Flies - Diptera

of Belair National Park and Adelaide Hills

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This chapter is dedicated to Anne Green, who doesn't like Flies.

The word Diptera comes from the Ancient Greek and literally means 'two wings'. It is this that distinguishes flies from most other insects which have four wings. In flies, the second pair of wings has evolved into a pair of club-like 'halteres' which serve as flight stabilisers. All flies have halteres. Many other insects are also given the common name 'fly' but it is the Diptera that are the true flies and have only one pair of wings.

Diptera are divided into two subgroups: the more primitive **Nematoceran Flies** and the more advanced **Brachyceran Flies**. The Nematocera have a longer body, longer legs, are more delicate and often have aquatic larvae. Their antennae can be quite elaborate. In this publication they include mosquitoes, midges, gnats and crane flies. The Brachycera are more robust and are what we would ordinarily think of when we hear the word 'fly'. They have shorter antennae and their larvae are terrestrial. They include the remainder of the flies from March Flies onward..

As much as possible, I have organized this publication in the standard way, which is to follow this line of evolutionary development, from mosquitoes through to Tachinid Flies.

The flies in Belair National Park and surrounding area are quite astonishing in variety and number, and yet I'm sure I've only just scratched the surface. Almost every week I find a 'new' fly I haven't seen before. I have photographed flies that are almost invisible to the naked eye, and seen others, like the Black-and-white Giant Fly, that take my breath away with their size.

On the one hand it surprises me that I am so passionate about insects and insect photography, but on the other, if I think back to my childhood, I kept weevils as pets, and loved to wander my backyard with a Bug Catcher in hand. Perhaps life has a way of coming full circle.

I didn't start out taking photos of bugs though. Initially I took photos of fungi, kangaroos, flowers, trees, landscapes … But over time, as I looked at all these things, it became glaringly obvious that fundamental to our natural world, were BUGS. They were behind everything. Simply by doing what they do, they were keeping the whole ecosystem chugging along nicely, and yet most humans seemed oblivious to that fact. And not only that, we humans so often chose to malign bugs as undesirable or unpleasant, without ever looking closer or trying to understand them.

Bugs are truly amazing! Bugs fill every ecological niche … pollination, recycling, decomposition, symbiosis, predator, prey … it doesn't stop. When I walk around in the bush I see that every little bit is connected and vital to every other little bit. It takes my breath away and I walk around in awe.

I imagine this publication on Flies to be part of a larger publication on all the insects of Belair National Park. I hope it will open others' eyes to their beauty and their necessity. (And also the diversity of Belair NP!) Yes, flies can be annoying, but those annoying ones are only the tiniest minority … the rest are … well take a look! They're magnificent!

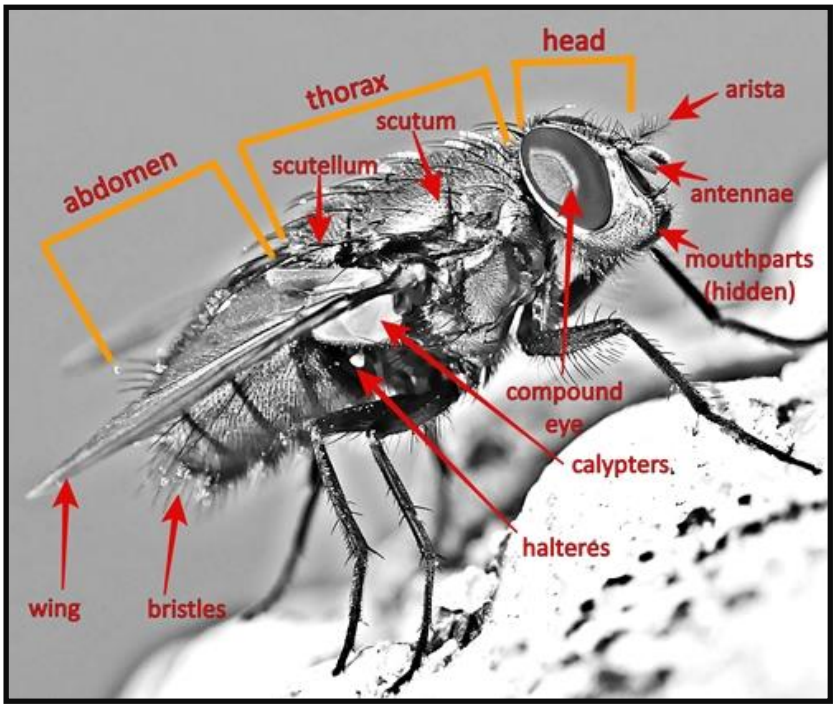
Acknowledgements

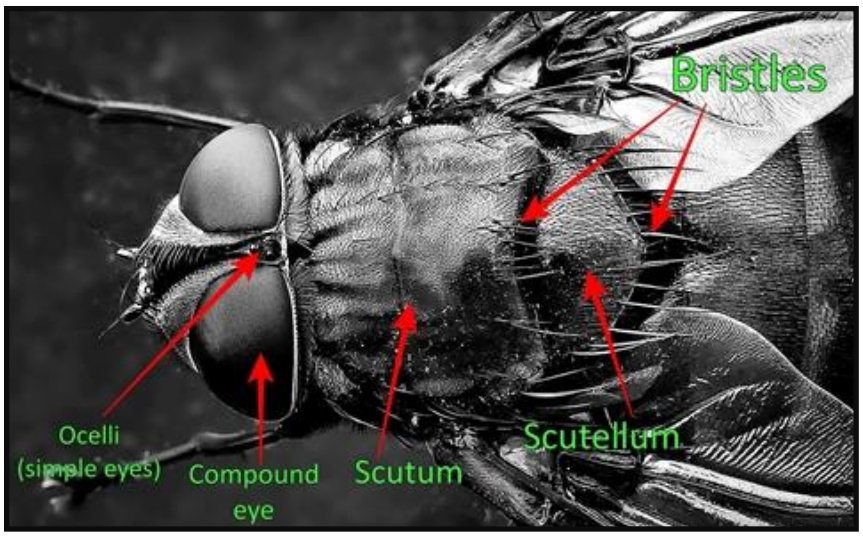
Thanks to **Tony Daley** of **www.tasmanianinsectfieldguide.com** for his passion for flies and his taxonomic expertise. Having someone to definitively identify the flies I found was invaluable and in many ways further stoked my passion for them (and for all insects).

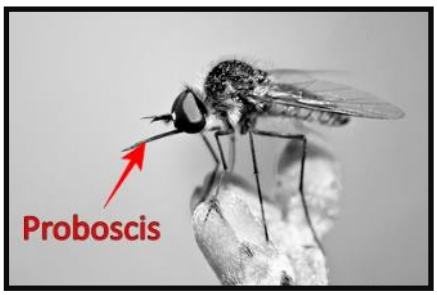
Thanks to **Brett Smith** of Ellura Sanctuary, for his expertise and the extraordinary database he has put together of all critters great and small **www.ellura.info**. Additionally, his personal help and suggestions are always very much appreciated.

Front cover image: Eurygastropsis tasmaniae, a Tachinid (Bristle) Fly.

Anatomy







Life stages

Complete Metamorphosis

Although none of these photos are from the same species, and there is immense variation in appearance between species, they still give a good idea of the life stages of flies.

Adult flies mating.

Eggs (circled) laid on caterpillar.

Larvae feeding on fungi.

Pupae in remains of carcass.

Fly freshly emerged from its pupa. Wings have yet to develop.

Mosquitoes - Culicidae

The name **Culucidae** comes from the Latin 'culex' meaning 'midge' or 'gnat'. **Mosquitoes** are immediately recognisable by their small head and long needle-like proboscis through which they suck blood from their prey. Their proboscis also distinguishes them from the other **Nematoceran Flies**. I have photographed four Mosquito species. Undoubtedly there are many more!

Above: ***Aedes nigrithorax*** trying to penetrate the fabric of my pants with its proboscis as I was sitting near water. It didn't succeed!

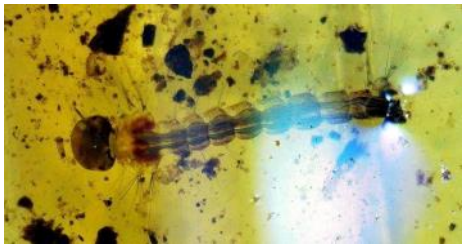
Above: **Southern House Mosquito, *Culex quinquefasciatus*.** Note the sizable proboscis pointing forward.

Above: ***Aedes notoscriptus*** briefly stuck in a spider's web near Playford Lake. A rare sighting for Belair NP.

Above: ***Tripteroides atripes***

Larvae

Below: Culicine mosquito larvae are aquatic and worm-like. They are colloquially called 'Wrigglers' because of their wriggly movement when disturbed. They hang at an angle from the water surface, supported by a long siphon on the tip of the abdomen through which they breathe air. They have a distinct head with well-developed mouth brushes for filtering microorganisms and organic matter.



Phantom Midges - Chaoboridae

I came across the **Phantom Midges** by chance. I was walking around Playford Lake one day and saw lots of tiny bits of white 'fluff' in the air. Looking through a macro lens I saw they were tiny flies (1-2mm). **Phantom Midges** are an integral part of the food chain and ecosystem of lake/dam areas, providing food for dragonflies, spiders, fish etc. These are at the size limit of what I am able to photograph.

Comparison

Two species from one genus, ***Chaoborus* sp**.
Above: ***Chaoborus ornatipennis***. Below: ***Chaoborus vagus***.

Of note are the very plumose antennae of ***Chaoborus* sp.**

Gall and Forest Midges - Cecidomyiidae

The name **Cecidomyiidae** comes from the Greek words 'kekidomia' meaning 'gall' and 'myia' meaning 'fly'. These small flies are known for their ability to induce galls inside which their larvae grow. It is rare to see the adult midges, only the galls they produce.

Left : **Olearia Gall Midge, *Trigonomyia ananas*** is quite common in Belair NP on ***Olearia ramulosa***. Note spherical shape and radiating 'leaves'. Also note pinkish larva forming inside a gall that was cut open.

Left : ***Dasineura glomerata*** seen occasionally on ***Acacia pycnantha***.

Left : ***Asphondylia dodonaeae*** seen fairly often on ***Dodonaea viscosa.***

Left: Two **Cecidomyiidae**. Unknown species. In both examples note the beaded antennae of males. Very small 1-2mm.

Non-biting Midges - Chironomidae

Chironomidae are often mistaken for mosquitoes but it is immediately apparent that they have no proboscis. I find **Chironomidae** everywhere. They are very small and an essential part of the food chain and ecosystem.

Distinctive antennae

Male and female **Chironomidae** have very different antennae. Above: Macro photo of a male **Chironomidae** showing plumose antennae. Right: A green female on the wall of my house showing simple antennae.

Left : Unidentified male.
Above: Unidentified female.

Right: ***Axarus* sp.**

Below: Male and female mating on my car.

Right:
***Cricotopus* sp.**

Chironomidae are seen everywhere and are an essential part of the food chain and ecosystem.

Far left: A myriad of **Chironomidae** caught in the viscosity of an **Elegant Blue Webcap, *Cortinarius rotundisporus*.**

Near left: **Chironomidae** on a ***Pterostylis nana*** orchid, perhaps as pollinator.

Larvae

Left and right: **Chironomidae** larvae are aquatic. Many are given the name of bloodworms because they are red due to the presence of haemoglobin, which allows them to survive in low-oxygen environments. They play vital ecological roles as a food source and as detritivores.

Moth Flies and Sand Flies - Psychodidae

The name **Psychodidae** comes from Greek words 'psyche' meaning 'soul' and 'odous' meaning 'tooth'. Likely this refers to the supposed psychological effects that the bites of some **Sand Flies** can have. (**Sand Flies** are not seen in the area covered in this publication). **Moth Flies**, however, do not bite. Their wings are covered with dense hairs, hence their common name which likens them to a Moth. Despite being thought of as a 'pest' they pose no adverse effect on humans and are actually valuable in numerous processes. Interestingly the covering of dense water-repellant hairs make **Moth Flies** impervious to liquids, toxins such as bleach and also boiling water. It also makes them resistant to drowning.

Bathroom Moth Fly, *Clogmia albipunctata*. Very common and introduced. Identified by the black dots on the wings and the white spots along the edges. Frequently seen near drains and wet areas.

***Pericoma illustrata*.** Beautifully patterned and with some iridescence.

***Psychoda sigma*.** This species is notable for the whitish hairs and the grey zig-zag pattern on the wings. I saw many of these on an old decomposing Kangaroo carcass.

***Brunettia* sp.** Very small. Seen on a screen door.

Lovebugs - Bibionidae

The name **Bibionidae** come from the Greek word 'bibion' which means 'small fly' or 'gnat'. These flies are given the common name of **Lovebugs** because they're so often found mating, particularly in large swarms. They are however not a bug but a **Nematoceran Fly**.

Left: **Australian Garden Maggot, *Bibio imitator***. Female. They are also called **Compost Flies** because they're found near garden compost bins. They are completely harmless.

Right: **Bibio sp**. mating, showing difference between male and female. Below is a male.

Right: ***Dilophus sp***. female seen on my car in Belair NP. She found it difficult to fly off, perhaps because she was so full of eggs.

Dark-winged Fungus Gnats - Sciaridae

The name **Sciaridae** comes from the Greek word 'skiaros', meaning 'shady' or 'dark', which refers to their darker-coloured wings and also the habitat where these tiny flies are found. They are essential to the winter food chain and I see them everywhere. There are many many species.

Left and below: **Sciaridae** seen on my car. Right: mating on a fungus, presumably to then lay eggs in it.

Fungus Gnats - Mycetophilidae

The name **Mycetophilidae** comes from Greek 'mykes' meaning 'fungus' and 'philos' meaning 'loving', so literally they are fungus-loving flies. Adults typically have long legs, slender bodies, and patterned wings. They are seen in damp, shaded gullies or near decaying vegetation.

Left: A very elegant but unidentified **Fungus Gnat.** Note its patterned wings.

Above: Subfamily **Leiinae.**

Predatory Fungus Gnats - Keroplatidae

The name **Keroplatidae** comes from the Greek 'keras' meaning 'horn' and 'platid' meaning 'broad' or 'flat'. I haven't been able to find out what this actually refers to.

Left: A very distinctive species, ***Macrocera mastersi***. Seen on the wall of my house.

Wood Gnats - Anisopodidae

The name **Anisopodidae** comes from the Greek 'anisos' meaning 'unequal' and 'podos' meaning foot. This likely refers to the uneven length of the legs as can be seen in the first photo on the left.

All photos are of ***Sylvicola dubius*.** The fly on the left was seen on my screen door. The two photos on the right were of a deceased fly. Note the tiny hairs on the wing (right).

Crane Flies - Tipuloidea (superfamily)

The name **Tipuloidea** comes from the Latin 'tipula' which means 'water spider' or 'water fly'. This is no doubt because they are associated with moist environments and bodies of water. **Crane Flies** may be mistaken for mosquitoes but they are larger in size, have longer legs, a longer abdomen and have no piercing proboscis.

Above: A wonderful sighting! ***Leolimnophila pantherina***. The first sighting for South Australia. Also the most westerly sighting for Australia. Note the spotted wings and long halteres.

Below: ***Discobola australis.*** Note the translucent patterns on the wings, very long thin legs, and short clear halteres.

Above: ***Helius* sp.** I saw many of these on a cool, dark, shaded rock wall.

Below: ***Dolichopeza* sp.** From the family Tipulidae or Large Crane Flies.

Above: **Short-palped Crane Fly, *Symplecta pilipes*** on reeds. A common crane fly.

The beautiful **Orange-striped Crane Fly, *Gynoplistia bella*,** momentarily holding onto a reed near Playford Lake**.** Note the exquisite antennae.

Long-palped Crane Fly, *Leptotarsus humilis*, with close-up view of mouth parts and thorax.

March or Horse Flies - Tabanidae

Tabanidae are the first of the **Brachyceran Flies** in this publication. Their shape is quite different to the **Nematoceran Flies** that precede it. **March Flies** are generally known as a nuisance fly because they can inflict a painful bite on animals and humans. It is only the females that bite, as the blood provides the protein they need to produce eggs.
The name **Tabanidae** comes from the Latin 'tabanus' which referred to a type of Horse Fly.

This page: The large **Flower-feeding March Fly, Scaptia *auriflua*** is one of my favourite insects. Unlike other **March Flies** it does not bite and feeds solely on nectar. Its colouring and bright green eyes are very striking and beautiful. They seem to be quite solitary. Left: This fly landed briefly on a twig beside me as I was walking and I took a quick photo. Below: Feeding on ***Leptospermum***.

Selection of large **Tabanidae** one of which had landed on my car. They seem quite attracted to cars, perhaps because *I* am inside! I have not been able to identify **Tabanidae** like these to species or even genus.

Largest Fly I have seen!

Rhigioglossa latifrons is the largest fly I have seen at approximately 25mm in length. It is the only photographed sighting in Australia. I assume it was very fresh as it didn't move as I photographed it. This is a female. It follows Mackerras' (1961) keys: an SA species, large and dark with wide diverging frons (anteriorly), the callus club shaped, and eyes haired (short).

Snipe Flies - Rhagionidae

Rhagionidae or **Snipe Flies** are a small family of flies related to the **March Flies** (see previous page). Their common name comes from the fact that their prominent proboscis can look like the beak of a snipe (bird). **Snipe Flies** are medium sized, with slender bodies and stilt-like legs. They have piercing mouthparts and feed on blood and are predatory on other insects.

Photos above and right: ***Atherimorpha* sp.** is a **Snipe Fly** I see fairly frequently. Leaving its back legs dangling in mid-air over the edge of a leaf or flower is characteristic of this species! Apparently this can sometimes be to its detriment … exposing it to the risk of being nabbed by a spider lurking underneath!

Left and below:: An unidentified **Snipe Fly** seen on the path in front of me.

Above::A commonly seen **Snipe Fly**, ***Chrysopilus* sp**.

Nose Flies - Rhiniidae

The name **Rhiniidae** comes from the Greek 'rhinos' meaning 'nose or 'snout'. This refers to their characteristic elongated proboscis. I have only see one genus of **Nose Fly**.

Comparison

Two species from one genus, ***Stomorhina***.

Left: ***Stomorhina subapicalis***. I regularly see this fly in summer but find it very difficult to photograph. The photos on the left were taken on a rare occasion that one sat still long enough to photograph from different angles. I generally see this species flying en masse. They make a very distinctive buzzing sound. They hover for prolonged periods, and then move very abruptly away.

Below: A very brief sighting of ***Stomorhina discolor***. Note the lined eyes.

Interesting Info - The Eyes of Flies

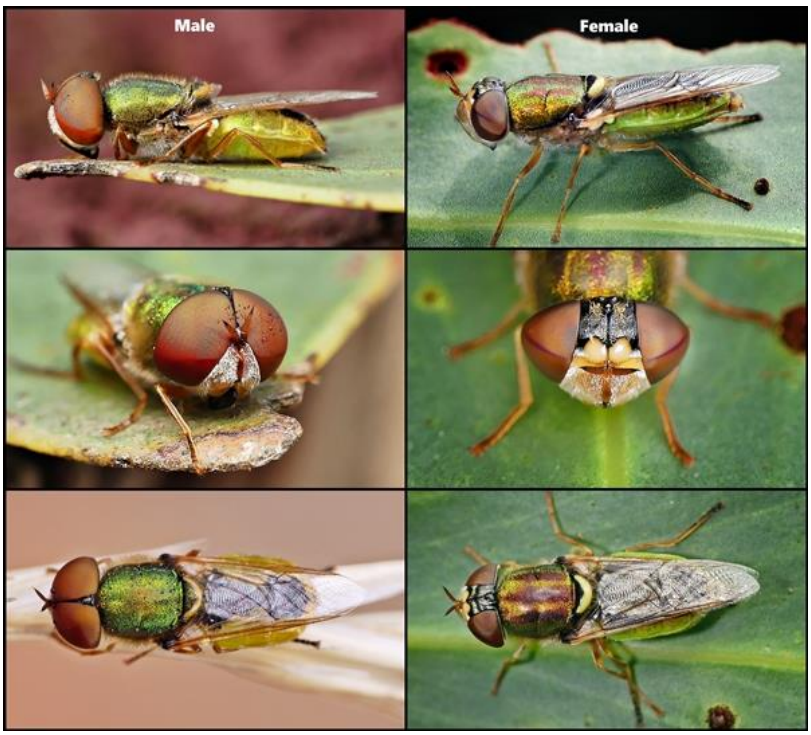
Left is a collage of some amazing fly eyes that I've had the privilege of photographing! These lines and colours are a classic adaption in insects with good vision, allowing them to detect a much wider range of colour than with just standard photo-receptors.

1. Soldier Fly, *Octarthria* sp.
2. Nose Fly, *Stomorhina subapicalis*
3. Stiletto Fly, *Agaphophytus queenslandi*
4. Soldier Fly, *Acanthasargus stricta*
5. Native Drone Fly, *Eristalinus punctulatus*
6. Soldier Fly, *Odontomyia decipiens* (female)
7. Stiletto Fly, *Agaphophytus queenslandi*
8. Flower-feeding March Fly, *Scaptia auriflua*
9. Soldier Fly, *Octarthria* sp.

Soldier Flies - Stratiomyidae

Soldier flies have a distinctive flattened body and large and often multi-coloured eyes. In my experience they can be quite placid. The name **Stratiomyidae** literally means 'soldier flies' and probably refers to their appearance.

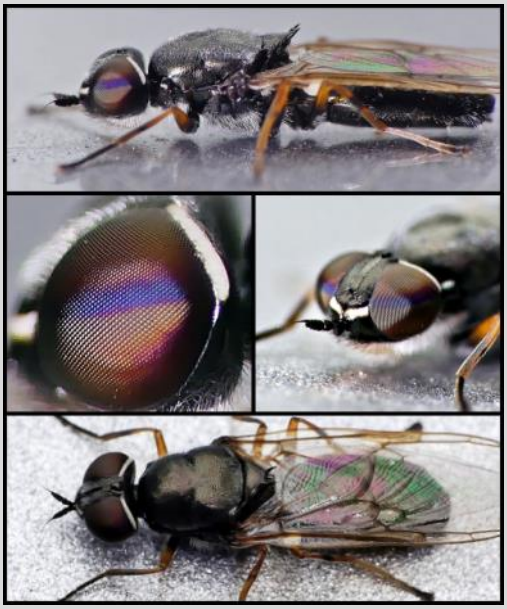
Right: A collage comparison of the male and female **Green Soldier Fly, *Odontomyia decipiens***. I've only seen these sporadically in Belair NP. Of particular note is the spacing of the eyes. The male has eyes touching and the female has eyes separated. Additionally the eyes are a very different shape and the female has a purple streak in the eyes. Perhaps this is an adaption for finding a male or for mating, but this is only conjecture. Also the colours on the scutum and scutellum between male and female are quite markedly different. A beautiful fly.



Left: The very common **Garden Soldier Fly, *Exaireta spinigera***. A frequent visitor in gardens with larvae being voracious eaters of compost and decaying matter. Both larvae and adult are harmless and very valuable in our ecosystem.

Left: Soldier Fly in **subfamily Antissinae**. Many times it is impossible to narrow organisms down to species.

Comparison



Two species from one genus, ***Acanthasargus***.

Left: Different angles of ***Acanthasargus stricta*** seen on my car in Belair NP. On first sight an unremarkable fly, but on closer inspection very beautiful. Note the coloured stripe in the eye.

Right: **Acanthasargus varipes.** One of only two sightings in Australia. A very placid fly.

***Chiromyza* sp. Soldier Flies** are very plentiful particularly during April and May. They are quite unremarkable and easy to dismiss, but are an integral part of the food chain and ecosystem. Above is a male. Below is a female laying eggs in a grass head.

Above and below: Female ***Inopus* sp.** seen on grasses and perhaps looking to lay eggs. A very distinctive orange head.

Larvae

Below: Distinctive **Soldier Fly** larvae with pointed head, feeding on the fungus **Common Grey Disco, *Mollisia cinerea***.

A small ***Octarthria* sp. Solider Fly** with stunning coloured bands in its eyes. These lines are a classic adaption in insects with good vision, allowing them to detect a much wider range of colour than with just standard photo-receptors.

Robber Flies - Asilidae

Robber Flies are quite common in the park and surrounding areas. They are impressive and fierce hunters. A number of times I have seen them catching prey on the wing right in front of me, impaling it with their beak-like mouthparts. The name **Asildae** comes from Greek 'asílos', which means 'fierce' or 'unapproachable'.

***Cerdistus* sp.** is also a relatively common Robber Fly. Here it has caught another fly.

Below: ***Laphria telecles***, also known as a **Bee-mimic Robber Fly** is distinguished by its dark, metallic body, white lateral spots on the abdomen, and the basal half of the hind femora which is orange.

Left and below: A relatively common medium-sized Robber Fly, ***Colepia rufiventris*.** The one on the left caught this Dragonfly in mid-air right in front of me. Quite astonishing to witness.

Below: ***Daptolestes sp***, is endemic to Australia and unlike other Robber Flies, has patterned wings (not visible here). It has caught a small native bee, ***Lasioglossum* sp**. as prey.

Herculean Robber Fly!

Right is a close-up photo of the aptly named **Herculean Robber Fly, *Neoaratus hercules*** that landed on my car right next to me when I was parked. It was a perfect opportunity to photograph this powerful animal showing the facial 'beard' or 'mystax' characteristic of all **Robber Flies.**

Neoaratus hercules is astonishingly large and perhaps 45mm long. Left is a photograph of the whole fly.

Smaller Robber Flies

Not all Robber Flies are large. Here are two very small and delicate flies, not immediately recognisable as Robber Flies. Below: ***Austrosaropogon* sp.** with tiny winged prey. Left: **Slender Robberflies, *Leptogaster* sp.** mating. Robber Flies are most vulnerable to predation when mating.

Stiletto Flies - Therevidae

The name **Therevidae** comes from the Greek word 'thereus' meaning 'hunter'. This reflects their predatory nature, as they hunt other insects for food. The common name of **Stiletto Fly** likens them to a stiletto knife ie. they have long and thin bodies and piercing mouthparts. Many **Stiletto Flies** are often wasp mimics, in the hope that they will look more ferocious than they actually are.

Above three photos: ***Taenogerella elizabethae*****.** An elegant and distinctive Stiletto Fly seen both on my car and on ***Acacia* sp.** (right). Note its characteristic stance.

Ectinorhynchus sp. Stiletto Fly. I saw this fly briefly and even debated whether to take a photo or not. In the end I was pleased I did. It is an undescribed species within this genus and the sighting was of particular interest to researchers and taxonomists at the Queensland Museum. The photo will be included in research papers.

Left and right: ***Pipinnipons fascipennis.*** Note its distinctive wings with light brown and black stripes, red legs with white 'socks' on the front pair, and a white-striped abdomen. Only poor photos due to inaccessibility.

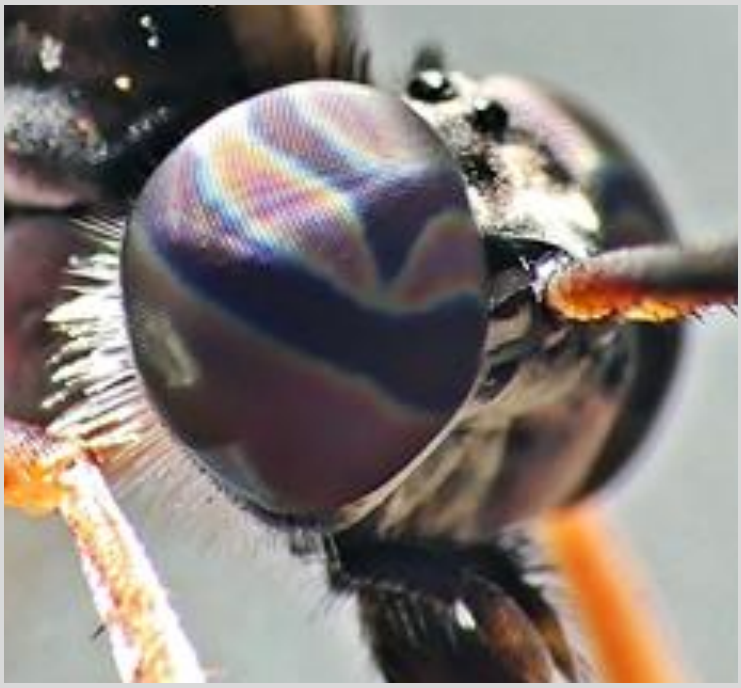
Comparison

Three examples from one genus, ***Anabarhynchus* sp**.

Right: Two instances where ID to species was not possible. Undoubtedly there are many species yet to be described.

Below: ***Anabarhynchus kosciuskoensis.***
The only sighting in SA.

Below: **Anabarhynchus plumbeoides**.
Also a rare sighting.



Agapophytus queenslandi seen hereon my car in Belair NP, has a much wider distribution in Australia than its name would suggest! Note its remarkable eye.

Bee Flies - Bombyliidae

I love Bee Flies!

Bombyliidae is a large family. The name **Bombyliidae** comes from the Greek 'bombyle' which means 'buzzing' or 'bumble bee'. They are often quite fluffy and may be indeed be mistaken for a wasp or a bee. They can hover motionlessly, but also move very abruptly. At times it can be frustrating to get good photos of them! Many Bee Flies such as ***Staurostichus* sp.** (right) have a very large pointed proboscis for probing deep down into flowers. **Banded Bee Flies** (next page) do not have this long thin proboscis.

***Geron* sp, (subgenus Plichtamyia).** I had been aware of these tiny flies for a few seasons before realising that they were in fact Bee Flies!

As with many small flies, it is easy to disregard them as inconsequential, when they are actually vital within the ecosystem, both as pollinators and prey. I have watched as these were actively stalked by an **Australian Green Mantis**! Of note is their very sharp and long proboscis for stabbing deep into flowers, such as ***Ixodia achillaeoides*** (left).

Right top and below: Two photos of a **Black and Grey Striped Bee Fly, *Meomyia sericans***. Its movements are so quick that it is very difficult to get a good photo. Note the distinctive black and grey colouring and its long thin proboscis.

Comparison

Two species from one genus, ***Zaclava.*** .

Left is an undescribed species of **Petite Bee Fly, *Zaclava* sp.** Right is ***Zaclava minima***. The behaviour of this species is quite unique and when I first saw it in no way did I think it was Bee Fly! Very quick and very small. Note the halteres and bulbous legs. Both on ***Ixodia achillaeoides.***

Comparison

Three species from one genus, **Charcoal Bee Flies, *Anthrax* sp**.
Top is ***Anthrax confluensis***.
Middle is ***Anthrax maculatus***.
Bottom is ***Anthrax incomptus***.
Note the different wing patterns.

Comparison

Three examples from one genus, **Long-winged Bee Flies, *Aleucosia* sp.**
Top is ***Aleucoia danielsorum*,** a very rare sighting and a first in South Australia.
Below are two ***Aleucosia* sp**. unable to be identified to species.
Note the difference in the wing patterning and also in their body shape when compared with ***Anthrax* sp**. (left).

Below and right: **Banded Bee Fly, Tribe Villini**.
Note the distinctive banded abdomen and the lack of a long thin proboscis.

Above: A **Micro Bee Fly** from the subfamily **Phthiriinae.** Very small at 3mm. Seen briefly on my car.

Above: Four individuals from ***Australiphthiria* sp.** Approx. 9-11mm in length. Females have eyes separated, males have eyes together.

Below: ***Choristes* sp.** A small Bee Fly seen very briefly.

Below: Subfamily **Bombyliinae**. Also a small and very quick Bee Fly seen very briefly.

Below: ***Comptosia magna***. A sizable long-winged Bee Fly I see fairly often, always low to the ground. ***Comptosia*** is frequently not identifiable to species but with this one, three thin brown lines are visible on the thorax that take this one to species. Note the exquisite long wings. The unidentifiable species look very similar to this one.

Tangleveined Flies - Nemestrinidae

I have been unable to find the etymology of the name **Nemestrinidae**. The common name **Tangleveined Flies** refers to the veins of their wings, which may appear tangled or patterned like a maze. They are usually seen resting on vegetation. They are effective pollinators.

Above and left: Most Tangleveined Flies I see are ***Trichophthalma* sp.** They are larger size flies and very much a favourite. Such a beautiful creature! The individual above was resting its proboscis on the edge of the leaf … perhaps the proboscis was heavy!

Left: ***Cyclopsidea* sp.** A rare sighting of this species in Australia Refer here to discussion about this fly https://www.inaturalist.org/observations/191723490

Small-headed Flies - Acroceridae

The name **Acroceridae** comes from Greek 'akros' meaning 'top' or 'tip' and 'keras meaning 'horn', referring to the position or form of the antennae on the head. Their common name is **Small-headed Flies** or **Hunchbacked Flies** which refers to their rather unique appearance. They are not commonly known. They are parasitic flies whose larvae develop inside spiders.

Above: ***Ogcodes* sp.** A very unique fly with a very small head and reduced mouthparts. Interestingly some have no functional proboscis because they do not feed. Antennae are on the ventral surface of the head near or below the mouth. In many species the eyes are holoptic in both sexes ie. meet in the middle. Wing venation is quite reduced compared to many flies. The abdomen often has pale horizontal bands across the posterior edge of each segment. Unfortunately very difficult to photograph ... most shots were taken directly upwards.

Signal Flies - Platystomatidae

The name **Platystomatidae** comes from the Greek words 'platys' meaning 'flat' or 'broad', and 'stoma' meaning 'mouth'. This refers to the wide or broad mouthparts characteristic of many species in this family. The common name **Signal Flies** comes from the distinctive visual signals these flies use for communication. These signals are used to carry out elaborate courtship dances, establish territory and attract a mate. Many times I have seen them 'signaling' with their wings and moving around in elaborate mating rituals.

Left and above: ***Euprosopia* sp**. I have seen these beautifully patterned flies in great numbers walking around and posturing on the trunks of ***Eucalytpus*** trees.

Left and right: ***Lenophila achilles*** has a very striking yellow 'nose' and distinctive patterning on its wings. Seen here on ***Xanthorrhoea semiplana.***

***Rivellia* sp.** are by far the most common **Signal Fly** I come across.

Below: Sequence shows the characteristic wing movements of just one fly. This one was on the trunk of ***Eucalyptus***.

Right: An interesting mating ritual which took place over time. The mating pair moved continually, always accompanied by the third onlooker in close proximity.

Right below: Fly showing beautiful abdominal markings. It is impossible to ID any of these to a specific species.

Left and right: ***Duomyia* sp.** a very placid fly that walked onto my finger as I was photographing it.

Hover Flies - Syrphidae

The name **Syrphidae** comes from the Greek word 'syrphos' meaning 'gnat' or 'mosquito'. **Syrphidae** are important pollinators and are very active around all flowers in the park. I find them delightful to watch.

Comparison

Above: **Yellow-shouldered Stout Hoverfly, *Simosyrphus grandicornis*** clearly showing the distinctive yellow 'shoulders' on the thorax. On ***Thysanotus patersonii.***

Above: **Common Halfband, *Melangyna viridiceps***, can initially look similar to the Yellow-shouldered Stout Hoverfly, but has a wholly black thorax. On ***Xanthorrhoea semiplana.***

Left and right: ***Psilota* sp.**, subfamily Eristalinae, are small dark Drone Flies.

Comparison

Left and above: **Native Drone Fly, *Eristalinus punctulatus***, with its striking spotted eyes.

★ Above: **Common Drone Fly, *Eristalis tenax*,** is an introduced species seen here in the Old Government House gardens.

Left: A **Yellow-shouldered Stout Hoverfly, *Simosyrphus grandicornis*** showing its characteristic 'hovering' behaviour as it approaches a ***Brunonia australis*** flower.

Below: Two **Yellow-shouldered Stout Hoverflies, *Simosyrphus grandicornis*** mating during flight.

Larva

Below: An almost translucent tiny Syrphidae larva with twin tubular structures on its rear end. Seen on ***Acacia pycnantha*** and approx. 7mm.

A rare fly

Above: A very unique **Inflated Hoverfly, Cyphipelta rufocyanea** on ***Leptospermum* sp**. The reason for the distinctive 'inflated' bits is unknown. A rare sighting.

Fruit Flies - Tephritidae

The name **Tephritidae** comes from the Greek word 'tephros' meaning 'ashen' or 'gray' and likely refers to the colour of their body. They do however have very distinctive markings on their wings.

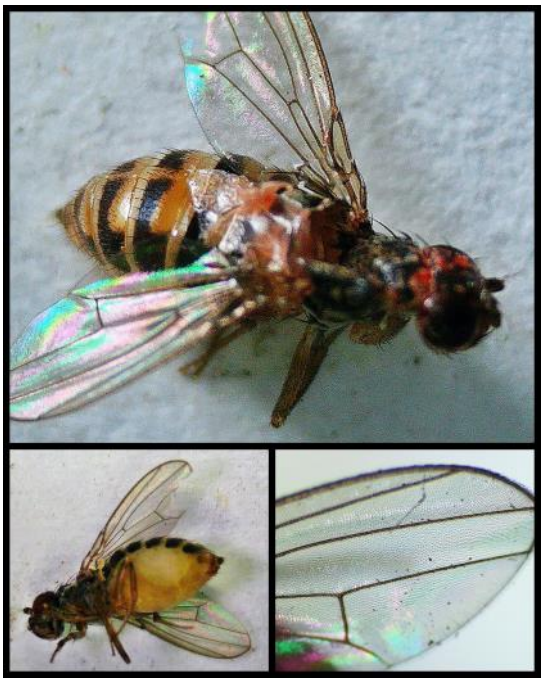
Unfortunately **Fruit Flies** have a bad name, but as is so often the case, it is only a tiny handful of this family such as the introduced **Mediterranean Fruit Fly, *Ceratitis capitata*** that pose problems as pest species. The vast majority are exquisite little native flies with beautifully patterned wings and a vital place within the ecosystem.

The first time I spotted a tiny fly with what appeared to be black suns on its wings I was smitten. I went in search of more and have so far seen seven species, always on flowers. Undoubtedly there are more and I will continue looking for them. Names of the flies are included on the collage.

Left and right: **Bull Thistle Gall Fly, *Urophora stylata*** was introduced to Australia as a biological control agent for invasive Spear Thistle. The control program began in 1985 to help reduce the Thistle's seed production. Its larvae feed on developing seeds and thus reduce the spread of the weed.

Vinegar and Fruit Flies - Drosophilidae

The name **Drosophilidae** comes from the Greek word 'drosos' meaning 'dew' and 'philos' meaning 'loving'. This refers to the fact that they are often active at dawn and dusk. They are best known for the genus ***Drosophila***, which includes ***Drosophila melanogaster***, which was so profoundly important as a key model organism in genetics research. Unlike the Tephritidae which are attracted to the growing fruit itself, Drosophilidae are attracted to fermenting fruit or decaying plant material.



Left : **Small Fruit Fly, *Drosophila sp.*** found deceased near my garbage bin.

Left : **Immigrant Fruit Fly, *Drosophila immigrans*** also found near my garbage bin. Although originally from East Asia it is now considered to be cosmopolitan (ie. its range extends across the planet.)

Shore Flies - Ephydridae

The name **Ephydridae** comes from the Greek word 'ephys' meaning 'midge' or 'gnat'. Although they are called **Shore Flies** they are not necessarily restricted to water. I've also seen them on flowers and vegetation.

Left: **Water Floating Fly, *Brachydeutera sydneyensis***.
I saw many of these tiny flies (left) in seasonal wet sludge by the side of the road. Specialised hairs on their feet allow them to 'walk' on water.

Above: ***Hydrellia* sp**. on ***Acacia pycnantha***.

Left: ***Scatella* sp**. seen on my car.

Long-legged Flies - Dolichopodidae

The name **Dolichopodidae** comes from the Greek word 'dolichos' meaning 'long' or 'extended', and 'pous' meaning 'foot'. **Dolichopodidae** are small (under 10mm) and often very shiny and metallic. Most have slender bodies and a distinctively elevated stance

Above: A selection of flies from ***Heteropsilopus* sp.** which is commonly seen everywhere.

Above: A selection of flies from ***Parentia dispar*** which is also a commonly-seen species.

Hydrophorinae is a subfamily in **Dolichopodidae**. They are found in or near fresh water.

I found the mating flies (left) in a puddle after a period of prolonged rain. The female is eating something and I wondered whether the male had brought a 'gift' prior to mating as can be the case with some fly species (see **Dance Flies**). Of note is their use of the surface tension of the water.

Below: ***Hydrophorus* sp.**

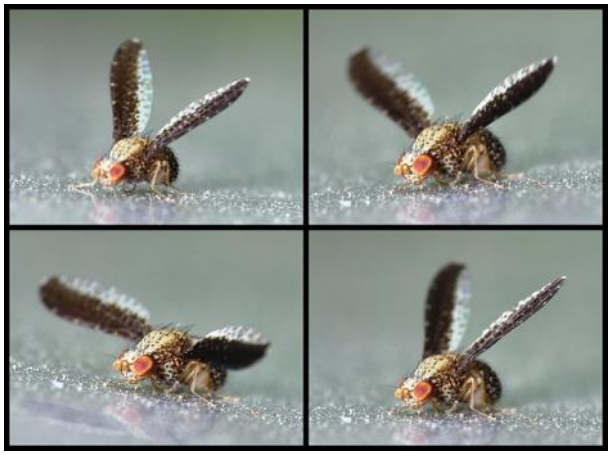
Left: ***Diaphorus* sp.** with distinctive striped abdomen.

Right: ***Chrysotimus* sp.** deceased. A very beautiful fly.

Lauxaniid Flies - Lauxaniidae

The name **Lauxaniidae** originates from the Greek 'lauxanios' meaning 'luscious' or 'delightful'. **Lauxaniidae** are difficult to describe, except for the fact that they are small (2 - 7mm) and sometimes orange-ish. Many are quite beautiful when seen close-up. Some of my sightings in Belair NP have been on my car, simply because they are easy to see on a blank background.

Left and right: ***Trypetisoma digitatum***. A wonderful little fly with intricate markings and spotty wings. 4mm. Note the collage of wing movements (right) which are reminiscent of **Signal Flies**. A firm favourite!



Left: ***Ceratolauxania* sp**. Two different species. Note black colourings.

Right: ***Minettia* sp.** is frequently seen.

Above: ***Sapromyza brunneovittata*,** male and female.

Homoneura binotata

Meiosimyza lineata

***Meiosimyza* sp.**

Meiosimyza appula

Root-maggot Flies - Anthomyiidae

The name **Anthomyiidae** comes from the Greek word 'anthos' meaning 'flower' and 'myia' meaning 'fly'. So literally it literally means 'flower fly', the adult spending time on flowers.

They are commonly known as **Root-maggot Flies** because the larvae are known for feeding on roots, bulbs, stems or decaying matter.

Anthomyiidae look a little like House Flies, Muscidae but are smaller and more slender.

Anthomyia punctipennis (far right) is a very common little fly easily identified by the black spots on its wings. It is an introduced species.

Anthomyia vicarians

Anthomyia punctipennis

Freeloader Flies - Milichiidae

The origin of the name **Milichiidae** is unclear. They are very small flies, 1-3mm and shiny black or brown. They are commonly known as **Freeloader Flies**, because of their kleptoparasitic habits. Adults often gather around predation or feeding events, such as where a spider or other predatory insects have caught prey. They then feed on that prey and its secretions. They are a fascinating model for scientists to study commensal and kleptoparasitic relationships.

Left: An **Orange Assassin Bug, *Gminatus australis*** has caught a ***Lepturidae* sp**. beetle, its precision-aimed rostrum targeting the beetle's vulnerable rear end. The beetle itself is covered in at least seven Freeloader Flies. They were very active on the scene. I have also seen them active around a spider that had caught a fly.

Below: ***Stomosis vittata*** showing the strong bristling of this family.

Below: ***Leptometopa* sp.**

Flat-footed Flies - Platypezidae

The name **Platypezidae** originates from the Greek word 'platy' meaning 'broad' or 'flat' and 'peza' meaning 'foot'. This refers to their characteristically flat hind tarsi (feet). I have only ever seen these Flies running around in rapid movements over flat surfaces.

Left: ***Lindneromyia* sp**. is a very small fly that moves in rapid angles over a surface. Left is the lighter-coloured female with separated eyes. Right is the darker male with eyes touching. This difference in the eyes between male and female occurs in many species of Diptera, but not all.

Cheese Skipper Flies - Piophilidae

The **Piophilidae** family as a whole are scavengers of animal waste, carrion and fungi. The name comes from Greek 'pios' meaning 'grease' or 'fat', and 'philos' meaning 'loving'. This refers to their attraction to fatty and decomposing substances. Interestingly these are the flies used in forensic entymology and medicocriminal investigations, often suggesting the time of death. Additionally, their ecological value in decomposition cannot be underestimated, as it underlies much of the web of life. Without them we would be waist-high in dead things.

Left: ***Piophilosoma antipodum*.** I found a myriad of these small flies on a Kangaroo carcass.

Humpbacked Flies - Phoridae

Right: The aptly-named **Humpbacked Fly, Family Phoridae** photographed on my car. There were quite a number of these flies, perhaps 2mm in length and they seemed to prefer running along in rapid jerky movements rather than taking flight. It's fascinating to come back to my car after a walk and see what's on it. On bark, trees, or the ground these tiny flies would be invisible. .

Frit or Grass Flies - Chloropidae

Chloromerus* sp.** (above) is probably the smallest fly I have seen. I only saw it because it was stuck in the stickiness of a ***Drosera. Right is **subfamily Chloropinae** many of which I saw on ***Correa sp***. leaves.

The name **Chloropidae** comes from Greek 'chloros' which means 'green'. Presumably because these flies are often a green colour and associated with green habitats such as grass.

Leaf-miner Flies - Agromyzidae

The name **Agromyzidae** comes from the Greek 'agros' meaning 'field' and 'myzao' meaning to suck. This roughly means 'field sucker' and refers to the fact that the larvae feed within plant tissue, creating distinctive blotchy or weaving 'mines' in leaves or stems.

Above: Two species within **Subfamily Phytomyzinae**, both showing the characteristic bristling around the head and thorax. 1-2mm.

Above: **Pittosporum Leaf-gall Fly, *Phytoliriomyza pittosporophylli*** creates very distinctive galls/mines on the leaves of ***Pittosporum*** plants. The fly itself is inconspicuous and very small.

Black Scavenger Flies - Sepsidae

The name **Sepsidae** comes from the Greek 'sepsis' meaning 'decay' or 'putrefaction'. This refers to the decaying matter, carrion or dung around which these flies are commonly found. They are usually small 2–6 mm and shiny black or dark-colored, with a slender, wasp-like body. Their wings are often held upright or flicked repeatedly in a behaviour reminiscent of Signal Flies.

Left and right: ***Parapalaeosepsis plebeia*.** A very common Sepsid Fly in Australia. It is small and ant-like and waves its wings when at rest. The spots on its wings are unlike any other Australian fly and immediately identifies it. The one on the left was near my compost bin, the one on the right on a Kangaroo carcass.

Thick-headed Flies - Conopidae

The name **Conopidae** comes from the Greek 'konops' meaning 'gnat' or 'mosquito'. This refers to the fact that despite their wasp-like appearance, they are actually a Fly. They are parasitic flies, with the female inserting an egg into the abdomen of a bee or wasp during flight. The larva develops inside and eventually kills the host.

Left: ***Thecophora australiana*.** A very unique-looking fly seen near my clothes line! Its distinctive narrow 'wasp-like' waist helps it to mimic its Hymenopteran hosts and so not be seen as a threat.

Picture-winged Flies - Ulidiidae

The name **Ulidiidae** comes from the Greek 'oulidion' meaning 'small scar' or 'mark' which perhaps refers to their strikingly patterned wing markings, even though the individual of the species shown here had no wing markings. Many species hold their wings out at an angle and flick them in characteristic movements, which this individual was also not doing!

Left and right:
Physiphora alceae.
A strikingly beautiful fly with extraordinary striped eyes! Also note the orange mite near the calypters.

Louse Flies - Hippoboscidae

The name **Hippoboscidae** comes from the Greek 'hippos' meaning 'horse' and 'boskos meaning 'feeder' ie. 'horse-feeder'. This refers to the fact that they are bloodsucking flies that parasitise large mammals and birds. They have flattened bodies, strong claws for clinging to host fur or feathers, and piercing mouthparts for feeding on blood.

Above left and right: ***Ornithomya* sp.** I had to laugh that at the time of taking these photos I was thrilled at the 'friendliness' of this little fly. It was the 'friendliest' fly I have ever encountered. It was happy to walk on my clothes and hand and had to be strongly encouraged to fly off. Only on reading up about it did I realise it was probably scoping me out for a feed!

Hybotid Dance Flies - Hybotidae

The name **Hybotidae** comes from the Greek 'hybos' meaning 'hump' or 'lump' and refers to the hump-like appearance of these flies. Like the **Empididae** (below) they are known for their intricate courtship dances and predatory behaviour.

Right: ***Hoplopeza pulcherrima***

Dance Flies - Empididae

My first encounters with **Dance Flies** were quite fleeting, simply because they are so very small and quick. I saw the very small (2mm) **Dance Fly** (far left) on an ***Acacia pycnantha*** leaf one day while looking at **Psyllids**. I researched it a little, and read that these flies are mostly predatory with piercing mouthparts. Shortly after, I saw the tiny fly (near left) with an even tinier **Fungus Gnat** as prey and suspected that it must be a **Dance Fly**. Both are **Tribe Chelipodini.**

Waterbuzz Danceflies, *Hilarempis* sp.

I saw many of these small flies skimming rapidly over the surface of a winter creek. I was intrigued by their behaviour so sat on a log and watched them. I later did some research.

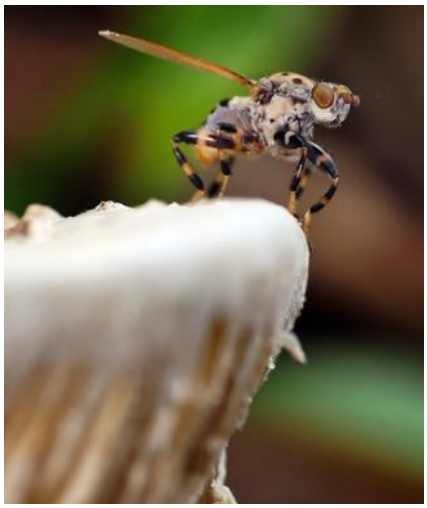
The males (left) have an enlarged basitarsi on their front legs which has silk producing glands. They use this silk to wrap 'nuptial' gifts (typically small prey, other objects or sometimes just silk) for a potential interested female (two females see right).

Below are males carrying their silk-wrapped gift and below right is a meeting between male and female at the water's edge, and the exchange of the gift. This happened very rapidly and with much commotion.

Dance Fly, Tribe Hilarini that I saw sitting on a **Narrow-lipped Spider Orchid, *Caladenia leptochila.***

Heleomyzid Flies - Heleomyzidae

The name **Heliomyzidae** literally means 'sun fly' but the reasoning is unclear. Adults I have seen have been in moist habitats, dense bushland, near fungal fruiting bodies or on decaying material.



Fungus Fly, *Tapeigaster cinctipes* (three photos above and right)**.** This is one of my favourite interactions with a fly. I was trying to take a photo of the mushroom it was sitting on, but the little fly wouldn't budge regardless of my activities. Flies are usually very flighty so I wondered why this one was not. When I got home I did some research. Apparently the male claims a mushroom as its territory and then sits and protects it. It waits for a female to mate with and the eggs are then laid in his mushroom on which the larvae then feed. He will stand up to any males (or photographers apparently) who wish to claim his mushroom. Beautiful markings.

***Pentachaeta* sp.** I have found these tiny flies en masse on entrails and dung. Their larvae feed on animal waste, carrion and fungi..

Tapeigaster nigricornis is the most common ***Tapeigaster*** species I see. As with its family member showcased above it is associated with fungi and is approx. 6mm in body length.

Lesser Dung Flies - Sphaeroceridae

The name **Sphaeroceridae** comes from the Greek 'sphaira' meaning 'sphere' or 'ball' and 'keras' meaning 'horn'. This refers to the rounded antennae.
They are referred to as **Lesser Dung** or **Lesser Corpse Flies** because of their saprophagous habits and because unlike the larger 'corpse' flies, the **Calliphoridae** (following pages) they are Acalyptrate. They are a close relative of **Heleomyzidae** (previous page).

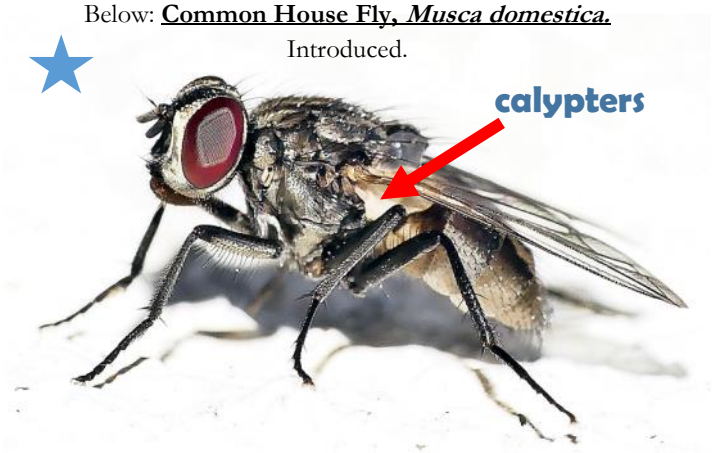
***Rachispoda* sp.**
A chance sighting of a tiny fly on my car. Nothing special but a fly and a family of flies I had never heard of. Every investigation is interesting!

House Flies and Allies - Muscidae

Muscidae have the common name of **House Flies** because some are synanthropic - they live near humans and benefit from our changes to the environment. We tend to see them as pests because they live in such close proximity to us and feed on 'waste', even though this activity is vital to keeping ecosystems healthy. Although a minority can transmit bacteria and disease from rubbish and faeces, the majority of **Muscidae** go about their business far removed from our lives.

Muscidae, along with the families of flies that follow are all '**Calyptrate'** flies and are what most people think of when the word 'fly' is used . ('Musca' literally means 'fly' in Latin). All the previous families do not have calypters and are called **Acalyptrate Flies**. See photo below left with red arrow pointing to the calypters, the two membranous lobes hidden below the wings. They are over the halteres (balancing organs) which are also at the base of the wings but shaped like small clubs. All flies have halteres.

Below: **Common House Fly, *Musca domestica.***
Introduced.



Above: ***Musca vetutissima*.** Tiny fly on my thumb.

Above: Two ***Musca* sp.** This a genus ordinarily thought of as 'annoying summer flies'.

Genus feature
Helina sp.

***Helina* sp.** is a large genus of Muscid Fly, with around 40 Aust. species. Photos show **Muscids** caught in **Hound's Tongue** (right) and also by a **Long Green Crab spider** (left below).

Left: ***Helina colossi*** on a sign. Note distinctive wing patterns.

Tribe Muscini

Tiger Fly, *Coenosia* sp. Many seen in mid-winter in Wittunga Botanic Garden.

Black Dump Fly, *Hydrotaea* sp.

Black Carrion Fly, *Australophyra rostrata* seen on a Kangaroo carcass.

Helinomydaea flavofusca

Pygophora apicalis

Blow Flies - Calliphoridae

Although the **Calliphoridae** are known for eating meat from carrion and open wounds, most are actually parasites of other invertebrates. Their common name comes from the fact that we talk of livestock or meat being 'fly-blown'. As with the **Piophilidae** they are used by forensic investigators to estimate a 'time of death'. Many are metallic green or blue in colour, hence the names **Greenbottle** or **Bluebottle.**

Bluebottle Fly, *Calliphora* sp.

Greenbottle Fly, *Lucilia* sp.

Right: ***Calliphora dubia***. Not a great photo, but this is a fly I see reasonably often, but find difficult to photograph. Distinctive yellow, blue and white abdomen.

Left: ***Amenia* sp**. A beautifully coloured and spotted fly.

Flesh Flies - Sarcophagidae

Sarcophagidae have similar habits to **Calliphoridae,** and the name literally means 'flesh eaters'. **Flesh Flies** are generally grey, although can also be pale yellow. They have three distinctive stripes along the thorax.

Above: Two examples of **Common Flesh Flies, *Sarcophaga* sp.**

Pupae

Above: Fly pupae in the stomach remains of a decomposing Kangaroo carcass. These are most probably from Carrion Flies (ie. Flesh or Blow Flies).

Bristle Flies - Tachinidae

The **Tachinidae** are a very large and commonly-seen group of Flies. They play a vital role in the ecosystem as parasites of plant-eating insects. Eggs are laid mostly on caterpillars but also other bugs. Their larvae (maggots) bury themselves inside the host, eventually killing it. When ready to pupate it will move into the soil, although some will remain and pupate in the host. Most Tachinids have prominent bristles on their rear end, but also on their thorax.

Above: A nail-biting encounter! ***Exoristinae* sp.** actively stalking a **Painted Apple Moth** caterpillar to lay eggs/parasitise it. I came upon this fascinating interaction by the side of the path. Very slowly and methodically the fly tried to determine its best angle of attack through the caterpillar's spines/setae. The fly's abdomen then curved under and the ovipositor slowly and carefully moved forward to lay an egg. The fly was utterly intent on its task, seemingly ignoring my presence.

***Rutilia* sp.** A beautiful large fly seen on my car.

Above: ***Amphibolia ignorata***. A large and beautiful fly, approx. 23mm in length. Seen on my garden shed.

Right: **Black and White Giant Fly, *Formosia speciosa*.** An exciting encounter with a very large fly. It was freshly emerged from its puparium, which had most probably been in the ground. The wings are still undeveloped. In the third photo the remains of the ptilinum can be seen (circled) as it starts to collapse. This is a special structure used by Schizophoran Flies to escape the puparium. In the first photo (which was taken later) the ptilinum has disappeared. The fly itself was slowly making its way up the tree, eventually disappearing from sight. Another fly of the same species was flying around, well aware of this one's presence.

Above: ***Eurygastropsis tasmaniae*.** A distinctive and placid fly with a white bottom. Despite the species name, it is widespread on the mainland, though easily missed because it's not a fly that annoys us humans!

Above left and right: Two different individuals of ***Senostoma* sp.** Seen quite frequently .

Microrutilia (subgenus) on ***Bursaria spinosa***. Proboscis visible.

***Trigonospila* sp.** I've seen these fairly frequently in recent seasons.

Above: Tribe **Rutiliini.** A very large and colourful fly seen only briefly before it took flight.

Above: ***Macrochloria* sp.** An interesting fly quite similar to both ***Eurygastropsis*** and also Calliphoridae. Confirmed by its wing venation to be a relatively rare Tachinid.

Above: ***Prodiaphania* sp.** A very fresh large fly.

Above: **Tribe Siphonini.** Not all Tachinids are large or distinctive. Here is a small Tachinid seen on ***Acacia pycnantha.***

Golden Tachinid Fly, *Microtropesa sinuata*. A large fat Tachinid and a firm favourite. Their buzz as they fly is quite audible and unique; I often hear them before I see them. It has large reddish eyes on a golden-coloured head and many bright white markings on its abdomen and thorax. A beautiful fly.

Above: ***Chlorotachini* sp.** A distinctive metallic blue medium-size fly. Very shiny.