23 October 2015 Ken Walker (kwalker@museum.vic.gov.au) Museum Victoria. Edition 31.

Hi All – I always enjoyed receiving email comments and questions from the BowerBird membership. This week, I received an email from a member. The discussion went along the lines that while they could relatively easily identify birds and mammals to species, they felt disappointed they could not do the same for invertebrates. My first reply was to say: “Welcome to my world of the unknown!”

Then I added a few statistics. In Australia, there are ONLY:

- 379 species of mammals
- 828 species birds.

We know these vertebrate species well and it is extremely rare to find a new Australian species in these groups.

Plant wise, Australia has about 28,000 species.

For invertebrates, Australia has over 300,000 described species and estimates say that may be only one third of the Australian fauna.

World-wide, there are about 2 million described species of plants and animals - over 98% being invertebrates. Estimates put the real number of species in the tens of millions of species.

The world-wide number of flowering plant species is about 260,000. Guess what? – There are over 550,000 described species of JUST beetles. That's twice as many beetles as all of the flowering plants in the world.

When I first began interacting with social media, I was stunned to see people putting images confidently to species level. I could not work out how they do that based on an image only. I finally realised they have a very narrow view of what is out there and if it "looks" like something they know, then it must be that species. I have seen some terrible mistakes made. I try to engage with the Facebook Native Bee group and I do most of their identifications. Some people a go at naming their picture but many get the family incorrect. They are not used to looking at and using the bee's wing venation as their first guide.

There are 27 Orders of Insects in Australia. For Australian beetles alone, there are 117 families - that's before you begin to tally up the numbers of genera (3,688) and species (24,107 – almost as many beetles as Australia's plant flora). Insect taxonomy is difficult and challenging – I have spent my working lifetime trying to understand the approximately 2000 species of native bees and I have described over 200 new species.

If you learn mainly from images, then you have a long road to learn. I have learnt from spending almost 40 years looking at thousands of specimens under microscopes and reading lots of scientific literature to learn their ways. I have three University degrees in Agriculture and Entomology. My first day of work at the Museum was 27 April 1981. I had recently received my Masters and I thought I knew something about insects. On that first day, I was asked to identify an insect from a member of the public. I took one look at it and other than suspecting it was a beetle larva, I had no idea of its identification. At University, I had only ever been taught to recognise the adult form - we had never been taught to identify the larval stages.

So, I went to the entomology technician, Ms Elizabeth Mathesion, who had been the Museum's entomology technician for over 30 years and knew the collection backwards – she had also had 30 years' experience answering public enquiries. Elizabeth immediately recognised the beetle larva and gave the member of the public some advice. The specimen was the larva of the most common Carpet beetle better known to Museum people as the Museum beetle - the insect that causes most damage to natural history collections worldwide – and I did not recognise it… A great first day !

Humbled and without me asking, Elizabeth took me under her wing and over the next 5 years, I began to learn something about the immature stages of insects.

And, I am still learning something new about insects every day - ever after 35 years of being the Curator of Insects at Museum Victoria.

I do my research on native Australian bees; however, my greatest learning tool comes from answering thousands of public enquiries. This is where I have to put on my detective's hat to first of all name the insect. I finally realised what information the public wanted from me. Was their insect:

1. An economic problem
2. A medical problem
3. A nuisance problem.

To answer these three questions, I first needed a key to access the enormous literature on insects. This key to the literature is the scientific name. In my job, nomenclature is the road to success with public enquiries. I cannot always put an insect to an exact species so I go up a level or two.

By nature, humans like to categorise and place things in known boxes. Think of a walking into a supermarket where nothing was in order and all of the items were mixed up. Where would

you start to shop? Cabbages next to powdered milk and strawberries next to canned tuna. What a mess. So with natural history classification, humans invented a hierarchical system – just like a supermarket. The system has many levels but in general we use these:

Kingdom -	Is it an animal, plant or mineral ?
Phylum -	Has it got a backbone or not ?
Class -	If it has 6 legs then it's a Hexapod
Order -	Is it a beetle or butterfly or ant or fly etc
Families -	There are 117 beetle families in Australia
Genus -	These are groupings inside families
Species -	The only true unit created by nature. Everything above species is a human made artefact.

So, if I cannot place an insect to species, then I name the Genus, or Family or Order or Class etc. The beauty of this system relies on the fact that has we move from Kingdom to Genus, we continue to associate animals that are more closely related.

At the Class level, all forms of insects are mixed together. We know that they do not have a backbone, that they have an exoskeleton, they have articulated appendages.

At the Order level, we know the differences between a moth and a beetle. We know that cockroaches have a Hemimetabolistic life cycle – which means out of the egg comes a miniature version of the adult form and over its life time it grows into an adult. We know this form of life cycle is the least successful because from day one, the miniature version competes for the same food source as the adults. Compare this to the butterflies, flies, beetle etc which have a Holometabolistic life cycle in which an organism grows through different stages of egg, larva-maggot, pupa and finally and adult. This is a highly successful life strategy as the immature stages do not

eat and compete for the same food as the adult so the all of the major groups of insects have a Holometablistic life cycle.

The Family level tells us the difference between a hoverfly and a robberfly or a scarab beetle from a weevil. As we move down the classification, animals within groups look more similar and have more similar life strategies. So, I can say that all adult robberflies are predators while all adult hoverflies seek nectar only.

The genus level provides us with very specific sets of characters that link the species within a genus. Using a bee example, I can tell you that all bees within the genus *Homalictus* carry their pollen primarily on the underneath of their abdomen using feather like hairs, whereas bees in the genus *Lasioglossum* carry most of the pollen on their hind legs and have branched hairs.

The effect of this hierarchical nomenclature allows me to glean and pass on information from any level of the classification. The higher the level the less specific the information is and the lower you go, the more specific the information is.

I often quote the termites as an example of classification allowing me to decide whether a person's termite infestation is an economic problem or a nuisance problem. There are about 270 termite species in Australia. A person may bring me in a termite they found eating wood in their house and I may say, you do not have a termite problem. Two of the common termite genera found eating houses are *Coptotermes* or *Porotermes*. *Coptotermes* is a genus of dry wood termite species while *Porotermes* is a genus of damp wood termite species. If you have *Porotermes* eating wood in your house, then most likely the grout around the bottom of your shower base has fallen away and water has been seeping onto the timbers below for a number of years. The water has rotted the wood and only because the wood is rotten have the termites come in to eat it.

Your solution is to replace the shower base grout and replace the rotten timber below. I have just saved you thousands of dollars as you do not need to engage a pest company to come and spray your house for termites. I can also tell you that the *Porotermes* will not occur in any of the dry timber in your house. BUT, if I tell you your termite is *Coptotermes* then sell up as you have a major economic problem. These dry wood termites destroy houses by attacking sound wood throughout the house. Usually, the *Coptotermes* nest is in the base of a tree in your yard or your neighbour's yard and most likely there will be several points of entry. You will need to engage a pest company treat your entire house and to lay a barrier around the perimeter of your house. The pest company will probably also sink pieces of wood in places around your house that they will inspect every 6 months for signs of termite attack. This genus of termite will cost you thousands of $$ to treat.

For me to provide the public with this information has required insect taxonomists to collect specimens around Australia, to describe new species, establish distributions for genera and species and then to place information in scientific papers about their biology and behaviour. I can access these years of work simply by correctly naming your termite.

I always say, the greatest problem facing taxonomy, is that we answer questions that have not yet been asked. If the species has not yet been described, then I cannot provide much information. If it has been described, then I can provide much information.

Placing animals to species is a difficult and important process. Get the name wrong and all of the information you give is wrong as well. Get is right and you gain access to a wealth of information. Invertebrate species level identification is difficult and often not something that can be done based on an images alone. Taxonomists need to look at a range of characters, in some cases even the insect's genitalia to place it to species.

The Atlas of Living Australia - A Legend: Part the Second – Lee Belbin

Yes, there are a few more legend features of the Atlas' Spatial Portal (SP: http://spatial.ala.org.au) that you may find useful. First up, one of the basic features – the **type** of basemap used. The options available are found under Map Options in the legend area of the SP. Note that when a number of layers are already being displayed, all you will see is this heading and not the options themselves. In this case, simply click on the heading and the options are revealed. The four options available are-

- An outline map that is useful for publications,
- A 'minimal' basemap that uses OpenStreetmaps,
- A 'normal' basemap that uses Google Maps default and
- A 'Satellite' option based on Google Earth

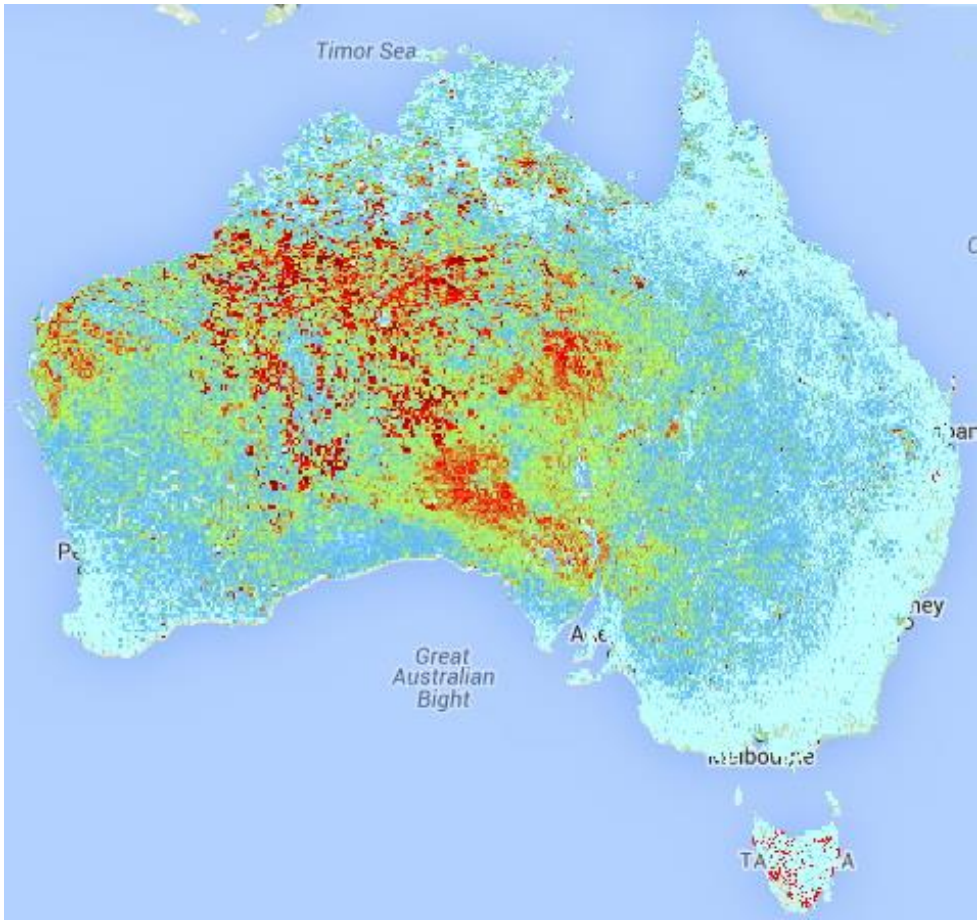
When multiple layers are being displayed, think of them as draped over the basemap like a layer cake. If you are looking down on the top of the 'cake', the layer on the top will be the most visible (unless it is a strange cake). In the SP the layers are in the legend area the same as in a layer cake; those at the top take precedence in the map display. There are situations where for example you may want the points associated with a species (or genus etc) displayed on a map of temperature. If the temperature layer is on top because it was the most recent layer added, you may not see the points, unless they extend spatially beyond the layer. So, what you do is **drag** point layer to the top in the layer list area (or you can drag a layer down). Easy. You can also modify the **transparency** of the layers (click on the layer and use the slider), so you can achieve some real works of ~~art~~ science.

There's more. Map a species, any species but preferably one with a goodly number of records. At the bottom of the legend, you will see **Animation show**. Click on the **Show** and you will see that you can animate the display of points on the map over year or month. Cute?

But that is not all the legend area offers. For any layer (point, polygon or grid), you can hide it and review it via the tick box to the left of the name, or zoom to its spatial extent, view the associated metadata or delete the layer using the three icons to the right of the layer.

OK, one more, and this one is versatile. You can display any layer from any data provider in the world that supports an international standard called Web Map Service (WMS), hence the button **Add WMS Layer**. If this button isn't visible, click on Map options and it will be so. WMS is basically a web address for map layers. I have provided some examples from

AusCover, iMOS (marine), Geoscience Australia, and the Bureau of Meteorology. If you want to explore some of these, click on **Use**, then click on **Select layers**, then click on the bottom drop-down box that will appear and select the layer you want to display and finally click **Add to map**. Bingo. I've mapped 'bare soil' from AusCover's collection. If you want to know more about the data, click on the link. One drawback of WMS compared to the layers in the ALA is that it is an image of the data, and not the data itself. Enough on the legend.



What’s your favourite fly Family?

People often ask me “What’s your favourite insect?” and I really do not have a convincing answer as I like them all. I know bees better than any other group but I enjoy the vast diversity of shapes, sizes and colours of the world’s invertebrate fauna.

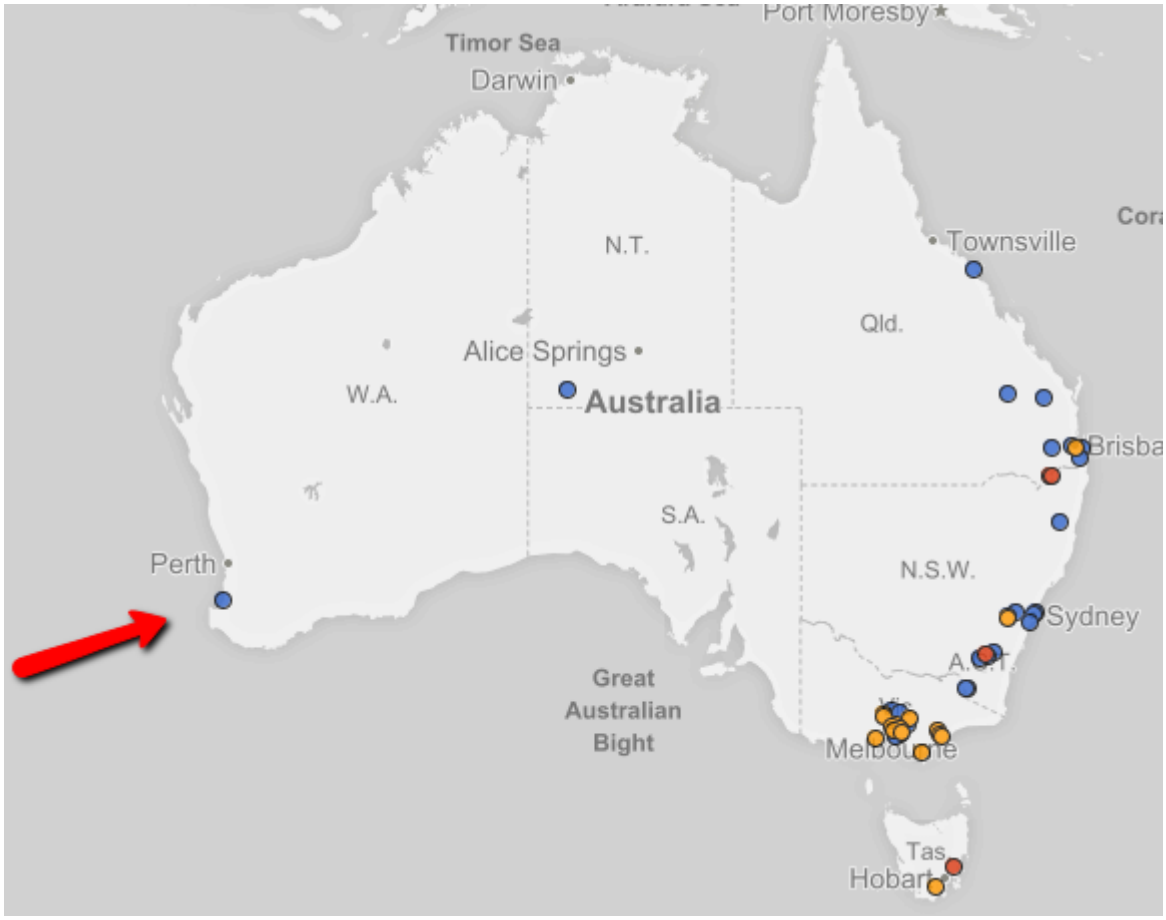
But, if there was a fly family I do “warm” to more than others, it is the Acroceridae commonly known as “small-headed flies” or “hunchback-flies”. Many acrocerids are bee or wasp mimics and because they are parasitoids of spiders, they also are known as “spider flies”.

Acrocerids are not commonly seen or collected. I remember at Uni, this family attracted extra points if included in the undergraduate insect collections we had to make.

On ALA, this entire fly family is represented by only 125 records.

The acrocerid maggot can move with a looping movement like a leech or inchworm and can leap several millimetres into the air. When the fly maggot comes in contact with a spider, the larva grabs hold, crawls up the spider's legs to its body and forces its way through the body wall, usually at an articulation membrane. Often it lodges near a book lung in the abdomen where it may remain for years before completing its development. Adult females lay large number of eggs, up to 5,000. Curiously, mature larvae leave the host to pupate outside the body of the host.

Another interesting Acroceridae ALA data statistic (I love playing with data!) is that there is only one acrocerid record on ALA for the entire state of Western Australia:



Well, get ready for the second WA record to be added next week. That dynamic duo from the west, Jean and Fred Hort, have done it again. And, what a cracker set of beautiful images of a local Perth acrocerid species. I noticed that Jean and Fred posted the record on the 19th October and Tony D. from Tasmania named it to species on the same day.

How's that for service!

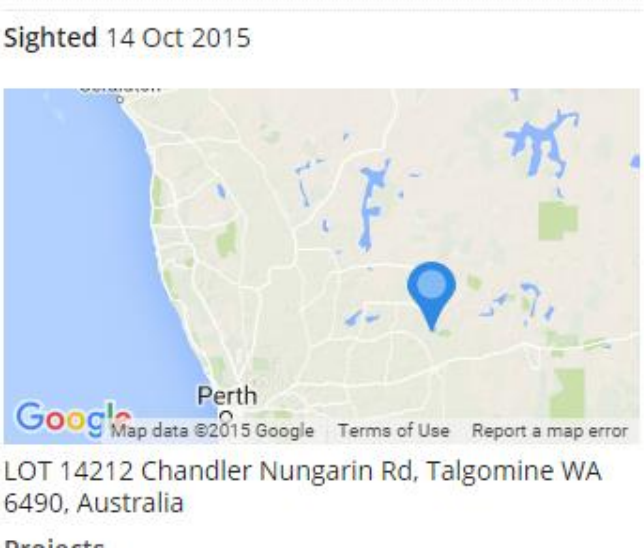
Jean and Fred's acrocerid looks to be a large sized fly and look at the hairy nature on the body of this fly!

Pterodontia mellii Location: Swan View WA

Photos by Jean and Fred Hort

Another wonderful series of fly images from Jean and Fred

Jean and Fred uploaded a fabulous series of seven robber fly images on Wednesday this week. The location is NEE of Perth:



Jean and Fred commented: “The robber flies were patrolling the sandy (slightly damp) edge of the Salt Lake for food. Caterpillars and flies were some of the food they were catching. I suspect the ones with the dark thorax and orange moustaches were males. The Asilidae with lighter thorax and moustache have female brushes visible at the end of their abdomen. More study required.”

Tony D. has offered an identification opinion: “Great series and observations. They are unusual little robbers. My best bet on wing venation and general look is *Amphisbetetus* (https://sites.google.com/site/australianasilidae/subfamilies/stenopogoninae/stenopogonini/amphisbetetus) but really one for the experts.” There are 4 Australian species in this genus of which 3 occur in WA. There are no images on the web for any of these species and ALA has no records for the genus. A real mystery that Jean, Fred and Tony D may have begun to open.

Photos by Jean and Fred Hort

I have sent these images to an Asilidae expert.

It had to be here in Victoria !

Fly (Diptera) records are certainly flavour of this week. Mitch Smith added a curious fly photographed at Cabbage Tree Creek, Vic that Mitch described as “Was aggressive toward other insects”.

Tony D. has identified Mitch’s fly as *Odyneromyia spadix*, a Syrphidae or hoverfly, and added these comments: “Great capture Mitch. There are more species for genus but looking at their descriptions I'm confident on O. spadix - the others either darker or with spots formed dorsally on the thorax (found on the scutum or scutellum).”

A look on ALA shows records for this species in NSW and Tas but none yet for Vic – until now! Great record Mitch!

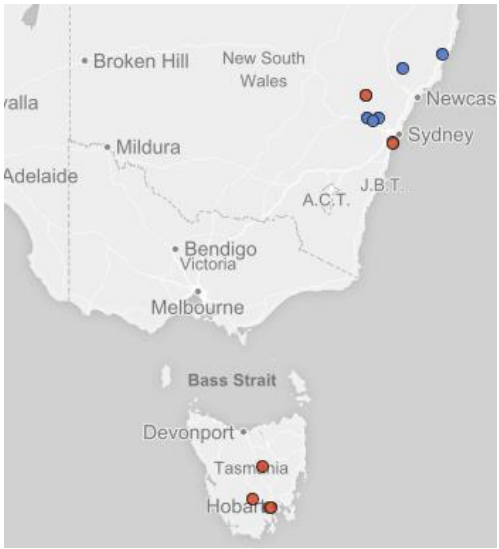


Photo by Mitch Smith

Flies on a dead wombat.

BowerBird photographers leave no stone unturned as seen by Mitch's images of flies found on a dead wombat.

Mitch managed to get a few great close up images of these small flies on the carcass.

Location: Munro VIC. Photo by Mitch Smith.

They were enough for our resident fly expert, Tony D., to put both fly images to species. The left image is Diptera: Sciadoceridae: *Sciadocera rufomaculata*. The right image is the Reddishbrown blowfly: Calliphoridae: *Calliphora ochracea*."

A check on ALA shows: The *Sciadocera rufomaculata* record will be the first record for this species on ALA; The *Calliphora ochracea* will be the first record for Victoria on ALA. All other records are from NSW. Tony knows his "blowies" with this comment: "Probably the most beautiful golden blowie. Note for this species the combination of reddish abdomen and scutellum (also legs), scutum densely dusted yellow, and eyes with dense erect yellow hairs. C. nigrithorax is another similar looking species but has the scutum lightly dusted grey instead."

Much to learn from Tony's comments.

Insect or Fish? (:->!

Maybe it is just me, but when I first saw this image I thought the head looked fish-like.

But really, it is an immature Flatidae sap sucking bug.

What an amazing colour pattern. Why?

Location: Hermit Park, Townsville QLD

Photo by Graeme Cocks

Even seen a bee having a clean up?

One of the characters that differentiates bees from wasps is their grooming ability which is needed to move pollen around the body. Pollen is collected by the forelegs but it is carried at the back of the body on either the hind legs or underneath the abdomen. These images show a bee's cleaning dexterity!

Lasioglossum mesembryanthemi Location: Cobains VIC

Photos by Suzanne Jones

It amazing how much information one record can hold.

Jenny Holmes recently uploaded this “bottoms up” view of a blue banded bee and wondered if it was *Amegilla cingulata*.

Location: Great Western, Vic. Photo by Jenny Holmes.

I often use 2 sources of information to assist me with identifications – PaDIL and ALA. There are two similar looking Amegilla species down here – A. asserta and A. cingulata. So, I went to PaDIL and I created a comparative image table for both these species image next page. I find with image based identifications, I need to “add-lib” and imagine characters when I cannot see them. I decided to select A. asserta – which species would you have chosen?

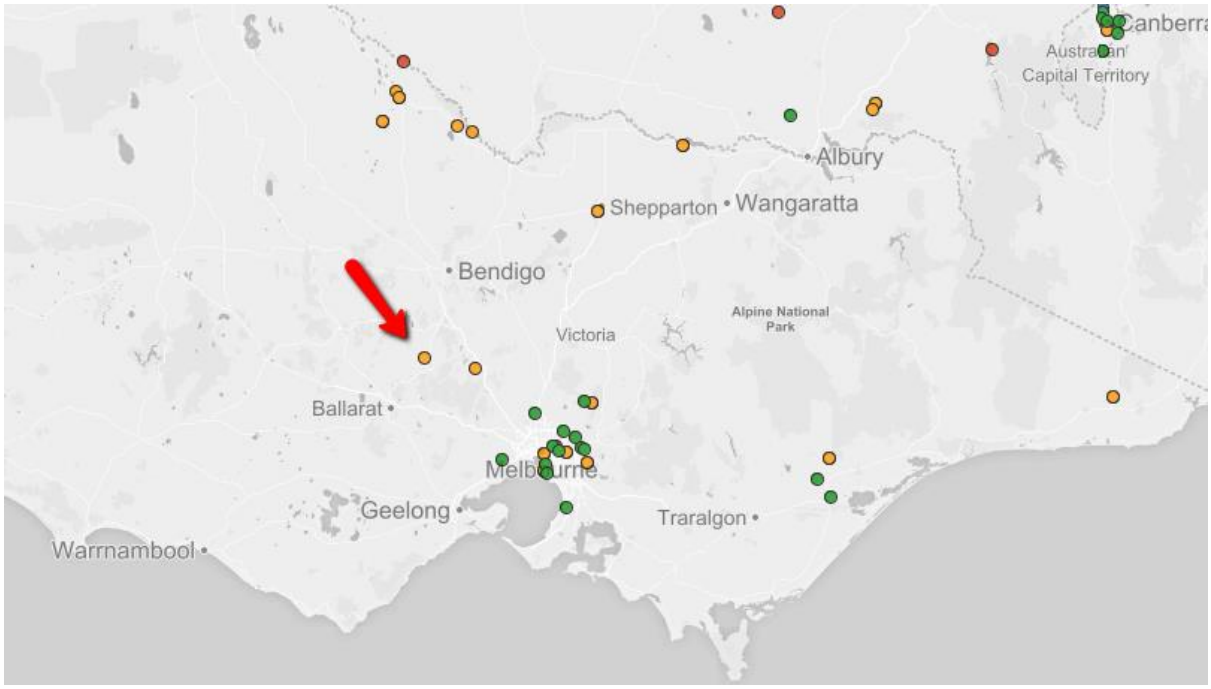
Amegilla asserta *Amegilla cingulata*

You can see the head colourations are extremely similar:

Probably the most useful view to aid separation is dorsal view:

But then I decided to check the ALA distributions to see if one of these species has not been recorded this far west (Great Western) in Victoria. What a surprise I found.

This ALA distribution map for the subgenus Amegilla (Zonamegilla) in which both of these species occur. The map showed that there are currently no subgenus record for anything west of Hepburn (arrowed dot). So, nothing west of Ballarat let alone further west to Great Western. So, what a great record to add to ALA – a new western Victorian record for this subgenus and species.



I keep saying and BowerBird keeps proving that every diversity/conservation record is of great value from spatial and temporal points of view. That's why BowerBird insist you include where and when your photo was taken.

Thanks for sharing Jenny.

Speaking about insect distributions –

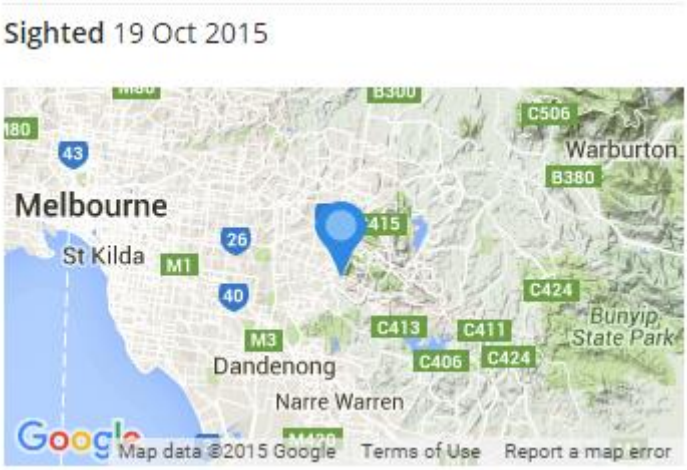
Is this a clear example of climate change?

A record popped up on BowerBird that had our “moth-er” people doing an Irish Jig! Strange people our “moth-ers” – mainly active at night around light-sheets, sleep most of the day, have over 10,000 Australian species of which oodles are not known, can get up to 500 moth species in one night’s trapping. However, they are full of help when an image of an unknown moth arrives on BowerBird.

Mark Ridgway uploaded this amazing moth from Tremont, Vic and added a wonderful record title of “***Hippy shirt moth***”. What a hoot and what a strange looking moth. I initially thought the hindwing was bifurcate but then realised the hindwing was reduced and the front half was all forewing.

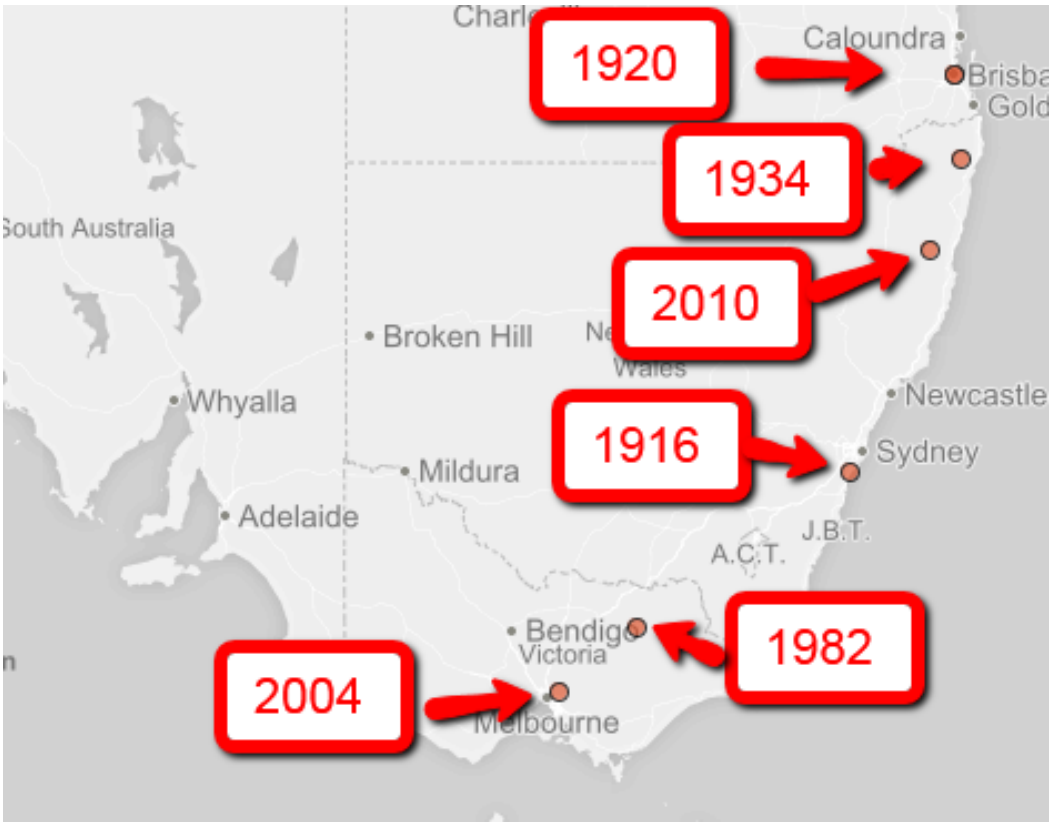
Location: Tremont, Vic. Photo by Mark Ridway.

So, I called upon one of our resident “moth-er” experts Peter Marriott who got all excited about the location of this moth.



Peter searched the Moth of Australia catalogue and eventually settled on the name of Lepidoptera: Noctuidae: *Holocryptis phasianura*.

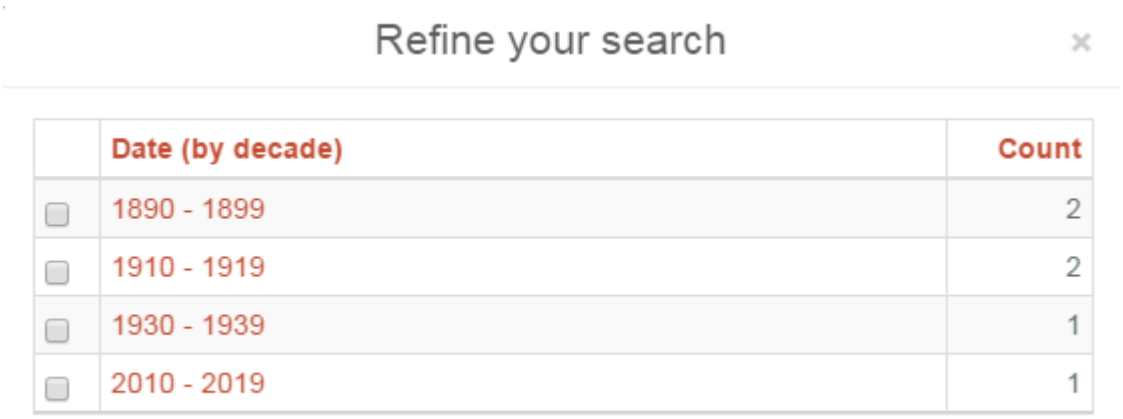
On ALA, there are 12 records for this species from SE Queensland down to Victoria. I have seen another record not on ALA from Kuranda, Qld.



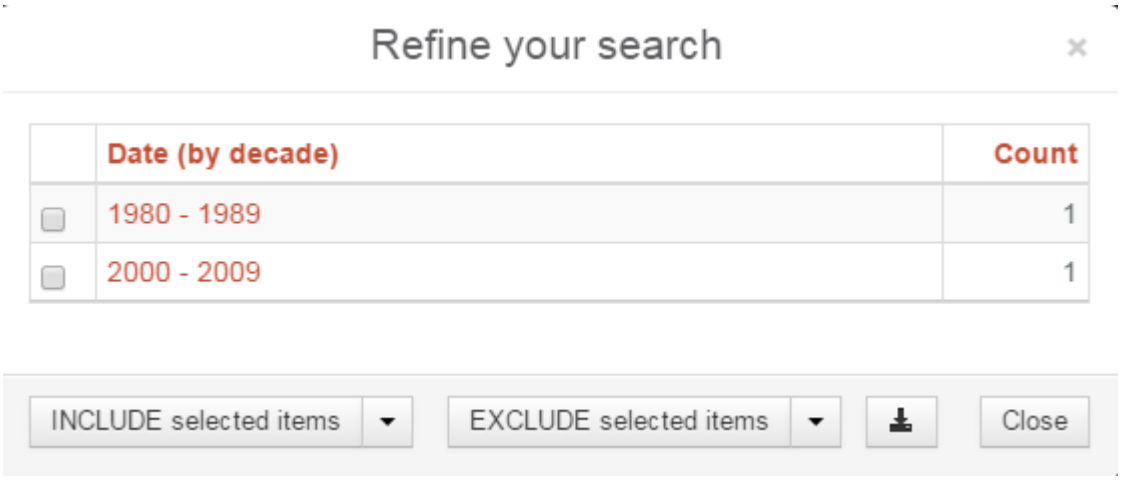
I love the way you can dissect the ALA data for any species. This the real strength of ALA but of course, it needs the raw data to give it something to dissect.

The reason why Peter got all excited over the location of this moth is this.

This is a table showing the temporal collection data for this moth in Queensland and New South Wales. As you can see, the records date back to the 1890s through until this current decade.



However, if you look at a similar temporal collection data table for Victoria, you will see the moth was not recorded in Victoria until the 1980s! – indeed, not until 1982 at Mt Buffalo in the north of the state. The first record from southern Victoria was not until 2004 !! And, another record near Melbourne this week.



Museum Victoria holds significant collections of moths from some of the best known past collectors – George Lyell as an example. Indeed, a number of the New South Wales specimens were collected by Lyell way back in 1916. Lyell collected extensively in Victoria and if the species had of occurred in Victoria back around 1916 then Lyell or others would have picked it up and it would be in our collection. But, the species was not recorded in Victoria until 1982 and certainly not recorded anywhere near Melbourne until 2004.

So, why had this species recently begun to appear in Victoria and more recently southern Victoria? Climate change could be an answer. Either its food plant (which I could not find recorded anywhere) now occurs in Victoria, or the Victorian climate, which previously was unsuitable for the moth (probably the cold winters killed the immature stages), is now suitable for this species.

Either way, I can see why the “moth-ers” got all excited about this southern Victoria record.

It again clearly demonstrates why biodiversity is all about tracking a species in time and space. The development of ALA’s data enquiry software really has put Australia’s biodiversity data at our fingertips to looks for patterns or trends. But of course, while the past data is so important for these investigations, it is the current data that is needed as well and this is where BowerBird and similar citizen science website that feed into ALA are making a difference.

Reiner’s flatworms

Reiner recently uploaded two fascinating flatworms from northern Tasmania. See what our resident flatworm expert, Dr Leigh Winsor, has to say about them.

Location: Lilydale TAS Photo by Reiner Richter.

Comments by Leigh Winsor:

“Australopacifica sp.

Reiner's beautiful photographs are of what is probably a new species. I have records from northern Tasmania of a number of similar white-mottled species that have not yet been examined anatomically. For the time being Reiner's species is placed in the genus *Australopacifica* which accommodates land planarian taxa for which there are insufficient morphological data to confidently allocate them to other genera.”

Location: Beaconsfield TAS Photo Reiner Richter

Leigh commented:

“Reiner's two excellent photos appear to be of a species of *Reomkago*, possibly *R. quadrangulatus* as it has a median and paired marginal stripes. Members of this genus are characterized by their leaf-like shape and angular cross-sectional form at rest, with a single row of eyes that contour their anterior tip; they are all mottled and the mottling aggregates to form longitudinal stripes both dorsally, and ventrally in some species. The pigment can be absent around the antero-lateral eyes giving a "port-hole" appearance under a lens. *Reomkago quadrangulatus* is recorded from Macedon and the Otway Ranges in Victoria, and members of the genus are present in Tasmania (*R. flynni* with a single median stripe and other as yet undescribed species).”

From the wonderful world of the weird!

It must be Friday afternoon as only images like this come into BowerBird on a Friday afternoon. I have seen many Dolichopodid flies and springtails individually before but never stuck together like this. Somehow the springtail has got itself stuck on the sticky part of the fly's mouthpart and then Dacre was there with a camera. Dacre's image series shows the springtail moving about trying to dislodge itself. Enjoy.

Location: Randwick, NSW Photo by Dacre England.

Insect humour!

Mark Berkery's Nature's Place

Things that get overlooked, in the garden or field and on the computer. There are so many images of encounters that are never seen but once.

It may serve as a reminder of the unique character of the individuals within the one amazing nature, everything with a place.

Nothing remains the same, even when change is imperceptibly incremental the movement is always towards 'better'.

As long as we don't give in to the dark side, and even that serves, has its place.

And time runs out, things die, nothing remains to change.

Zebra Bee. Ok, not really. A native resting on a cold afternoon.

An unusual fly warming up by the light at night.

Too cold to fly away, resting on the grass.

Racing Red and blue/black winged Wasp.

Long legged fly enjoying the rotting fruit.

Red Assassin Bug, hunting on the flowers other creatures eat.

Bee echo ...

Assassin nymph chasing native bee.

Hoverfly in the spiders grasp. Bye, bye fly.

Mating time for the ants.

Doli fly in the afternoon.

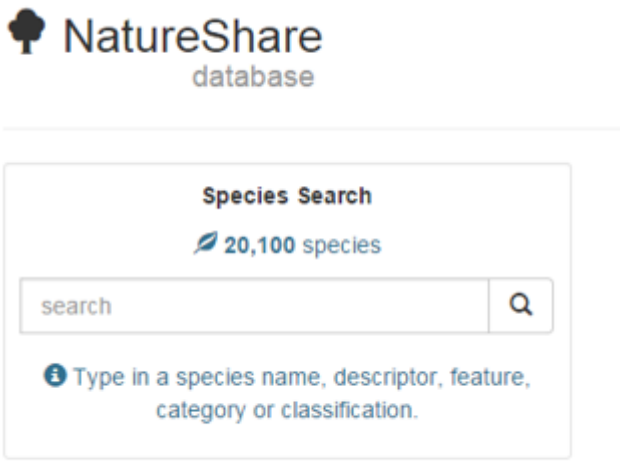
Honey Bee meets Spider, usually ends bad for the bee – which is good for the spider.

Mighty wasp. She was seeking nesting sites around the ants feasting on fruit.

Asleep in the field, not far to travel for breakfast.

On a Sad note ……

An Australian citizen science pioneer sadly passed away last Wednesday week night (15 October 2015) at 10:20pm. Russell Best was the inspiration behind the Victorian citizen science website NatureShare: http://natureshare.org.au/



NatureShare was the brainchild of Russell and the volunteer programming done by Reilly Beacom. While BowerBird's development was significantly funded by ALA, NatureShare was put together on a shoe-string budget and it's good.

Initially, NatureShare was Russell's way of sharing the plants and animals around his home and forests at Riddle's Creek, Victoria. But soon, others found the website and began to do the same for the biodiversity around their own areas as well.

During the development of BowerBird, Russell was my sounding board and mentor and I will always thank him for the generous and spontaneous support he gave freely.

Russell leaves behind Gill his wife and his two young daughters, Lydia and Ellena. I'll miss you Russell. Thanks.

Now – I have a lot of fun writing the Bugle each week and I would like to share that fun. If anyone has a BowerBird related story they would like to tell, please send me your story and I will include it in the next Bugle.

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

Haveagoodweekend all …. Happy photographing …

Cheers – Ken

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