Issue 71 - March 2025

Wombat Forestcare Newsletter

Welcome to our March edition. You will observe the native bees in your garden more closely after reading Lynda Wilson's article on their fascinating adaptations. As summer draws to a close, we look forward to some autumn rains and the emergence of fungi. Happy rambling.
Gayle Osborne (editor) and **Angela Halpin** (design)

Bubbling and buzzing bees

Words and images by Lynda Wilson

Left: *Hylaeus bituberculatus* with a clear nectar bubble on *Corymbia ficifolia*.

Having ventured further into the fascinating world of native bees over recent months with around 50 species now photographed around Kangaroo Hill, I've become more aware of different bee characteristics and feeding behaviour.

One of these behaviours is what is commonly described as 'bubbling', a process thought to concentrate the otherwise dilute sugars in nectar.

The bubble is a regurgitated droplet of nectar, sometimes combined with pollen. A bubble can be held by special mouthparts for some time, allowing the ambient warmth and direct sun to do its job. Others adopt a more rapid action of retracting and blowing new bubbles in quick succession, constantly working the bubble to facilitate evaporation.

Representatives from all bee families have been known to adopt this bubble-blowing behaviour. Both adult male and female bees consume nectar and pollen, nectar being a source of water and carbohydrates in the form of sugars, and pollen being a source of protein and fats. By concentrating the nectar, a bee is able to ingest more energy from the available resources.

Some of the attached images show bees regurgitating very clear bubbles indicating they consist of quite dilute nectar. Others show more opaque bubbles suggesting a combination of nectar and pollen.

Female bees of many native species also collect and carry pollen on special hairs called scopal hairs on their legs or abdomen while some other native bees of the subfamilies Euryglossinae and Hylaeinae have evolved without the scopal hairs and carry the pollen in the first part of the stomach called the crop. Concentrating the nectar enables female bees to transport more energy and protein-rich supplies for depositing as larval provisions in their brood cells, or for a few species, to feed their live young.

The hairy flexible tongues that bees use to lap up nectar come in a variety of shapes and sizes making each suitable to different floristic forms. Very small bees and bees with long tongues are able to access the nectar inside long-tubular flowers. Some bees with short tongues may have long mouth parts which can exploit such long tubular flowers, but broad-tongued bees tend to have a preference for more open cup-shaped flowers. The length of tongue, short or long, is a characteristic that is used to distinguish between bee families. The finer details of the tongue are often used as a diagnostic feature to distinguish between bee genera.

In foraging for nectar and pollen, most bees provide essential pollination services. The European honeybee *Apis mellifera* is a generalist feeder and is prevalent on pretty much any flowering plant. Well managed hives of this introduced bee are important in crop pollination and honey production. This introduced generalist feeder is, however, able to outcompete native bees for floral resources, and fauna for nesting hollows, while not necessarily pollinating native plants as they have different characteristics and behaviours to our native pollinators.

continued next page ...

The mouthparts and tongue of this *Lasioglossum exlautum* are quite visible through the clear nectar bubble. On Callistemon/Melaleuca hybrid.

Some native bee species are able to exploit a variety of native and exotic plants for pollen and nectar. For example, the buzz-pollinating behaviour of some *Amegilla* species, also known as sonication, utilises rapid head movement at about 350 revolutions per second to vibrate the pollen out of the flower's anthers. These bees can often be heard before they are seen, especially around tomato plants. If you listen really carefully, you can hear a difference in pitch between the normal flying hum and when the blue-banded bee is 'buzzing' a flower.

This small *Lasioglossum (Homalictus) urbanum* is able to access the resources on offer in this non-native Salvia hybrid using the scopal hair on her abdomen to transport pollen back to her brood cells.

Blue-banded bee *Amegilla* species sonicating a tomato flower with its rapid head movement at around 350 revs per second! Wow!

Some native bees are even able to exploit plants that are more adapted to pollination by birds, mammals and wind without providing any pollination service at all.

Many species of native bees are, however, much more limited in the plants upon which they can forage and obtain pollen and nectar. Some native bees will visit exotic flowers, but most have a strong mutualism with native flowering plants, a few even being specific to a single native plant species. These bees in particular require native flowering plants to ensure their survival … another reason to not only plant a variety of native flowering plants where we can, but to retain a healthy diversity of native flowering trees, shrubs and herbs in protected areas such as in the Wombat Forest. ■

References

Houston, Terry (2023) *A Guide to Native Bees of Australia*. CSIRO Publishing, Clayton South, Vic

https://inaturalist.ala.org.au/projects/bees-concentrating-nectar accessed on 14 February 2025

https://ausemade.com.au/flora-fauna/fauna/insects/bees/amegilla-sp/amegilla-chlorocyanea/amegilla-chlorocyanea-bubbling-bee/ accessed on 14 February 2025

https://museumsvictoria.com.au/article/from-a-to-bee/ accessed on 14 February 2025

Thanks to John Walter for encouraging this new-found interest in pollinators and for reviewing this article.

Even the tiniest of bees such as this *Hylaeus minusculus* (left) and *Hyphesma atromicans* (right) can blow bubbles. The *Hylaeus* bubble is clear while the *Hyphesma* bubble is cloudy indicating the latter consists of a mix of pollen and nectar. On Callistemon/Melaleuca hybrid and *Corymbia ficifolia* leaves respectively.

This female *Exoneura* spp. is carrying a load of pollen on the scopal hairs on her legs while concentrating nectar in a bubble to lighten her load. On Callistemon/Melaleuca hybrid.

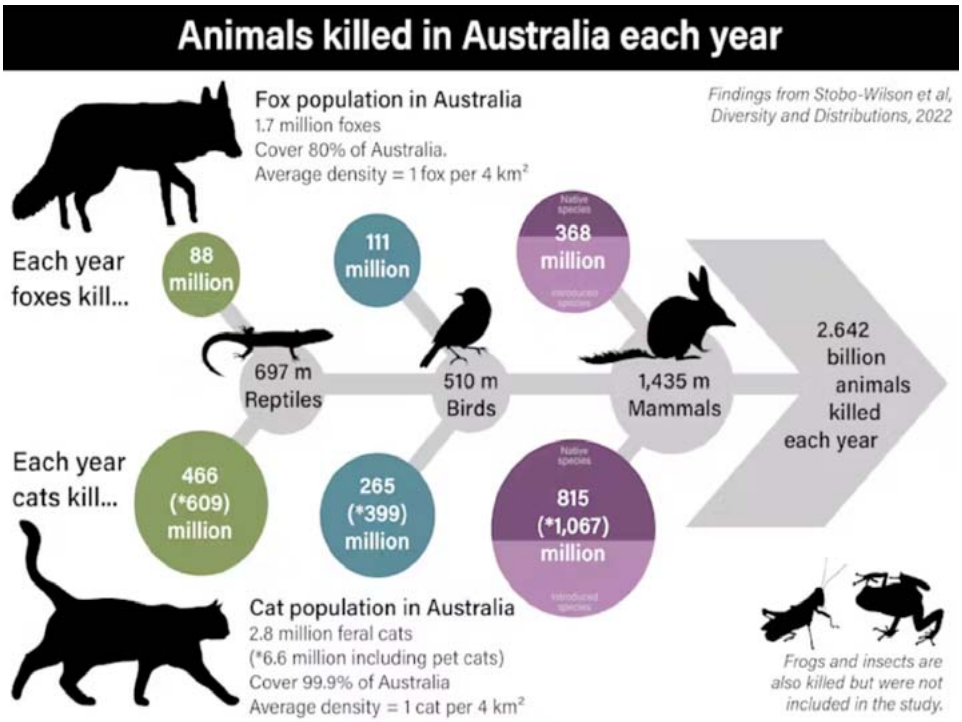
Ferals putting our wildlife at risk

By Gayle Osborne

Our motion-sensing camera projects were developed to document the indigenous fauna of the Wombat Forest, particularly threatened fauna species, however, we have found that the projects have been useful in recording many feral animals. Our projects have now been extended to include the Lerderderg State Park.

The most concerning sightings of feral animals are of Red Foxes *Vulpes vulpes*. They have been recorded at nearly every location that we have deployed groups of cameras. Feral and domestic cats have been recorded at a few locations as well as deer and pigs.

For significant numbers of foxes to continue to exist in the forest their consumption of indigenous mammals, birds and reptiles must be considerable. We are very concerned that this broad-scale and continuous predation will lead to and may have already led to loss of species in some areas of the Wombat Forest.



https://science.anu.edu.au/news-events/news/17-million-foxes-300-million-native-animals-killed-every-year-now-we-know-damage

Fox in the Wombat State Forest.

Cat in the Wombat State Forest. Feral or a pet? One kilometre to the nearest house.

In Victoria, Red Foxes, feral cats and pigs are classified as established pest animals under the Catchment and Land Protection Act 1994 (CaLP Act), meaning that landowners have a legal responsibility to take all reasonable steps to control them. The Department of Energy, Environment and Climate Action (DEECA) is responsible for management of the Wombat State Forest and therefore should be undertaking programs to control these animals. We are not aware of any fox control measures undertaken by DEECA, or its previous entities, in the Wombat Forest over the last 25 years.

Scientists at the Arthur Rylah Institute for Environmental Science have found that small scale fox control programs were the least effective and that the most effective programs needed to be at least 30,000 hectares in size with a network of bait stations regularly replaced. It is apparent that a large-scale and strategic project encompassing the Wombat and Lerderderg forests and surrounding private land needs to be undertaken if we are to protect the fauna of the Wombat Forest from fox predation.

In discussion with a researcher from the University of Melbourne I learned that foxes assist in keeping feral cat numbers contained, and that fox control needs to be integrated with a cat control program.

The relatively few sightings of feral cats on our cameras may be due to suppression by the fox population, or it may be that the cats are particularly wary and are not approaching the bait station.

Predation of native wildlife by the introduced Red Fox *Vulpes vulpes* and by the cat, *Felis catus* are listed under Victoria's *Flora and Fauna Guarantee Act 1988* as potentially threatening processes. Foxes and cats have the capacity to threaten the survival of a range of fauna species *continued next page ...*

Each year the vixen has 4 – 5 cubs.

and I suspect that some species, such as the Mountain Brushtail Possum *Trichosurus cunninghami* may have been affected. This species was quite common at many locations in the forest, and now it is quite rare to see one on our cameras.

The recently terminated Regional Forest Agreements (RFAs) were established to provide ecologically sustainable forest management. This objective clearly was not achieved, however the west RFAs also included other undertakings that were also not achieved including developing pest plant and pest animal control programs.

The *Midlands Forest Management Plan (1996)*, which guides the management of the Wombat State Forest outlines two actions that have never been acted upon. "*Prepare and implement three-year pest animal control programs for State forest in the Midlands FMA based on the Guidelines for Control of Pest Animals and relevant legislation and policies*."[1] and "*Maintain comprehensive records of the occurrences of pest animals and control methods taken*."[2]

It has been frustrating to be told by Department of the Environment management at meetings, over very many years, that there is no budget for feral fauna and flora control in the Wombat Forest. It is very clear that the Wombat Forest has been managed for its resources, such as timber and mining and more recently for large volumes of firewood, with little regard for the conservation of its flora, fauna and fungi and its vegetation structure.

Occasionally we have also recorded feral pigs *Sus scrofa* on our cameras, but far more often we come across very large, overturned areas of the forest floor, to a depth of about 20cm. This is evidence that feral pigs are foraging for frogs, lizards, fungi and tubers of orchids and lilies. They are also preying on insect larvae, beetles, snails, centipedes and earthworms.

Feral pigs have disturbed large areas of high-quality habitat where populations of the endangered Mountain Skink *Liopholis montana* have been located. This is incredibly worrying as the skinks live in burrows and will easily be predated. They are already vulnerable to predation by foxes and feral cats.

We understand that a contractor is to be engaged by DEECA to eradicate the pigs if possible. Feral pigs are highly mobile and once disturbed they could be difficult to locate.

As well as the destruction of habitat, the pigs have the potential to spread *Phytophthora cinnamomi*, a plant pathogen that can cause death of susceptible plants such as the iconic Austral Grass-tree *Xanthorrhoea australis* that is found throughout the Lerderderg State Park.

Young feral pigs in the Lerderderg State Park.

It is very clear that under the management of DEECA and its previous entities that either little or inadequate pest animal control has been carried out in the Wombat Forest. We are aware that, over many years, Parks Victoria have been carrying out pest eradication programs for invasive species including feral goats and pigs in the neighbouring Lerderderg State Park.

For the sake of our wildlife, it is time to legislate the promised Wombat-Lerderderg National Park and hand the management of the Wombat Forest to Parks Victoria. ■

Notes

1.& 2. NRE (1996b). *Forest Management Plan for the Midlands Forest Management Area,* December 1996. Department of Natural Resources and Environment, Victoria.

References

DELWP (2023). *Flora and Fauna Guarantee Act 1988 – Potentially Threatening Processes List.* Department of Environment, Land, Water and Planning. East Melbourne, Victoria.

https://science.anu.edu.au/news-events/news/17-million-foxes-300-million-native-animals-killed-every-year-now-we-know-damage

https://www.ari.vic.gov.au/research/pests-weeds-and-overabundant-species/best-practice-guidelines-for-fox-management

Sarcodon sp. 'Wombat'

Words and images by John Walter

Well, it is now official. *Sarcodon* sp. 'Wombat" is no more! Gone! I first wrote about this fungus in issue 16 of this newsletter back in June 2011. My first adventure with Wombat Forestcare was a walk in the forest near Lyonville Springs in March 2011 and we stumbled upon a population of this very unusual and extremely rare chunky brown fungus that had spines instead of gills.

Later that night I identified it as a *Sarcodon* species and contacted Tom May from the Melbourne Herbarium to report the interesting find. Tom confirmed my ID and I subsequently collected two specimens and lodged them with the Herbarium. In the following weeks I located three other populations that appeared to be the same species but unfortunately did not make any collections at those sites.

I am, of course, toying with you a little. While the *Sarcodon* has not been seen at any of the original sites since 2011 (despite some serious looking), it is probably still there, and it is the name that I am referring to when I stated above that it is gone. In 2019 Dr. Tom May led a review of several Australian fungus species to assess their status and propose their inclusion on the IUCN Redlist. This resulted in the printed use of the name *Sarcodon* sp. 'Wombat' which was subsequently added to the list under that name with a status of vulnerable.[1] Earlier, in 2018, James Douch had advised that DNA sequencing had confirmed that my Lyonville collection was in the genus *Sarcodon* and was the same unnamed species as a collection made near Toolangi in 1969.[2] Further study on the various specimens held in Australian and New Zealand herbaria that were listed as *Sarcodon* species produced some interesting results which were subsequently published in August 2024.[3]

It turns out that almost all the specimens from Australasia thought to be *Sarcodon* species are actually fleshy *Hydnellum* species, and the paper describes four new species to cover them plus one additional species was moved to the genus *Neosarcodon*. This leaves just one *Sarcodon* species in this part of the world, *Sarcodon austrofibulatus*, formerly known as *Sarcodon* sp. 'Wombat' which is also described as new in Douch et al. (2024). The term '*austro*' is a reference to our southern location and '*fibulatus*' refers to the way the hyphal cells in some parts of the fungus are joined together (clamp connections).

In 2023, I was advised by members of the Ballarat Field Naturalists that another specimen of *Sarcodon* had been found near Barkstead. I immediately went to the location to see if it was possible to make a collection of the find as I knew the Herbarium in Melbourne needed material. I located the new find with the help of Ballarat member Les Hanrahan, and while much of the specimen was now unsuitable for collection, one

Sarcodon austrofibulatus is sometimes difficult to see as it nestles into the leaf litter. There are two large specimens in this image.

And sometimes you will find *Sarcodon austrofibulatus* is very much "out there", like this cluster with multiple lobes showing off their 6 mm long spines.

The unnamed *Hydnellum* species from Barkstead was looking a bit sad by the time I was alerted to it but the fresher lobe collected for DNA analysis can be seen just left and below the centre of this image.

continued next page ...

small lobe was fresh enough to collect and it provided a DNA sample for analysis. I have subsequently heard that this Barkstead specimen is not a *Sarcodon*, but a *Hydnellum* species and is not a match for any of the new species listed in Douch et al. (2024). This paper also noted that the Australian Microbiome Initiative had detected eDNA in soil samples from the Wombat Forest taken near Werona that does seemingly match one of the newly described species, *Hydnellum pseudoioeides*. This species has only been recorded previously in New Zealand and Tasmania so its presence in the Wombat is significant if it can be supported by actual specimens.

While some readers may be concerned about the time taken to go from discovery of *Sarcodon austrofibulatus* at Lyonville in 2011 to its eventual naming in 2024, I am actually surprised that this has been so quick. *Sarcodon* species in the northern hemisphere have become species of concern in recent decades with noticeable declines in populations, while here in Australia we are only just beginning to understand the diversity of species from this family in our forests. All of them appear to be rare, or, at the very least, rarely seen. We can all help by keeping alert when out in the forest and reporting any Sarcodon-like species to either myself or Tom May at the Herbarium. Please do not pick a specimen if you see one but take some photos and tell me that same day. I promise you I will be onsite within hours to assess the situation and make a collection if necessary to improve our knowledge of these important ectomycorrhizal species. ■

Notes

1. See Wombat Forestcare Newsletter Issue 49 Sept 2019 and Issue 53 2020

2. James K. Douch (2018): *Phylogenetic and taxonomic study of Sarcodon, Bankera, and Boletopsis (Bankeraceae) in Australia and New Zealand*. BSc (Hons) thesis, School of BioSciences. The University of Melbourne

3. James K. Douch, Luke J. Vaughan, Jerry A. Cooper, Gareth D. Holmes, Richard Robinson, Franck Stefani, Alexander Idnurm & Tom May (29 Aug 2024): Taxonomic revision of fleshy species of *Hydnellum*, *Neosarcodon*, and *Sarcodon* (Thelephorales) from Australasia, *Mycologia*, DOI: 10.1080/00275514.2024.2363211

Langley Flora Reserve

By Trevor Speirs

The 1970s and early 80s was a productive period in the history of nature conservation in Victoria, with the Hamer state government legislating many of our existing national and state parks, as well as other smaller but nonetheless, very important parcels of public land.

The Langley Flora Reserve was recommended for protection by the Land Conservation Council in its 1977 investigation of the greater Melbourne area and was officially declared in 1980. Now an obsolete category, flora reserves

Fringe Myrtle *Calytrix tetragona* and a Short-beaked Echidna *Tachyglossus aculeatus*.
Photography © Gayle Osborne.

continued next page ...

were typically fragmented areas of native vegetation, small in size but in a relatively natural state. Importantly no timber harvesting is permitted in flora reserves. Although only 29 hectares, Langley FR is an excellent example of the benefits to biodiversity in habitats that are long undisturbed. Large habitat trees containing hollows of various sizes, and an abundance of fallen timber are immediately noticeable to any visitor to Langley.

With no boundary tracks to the east and north to provide access for fire management, the reserve hasn't had any planned burning for many decades. Also being some distance from large towns has probably seen it spared from the irresponsible collection of fallen timber that can be seen near more populated areas.

Tiger Orchid *Diuris sulphurea*.
Photography © Gayle Osborne.

While Langley FR has had detailed flora surveys undertaken in the past, data on mammal species in the reserve is much less documented. Following several rounds of remote camera trapping in the Cobaw State Forest, which is several kilometres SE of Langley, Wombat Forestcare members moved the cameras to the reserve and the results after two months of recording have been very encouraging. The habitat is ideal for Brush-tailed Phascogales *Phascoagale tapoatafa* being reasonably open and very little bracken and it was certainly no surprise to see images of this threatened species on all three rounds of cameras.

More unexpected was the appearance of the vulnerably listed Common Dunnart *Sminthopsis murina* on the very last camera that was set up. The Common Dunnart is favoured by an open habitat with a dense layer of bark and forest "litter" and where old fallen timber provides a range of shelter and nesting sites. These small marsupials have a close association with Ecological Vegetation Classes (EVC) that come under the umbrella of dry forests. Langley fits that criteria being shrubby dry forest and there are other suitable EVCs such as grassy dry woodland in close proximity, albeit on private land

The geology at Langley is similar to the Cobaw State Forest with large granite boulders a dominant feature of these landscapes. This habitat type is particularly suited to a variety of reptile species which find the nooks and crannies offer ideal protection from predators. The Cunningham's Skink *Egernia cunninghami* is found in such rocky sites, where it lives in small family groups, usually in close proximity to its home retreat. These skinks have an excellent defence strategy where they can squeeze themselves into rock crevices, inflate their body and thereby making it extremely difficult for a predator to dislodge them. Another defence mechanism they, and a number of other lizard species possess is autotomy. While other species like spiders can drop or shed a leg, it is the tail that skinks like the Cunningham's are able to cast should it be seized by a predator.

Langley Flora Reserve is typical of many of these remnant native vegetation areas in that they are generally bordered by private land. Langley has cleared farm land to its north and east but fortunately it is contingent with good quality forest to the west and south. The Langley Bushland Reserve is also nearby and roadsides containing many old large eucalypts that are a prominent feature of the landscape. The connectivity of habitat is obvious around Langley and of course vital for species like the Common Dunnart and Brush-tailed Phascogale, threatened species which would otherwise struggle to survive in small, isolated and fragmented patches of bush. Langley FR is well worth a day visit, especially in spring and early summer. Although it would be extremely unlikely to see one of the threatened nocturnal species mentioned above, there is every chance that displays of orchids like the pictured Tiger Orchid *Diuris sulphurea*, will be on show. ■

A Common Dunnart S*minthopsis murina* runs along a fallen tree trunk.

Who are the night visitors – Trentham

Words and images by John Walter

It is now a year since I set up my light sheets at a site just off Countess Road, south of Trentham and invited the members and friends of Wombat Forestcare to come down and take a close up look at the many night visitors attracted to the lights. In no time at all we had approximately 30 visitors (humans) and I was secretly hoping the insects would not let me down given I had such a large audience to please.

A small portion of one side of one of the two sheets. How many insects can you count and how many different species can you see? I see over 300 insects and 80 or so species.

Fortunately, the moths, hoppers, psyllids, lacewings, wasps, flies and beetles also turned up in big numbers and we soon had both sides of two sheets well covered in specimens for me to photograph. Some species came alone while others came with several friends. Some arrived by the dozen and some even came in the hundreds. In all, I recorded 335 different species for the night, and there were plenty more that I did not manage to get a useable photo of. The final list included representatives of twelve different insect orders plus a couple of spiders who took advantage of the bounty.

Mixochroa sp.

The list of species included the unnamed *Mixochroa* species illustrated opposite. This beautiful green moth with orange hind wings is quite a dazzler and is only known from a handful of records. Another 'flashy' species with bright hindwings was the *Heliomystis electrica*. I am afraid a great many insect species do not have common names which strains my ability to recall the vast number of syllable-rich scientific names in detail. I have heard some individuals refer to the *Heliomystis* as the Electric Moth which does make sense, but the name is not in general usage. Edward Meyrick described both the genus and the species in 1888 but unfortunately left no clues at all regarding his choices of name. Did he see lightning bolts in the white lines on the wings?

Heliomystis electrica

Just over half the species I recorded were moths and most people would expect to see lots of moths out at night, but there were good numbers of some of the other insect groups as well. Fourteen different Psyllid species was a personal record for one night, as were 23 different Leaf Hoppers. While five species of Neuroptera (Lacewings) was not unusual, four of them were species I had not previously recorded anywhere else!

A female Rose Anthelid, *Chenuala heliapsis* is added to the arm collection. The male of this species is the large dark brown moth in the first image.

Our younger humans soon discovered that the bigger moths might flutter around furiously when they first arrive at the light sheet, but once they had settled down, you could pick them up with your hands and they would sit calmly on your fingers. One young man managed to construct quite a display along his arm which he showed to interested adults before he dutifully returned them all to the light sheet and started a new collection of different

continued next page ...

species. While I was conducting a survey that would ultimately increase knowledge around Wombat Forest insect species, the real benefit of the night was that engagement between the human and insect visitors.

As the night moved on and the humans did the same, I focussed on recording all of the species on the sheet. Even the tiny ones that many recorders do not attempt to photograph as "they are just too small". I understand the difficulty in getting good images of insects less than 6 mm in length and below 4 mm really tests your skills and equipment, but if we ignore these species as a recorder, then we are creating a biased view of the insect fauna of a district. I have learned that there is expert knowledge out there on iNaturalist eagerly waiting for someone to post an image of their specialised insect group no matter how small they are nor how poor the image is. A trained eye will see far more in a poor image than you might imagine. The smallest species I recorded were two thrips, each just a tad over 1 mm in length.

There were a number of small beetles in the 2–3 mm range, some small flies and a tiny wasp that checked in below 2 mm. Even some of the moths are given the minute status with several Pygmy Eye-capped Moths (Nepticulidae) in the 2-3 mm range. Yes, some moths have a thickened base to their antennae which they use to cover their eyes when they are resting. How do I know the size of these insects? I have measured and counted the number of threads in a given distance across the sheet and shown that, on average, there are 2.5 threads to the millimetre.

You can see all of the species recorded at this event on iNaturalist via the link below. I have set up a project which brings all of the species into a single location and the link takes you to the header page of the project. Click on the green "View All" button to see all of the individual records.

https://www.inaturalist.org/projects/who-are-the-night-visitors-trentham

I generally group the posts by insect order so the first ones you will see are the moths. You will need to look a little deeper to see the Lacewings, Psyllids and Leaf Hoppers and the beetles are right at the back.

You might notice that iNaturalist reports a different number of species than the 335 I have noted here. In fact, it lists two different numbers on the header page. iNaturalist uses different definitions of species depending on where the number is reported. In the project header it states there are 360 Observations (correct) and 243 Species. Here the species count includes those observations that are identified to full species level, plus, if there are two or three different species that have only been identified to the same genus level, it will count one for the genus and so on for tribe, sub family, family etc. Below this, it advises that I have recorded the most species in the project and puts the number at 162. This is the total number of species that have been fully identified to species level. My number of 335 species is the total of all the different insect species that were recorded, regardless of how detailed their identification is. This number is smaller than the number of observations as I have sometimes listed both the male and the female of a species in separate observations. In some cases, I have also posted different colour variations of the same species which gets us to the number 360 for total observations. ■

A selection of Leaf Hoppers. See the iNaturalist link for the details and more species.

The beautifully marked Lacewing *Dictyochrysa peterseni* is one of the species I had not previously seen.

A selection of Psyllids. The larvae of Psyllids construct the sugary shell-shaped houses known as Lerps that can be found on the leaves of many Eucalypts

Metamorphosis

By Lynda Wilson

How does a plump grub-like crawling caterpillar transform itself into the most delightful and delicate flying creature known to every child?

From "The Very Hungry Caterpillar" to countless books, fables, and anecdotes about dainty butterflies, the transformation of caterpillars into butterflies is possibly one of the first biological lessons that every child encounters. But beyond the childhood story, there is still mystery and awe associated with the process known as metamorphosis. What actually happens for a pupa (caterpillar) to transform into an adult form of a butterfly?

Unlike a fully-formed human infant which grows and develops almost uniformly, in a process called hemimetaboly, metamorphosis is a process known as holometaboly which involves a complete bodily change as the life-form develops. Approximately 80 per cent of all insects, including butterflies, beetles, moths, flies, bees, wasps and ants, develop in this way.

To take a step back, from the day it hatches, a caterpillar has cells known as imaginal discs which are each pre-destined to evolve into specific adult features such as wings, legs, eyes and antennae.

The caterpillar's job is essentially to eat, moulting several times as it grows. The ebb and flow in the concentration of juvenile hormones determine when the caterpillar undergoes its moults. The growth of the imaginal discs is inhibited by the same juvenile hormones, effectively holding back the development of adult features.

The final stage of the caterpillar's growth includes the development of the chrysalis case under its skin, the outer layer of which is shed as the chrysalis hardens.

Within its protective chrysalis, the rest of the caterpillar's well-fed body is de-natured by enzymes into a nutrient-rich soup providing sustenance for the now active imaginal discs. The adult features develop from the imaginal discs into the eventual adult body form. An exhausted level of juvenile hormone and a burst of the moulting hormone, ecdysone, trigger the fully formed adult butterfly to emerge from its chrysalis to face the outside world, to go on and reproduce the next generation of butterflies. ■

Imperial Hairstreak *Jalmenus evagoras* caterpillar on a Silver Wattle *Acacia dealbata* with attendant ants. Photography © Gayle Osborne

Imperial Hairstreak Chrysalis. Photography © Gayle Osborne

Imperial Hairstreak Butterfly. Photography © Gayle Osborne

Reference

Jones, R. 2024. *How does a caterpillar turn into a butterfly? A guide to nature's greatest transformation.* BBC Wildlife Magazine Published: October 14, 2024 at 12:26 am Accessed on 9/2/25 at https://www.discoverwildlife.com/animal-facts/insects-invertebrates/how-does-a-caterpillar-turn-into-a-butterfly