



24 November 2016 Ken Walker ([kwalker@museum.vic.gov.au](mailto:kwalker@museum.vic.gov.au)) Museum Victoria. Edition 49.

Hi All – A few weeks ago, Melbourne hosted the 46<sup>th</sup> Annual Australian Entomological conference. It was also our fourth combined conference with the New Zealand entomological society. I was on the conference planning committee – so much discussions and decisions over a 6 month period to make for a 3 day conference seemingly run smoothly. The only hiccup I heard was that someone was eating a salad lunch and half way through the greens he found a mashed up dead moth. As only an entomologist could do, he called over some of his moth friends and they proceeded to identify the moth while he happily continued to eat his salad – only at an entomological conference!

I gave a talk about citizen science at the conference which was both well received and I also received a few adverse comments. I thought I would offer a few thoughts on the debate about collections and whether we should continue to collect and build museum collections.

Funding for zoological biological collections held in Museums has always been a contentious issue and attracting sufficient funding to maintain such collections and their resident curators and collection managers becomes more and more difficult each year. Primarily, our museum's core funding comes from

government sources either directly or through grants. The government does not provide our total funding requirements. We supplement the state government funding through charging an entrance fee for adults while entry for children and students under the age of 16 remains free – the museum attracts over 500,000 children/students each year. We also charge an additional fee for those wishing to visit our touring exhibitions – such as the recent, very successful dinosaur exhibition called “Jurassic World”. Our only source for research funding this through competitive grants. ARC grants are now below a 20% success based purely on the amount of fund they have for grants. ABRS funding now requires significant co-contributions from partners to obtain a successful grant. It’s getting harder and harder.

Over 90% of the museum’s funding goes to staff salaries so our non-governmental funding is essential to our continued staffing levels. A few years ago, following two unsuccessfully attended touring exhibitions at Museums Victoria, 53 staff were lost so that we could balance the books. The museum is not allowed to carry over a debt into a new financial year.

I think I have said before that I believe part of the problem of taxonomy is an image problem. Museums are basically enormous taxonomic repositories where “questions are answered before the question is asked”. That may cause a perception problem because some do not see the value of answering questions before the question has been asked and therefore view museum collections and museum research as irrelevant and the costs of storage of specimens as excessive. A commonly asked question on my collection tours is – “Why do you have so many specimens of the same species?”

And yet, when a doctor or a poisons information centre or a pathologist or a pest company or an agricultural advisor or farmer or a member of the public has a problem with an insect or spider, they expect an immediate identification as well as details of the life history of the species and pest status. How can we answer these questions without research being done prior and specimens collected to inform us of the distribution range or the host preferences? More importantly, when a specimen is found on an overseas product we are asked to determine whether the specimen's origin was Australian or overseas. Our can we answer without prior knowledge of the Australian fauna? I pity the person who lets into Australia the varroa mite which destroys the Australian honeybee industry or the person who allows into Australia the glassy sharpshooter, *Homalodisca vitripennis*, from Hawaii which will destroy the Australian grape vine industry. There are a myriad of other Priority pests that Australia wants to remain keep out. Of course, the introduction of an exotic pest can have a significant on our exports. Some countries will not accept imports if the importing country has certain pests. Currently Australia is designated as Khapra beetle free so you can imagine the commotion and consternation when Khapra beetle was recently found on Kangaroo Island. If the beetle had not been immediately identified and dealt with and its pathway to Australia discovered then Australia would have lost our Khapra beetle free status which would have knock effects to export from our grains industry. They traced the source of infestation of Khapra beetle to a shipping container that had passed through Mauritius and Madagascar and then onto Australia. While Madagascar is Khapra beetle free, Mauritius has this pest and was the most likely infestation site.

At the conference, I had a chat with a quarantine worker from Sydney. Two years ago, it was decided to do an ant survey at Port Botany where most of the shipping containers are deposited before being transported around Australia. The survey collected many ants. Boris, the biosecurity worker, charged with identifying the ants said most species were the typical ant species from around Sydney except for one small ant specimen which he put aside until the end of identification. When he identified this final ant it turned out to be the first record in Sydney of the exotic Red Imported Fire Ant, *Solenopsis invicta*. Queensland has already spent over \$300 million trying to eradicate this ant species. Biosecurity NSW asked Queensland Biosecurity to confirm the identification and then asked for their assistance to locate the fire ant nest. Queensland Biosecurity lent NSW one of their fire ant trained sniffer dogs and handler and the nest was quickly found and destroyed. Fortunately, it was a young nest that had not yet produced queens. NSW really did dodge a massive and expensive bullet in quickly identifying, locating and destroying this single fire ant nest. As an aside, he told me about these fire ant trained sniffer dogs. While they are great at what they do and the speed in which they do it, the dogs can only be used to sniff for fire ants for three continuous days then they must be given a week off to “recover”. As they say - It’s a dog’s life.

I say that when people come to me wanting an identification, they do not really care about the specimen’s scientific name. They really want to know from me either of three attributes about their specimen in question: (1) Is it economically important?; (2) Is it medically important?; or (3) Is it only of nuisance value? Whichever answer I provide gives a clear pathway for what actions to take or not to take regarding a specimen in question.

Let's take for example these three different species of termites.



One species was first named and described back in 1897, another in 1898 and the third in 1909. Why should we worry or even keep reference collections of these insects described so long ago? Well, while two of these termites are Australian natives, the third is an exotic not yet found in Australia. If you find one of these termites in your house then I will advise that you have a major termite problem and I will recommend you get an urgent termite treatment done which may cost you up to \$10,000. Following the treatment, the pest company will place pieces of wood in the ground around your house which the pest company will inspect 6 monthly looking for signs of fresh termite activity and of course you pay for each visit and if they find fresh activity then you will need more treatment. I know some people have sold their house following my identification of this termite. Another termite above is an exotic species found often in old wooden sail boats arriving in Australia ports from overseas destination. If this exotic termite becomes established in Australia then it has the potential to cause millions of dollars of damage to wooden structures across Australia. Finally, the third termite, even if you do find it in eating timber inside your

house, I will say is nothing to worry about. The first two species are called drywood termites and will attack sound and seasoned timber whereas the third species is called a dampwood termite and only attacks rotting timber. These dampwood termites are generally found in rotting trees or in garden sleeper posts. If found inside the house they usually occur below a leaking water pipe where the timber below the pipe has rotted and only because the timber is rotten have the termites arrived. Your solution here is a builder and plumber – not a pest company. However - Which is which species? Who should have the responsibility for knowing the differences between these species? Who should be charged with informing the public? Who can save you a cost of \$10,000? If the identification is incorrect and it is the drywood termite species then a home will literally be destroyed in a matter of months. People come to me with a termite asking is it dangerous. What should they do? Should they call in a pest company or even sell their house?

Now I have the prior knowledge on how to distinguish between and name these three termite species and I have the specimen collections to use as a reference sources to ensure my identifications are correct. So, I sit here at work (metaphorically speaking) waiting for someone to bring in a termite specimen and ask me to identify it. By the way, there are over 300 Australian native termites and I also need to know these as well. My knowledge is accrued and waiting for someone to ask the question. Do you want to save \$10,000 or perhaps your house? Then you need someone who has the experience to answer your question immediately and accurately when asked. And by the way, an image of these termites is not sufficient to ensure an accurate identification – I need specimens and in particular, I need specimens only of the soldier caste.

For the above termite images, the left image is the highly destructive drywood termite *Coptotermes acinaciformis*, the middle image is for the exotic drywood termite *Coptotermes formosanus* while the right image is of the harmless dampwood termite *Porotermes adamsoni*.

As I suggested earlier, there is a current debate about the value of collections and why should we continue to kill and collect specimens to put into museum drawers. Two weeks ago, I gave a conference talk about citizen science in which I had a “bob each way” on this debate.

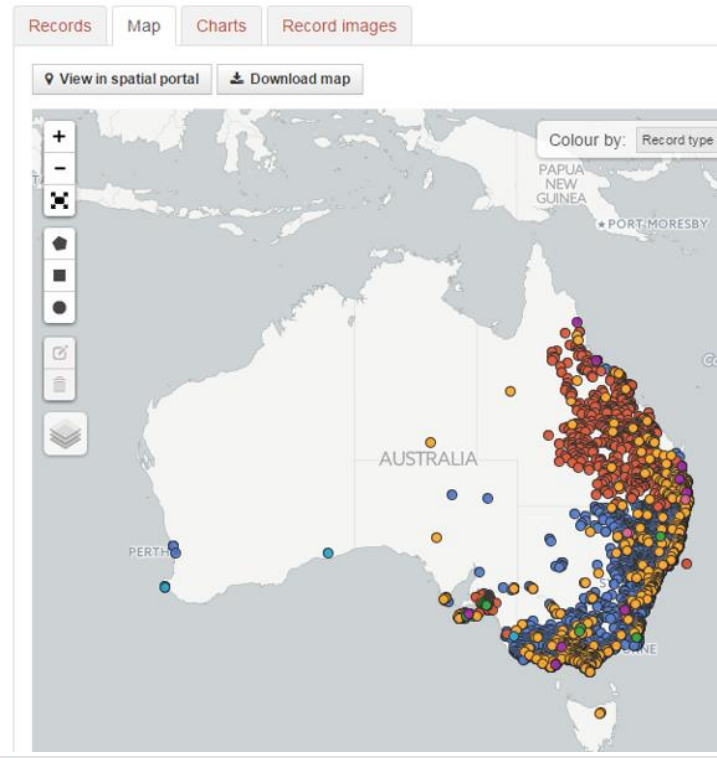
The arguments either way sometimes use the rather emotive phrases to describe zoological collections – the popular phrase used to describe museum collections is that they are full of “dead bodies” – and yes, I literally work in a zoological morgue. The entomology collection I work with at Museums Victoria has about 3 million “dead bodies”. Personally, I do not view specimens as “dead bodies” rather I see specimens as packets of information. I often say that I have a book of 6 million pages – for each specimen there is one page with the specimen’s image and the opposite page has spatial, temporal, behavioural, pest status, host preferences data etc information which I used to decide how to advise a person about their insect. I use this collection book every day of my working life. For me, it is a “living book” as every new specimen added is another piece of information. I see my role as the museum as being a voice for the collection and a conduit between the specimens and the enquirer. The advent of ALA which allows us to amalgamate collection records from all Australian museums allows me to marry other collection data to get a more complete picture of the species rather than using only Museums Victoria resources.

During my conference talk, I tried to show that easily recognisable iconic Australian species do not need many “dead bodies” whereas smaller, cryptic species do require lots of “dead bodies”. I also tried to show the incredible richness that can be added to “dead body” collection through image capture by citizen science. Ha! My talk was the last before lunch and I actually missed eating lunch that day due to the number of people who came up and discussed their thoughts of collections and citizen science with me. I certainly brought about some engaging discussion – but I missed lunch!!

Let's take an iconic species such as the Australian koala. We do need to know its distribution limits, its food plants and we need to regularly monitor its populations. But we do not need a “dead body” for every record point on an ALA map. Below is the distribution map for the koala which consists of 55,302 specimens. However, when you look at museum skin holdings for koalas, Museums Victoria holds 554 skins, the Australian Museum holds 360 and down to some holdings have only 2 skins. Many of these skins would be unfortunately road kills or death due to disease. However, there are 53,802 records based purely on observational data – a rich and valuable source of data for this species. Many of these observational records would have come from the several years of Annual Great Koala Counts that occur annual for 2 weeks in November. This is an excellent example for the use of citizen science and not “dead bodies” to inform about a species.



55,302 results for SPECIES: *Phascolarctos cinereus*



	Collection	Count
<input type="checkbox"/>	Museum Victoria Mammalogy Collection	554
<input type="checkbox"/>	Australian Museum Mammalogy Collection	360
<input type="checkbox"/>	Queensland Museum Mammals	206
<input type="checkbox"/>	South Australian Museum Australian Biological Tissue Collection	160
<input type="checkbox"/>	South Australian Museum Mammalogy Collection	118
<input type="checkbox"/>	Australian National Wildlife Collection	55
<input type="checkbox"/>	Western Australian Museum Mammal Collection	24
<input type="checkbox"/>	Museum and Art Gallery of the Northern Territory Mammal Collection	14
<input type="checkbox"/>	Queen Victoria Museum and Art Gallery - Mammals	4
<input type="checkbox"/>	Museum Victoria DNA Laboratory	3
<input type="checkbox"/>	South Australian Museum Palaeontology Collection	2
<input type="checkbox"/>		53802



Now let's look at the native bee (Apoidea) distribution map for Australia. It contains 205,843 record points. Australia has almost 1,700 native bee species and we have the world's smallest bee measuring less than 2mm in body length – *Euryglossina (Quasihesma) leucognatha* up to Australia's largest bee, *Amegilla dawsoni* measuring almost 25mm in body length.



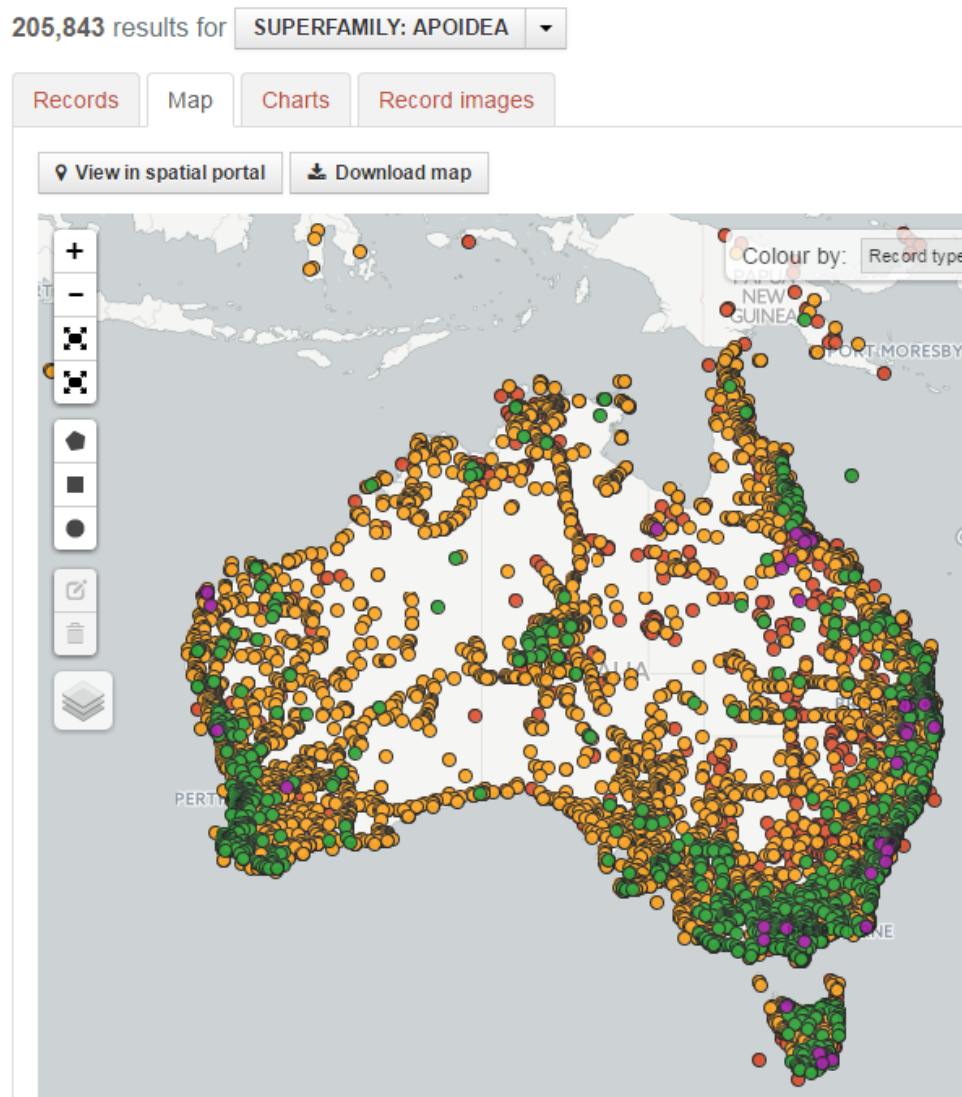
*Euryglossina (Quasihesma) leucognatha*



*Amegilla dawsoni*

While some female bee species are readily identified by image, males are not as easily identifiable by image alone. Males often require a genitalia preparation to place them down to the correct species or we need to see the species specific hair patterns on the underneath of the male abdomen to make a species ID but of course, I have yet to see an image of a live male bee showing its ventral abdominal hair patterns. (See below for image of several male ventral hair patterns.)

Females of many bee species also look very alike, in particular groups such as *Exoneura* or *Brevineura*. Even for *Lasioglossum* females, the best diagnostic character is the propodeum which is also rarely seen in images.





**Native argopilatum halictid** ⓘ *Lasioglossum (Chilalictus) argopilatum*



**Native asperithorax halictid** ⓘ *Lasioglossum (Chilalictus) asperithorax*



**Native aspratulum halictid** ⓘ *Lasioglossum (Chilalictus) aspratulum*



Ventral metasomal hair patterns for three *Lasioglossum* male species

BowerBird has opened my eyes, and hopefully many other scientists, to the value of citizen science. To me, the more people interested in or involved with science is an asset to who understands and appreciates Australia's biodiversity. Hopefully, the involvement of non-scientifically trained people with science demonstrates to them that the basis of all good science is observation and that is something citizen science does very well. What is this species? Why it is here and not elsewhere? Why has it disappeared from an area? Why was it interacting with other invertebrates or plants? And, many more questions.

Of course, BowerBird has provided startling results in the fields of research and biosecurity to name just two. Dr Leigh Windsor used to work alone catching and naming flatworms. Through BowerBird he now has almost 100 extra workers across Australia who not only photograph flatworms but also collect them for him. Much of the taxonomy of flatworm involves DNA analysis so to have an Australia wide covered regarding the collection of specimens is a dream come true for Leigh. He often tells me that for many of the BowerBird flatworm images, it is the first time that he has seen the species alive – he usually only see pickled specimens in museum collections. Then of course biosecurity has benefited enormously from BowerBird citizen science. The first record in Australia of the South African praying mantid, *Miomantis caffra*, was an amazing find down at Geelong by Adam Edmonds.

I have sometimes followed up BowerBird images with requests to collect specimens of those photographed and I have then put them in the museum's collection. Adam collected for me the first Australian specimen of *Miomantis caffra* which has now become a valued reference specimen for this species – the only one in any Australian museum. When an image of the

ootheca (mantid egg case) was posted on BowerBird, I went to the location, Brighton, and collected the ootheca off the wall of a house. Our Museum's live support department then bred the eggs through to adults as we needed a male to be able to do a male genitalia examination to confirm the species – which was indeed “caffra”. The male specimen enabled us to give the images and specimens a definitive name – but to do this we needed to collect a specimen. The correct name is important as this invasive species was also introduced to New Zealand in 1978 so we can predict what effects this exotic species will have on the local Australian mantid fauna using knowledge gained from NZ. I always love to repeat one of Confucius's many quotes but the one that relates to taxonomy: “The beginning of wisdom comes through calling things by their correct name.”

I recently asked Laurence Sanders and Tony Eales to collect two specimens each of rare males of two *Nomia* species they had posted images of on BowerBird. I know that when someone finally does a taxonomic revision of this genus, they will need males to examine the genitalia and there are few male specimens in Australian collections. The question to yet be answered is whether or not these two named species are indeed distinct species or just the one species. The male genitalia will provide a definitive answer.



*Nomia rubroviridis* male: Laurence Sanders



*Nomia lysoniae* males: Tony Eales

My finally series of slides in my conference powerpoint presentation illustrated what I called the “richness” to a record that an image can bring. Not only richness but also increased values and information available through images rather than just “dead specimens”. I used Laurence Sanders amazing images of a wolf spider and leaf cutter bee sharing the same nest entrance. Remember, this unique behaviour had not previously been recorded world-wide. I can still remember my amazement when Laurence first sent me images of this interaction. I forwarded the images to my Australian spider colleagues who then forwarded it on to their overseas colleagues. I covered the Australian and overseas bee workers and both groups of scientists came up a blank – never before seen or heard of. Thinking back, I should not have been surprised as typically both bee and spider scientists would have individually collected specimens but not wait to see and record the interactions between the two specimens.





*Megachile macularis* and wolf spider. Location: Emerald, Qld Photo Laurence Sanders

I said at the conference that if these specimens were “dead bodies” only, then the bee would be pinned and would reside in Museums Victoria’s dry collection. The wolf spider would be inside a tube of alcohol and placed in the museum’s wet collection. The two specimens would be physically separated by about 50 metres between the wet and dry collections and the richness of the interaction between the two specimens would be unknown.

E.O. Wilson, the Harvard Professor who invented the word “Biodiversity”, once wrote: “Knowledge does not become science until it is shared.”

Had Laurence not shared his images with scientists then the “scientific richness” of his images would have remained locked within his images and not become new “science”. I believe there is a need to continue collecting ethically and with a purpose “dead bodies” but citizen science can now enormously enhance our quality and breathe of science without producing “dead bodies”.

As I said – I had a bob each way on the debate !



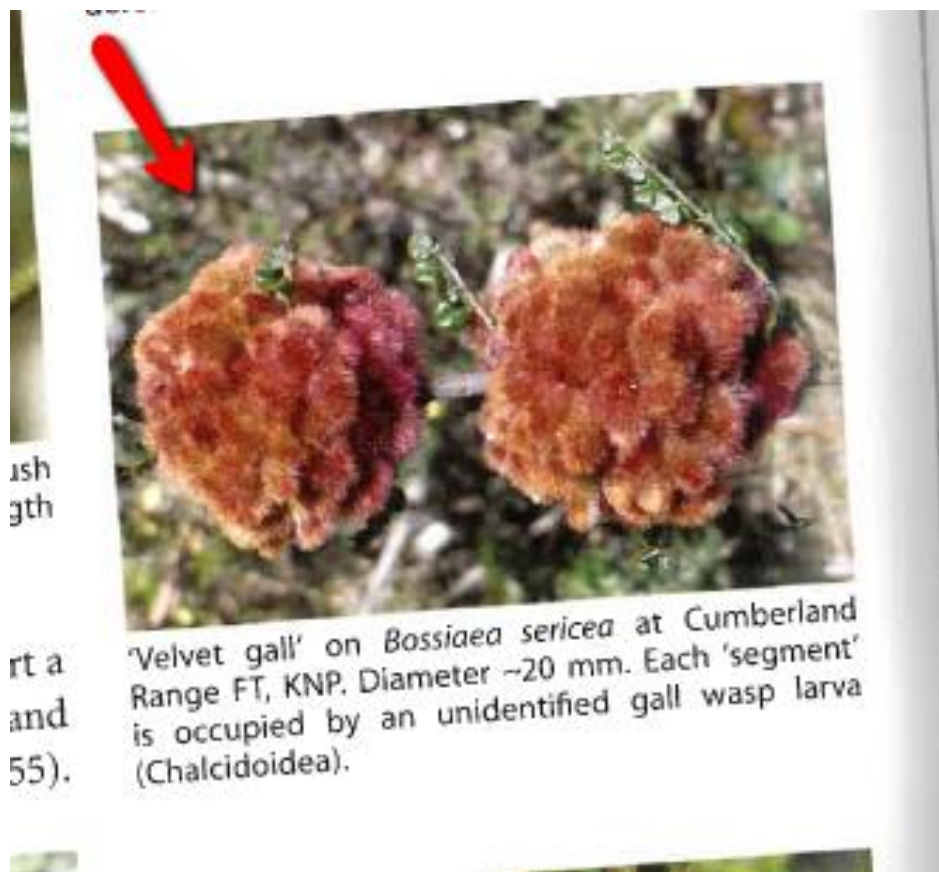
**Something to watch out for in the Victorian high country.**





Several people in the past two weeks have sent me images of these galls on *Bossiaea* from high altitude locations such as Falls Creek, Mt Buffalo and Bogong High Plains. The red growths are insect gall but which insect is the question!

I forwarded the images on to Australia's leading gall expert, Penny Gullan, who sent the images to the other leading Australian gall expert, Dr Lyn Cook at the University of Queensland. Lyn recalled seeing a single image of these galls in the 2016 Roger Farrow's book called "Insects of South-eastern Australia."



If anyone is up in the high country and sees such galls, can you please collect a sample or two and them to me (Museums Victoria, GPO Box 666) Melbourne 3001.

I will breed out the wasps and get them identified. Another mystery waiting for an answer!

## I love the weird and wacky records on BowerBird.

When I first saw this image, I thought it was some kind of biscuit that someone had bitten into. Reading the record, I then realised I was looking at something quite unique!

The object is part of the backbone of a cuttlefish and the marks are the teeth marks of a long-beaked bottle-nose dolphin – and Daniel suggests a young one at that.



*Tursiops aduncus* teeth marks on a cuttlefish backbone. Location: Just off Point Peron Rd, Peron WA . Photo by Daniel Heald.

This is what I love about BowerBird – you never know what will pop up as the next BowerBird record. I find that thrilling and exciting – a real sense of discovery.

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

## Nature Place

*It was just before the rains, I was walking where the drain runs into a creek, the road into a rainforest.*

*On the edge of things, you could say. And what did I find but ephemeral form. What else is there in this world ...*

*I was inspecting the concrete wall of the drain below the road when she announced herself, antennae waving, staccato gait.*

*She was already carrying her burden, a spider, food for her yet to be born young, looking for a suitable nest site to deposit.*

*Following her wasn't easy but she did present on a number of occasions, shots taken from a prepared position, lying in wait ...*

*Some things come easy, some you work for. No telling what may be either way until the distortion of resistance is negated.*

*And in the spirit behind that infamous battle cry down through the ages, god wills it ... or not.*





\*Click the pictures for a closer view ...











Merry Christmas everyone !!

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](mailto:kwalker@museum.vic.gov.au) – else share with your friends)