



1 September 2017 Ken Walker (kwalker@museum.vic.gov.au) Museums Victoria. Edition 53.

Hi All – First, I must apologise for this delayed Bugle. Things have been busy lately at the Museum. In July, we received a new touring exhibition from the Te Papa Museum in Christchurch, New Zealand called “**Bug Lab – Little Bugs, Super Powers**”. As the exhibition title suggests, it’s all about amazing things that bugs do. The real drawcard for the exhibition are six huge and amazing bug models created by the Weta Workshop which are the same people who made the models for the successful “Lord of Rings” movies. The models are used in the six zones of the exhibition.

In the “**Exoskeleton Zone**” is the bombardier beetle whose model has a children’s slide running through the middle of the beetle – the kids love it. So many parents take photos of their child sliding out the rear end of a bombardier beetle. Who would have thought ??? (:->!

The bombardier beetle’s claim to fame is its ability to inside their body to combine two chemicals which when mixed heat up to boiling point instantly and then the beetle can use this toxic, boiling point spray for defence.



Bombardier beetle Photo credit: @kateflatman

The “**Venom Zone**” has a model of a jewel wasp stinging a cockroach. The wasp’s venom makes a zombie of the cockroach which the wasp makes walk into a burrow it has pre-dug and then lays an egg on the roach. The egg hatches and the wasp larva eats the live, but immobile cockroach.



Jewel wasp and cockroach

The “**Swarm Zone**” shows how Japanese honeybees defend their colony against attack from giant Japanese hornets. The hornet like to get inside the colony and kill the adult bees and rob the bee larvae to feed their own young. Only the Japanese Honeybee (*Apis cerana japonica*) can defend against this attack. If hornet accidentally chooses this subspecies of bee to attack, the worker bees surround and encase the hornet inside the hive. They then beat their wings to increase their body temperature and literally cook the hornet. These honeybees can generate and can stand a temperature of 48C whereas the hornet dies at a temperature of 47C. Very cool.



.Japanese honeybees and Giant Japanese hornet

The “**Flight Zone**” talks about 300 million year old dragonflies. They have recreated an old zoetrope which spins around at a high speed and fools the human eye into thinking they are watching a dragonfly fly in motion. The illusion is amazing.



Zeotrope creating an illusion of dragonflies flying.

Next is the “**Display Zone**”. Here the model is of the Orchid Mantis which uses mimicry to resemble a flower and waits for a bee to approach which it catches and eats. Recent studies have shown that the orchid mantis uses another trick to entice bees. Human eyes cannot see UV light but insects can. Flowers often use UV to attract insects but it was recently discovered that the Orchid mantis body also reflects UV which shines brighter than that of flower. No wonder the insects always go to the mantis!

Finally, there is the “**Silk Zone**” which uses the New Zealand equivalent to our Australian red-back spider which they call the Katipo spider (*Latrodectus katipo*). The silk zones talks about the strength and flexibility of spider silk and its many potential uses in industry and medicine.



Orchid mantis.

A wonderful addition to this exhibition are the “Bug Puppets” – they are huge and need a person each inside to move about. Adults and children interacted so well with these puppets. We had them out and about in shopping centres as well as Victorian regional locations to promote the exhibition.





Another major project I was nominated for (I just didn't step back fast enough) is something called the "Decadal Taxonomy Plan". It's actually quite important as it will hopefully set out the reasons why industry and government should fund taxonomic research in Australia for the next 10 years – 2018 to 2028. Taxonomists from all major Herbaria and Museums have formed a working group to write this document. The initiative and funding is from the Academy of Science.

The hardest part for us is not to write to the converted people but rather to explain to people who do not really know what taxonomy and systematics is all about and to convince them why they should fund it.

The initial plans were to write a massive a tome to be used as a doorstop by now we have decided to write a relatively short, pithy and convincing story. Hopefully, people will read it.

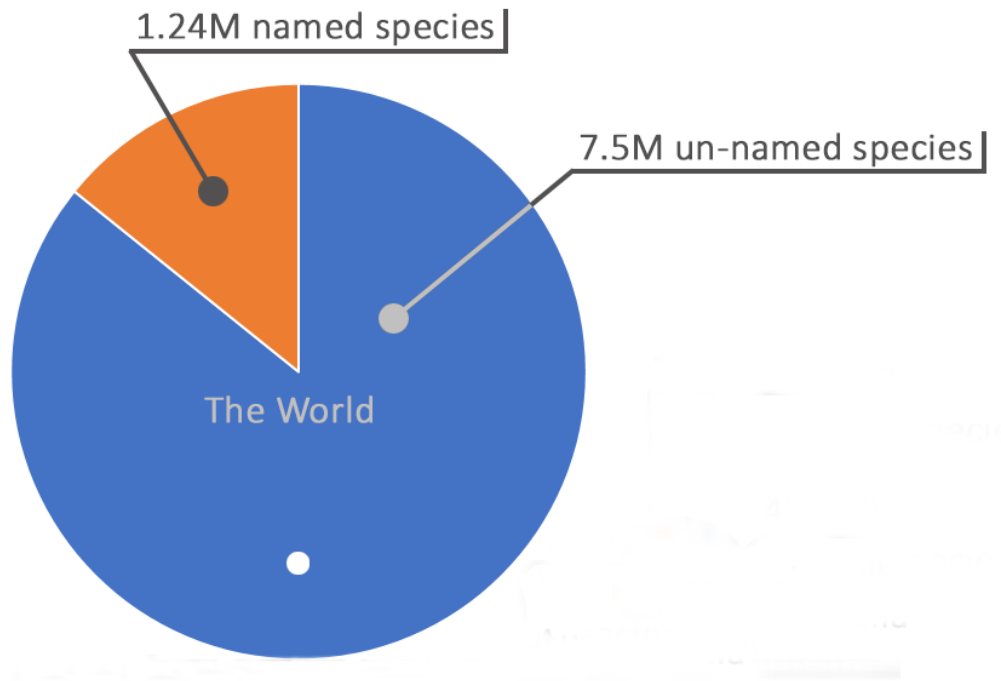
We hope this document will be used by taxonomists when applying for grants. It will allow us all across Australia to use a unified voice and sell the same message.

Now – how well do you think we are going with multiple authors writing a short, pithy and convincing story. Everyone wants to tell their story so lots of "interesting" discussions and editing going on.

It reminds me of one of my favourite statements about taxonomists: If you ask 10 taxonomists to identify something, you will most likely get 11 different answers.

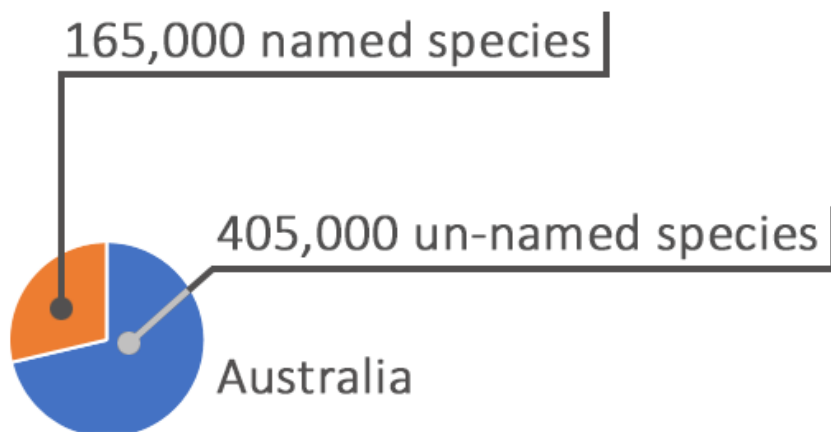
However, I did want to share with you some interesting pie charts about the state of world and Australia known and unknown species – I do not even want to begin talking about the unknown unknown species Thanks Donald Rumsfeld

This first chart shows the estimated number of undescribed species (blue colour) compared to the number of described species (orange colour) and the number of new species described each year (that's the white dot). Depressing hey?



Note the small white dot in the lower half of the world's figure – that's the number of new species described per year.

The next pie chart shows the Australian situation – number of named species and estimated number of un-named species.



So, new exhibition and new Decadal plan but where much of my recent time has been devoted is going down a rabbit hole with me writing a major revision of the bee subgenus *Lasioglossum* (*Parasphecodes*). Many of the available scientific names for these bees were proposed over 100 years ago. Different people have sometime described the same species under different names. And, our collections are now much better than those of 100 years ago so we can now discover new species.

The genus *Lasioglossum* is Australia's largest halictid bee group with almost 300 species. The Australian *Lasioglossum* is currently divided into eight different subgenera with the two largest being *Chilalictus* (almost 140 species) and *Parasphecodes* (almost 40 species). These bees are major pollinators of our native flora and in many cases our commercial crops. Giving them accurate names and knowing where the species occur is important to understand and manage these assets. In 1995, I produced a 423 page paper revising the subgenus *Chilalictus* – it was the result of a “labour of love” over a five year period. I am now preparing a similar paper, hopefully not as large, for the *Parasphecodes* bees.

Michener's 1965 seminal publication on the bees of the Australia and South Pacific Island laid the foundations for bee taxonomy in our region. Michener 1965 listed 99 species that he placed in *Parasphecodes*. To conduct a fulsome revision you need two basic ingredients. You need to see of the original type material used to describe each species. The *Parasphecodes* types are spread across many museums located in the British Museum, London, Berlin Museum, several American museum and several Australian museum. Borrowing, examining and returning 99 types has taken several years of work. In some cases, I personally visited and examined

specimens in Australian and overseas collections but in most cases I borrowed material so that I could compare type material with specimens in my collection. For example, what specimen was Fredrick Smith actually looking at in 1853 when he described and wrote the description for the species he named as *Parasphecodes hiltacus*. Once I can understand what Smith meant with that name then I can add that name to specimens collected after 1853 and then I can produce a distribution map for that species. Pulling together the most complete *Parasphecodes* collection for my revision also took a while as I had to borrow material from many Australian collections. Not all collections have their bee collection well sorted down to subgenus level so I often had to visit many collections and pull out specimens of interest to my study.

Over time you begin to paint a picture. You see what specimens were used to describe species. In some cases, males and females of the same species were described as different species though in many cases colour variation with a species is often the reason the same species has been described several times – even sometimes by the same author!

So in the end, I have decided to:

- Erect 18 new species of *Parasphecodes*
- Place 65 currently named *Parasphecodes* species into synonymy - that is, these are duplicate names of already described species and therefore are invalid names
- Move 7 species placed by Michener 1965 in *Parasphecodes* to the subgenus *Ctenonomia*
- And finally, I have decided there are 38 existing and new valid names for Australian *Parasphecodes* which includes one species known from New Guinea.

Now if only a scientific paper was as easy as my summary above. Science is based on evidence so I must provide scientific evidence to support all of my above decisions. Since many of the species descriptions were written over 100 years ago and often contained only one sex per species, I must write full new descriptions for all known valid species. I must also prepare accurate distributions maps for each species and where males are known I must dissect the genitalia and make a series of drawings – dorsal, ventral and lateral views of the genital capsule as well as a drawing of the 7th and 8th sterna that lie on top of the genital capsule. Finally, with the excellent microscope photography now available to use, I am taking montaged 3D images for each species showing for each species:

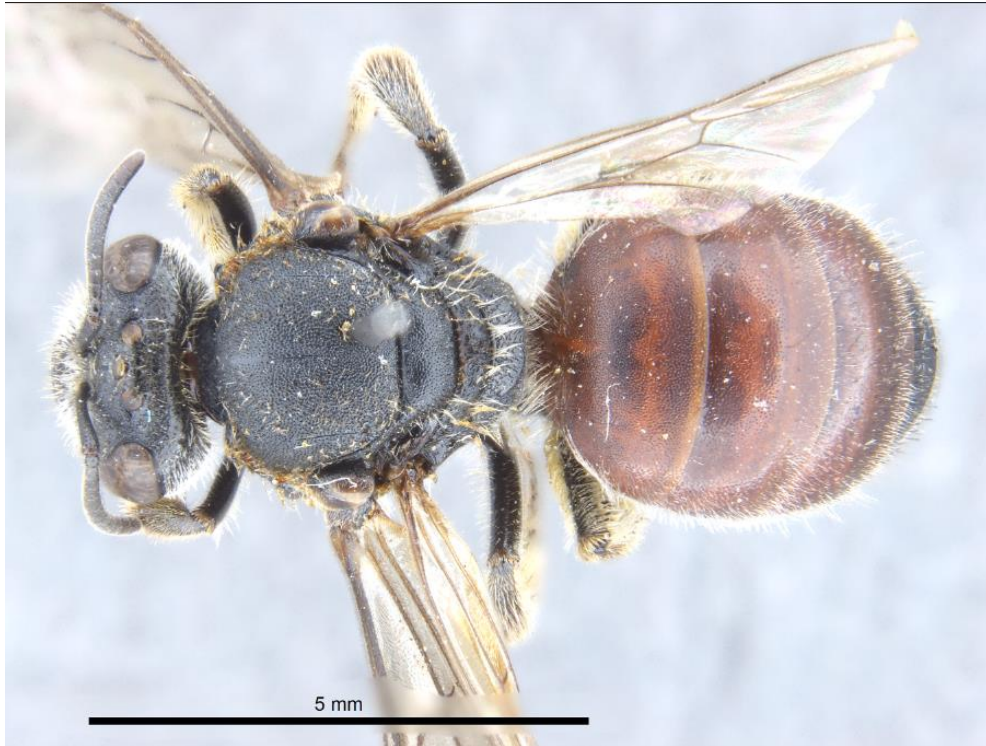
- Female dorsal and lateral view
- Male dorsal view only
- Female head, mesoscutum, propodeum and metasomal views
- And any characters that a species to each species.

As you can image this is no quick or easy task – in fact it takes years of effort. I am now at the stage of combining the many aspects of my revision into a single scientific paper. There are 115 text pages just for the species descriptions alone and many more pages for subgeneric overviews and character analysis.

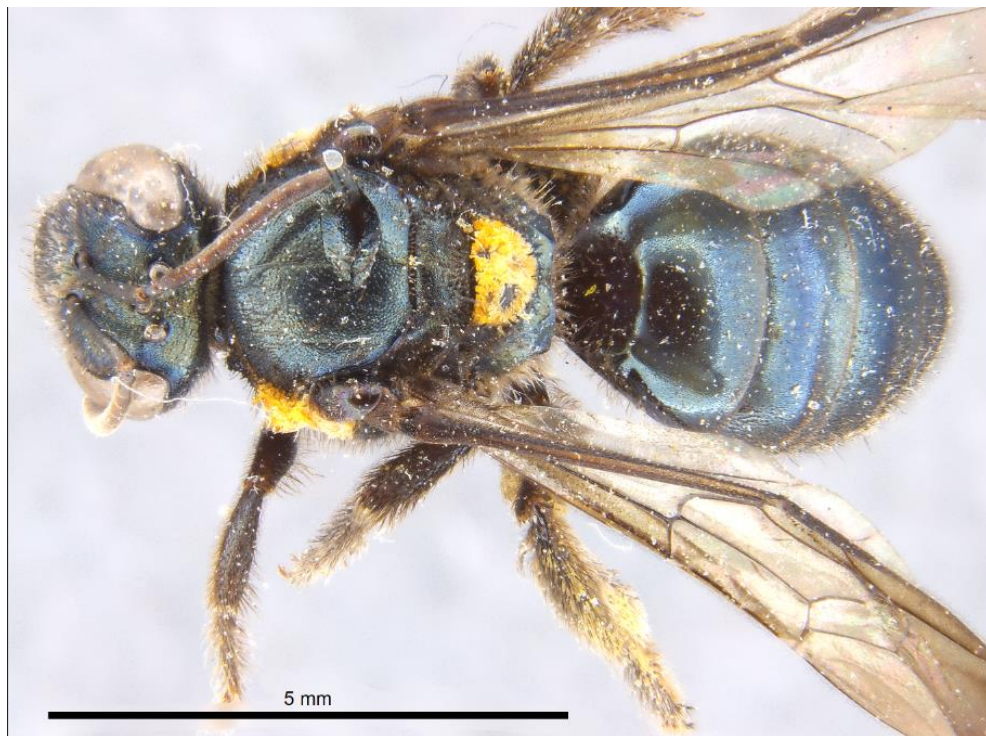
Perhaps you can see why at the beginning I said that I was going down a “rabbit hole” as taxonomic revisions are a bit like asking “How long is a piece of string?” You will only know you have reached the end when you are at the end.

I tend to become extremely focussed and single minded at this stage of the revision and I find it difficult to spend time doing other tasks. Ah – the life of a taxonomist !

Below are some images I have taken showing a range of *Parasphecodes* species from the typical “red and black” species to other colour ranges – including metallic ! Enjoy.



L. (Parasphecodes) loweri



L. (Parasphecodes) sp. nov.



L. (Parasphecodes) carbonarium



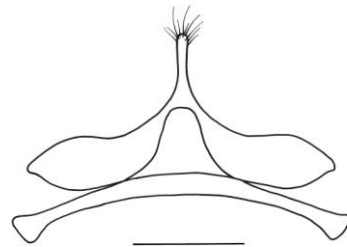
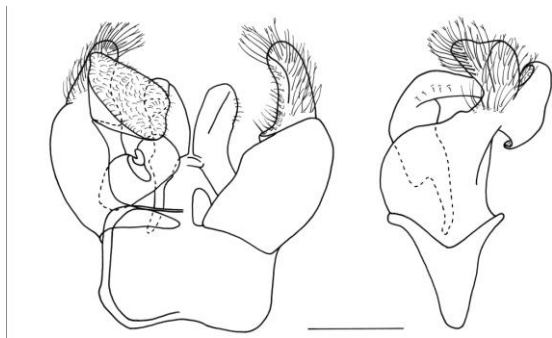
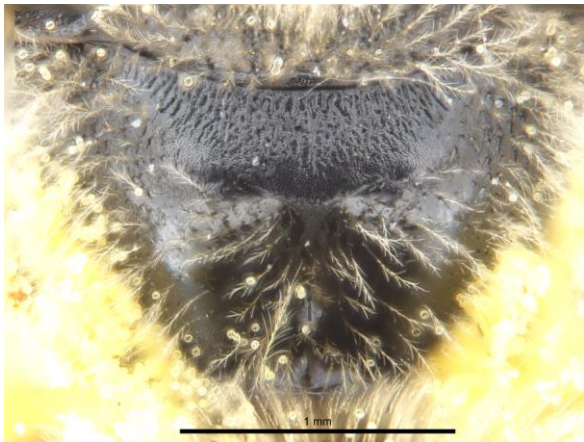
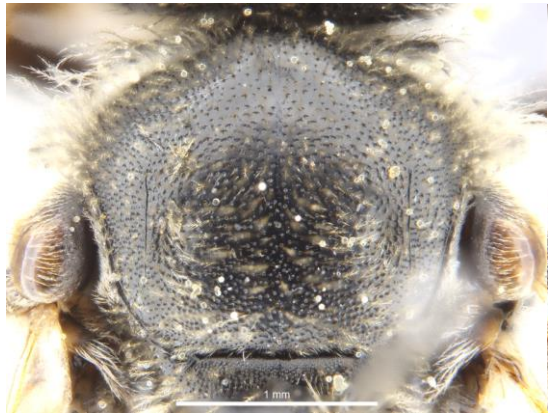
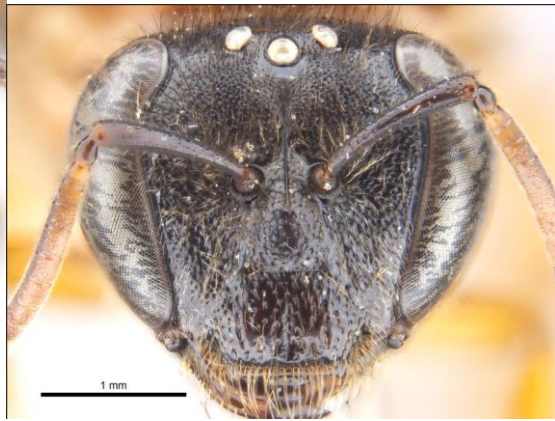
L. (Parasphecodes) sp. nov.



L. (Parasphecodes) musicum



L. (Parasophecodes) imitator



These line diagrams are male genitalia handmade drawings.

A new Project that I recommend is worth a look.

E.O. Wilson coined the most accurate description of the world's most common biota when he said – “It's the little things that run the world.” By sheer numbers of species as well as volume, the invertebrates win every biodiversity race. It has been estimated that there are approximately 200 million insects for each human alive on this planet.

In the world, there are about 20,000 species of fish, 6,000 species of reptiles, 9,000 species of birds, 1,000 species of amphibians, and about 15,000 species of mammals. And, although there are about a million named species of invertebrates, we estimate the real number of invertebrates could be as high as 10 million species.

So, let's look at a group of very small invertebrates. They are not insects and yet they have 6 legs. They are so special that they have their own subclass called “Collembola”. They are the humble **Springtails** – that group of inverts that abound and jump about in your compost heap and can be found almost any rotting log you roll over in the bush. For many, they are too small to see and we humans have a very curious trait – what we don't know we do not appreciate.

So – hopefully, this new BowerBird project will make you all fans of springtails and you will sing their praises to the heavens.

The Project is being constructed by Dr Nick Porch who is a senior lecturer at Deakin University. Nick studies sub-fossil insects and travels throughout the world digging up and looking at insects up to 15,000 years old. Nick's brain needs to work in a funny way to identify the insects he digs up. Rarely does Nick find an entire insect. Usually, he finds only bits of insects – a

head or an elytron or a leg etc. So in Nick's mind he has to build a complete insect based in the bits he has gathered and then he can name what he has found.

I sometimes have to get my mind to work in the same way as Nick when I identify modern day insects by building a complete animal around the bits I have been provided.

The funniest or best example of building an insect from parts presented was when a pest company person brought me in a piece of sticky tape with an insect attached. Unfortunately, by the time the pest controller and the piece of sticky tape reach me, the insect was gone. However, the insect was a moth and the sticky tape had captured an imprint of the wing scales of the moth. Fortunately, it was very easy to identify from just the scales as the two toned Indian meal moth, *Plodia interpunctella* – a major cosmopolitan pantry pest species.



Australia expert scientist on Collembola is Dr Penny Greenslade and she is following Nick's BowerBird records and identifying images where she can.

I fully recommend looking at and joining Nick's "Springtail" Project. You can view it at this URL:

<http://www.bowerbird.org.au/projects/13249>











All images by Nick Porch.

Not even the Grimm brothers could write such a story !

I have always said that if there is such a thing as rebirth, then I do not want to return as a parasite – no way.

Matthew Connors recently posted images of what looked like a worm protruding from the leg of a gecko. Matthew said that he had no idea what the parasite was and asked for assistance. I have a few colleagues at Melbourne University who work on geckos and lizards and so I forwarded the images onto them. They then on-forwarded the images to some other colleagues and we finally got an identification and a story that nightmares are made of.

I was stunned to learn that the worm-like animal was in fact a crustacean – a terrestrial relative to other crustaceans such as marine prawns and crabs or terrestrial slaters and land hoppers.

Parasites often have a remarkable life cycle which sometimes involves an intermediate host. Such is the case with this crustacean animal. The female lays eggs which hatch and wait around until they can attach to an intermediate host such as a dasyurid or elapid or gecko or skink or frog or even an owl. At this stage the crustaceans are in the juvenile, non-reproductive part of their life cycle. They burrow under the skin of their intermediate host and wait. They are hoping that the intermediate host, in which they are waiting, gets eaten by a carnivorous reptile such as a snake. Once inside the gut of the snake, they migrate through the blood stream to the lungs where they hang on using modified mouth hooks. Once inside the snake lungs, the crustacean matures into an adult. The

sexes mate inside the lung and the female crawls outside to lay eggs and begin the life cycle again.

I was totally amazed and totally unaware of such a life cycle – but then again, I should never be surprised at the life cycle of a parasite.

The scientific name of this crustacean is *Waddycephalus* and its taxonomy is: Arthropoda: Maxillopoda: Porocephalida: Sambonidae. Below are images Matthew uploaded with his record.





All photos by Matthew Connors. Location: Douglas, Qld.

Keep your head down and go like the wind.

I enjoyed seeing these images. Below is an answer to a question someone asked about these images: “Do you think this was hunting or anti-predator behaviour?”



Stimson's python: *Antaresia stimsoni* Location: Broome, WA. Photo by Rog Standen

And the answer to the above questions was:

“Liz I am sure this was anti-predator behaviour by the butcherbird as they didn't actually attack the snake. There were two pied butcherbirds and a magpie lark behaving like this and had the snake bailed up in the centre of the track.

When I first arrived the two butcherbirds were standing on the ground near the snake. When it decided to go, the snake bolted for the vegetated verge, almost bouncing across the ground it was going so fast. Both the butcherbirds and the magpie-lark followed the snake to the roadside by hovering above it as shown above.

Immediately after the snake found refuge in the grass I took a photo of the two butcherbirds sitting in a small bush above where the snake disappeared and it was only after I checked the photo later that I had also captured a blue-winged kookaburra flying past behind the butcherbirds.

I can only surmise that it had been watching the events, or was attracted by the commotion, and flew off once the snake had gone (although it may have been the arrival of the kookaburra that caused the snake to leave).

A fascinating piece of theatre by all involved.”

I love reading the stories attached to BowerBird record – they offer such rich insights from people who took the photos.

Live images show so much more.

I often say to people that the live images that people upload to BowerBird show so much more than just the taxonomy and identification of the animals in the image. I have seen so many new behaviours from BowerBird images.

One such image is below. We all know or have heard that ants “milk” the honeydew produced by sap sucking insects. The bug sticks into mouthparts into the plant and due to the enormous sap pressure inside the plant, the sap shoots into the bug and out the other end.

I have revisited this images several just to enjoy it.



Iridomyrmex ant milking a eurymelid bug. Location: Uleybury SA Photo by Frank Prinz

Banksia bees fascinate me – watch out for them.

Males of so called “banksia bees” are ferocious protectors of their domain. They sit on banksia flowers waiting for a female bee to visit and will attack any other male bee that tries to use the same banksia flower. They are fascinating to watch.

There is a banksia bee on either side of the country in SW Western Australia and SE Queensland and BowerBird members have uploaded images of both species.

In SW Western Australia, the banksia bee is *Hylaeus Macrohylaeus alcyoneus*.



Male *Hylaeus alcyoneus* Location: Jandakot WA Photo by Faye Arcaro

In SE Queensland, the banksia bee is *Hylaeus Prosopistemon bidentatus*.



Male *Hylaeus bidentatus* Location: Palm Beach QLD Photo by Tobias Smith

Males of many bees stake out specific territories and wait for a female to enter.

If you sometimes walk along a bush track you may notice an insect flying up and down a section of the track. More than likely this will be a male halictid bee on patrol. Then the central Australian males of *Xenohesma euryglossine* bees forming enormous swarms of male bees. Females fly into these male swarms to mate. Interestingly, males has enormously enlarged eyes presumably used to spot females amongst the flying mass of male bees.

A rare larva spotted.

If you have been infected with the butterfly collecting “virus” and in particular the particularly virulent strain of Lycaenid or hairstreak butterflies collecting, then you will know that one of lycaenid Holy Grails is to find specimens of *Ogyris idmo* butterflies whose larvae live inside a *Camponotus* ant nest. The butterfly larvae are predacious on the ants. Jean and Fred Hort recently went one better than finding the adult butterfly and found the larvae of these butterflies. I could not find any other example of these larvae images on the web so they will be a first images captured.

I have now almost fully recovered from my earlier butterfly collecting virus but I still found my breath was still taken away by Jean and Fred wonderful images. Enjoy:







Ogyris idmo larvae with *Camponotus* ants. Location: Lesley, WA. Photos by Jean and Fred Hort

Fungi attacking insects

Fungi attacking insects has always fascinated me. Varieties of Cordyceps type fungus are usually involved. The reproductive fungal fruiting bodies that grow out from the body are amazing to me. Reiner recently uploaded this fungal attack image.



Sordariomycetes: Hypocreales Location: Gembrook, Vic. Photo by Reiner Richter.

Another first for BowerBird on ALA

Matthew Connors recently uploaded images of a beautiful cerambycid beetle which he said he was not able to identify. So, I sent Matthew's images to the CSIRO cerambycid expert, Dr Adam Slipinski who gave the beetle a name. I checked on ALA and there were no records or images for this species. The beetle can be found in Moluccas (Aru Islands, Kai Islands), New Guinea and Australia (Queensland).





Pelagoderus rubropunctata Location: Cape Tribulation QLD Photos by Matthews Connors

Frogs galore!

I have been enjoying Matthew Conners' wide variety of frogs species of the genus *Litoria* he has found and uploaded to BowerBird. They provide a wonderful identification resource. Here are some recent uploads:



Litoria rubella Location: Coolbie QLD Photo by Matthew Conners



Litoria gracilentata Location: Mutarnee QLD Photo by Matthew Conners



Litoria infrafrenata Location: Mutarnee QLD Photo by Matthew Conners



Litoria wilcoxii Location: Mutarnee QLD Photo by Matthew Conners



Litoria bicolor Location: Mutarnee QLD Photo by Matthew Conners



Litoria sp. Location: Kuranda QLD Photo by Matthew Connors



Litoria caerulea Location: Douglas QLD Photo by Matthew Connors



Litoria rubella Location: Douglas QLD Photo by Matthew Connors



Litoria gracilentata Location: Douglas QLD Photo by Matthew Connors



Litoria lesueuri Location: Greendale, Vic QLD Photo by Matthew Conners

Spotting the mimic

Mimicry is the art of fooling a predator into thinking a harmless insect is in fact something that can cause harm and to be left alone.

The insect being mimicked is called the “model” while the insect doing the mimicry is called the “mimic”.

The best known examples of mimicry are insects mimicking wasps and these include beetles, flies and bugs mimics.

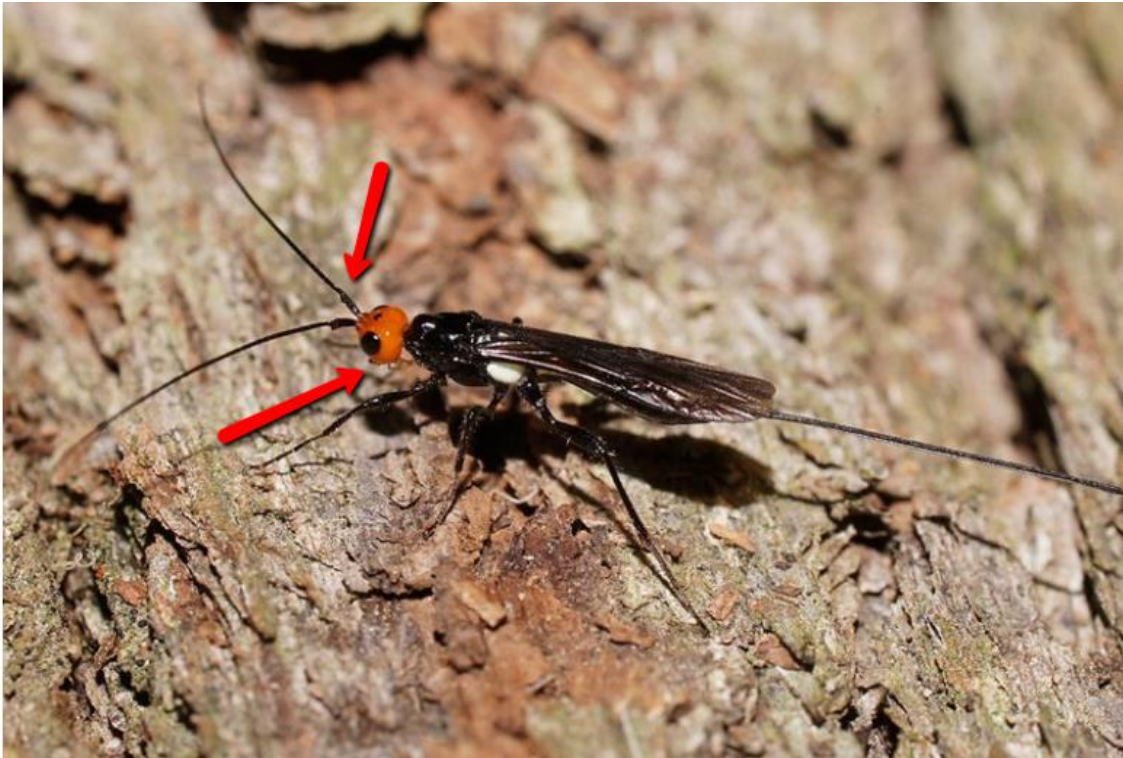
There are certain rules for the mimicry to work. Obviously, the mimic must be a good size and colour match. The distributions of the model and mimic insects must overlap. And finally, the mimic must be in lower population numbers than the model so there is a better chance of a predator first attempting to attack the model and getting bitten or stung. Once the attacker connects a particular colour pattern with harm then it will leave alone that colour pattern – hence the mimics.

I was recently asked how to distinguish between a Braconidae wasp model called *Callibracon* and the remarkable Miridae bug mimic called *Rayieria basifer*.

The difference are easy to spot when you know what to look for. There are two major difference -see arrowed images below:

1. The first segment of the bug is elongate before the elbow where the rest of the antennae curves away. The first segment of the wasp antennae is short.
2. The eyes of the mirid bug protrude laterally from the sides of the head – a common character in mirids. Whereas, the eyes of the braconid wasp do not protrude and are rounded with the shape of the head.

Below are great examples of both model and mimic.



Callibracon sp. wasp Location: Penrose State Forest, NSW Photo by Reiner Richter



Rayieria basifer mirid bug mimic Location: Conder, ACT. Photo by Reiner Richter

Here are some other excellent mimics.



Drone fly mimicking a honeybee *Eristalis tenax* Location: Elizabeth East SA Photo Frank Prinz



Hover fly mimic *Ceriana ornata* of a vespid wasp Location: McArthur NT Photo Linda Rogan



Wasp mimicking hover fly *Melangyna viridiceps* Location: Viewbank VIC Adam Edmonds



Wasp mimicking hover fly *Allobaccha* Location: Sunnybank QLD Jenny Thynne



Wasp mimicking hover fly *Allobaccha* Location: Sunnybank QLD Jenny Thynne



Wasp mimicking hover fly *Allobaccha* Location: Sunnybank QLD Jenny Thynne



Wasp mimicking longicorn beetle *Hesthesis* Location: McMahoNs Creek VIC Reiner Richter



Wasp mimicking longicorn beetle *Hesthesis* Location: McMahoNs Creek VIC Martin Lagerwey



Wasp mimicking longicorn beetle *Hesthesis* sp. Location: Southwest TAS Reiner Richter



Wasp mimicking longicorn beetle *Hesthesis* sp. Location: Stratton WA Jean & Fred Hort

Mimicry can also be used by predators to fool their prey that they are not actually predators as in this particular genus of jumping spider which mimics ants!



Myrmarachne erythrocephala Location: Freshwater QLD Photo by John Eichler



Myrmarachne sp. Location: Cranbourne VIC Photo by Lek



Myrmarachne erythrocephala Location: Roebuck WA Photo by Rog Standen



Myrmarachne sp. Location: Emerald Photo by Laurence Sanders



Myrmarachne sp. Location: Emerald Photo by Laurence Sanders



Myrmarachne sp. Location: Emerald Photo by Laurence Sanders



Myrmarachne rubra Location: Edge Hill QLD Photo by Martin Lagerwey



Myrmarachne sp. Location: Clifton Beach QLD Photo by Andrea Lim

Finally, your Fungal & Slime Mould Foray !



Schizophyllum commune Location: Uleybury SA Photo by Frank Prinz



Fungal mass Location: Mount Cooke WA Photo by Jean & Fred Hort



Leocarpus fragilis Location: Great Western VIC Photo by Jenny Holmes



Coral fungus Location: Cockatoo VIC Photo by Torbjorn von Strokirch



Mycena fumosa Location: Toorong VIC Photo by Tamara Leitch



Hygrocybe sp. Location: Yallourn VIC Photo by Tamara Leitch



Psathyrella echinata Location: Tarraleah TAS Photo by Tony Eales



Galerina patagonica Location: Southwest TAS Photo by Tony Eales

Delicate and very rare !

Lacewings are the some of the most delicate of insects and their wing venation looks like lace.

Through much hard work and diligent study of our museum collection, reading much of the available literature and spending countless hours collecting at night lightsheets, Ken Harris is becoming a recognised authority on Victoria lacewings.

Only today (1 September 2017), Ken has annotated a previous record saying that it is a recently described new species. I checked on the web and there are no images of this new species. Enjoy here on BowerBird.



Austroneurorthus horstaspoecki Location: Baw Baw VIC Photo by Reiner Richter

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

Nature Place

Walking about the local bush I came across an unusual sight. These are larva similar to that seen alongside the sawfly of a recent post. They have in common their appearance and this raising of their pointy rear end when alarmed but otherwise are of a different kind.

When I touched the stem they were congregating on they raised their rear ends, some quickly blew out that orange liquid and a few just dropped to the ground. I can't imagine many would-be diners would find their appearance appetizing.

All get defensive, some go passive and some get aggressive, or have the appearance of that. Not unlike people under threat. But unlike 'many' people they (mostly) don't give me any sense of a capacity for self reflection ...

... the prerequisite to 'self improvement', which, after all is done and been, must end in the simplification of being, because everything else (being identified with anything that dies, and everything dies) hurts, eventually.

That is not to say there is no animal, big or small, that doesn't have it – self reflection. It's a wonderful earth and such a wonder wouldn't be out of place here ...



© Mark Berkery - Beingmark.com





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)