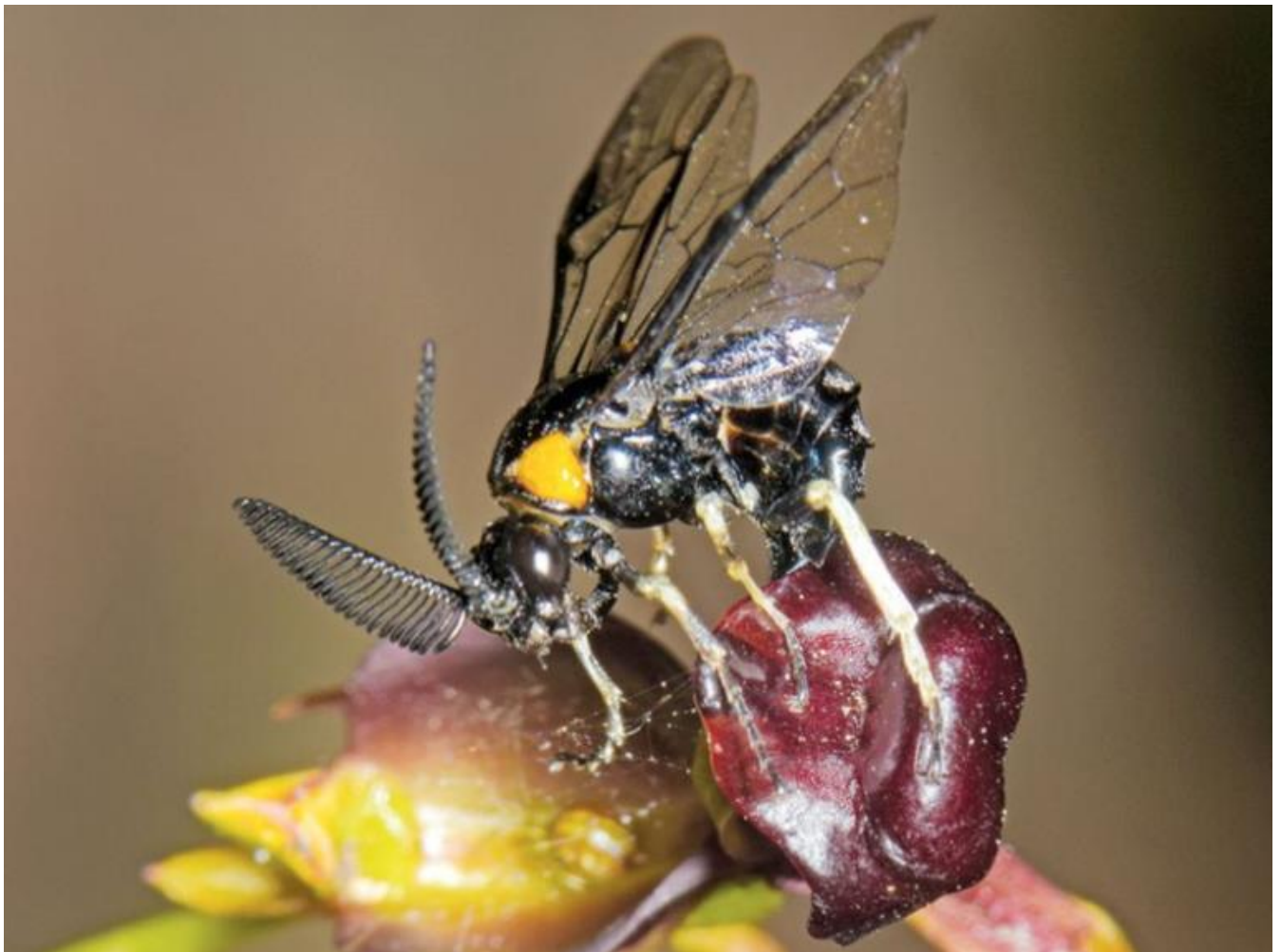
Sawflies are a relatively small and primitive group of wasps. They are considered to be primitive as they do not have the usually restricted waist as seen in other wasps, bees and ants.

This means the female cannot arch her abdomen when laying eggs. Females lay eggs into plant tissue and stand at angle to be able to scratch a furrow in the plant tissue in which to lay

their eggs. The sawfly larvae develop solely on eating plant tissue.

Rudie's photo below is the rare sawfly *Lophyrotoma ramosa* on *Caleana major* – the flying duck orchid.

The wasp itself is only a few millimetres in body length. Look at the amazing, feathery antennae. A male specimen I guess.



Lophyrotoma ramosa Location: Langwarrin VIC Photo by Rudie Kuitert

As the expression goes – I’ll some of what you’re smokin’ !

Wow! What a crazy web design and it is characteristic of the orb weaving spider *Argiope mascordi*. You have probably all readily seen the female spider sitting in the middle of the web but the male spider can also be spotted just left of centre at the top of the web.

Rumours have it that this is a bit of a “party spider”.



Argiope mascordi Location: Irvinebank QLD Photo by Graham Winterflood

Does *Argiope aetherea* – St Andrew’s Cross Spider – occur in Australia?

Graham Winterflood posted this image of a St Andrew’s Cross spider and in an email asked me whether the species name should be *Argiope aetherea* or *Argiope keyserlingi*.



St Andrew’s Cross Spider Location: Mooroolool QLD Photo by Graham Winterflood

The plot thickened when I consulted the two recently published books on Australian spiders – one by Volker Framenau, Barbara Baehr and Paul Zborowski in 2014 and Robert Whyte and Greg Anderson in 2017.

Curiously and interestingly, if you look in the index of both books there is not a reference in either book to *Argiope aetherea* so I asked Robert what was going on. It seems the answer is a long and drawn out story.

Argiope aetherea was originally described on specimens collected in New Guinea. Subsequent authors misidentified Australian specimens as *Argiope aetherea* and so the “myth” that *Argiope aetherea* occurred in Australia flourished and a number of earlier spider books used this name.

The question as to which species name to use has not been definitely resolved but there seems to be an “unwritten” agreement not to use *Argiope aetherea* for Australian specimens of the St Andrew’s Cross spider but to only use the name *Argiope keyserlingi*.

Perhaps the hope is the name will fade away through non-use.

We will need to wait until someone, probably a PhD student, decides to revise the *Argiope* species of New Guinea and Australia and finally resolves the issue of the correct name and publishes the results.

In the meantime, the Australian Faunal Directory (AFD) and ALA both cite *Argiope aetherea* as an apparent valid Australian species but the authors of the two most recent Australian spiders identification books have not use that name in either book.

Taxonomy by stealth ... Stay tuned

Let's play "Name the Order" !

Our merry band of volunteer "moth-ers" surrounded my desk the other day and asked me to name the Order of Cathy's image. Now there are 26 Orders of Insects in Australia. Until recently, there were 27 Orders but Isoptera (the termites) is now a subOrder under Blattodea (the cockroaches).

Now, I should be able to name an Order of insect and it is always "fun" when a name does not immediately spring to my mind. I was blank and I began to run through the Orders it could not be which left me with the Orders it could be to ponder

Cathy uploaded the below image to my PC screen and we peered long and hard at the image. The mouthparts and position of the legs looked very moth like, but the monoliform (beaded) antennae segment and hairy back did not look moth like. Mind you, this animal is about 2 mm in body length.

Cathy named the Order: "Betweenioptera"

So with a tentative "moth-like" identification we sent the image to the Australian moth guru, Ted Edwards in ANIC, CSIRO.

Ted deliberated and thought it was not a moth but possibly a caddisfly (ie. Trichoptera). So, the image got forwarded to one of the few Australian Trichoptera experts, Dr Alice Well, also now at ANIC, CSIRO.

Eureka – Alice named it as one of her research families called Hydroptilidae which is one of the micro-caddisflies. Try putting this monster on the end of a fly-fishing hook !

There is even a parasitic Trichoptera, the world's only one, here in Australia. *Orthotrichia muscari*, named by Alice, gets inside the pupae of other caddisflies and parasitises them. A weird group indeed.



Hydroptilidae Location: Warrandyte VIC Photo by Cathy Powers

Tracks and Traces

Animal tracks and traces is a fascinating way to record observations. You do not actually see the animal involved but you can identify its presence by the tracks and traces it leaves behind. You need to be a skilled observer to match the tracks with the real animal.

I enjoyed seeing the below images of a tube-dwelling spider - family Segestriidae. The inwardly directed tube is evident as are the nine radiating, strong silk lines that encircle the tube.

A very cool spider indeed.



Segertriidae Location: Bonville NSW Photo by Jeannie.



This tracks and traces presumed insect structure was sent to me the other day. I cannot find anyone who has any idea who/what built such a structure. We still have much to learn.

Paper wasps

Australia has 14 species of paper wasps in the genus *Polistes*. Often you do not see their paper nest but if you happen to disturb the nest then you will most certainly feel their painful sting. Over the past decade or so, two exotic *Polistes* species have taken up residence – one on the central NSW east coast (*Polistes chinensis antennalis*) and the second species in the SW corner of WA (*Polistes dominula*). While both are beautiful species, we would rather not have them here in Australia.

Due to the way these wasps attach their paper nest to almost any solid structure, they have most likely been attached to the side of a transport container and sailed here into Australia. Here is what these wasps look like.





Polistes chinensis antennalis Location: Wollongong NSW Photos by Jeannie



Polistes dominulus Location: Munster WA Photo by Daniel Heald

Now I know you have to eat but

I know spiders have to eat but taking a beautiful, Blue Banded bee as a meal is a bit beyond the pale. Great photos!



Daddy longlegs spider Pholcidae Location: Albury NSW Photos by Karen Retra

I am always amazed at the foreleg structures on some leaf cutter bees

Some, but not all, *Megachile* male bees have enormously expanded for tarsal segments. They come in all shapes, sizes and with different colour patterns.

Observations of these bees when mating showed the male placing these expanded leg segments over the eyes of the female. With light passing through these male segments, we think female sees a mate recognition pattern and they allow mating to occur. Still – they are the most incredible structures.



Megachile lucidiventris Location: Black Rock VIC Photo by John Eichler

And finally, what's a Bugle without Mark Berkery's

Nature Place

Bee life

Every year the orange tail resin bees wake up with the warming sun and the moisture of spring rain.

These may all be female bees, mostly found by the nest – a hotel made of a log drilled for their use.

Their primary use seems to be to lay eggs, along with a little food bomb for the larva that will be.

Another use is protection at night, somewhere to sleep away from all the predators in the garden.

The males live and sleep somewhere else in the garden, not too far away but still a mystery.

Once the bee cycle is underway and some eggs are sealed up in the nest a wasp turns up.

She, the wasp, is also laying eggs, in the bees nest. Her young will take advantage ...

And so it goes, one thing dependant on another thing, until completion.

An end that is not 'just' another beginning.

But a beginning ... without end.

Hmmm ...



© Mark Berkery - Beingmark.com

Hello world ... Breaking out of the nest after a long winter, it's time to get to work. My little brave bee, instinctively ...



© Mark Berkery - Beingmark.com

Time to stretch out, on the wall of the hotel, orientation time perhaps. The sky lightening behind, it's a new world.





© Mark Berkery - Beingmark.com

She lines the nest with resin for protection, some gets spilt on the way in, and she enters backwards to lay an egg.



© Mark Berkery - Beingmark.com

On her way to replenishing the earth with bees, one on the other in a deep dark chamber, here sealing up the first nest entrance.



© Mark Berkery - Beingmark.com

Not quite finished, she goes to sleep the best she can. Not the safest position in a house full of geckos, but she stings ... I know.



© Mark Berkery - Beingmark.com

And what's this, one greeting another to the new world, male looking for a mate, or just saying hello. They talk to one another ...



© Mark Berkery - Beingmark.com

And in case anyone thinks a bee is fragile, I'll have you know she's fierce as a lion to protect her ways. Gentle too ...



© Mark Berkery - Beingmark.com

The wasp appeared, at first no threat it seems, no ovipositor I see. A male perhaps, or just young. Found below the bee hotel.



© Mark Berkery - Beingmark.com

Here she is in fuller form, ovipositor held aloft behind, sitting on the hotel wall, listening for the signs that tell where to ...





© Mark Berkery - Beingmark.com

And this is how it goes – the bee does her work and the wasp does hers too, so it turns. Everybody has its time ...



© Mark Berkery - Beingmark.com



And, as 2017 draws to its natural end, I would like to thank everyone who has contributed in any way to the betterment of BowerBird.

I love the way that so many people I do not know actively participate in enhancing Australia biodiversity knowledge.

I have learnt so much new science from BowerBird and I thank you all for educating me and inviting me and showing me what is in your backyard.

Many great discoveries have been made by BowerBird in 2017.

I wish everyone a Merry Christmas and a Happy New Year.

Thanks for BowerBird and for reading my ramblings in the Bugle.

Happy BowerBirding over December and January and I will see you all again in February 2018.

Bye and Best seasons greetings

Ken

As always from BowerBird .. that's your lot for this month.

Haveagoodweekend all Happy photographing ...

Cheers – Ken

(If you wish to leave this email list, please contact me directly at
kwalker@museum.vic.gov.au – else share with your friends)