Summer 2025

Angair Quarterly

Bringing you stories from the Anglesea, Aireys Inlet Society for the Protection of Flora and Fauna.

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Angair

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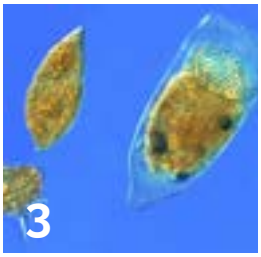

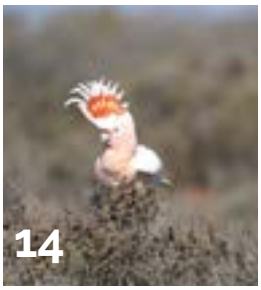

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The DNA of a living, connected valley

Rod Brooks

When you are monitoring the health of a waterway, how do you know what's living in the water and its surrounds? Terrestrial surveys can use traps and cameras but that's a bit harder in the water. Environmental DNA (eDNA) surveys can help solve the problem. These surveys work by collecting tiny traces of genetic material – such as cells, scales, or waste – that organisms leave behind in water, soil, or air. Analysing that DNA can then identify which species are, or were recently, present in the environment.

The Painkalac Valley Network undertook a 'Tree of Life' eDNA survey in June to increase the network's understanding of the health of the Painkalac Creek and its surrounds by providing a non-invasive, high-resolution snapshot of the total biodiversity including aquatic, rare, microscopic and invasive species. The survey results serve as a baseline and indicator of the ecosystem's ecological status and reveals the diversity and balance of life of the Painkalac wetlands, river, and estuary.

The survey covered five sites: the Reservoir in the freshwater reaches of the Painkalac Creek; Bimbadeen in the upper estuary; the Bend in mid-estuary; the lower estuary at the creek mouth and the freshwater wetland of the Allen Noble Sanctuary.

Two samples of water were collected at each site and filtered. The filters were sent to the EnviroDNA laboratory for analysis of any DNA present.

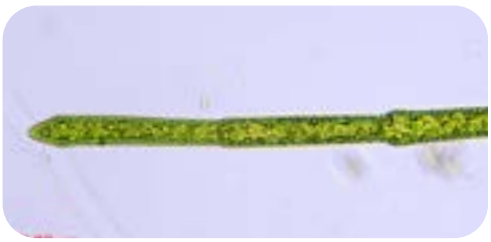
A 'Tree of Life' survey investigates all the functional elements of an ecosystem:

- **Producers:** plants, moss, algae and phytoplankton convert sunlight into energy and form the base of the food web
- **Consumers** (herbivores and carnivores) – zooplankton, mussels, insects, snails, crustaceans, fish and birds
- **Decomposers** – bacteria, fungi and animals that feed on dead plants and animals including worms, crabs and insect larvae transform dead matter into the building blocks that fuel new life.
- **Pollinators** – insects and birds that transfer pollen
- **Habitat formers** – seagrass, seaweeds and oysters that shape the ecosystem

A sample of organisms identified in the Painkalac EDNA Survey

Producers

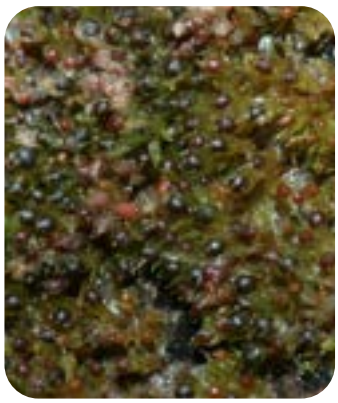
Mixed Phytoplankton community



Algae. Image: amayakan

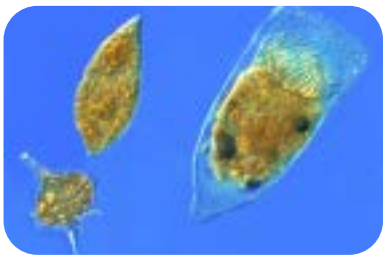
Pennywort. Image: Prenn

Beaded Glasswort
Image: Ellinor Campbell



Moss. *Physcomitrium readeri*
Image: Valentin Hamon

Consumers



Microzooplankton.
Image: Tintinnidguy

Little Brown Mussels

Mesostome Flatworm
Image: Wolfgang Bacher

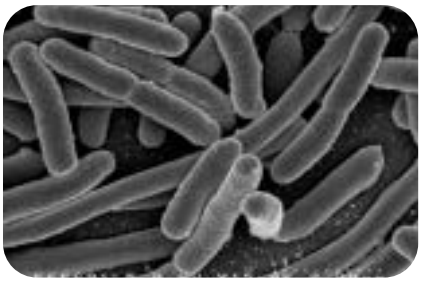
Springtail: Image: Tony Wills

Freshwater Shrimp. Image: Emily Roberts

Blackworm. Image: Wolfgang Bacher

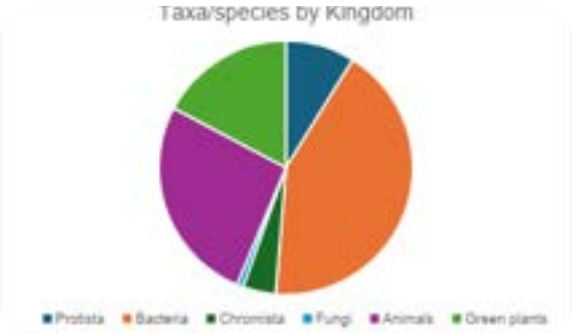
Decomposers

Yellow Earth Button Fungus.
Image: Reiner Richter



Bacteria

The Painkalac samples found 499 taxa, or groups of organisms, of which 65 per cent were identified as specific species. All six animal Kingdoms were represented.



It is worth noting that the number of bacterial taxa is almost identical to all animal and plant taxa combined!

The absence of a species in an eDNA survey doesn't necessarily mean that it wasn't there; it was just not detected in this sample at this time. For example, DNA may only persist in an aquatic environment for a week or two.

The following **vertebrates** were identified in the survey: 26 taxa of fish (including two introduced species – European Carp and Mosquitofish); 24 taxa of birds; 17 taxa of **mammals** including nine introduced species (cow, dog, deer, cat, house mouse, rabbit, rat, pig, fox) and four taxa of **frogs**.

The survey identified 24 native fish species. There were 18 native species in the Painkalac estuary, four in the Allen Noble Sanctuary and seven native species in the Reservoir.

The differences can be attributed to the creek mouth being an ecological junction, where the freshwater system meets the ocean. This creates many more kinds of habitats and feeding conditions than exist in stable freshwater systems. By contrast, the Reservoir and Allen Noble Sanctuary are more isolated, stable freshwater habitats that support fewer specialist species that are adapted to freshwater only.

Notolabrus gymnogenis, Crimsonband Wrasse
Image: Richard LIng

"the Painkalac Valley is an important wildlife sanctuary which must be protected"

Rich fish biodiversity in the estuary implies a good food web because it shows that many species at different levels – predators, prey, and microbial and animal decomposers (e.g. worms, insect larvae) – can find enough food, oxygen, and habitat that confirms a balanced, functional ecosystem with plentiful resources.

Notolabrus gymnogenis, Crimsonband Wrasse Image: Richard LIng

Eel

Little Pied Cormorant

By contrast a higher number of arthropod detections (insects, crustaceans, mites, etc.) and bacteria at the Allen Noble Sanctuary and the Reservoir compared to those at the creek mouth reflects the fact that arthropods and bacteria generally prefer stable environments rich in organic debris with low flow and consistent salinity. At the creek mouth there are more changes in flow, salinity and sediment with fluctuating water levels. Here are only those arthropods and bacteria that can cope with frequent changes and physiologically stressful conditions.

The count of mammal taxa showed that ubiquity of introduced species at nine species versus eight native ones. The endangered Broad-toothed Rat was found at the creek mouth and The Bend and the vulnerable Swamp Antechinus was identified at the Allen Noble Sanctuary. These findings show that the Painkalac Valley is an important wildlife sanctuary which must be protected.

It was concerning, but not surprising, to detect feral cats, foxes, deer and rabbits emphasising the need to continue control measures. On a lighter note, it is believed that the detection of 'pig' in the creek mouth and 'cow' in Allen Noble Sanctuary is likely to be due to scraps of ham sandwich and beef sausage finding their way into the waterway rather than DNA from live or recently dead animals.

The patterns observed at each site highlight how connected the Painkalac Valley system is. Each site contributes to overall ecosystem health through its unique role.

From a management perspective, maintaining a balance between stability (as seen at Allen Noble Sanctuary) and diversity (as seen at The Bend and Bimbadeen) is essential.

Ongoing monitoring through eDNA surveys can track how changes in land use, flows, disturbances such as fire, flood and drought, and climate affect the valley's living systems.

Swamp Antechinus

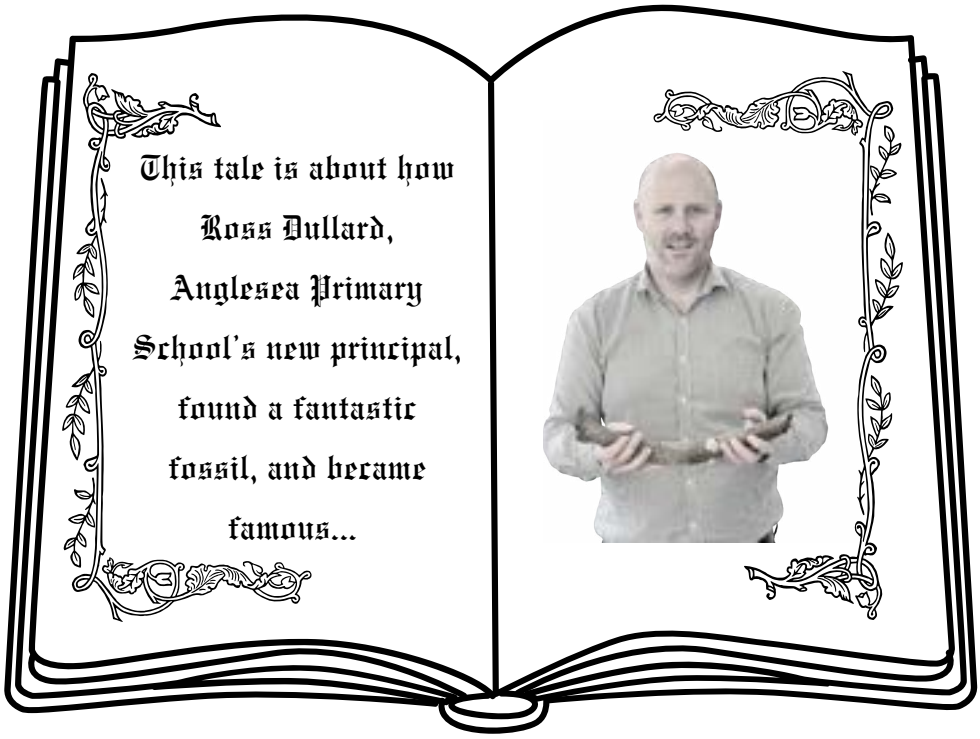
Broad-toothed Rat

Acknowledgements

This survey was made possible by a generous grant from the Victorian Field Naturalists Club of Victoria plus donations by Angair and two community members.

How to find a fossil at Jan Juc and hit the headlines

Angela Rutherford

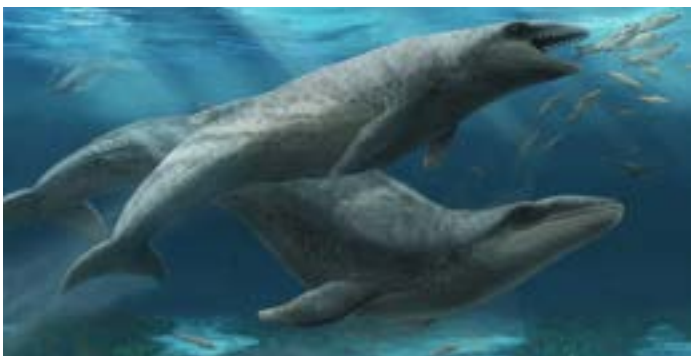


He chose parents who are educators and love the natural world. He spent school holidays with them on planting projects, or looking for rare and endangered species throughout Australia. His grandfather fossicked for opals around outback Queensland, and helped him find opal potch or megafauna fossils such as the partial jaws of Diprotodon. He loved his visits to his grandfather's place and raced in to see the latest finds. He learnt to ask questions about everything, and just as importantly, how to find answers.

He has a powerful passion for collecting: finding things, hunting for things, and even better, sharing those finds. Competition with a couple of brothers provides incentive. He started with old bottles, and moved on to the natural world. Carnivorous plants were his thing for several years.

Around 20 years ago he thought up a unique ambition – to one day discover something that changes history, and is named after him. He has been 'hell-bent on it'.

Ross Dullard has achieved his goal. In 2019, he found a skull fossil at Jan Juc. It is a new species of ancient whale, and has been named after him: *Janucetis dullardi*. It belongs to a family of extinct whales, the Mammalodontidae. These whales were small-bodied (up to three metres) with sharp teeth and powerful jaws.



Janjucetus dullardi calf and mother.
Artwork by Ruairidh Duncan Museums Victoria

This was no chance find. Ross became focussed on fossils in recent years, and he is a highly skilled observer. He says that 99% of people would not see the fossil in around half the stuff he finds. He knows where to look, and what vertebrae or skulls are likely to look like. He immediately recognised the potential in this find.

There are rules about collecting fossils: *https://www.foundafossil.com/for-fossil-finds*. Surface collecting is allowed, but no manual or mechanical digging is permitted. Ross is a respected citizen scientist and has good connections at the Melbourne Museum. When he sent the palaeontologists a description and photos of his find embedded in the cliff face, he was authorised to remove it. In that location, the fossil could disappear after the next big tide.

Ross donated the find to the Melbourne Museum, where it was cleaned and repaired. The palaeontologists at Museums Victoria Research Institute worked on the description and identification, including international comparative studies. The work was published to acclaim in August this year. It has been a lengthy and incredibly exciting journey. Ross has shared the story widely in the school, and now has a number of budding collectors among the children.

The Jan Juc Formation is one of the rich marine fossil beds in Victoria, formed around 25 million years ago, in the Miocene period. Marine animal fossils are fragmentary and dispersed, due to tides and currents. The fall in sea levels from the Miocene means that the sea floor is now accessible.

Ross has a passion for this place, visiting it regularly in the last eight to 10 years. This is his down time, his 'relaxation, almost meditation, time away, just me and the cliffs and the fossils and everything, fresh air.' He constantly monitors tide charts, wind and weather. He waits for the right conditions, at low tide and when there is no sand overlaying the clay fossil bed. He always has one eye on the ocean. Perhaps a big storm or wave action has caused a bit more erosion, exposing interesting fossils, but also increasing the risk of injury by falling boulders. On one occasion he had to retreat into the water, fearing that a major cliff fall was imminent.

Ross is not done yet. He currently has a rib fossil that he is planning to donate in the next few months. Other interesting finds are pieces of amber, a dozen or so of which he has donated to the museum, in which microscopic life forms are preserved, not visible to the naked eye.

His professional career has been shaped by his interest in education that's a bit different, in smaller regional settings. He worked in northeast Arnhem Land, going into 'insanely remote' places, where he collected things and sent them to the Melbourne Zoo or Melbourne Museum. He always engaged with staff about the samples. He has been a teacher at the Melbourne Zoo, in a children's hospital and in the UK. On walking into the Anglesea school grounds for the first time, he loved the garden that Angair helped create. 'Just magnificent, the connection to nature speaks to me.'

Jan Juc

Sedges and Rushes What's the difference?

Gail Slykhuis

You may be familiar with the rhyme 'Sedges have edges and Rushes are round; Grasses have nodes all the way to the ground' but is this always the case?

We will investigate Sedges and Rushes in this issue, leaving Grasses for another day. Let's start by looking at four sedges from the 50 or more that grow in the environs of Anglesea-Aireys Inlet.

Sedges are herbaceous plants most having a tufted or clumping habit. Some species grow in wet to swampy areas and along the margins of watercourses while others prefer Heathy Woodlands, Heathlands or Coastal Dune Scrub.

All sedges are classified into the plant family Cyperaceae, although the use of common names may create confusion, as we will see. Sedges are excellent habitat for wildlife providing food sources, shelter and breeding spots.

Tall Spike-sedge, *Eleocharis*, also known as Tall Spike-rush

A vigorous upright aquatic herb growing to two metres high, with ribbed, rounded (terete) stems to 12 mm wide. The stems support tapering terminal flowering spikes between October- April. The leaves form a rounded sheath at the base of the stem.

If you were to examine the inside of a stem you would notice the hollow partitions that enable air to move between the upper parts of the plant and the submerged root system.

Allen Noble Sanctuary, well known for its wonderful bird life, has an extensive coverage of Tall Spike-sedge growing in the deeper water. If you are not familiar with the sanctuary, now is a great time to visit.

Coast Saw-sedge, *Gahnia trifida*

A tussock growing to one metre high with narrow spreading leaves with rough, sharp toothed edges. The flowers are densely clustered, pale dark brown spikelets arranged in an interrupted manner along erect stems.

You will find this attractive sedge growing along the margins of the Anglesea River, particularly upstream from the bridge.

Sandhill Sword-sedge, *Lepidosperma sieberi*

A tufted herb growing to 60 cm with spreading rhizomes that create large plant colonies. The fan-shaped growth pattern, particularly noticeable at the plant base, is a useful identification tool. The flowering stems are generally taller than the leaves and have minutely toothed edges; the leaf edges are also minutely toothed. The Sandhill Sword-sedge is very common in the Heathland and Woody Heathland around Anglesea and Aireys Inlet.

Wire Rapier-sedge, *Lepidosperma semiteres*

Another Lepidosperma species that is widespread in our Heathlands and Heathy Woodlands.
Many of the Rapier-sedges have rounded (terete) stems, The flower stems of the Wire Rapier-sedge can be misleading as they appear round but on investigation have a smooth, acute edge. This identifying feature can be appreciated via the use of a hand lens or by rolling the stem through your fingers.

Rushes are a diverse group of moisture loving plants, classified into several plant families. The focus in this article will be the plant family Juncaceae as it contains well recognised species, many growing in our area.

Like the sedges, rushes are also important habitat plants as well as nutrient filters and soil stabilisers

Tall Rush, *Juncus procerus*

A densely tufted perennial to 2.5 m high, clusters of brown flower spikes form on the stems. The green rounded stems, to 10 mm wide, are soft to touch due to the large air spaces in the middle of the stem (pith). When compressed the stems will split lengthwise.

Although not as large as those of the Tall Spike-sedge, the large air spaces connecting the stems with the root system are an adaptation for survival in an aquatic to semi-aquatic environment.

Tall Rush can be seen growing in the water at Allen Noble Sanctuary.

Broad-leaf Rush, *Juncus planifolius*

A short-lived grass-like, tufted rush growing to 60 cm high with many clusters of dark flowers from September-February. The flat leaves can be as wide as 11 mm and provide a useful identification feature. The flower stems appear firm when compressed and when examined the pith is cobwebby with far fewer air spaces than noticeable within the Tall Rush. Availability of air for the roots is not as critical in the damp sites that this Rush frequents: roadside ditches, seasonal wetlands and moist gullies.

It is known to grow in Grasstree Park, Torquay

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VicFlora – www.vicflora.rbg.vic.gov.au

Summer orchids are a'coming in

Margaret MacDonald and Alison Watson

After a sporadic display of sun orchids with some beautiful specimens being observed, it was on the whole a rather disappointing season. Many of the smaller specimens just did not open due to the lack of warm, humid days, and the sun orchid season came to an abrupt end. There are still a few Blotched Sun Orchids, *Thelymitra benthamiana*, scattered throughout the district and if we get some warm sunshine, they might just have a last fling in December. The smaller Leek Orchids, *Prasophyllum* sp., are still appearing. Keep a watch out for the endemic Anglesea Leek Orchid, *P. odoratum* (Anglesea form), which usually flowers after most other Leek Orchids have finished.

Anglesea Leek Orchid

Large Tongue Orchid

We can look ahead to some of the more unusual orchids in the next few months. The Large Tongue Orchid, *Cryptostylis subulata*, is impressive with its red and yellow colouring. We have found a few new sites where we have observed the large evergreen leaves but the flowers are extremely rare. The brownish-green to yellowish-green Horned Orchid, *Orthoceras strictum*, is more subdued and harder to see amongst the grasses where it grows, but is an impressive flower. It can grow to 80 cm tall bearing six to nine flowers.

In contrast the tiny unusual Elbow Orchid, *Thynninorchis huntianus*, is always special to find along the edges of tracks. Growing just 10-15 cm in height, it has a fascinating pollinating mechanism. Look closely for the pollinating wasp attracted to its deceptive insect-looking flowers.

Horned Orchid

Elbow Orchid

Fascinating Duck Orchids, *Caleana*, sp., should continue to flower into the early summer. Large Duck Orchids, *C. major*, are just so spectacular with their glossy flowers looking as though they are ready to take flight. The Small Duck Orchid, *C. minor*, is also an impressive little orchid and needs keen eyes to observe it on the sides of tracks.

Beard Orchids, Calochilus sp., can be seen during early summer. Keep a watch out for the four species that grow in the district.

Large Duck Orchid

Small Duck Orchid

We always look forward to the Rosy Hyacinth Orchids, *Dipodium roseum*, and their tall pink flowering stems that brighten up our heathlands and roadsides. They can vary in so many shades of pink. The rarer Spotted Hyacinth Orchid, *D. pardalinum*, which is more selective of its habitat, should be flowering in January and usually flowers for some months. Some spectacular hybrids between these two species have been observed over the past few years.

Spotted Hyacith Orchid

There are two greenhoods that could be seen soon, though both are rare and you have to be very lucky to find them. One is Dark-tipped Greenhood, *Pterostylis atrans*, with its brown-tipped hood. It grows in shrubby and grassy open eucalypt forests. It has been sighted both at Aireys Inlet and Moggs Creek. The other is the Sickle Greenhood, *P. falcata*, which has a large flower with a long hood and grows on the edges of streams and swamps.

Cinnamon Bells, *Gastrodia sesamoides*, with its sweetly-scented cinnamon-brown flowers with white tips has been seen flowering already this year. The flowers are well spaced along the slender stem. Growing in moist forested areas and woodlands, it has certainly reduced in numbers observed in the district. The Tall Potato Orchid, *G. procera*, which flowers a little later, is a very sturdy species with the flowers crowded at the top of the stem. They are usually observed close to tree trunks in moist forested areas.

Potato Orchid

Please let us know of any of your interesting orchid experiences you have this summer.

MargaretMacDonald:margmacmoggs@icloud.com
Alison Watson: alisonw577@gmail.com

A short list from the Red Centre

James Orton

Pink (Major Mitchell's) Cockatoo.
Image: Keith McLean

I was on a trip to Alice Springs and surrounds and part of the motivation was to cross Uluru off my bucket list. The focus was not bird watching, but walking, geography, and Aboriginal art. But, of course, when birds fly over or (heaven forbid) make a noise, it is hard not to take notice! So here are some comments about the birds you might see in the Red Centre—even if you are not searching.

Crested Pigeons, Galahs and Magpie-larks are very common. There are lots of large black birds in groups of 10+ but these are Little Crows or Torresian Crows, and not the Little Ravens that we have on the Surf Coast. The common parrot is the Australian Ringneck and the common honeyeaters are the Yellow-throated Miner and White-Plumed Honeyeater, and there's no sign of Red Wattlebirds or New Holland Honeyeaters.

There are no Superb Fairy-wrens, and they are replaced by the Splendid Fairy-wren and I found the male Splendid more superb than the Superb. However, whereas the Superb Fairy-wren is very common in the Angair postcode, the Splendid Fairy-wren is much less common in the Red Centre. I didn't see any Sulphur-crested Cockatoos (great?) but there is the spectacular Pink Cockatoo (formerly Major Mitchell's Cockatoo). Again, unfortunately, this cockatoo is only seen occasionally.

Splendid Fairy-wren Image: Keith McLean

When you walk around the base of Uluru, the three most common calls come from the Rufous Whistler (common in the Surf Coast in spring/summer), Willie Wagtail, and Singing Honeyeater (common around the Surf Coast all year round). Which just shows, some birds can thrive in multiple environments.

Australian Ringneck Image: Keith McLean

Rufous Whistler
Image: Jordan Ayton

Singing Honeyeater
Image: Margaret Lacey

If you go to Alice Springs make sure to visit the Botanic Gardens. There are no Satin Bowerbirds, but there are Western Bowerbirds that live there, and if you are lucky like me, you might see several hopping around their bower. Also on the kerb at the entrance to the gardens are lots of Sturt Desert Peas and they were in flower: fantastic!

The final excitement I will mention are the Zebra Finches with black and white tails. In the great red outdoors they are everywhere in groups of 20+ birds making a racket, and if you call every small bird you see, a Zebra Finch, you won't be far wrong.

Zebra Finches. Image: Margaret Lacey

From Sea Lake to the Surf Coast

Sally White

Splendid Fairy-wren

Evelyn Jones, who died in mid-October aged 96, gave Angair many hours of her skilled and dedicated labour. She was an enthusiastic participant in working bees and flora surveys, weed control on the Aireys Inlet cliff top walk, and the wildflower show preparation. She was a Committee of Management member for 13 years, secretary from 1993-1996 and editor of the newsletter.

Born in Sea Lake, Evelyn went to Melbourne for her education but took with her an interest in natural history nurtured by her parents. She retired from her job as a surveyor in 1985 and built a holiday home in Aireys Inlet.
She moved to the Surf Coast permanently in 1991, becoming involved in Angair activities and honing her botanical knowledge and understanding of the local environment. Even when she moved into aged care in 1916, she – and her little dog Terry – occasionally came to the new propagation centre in Anglesea to sort seeds and talk knowledgeably about the local flora.

Longtime friend Margaret MacDonald remembers Evelyn with a great deal of affection and sense of loss. 'She accompanied me on so many outings and adventures. She was particularly close to me when we were preparing *Flowers of Anglesea and Aireys Inlet* in 2009. Evelyn was like my shadow. She never once said "I don't particularly want to go out in the field today". She was always there – her keen eyes helping me to find the best photo possible of each specimen, and making sure I knew which direction the car was. Her acute observation and quiet enjoyment of the special values of the environment were indeed inspirational. I really appreciated her input."

What rises from the ashes

Deakin University student Josh Burke reports on the findings from his honours thesis which assessed the seasonal impact of planned burns in the Anglesea Heath

Fire ecology – as people continue to tell me tongue firmly in cheek – is a hot topic. Last year, I spent six weeks straight in the Anglesea Heath counting seedlings and estimating mature vegetation cover. I wanted to know if the season when a planned burn was conducted had any influence on seedling survival, or recruitment, and overall vegetation community composition.

First, a little about why fire is so important to our vegetation systems. Some 37 million years ago, Australia began a northward drift, separating from Antarctica in what was once Gondwana. As the continent drifted, it experienced drying and warming, altering ecosystems. For example, pollen records show that much of the renowned arid zone in our continent's centre was once rainforest. Continental drying saw the rise of Australia's now iconic and ubiquitous sclerophyllous vegetation: the short, hardened leaves that often bear volatile oils. Compared to a soft, fleshy leaf one might see on a house plant, sclerophyllous vegetation makes for remarkably good kindling. So, this northward drift saw a rise in continental flammability. The flammable vegetation structure saw the continent's first human inhabitants adapt to and eventually master the use of fire.

Setting up a quadrant for the vegetation survey

These factors combined saw the development of unique functional traits from plants in response to fire. In the heath, there are three dominant responses, each requiring particular conditions of life:

- Obligate seeding (OS) species direct energy to protecting their seeds with hardened coats or pods until fire breaks dormancy,
- Obligate resprouting (OR) species direct masses of energy to subterranean or beneath-cambium storage to resprout quickly following fire,
- Facultative seeding/resprouting (FS) species follow both response pathways.

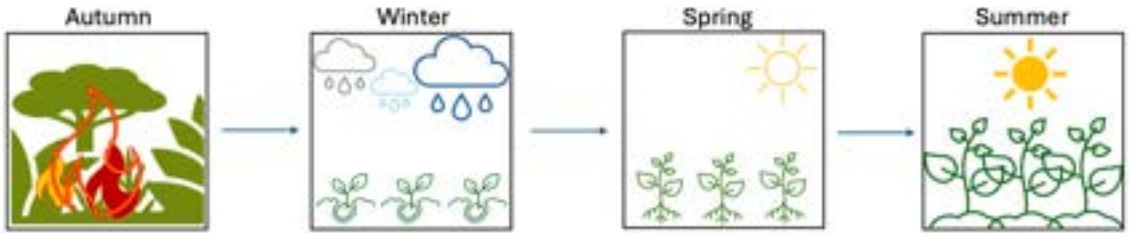

Figure 1: Theoretical obligate seeding survivorship following an autumn burn.

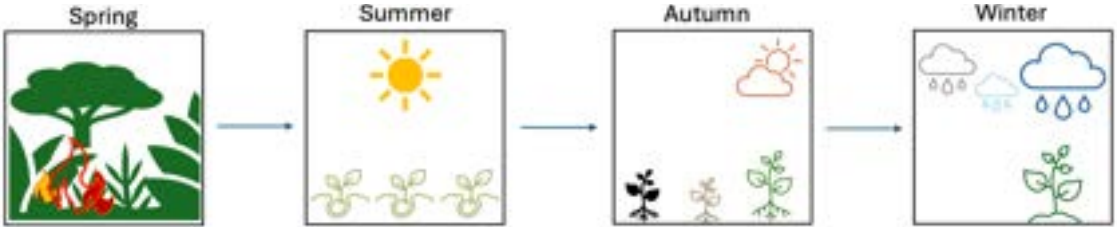

Figure 2: Theoretical obligate seeding survivorship following a spring burn.

Research also suggests that this burn window from autumn to spring is shortening due to climate change. Temperatures in autumn will be too high, with moisture content too low, and germination events in spring will have reduced survivorship of seedlings with warmer and drier summers.

However, no monitoring of seedling recruitment following differing burn seasons has been done in heathlands in Victoria. I thought it was an important piece to add to the puzzle that is fire ecology.

I set up vegetation surveys in two areas that were burnt in each autumn and spring of 2022. I identified all plants to species level, counted the number of seedlings, estimated vegetation cover, and attached appropriate fire response if known (OS, OR, FS). I then conducted various statistical analyses.

One key finding was that seed-adapted (OS) taxa responded significantly better to autumn burns than spring. I looked at this as seedling recruitment, then organised data by fire response (OS, OR, FS) and lifeform groups: woody species (trees/shrubs), herbs, graminoids (grasses/sedges/rushes), and twiners.

What perplexed me for days was that only the graminoid category showed significantly more recruitment following spring burns than following autumn burns. I speculated that this was because many of the grasses, sedges and rushes I observed are fire-adapted, but not necessarily dependent on fire for germination.

I theorised that the fire-dependent OS species germinated after the burn but then didn't survive the drier-than-average summer of 2022-2023. The grasses, sedges, and rushes then took advantage of the open space made by the departed OS species, hence their greater presence.

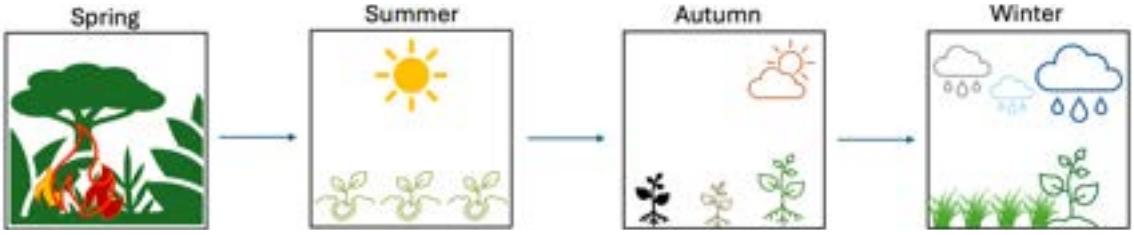

Figure 3: Proposed colonisation of open space by grasses, sedges and rushes

So, there is my first piece of the fire-ecology puzzle. Burning windows might be shortening. Spring burns are likely to reduce numbers of obligate seedling plant species and allow for influxes of colonising species.

What does this mean for the future? Well, if we don't learn from research like this, we may start to see landscape change more obviously. Some plants might eventually be phased out.

What about winter burns?

Well, comparing my data to some existing data on winter burns might just be the next piece of the puzzle I lay on the board of this hot topic.

The basis for my research can be found within the two sources below. For any further readings or questions, please contact me at josh.burke@deakin.edu.au.

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Our wonderful, but disappearing, grasslands

Ellinor Campbell

In October this year I spent an action-packed weekend with field naturalists from all over the state, at a campout in Ballarat for the South East Naturalists Association (SEANA). A highlight was visiting areas of native grasslands. Native grasslands are among the most threatened ecosystems in Victoria, with only a tiny percentage remaining. Unfortunately, grasslands can look really uninteresting and ripe for development to the untrained and disinterested eye. Some of the main areas where they have survived are extremely vulnerable roadside and railway reserves. We are so fortunate here, in the Surf Coast, that our heathlands and woodlands look more interesting, but even so the richness and diversity of flora and fauna are not appreciated by many people who just see it as 'scrub.'

The Ballarat area is in the southern part of the Central Victorian Uplands bioregion. The region has several small reserves that were formerly government-owned sites in danger of being sold off for housing etc. Fortunately, the Western Region Ecological Network (WREN), a non-profit environmental group, was able to obtain permission to manage the reserves. We visited the Illabarook Grasslands Nature Conservation Reserve near Dereel, 42 km from Ballarat. The native vegetation at this site is Grassy Woodland, classified as endangered. Next we checked out the nearby Illabarook Rail Line Nature Conservation Reserve, situated in the grounds of the former Illabarook station. Finally we went to the Rokewood cemetery with two large fenced areas at the front and a fairly healthy roadside verge.

Orchids were one of the highlights. Their colourful swaying flowers really stood out in the low vegetation. Many of the species were the same as or similar to those in the Surf Coast such as the Salmon Sun Orchid, *Thelymitra rubra,* and the Spotted Sun Orchid, *Thelymitra ixioides*. However the stand-out was the Golden Moths, *Diuris chryseopsis*, which we rarely see in our region, and they looked stunning.

Golden Moths, Image: Ellinor Campbell

Lilies were common, such as the Black-anther Flax-Lily, *Dianella revoluta,* and the Chocolate Lily, *Arthropodium strictum*. I was fascinated to see how the Twining Fringe Lilies, *Thysanotus patersonii,* managed to climb up grass stems due to the lack of larger plants. Milkmaids, Burchardia umbellata, were dancing in abundance in the sunlight.

Another stand-out was a spectacular clump of very healthy and large Feather-heads, *Ptilotus macrocephalus*. In our area a few struggle to grow in heathland near the Anglesea sewerage plant. I was pleased to get a nice photo of a small Branched Sundew, *Drosera* sp., devouring a tiny moth as it glistened enticingly in the sun.

Twining Fringe-Lily

Feather Heads

Branched Sundew devouring moth

A dense and beautiful clump of Common Eutaxia, *E. microphylla*, one of the few peas, really stood out. It was such a strong orange colour, much brighter than the ones I see in one small area of the Aireys Inlet cliff tops.

Common Eutaxia

Yellow flowers were quite common, particularly daisy species including the Common Everlasting, *Chrysocephalum apiculatum*, and several button species such as Scaly Buttons, *Leptorhynchos squamatus*. Two small showy stars were nice to see: the yellow Tiny Star, *Pauridia glabella*, and the Blue Squill *Chamescilla corymbosa*. The latter were quite tall, maybe due to the lack of competition around them.

Tiny Star

On the road verge in front of the Rokewood cemetery the group counted nearly 100 of the rare Button Wrinklewort, *Rutidosis leptorrhynchoides*, just in bud. This really pleased our guide who had thought they were disappearing from this site.

Blue Squill

Creamy Candles, S*tackhousia monogyna*, were in abundance, but appeared to have smaller flower heads than ours. Sweet Hound's-tongue, *Hackelia suaveolens*, with its tiny white flowers stood out in the open habitat. It is widespread in the Surf Coast but is hard to see among our many low bushes and plants.

The next SEANA weekend will be run by the Geelong Field Naturalists Club in March next year.

Let there be Bees

Text and images by John Lenagan

African Honey Bee, *Apis millifera*

Bees: this essential group of insects sits within the order of Hymenoptera along with the wasps and ants. Most bee species are in the family of Apidae and the most common bee recruited for honey production around the world is the Western Honey Bee, *Apis millifera*. It is one of nine species of honey bee found in the *Apis* genus. However, within the Apidae there are many different tribes that include over 2800 species of bees currently described around the world.

While I could just focus on our local honey bees, this article introduces you to a few of the other uniquely different, yet essential species of bees that can be found within the many varied habitats both in Australia and abroad.

The introduced Western or African Honey Bee which carries out that essential job of pollinating our native trees, flowers and crops along with the many other pollinating insects is the *Apis Millifera*. Like most bees they are only found where there is a supply of water and generally are not found in the arid and desert regions.

Their appearance can vary from orange banding on the abdomen to almost a uniform dark colour. In their natural habitat they typically create hives in tree hollows or within rock crevices, however they can also be seen in large clumps hanging off branches or shrubs when they are swarming and looking for a new location often with their new queen. These Honey Bees due to their single mindedness in collecting pollen, nectar and water are frequently preyed upon by birds, and I have often seen them in the clutches of European Wasps, Assassin Bugs and Robber flies to name a few.

Common predators of Bees.
Beeeater, Robberfly, European Wasp, Assassin Bug

Honey Bees have been studied and cultivated for thousands of years, their life cycle, methods of communicating and much of the intricate functioning of their hives are relatively well understood. We have utilized them for crop pollination and honey production for so long, however the intricate workings of the many other bee tribes and genus are not so well understood and there is much more to be learnt from these amazing insects.

Some bees not as often seen include the smaller **Sweat Bees** from the family **Halictidae**. As the common name indicates, they are often attracted to perspiration. While small in size at one centimetre, the sweat bees comprise the second-largest family of bees with nearly 4500 species described. Halictid species are an extremely diverse group that can vary greatly in appearance. They are found on every continent

Most halictids nest in the ground, often in clay soil and river banks, although a few nest in wood. They mass-provision their young: a mass of pollen and nectar is formed inside a waterproof cell, an egg laid on it, and the cell sealed off, so the larva is given all of its food at one time, as opposed to the 'progressive provisioning' of the Honey Bee. Some species do not have permanent, rigid divisions of labour and are considered primitively eusocial, meaning they have not reached the advanced level of social organisation that species like the honey bees exhibit. Phylogenetic data from the halictids suggests that their communal strategy serves as a transitional step between eusociality and a reversion back to solitary nesting which can be seen in the Digger Bees.



Sweat Bees - examples from the Surf Coast

The relatively solitary **Digger Bees** from the genus ***Amegilla*** are often recognised from their compact furry bodies and distinctive banded abdomen. Their loud buzzing can be heard before you notice them zip around and then hover seeking out the less-visited flowers where they can extract nectar without even landing. In Australia we have 22 described species with the two most common being the Blue-banded Bee, *Amegilla chlorocyanea*, which we see around Anglesea and the more golden form of *Amegilla cingulata* seen up the east coast to Cape York.



Digger Bees - Genus *Amegilla* and example of underground cells

The genus is found worldwide with many species undescribed. They do not live in colonies and build their solitary underground pod chamber casings out of hardened mud and wax. Their eggs and larvae are raised within these chambers. These bees are seasonal and not known for honey production or storing food. At times they can be seen in groups holding onto a grass stalk or branch at dusk as they buzz in unison. I have described this de-dusting as a grooming behavior before they rest for the night.

Then there are **Carpenter Bees** of the genus ***Xylocopa***. They are often much larger than other bees; some are up to four cm – almost Bumble Bee size. Similar to bumble bees they have a furry thorax and legs but without the fuzzy backside. Like bumble bees they are known for their loud buzzing as they zip to and fro across flowering shrubs. They are solitary and the males and females often look very different. They have large compound eyes and are fast and dexterous fliers often taking off and landing from the same platform.



Carpenter Bees - Genus *Xylocopa*

The carpenters are specialist wood borers, burrowing into hardwood or bamboo. Typically, they have single generation nesting holes where they create numerous layered cells in which pupating larvae feed off the pollen cache before eventually emerging. The entrances to these nests have perfectly rounded openings, approximately 15-19 mm in diameter and sealed off with wood shavings moulded with gluey saliva. Carpenter bees when disturbed at night while guarding their nest will aggressively target an intruder and, like wasps, can sting an intruder many times without any harm to themselves unlike Honey Bees.

Finally a couple of rarer Bees the **Leafcutter, Resin Bees Genus *Megachile*** and the **Masked Bees Genus *Hylaeus*** both are highly adaptable and solitary Bees making their nests within hollow twigs or other similarly constructed leaf material to form cavities. Nests are constructed from the deepest portion of the tunnel outwards. The female places an egg in each cell with a cache of pollen sometimes mixed with nectar, she builds a cap and walls off the cell. Again, numerous families of wasps and bees parasitize these families of bees given their relatively exposed nests, including the Gateruptiidae Wasps with their long ovipositors. Some Megachile wasps have been recorded using synthetic materials to make their nest, these are the first records of such behavior.


Leafcutter, Resin Bees - Genus *Megachile*

Masked Bees - *Genus Hylaeus*

While there is so much more still to be discovered about each of the bee tribes, and the 2800 or more species from around the world, there is no doubt that each plays a crucial part in the pollination, propagation and nutrient cycles within each of their unique ecosystems.

I have enjoyed finding and photographing over 40 different species of bees and after uploading to iNaturalist and other Apoidea ID data sites, I am often informed that they are yet to be described.

But for me each has its own distinctive and seemingly extrovert behaviour which I find mesmerising and can often spend many hours observing them in their natural habitats.

Meet the meticulous Mr Cunningham

Neville Millen

Allan Cunningham was a botanist and explorer in Australia in the 1820-30s. I was aware of the suffix ‘cunninghamii’ appearing regularly in Australian flora, but knew very little about the man behind about 20 plant species that honour his name.

At the Kew Gardens herbarium this year I saw an exhibition that commemorated Cunningham’s explorations and documented his botanical collecting by land and sea in early colonial Australia. I was left with the impression that Cunningham, through sheer perseverance and dedication, became a Titan in the annals of Australian botany.

Born in London, Allan Cunningham, aged 20, was employed as an herbarium clerk at Kew Gardens, where he came under the direction of Sir Joseph Banks. Banks was impressed with his meticulous recording skills and decided to despatch him to Brazil in 1814 as a plant collector. In two years, Cunningham and fellow collector James Bowie found and shipped 400 plant specimens to Kew Gardens. Cunningham, with continued support from the influential Banks, was then directed to New South Wales where, under Governor Lachlan Macquarie, he became chief botanist and director of the fledgling Sydney Botanic Gardens.

Despite his shy nature, Cunningham was resolute to go exploring, so sought and got approval from the imposing Macquarie to be part of the 1817 Oxley expedition that would spend five months in north west areas of NSW and in lands later known as Queensland. The expedition was to look principally for new pasture lands for the growing sheep flocks of the young colony. Cunningham is recognised for being the first European to see and name Pandora's Pass in the Warrumbungle Range, the Darling Downs and Cunningham's Gap. However, exploration was to him a secondary interest that could be pursued in conjunction with his real purpose – the study of botany.

Alan Cunningham Image: Queensland Museum

As well as several more land-based expeditions in the east, Cunningham undertook five voyages with Philip Parker King, collecting about 1300 plant specimens, many of which were preserved in better condition than those collected by preceding botanists. Cunningham was known to be a meticulous curator and recorder of plant specimens and he used with great care the British botanist Robert Brown’s book, *The Prodromus*, to note differences and similarities within the species he collected. Many of Cunningham’s plants became the ‘type specimen’, especially his collection of dryandras and banksias from the west of Australia, that helped form a Proteacea supplement to Brown’s book in 1830. Cunningham also toured the interior of Tasmania and mapped Macquarie Harbour, where he collected specimens of still–to-be-described Huon Pine, and found new specimens of daisies, orchids and button grass on Mount Wellington in Hobart.

Slender Tree-fern, *Cyathea cunninghamii*
Image: Daniel Ohlsen

Southern Beech Myrtle, *Nothofagus cunninghamii*
Image:Yarra Ranges Council

Hairpin Banksia, *Banksia spinulosa var*.cunninghamii Image: Luke R. Hardy

Allan Cunningham's health was always delicate, but it deteriorated further with bouts of hepatitis on King-led voyages and finally with the onset of tuberculosis (TB). He returned to England in 1831 and recommended his younger brother Richard (1793-1835) replace him as NSW's chief botanist. Richard's career in the position was cut short when he was killed in 1835 while on an expedition with Major Mitchell. Allan Cunningham, obligated to replace his brother, returned a very sick man to NSW the next year but resigned after three months. He made an exploration in New Zealand in 1838; however, his health eventually failed and he died of TB in Sydney in June of 1839, aged 47. His ashes and memorial are located in Sydney's Royal Botanic Gardens.

Fellow botanists have honoured Cunninham's work, applying his name to a number of Australia's trees and other plants. growing throughout the country. Of interest in our region are the tall temperate rainforest Southern Beech Myrtle, *Nothofagus cunninghamii*, in the Otways and the Slender Tree-fern, *Cyathea cunninghamii*.

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Aireys life - a jog, a walk with all the family or just sitting on a stump looking at nature.

Image: Darcy Bennett

We acknowledge the Wadawurrung of the Kulin Nation and the Gadubanud of the Maar People as the Traditional Owners and protectors of this place.

We also acknowledge their ancestors who cared for the land, water and marine areas and all its biodiversity for thousands of years. We pay our respects to their Elders past and present who continue to care for this place.

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Our next issue will be published in March 2026 and will be the autumn edition. We welcome any contributions of local, seasonal or general environmental interest. Send your contributions to angair.communication@gmail.com by mid-February and clearly label them 'for Angair Quarterly'.