FROGCALL

No. 188, December 2023

THE FROG AND TADPOLE STUDY GROUP NSW Inc.
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MEETING FORMAT

Friday 8th December 2023

6.30 pm: Lost frogs: Priority to new pet frog owners. Please bring your membership card or join FATS on the night and $50 donation. CREDIT CARDS accepted (purchases over $10), but bring cash for raffle, unless spending over $10. Your current NSW NPWS amphibian licence must be sighted on the night. Rescued and adopted frogs can never be released. Contact us before the night and FATS will confirm if any frogs are ready to rehome.

7.00 pm: Welcome and announcements.

7.45 pm: The main speaker is Michael McFadden, who will update us on the Corroboree Frog Program.

8.45 pm: Frog-O-Graphic Competition Prizes Awarded.

9 pm: Raffle, Christmas supper and a chance to relax and chat with frog experts.

Thanks to all speakers for an enjoyable and informative year of meetings, and all entrants in the Frog-O-Graphic Competition. We look forward to the same in 2024.

Email **monicawangmann@gmail.com** to send an article for FrogCall.

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Cover photo: Red-crowned Toadlet, *Pseudophryne australis* **Josie Styles**

President's Page

Arthur White

In 2023, FATS was able to resume more normal activities with the easing of COVID restrictions and public meetings have generally been well attended.

In 2021 FATS commenced the Strathfield Green and Golden Bell frog project. Green and Golden Bell frogs have bred at the site and a small community of frogs is now established there. More work needs to be done to further develop the site. Several working bees were held at Greenacre and the site is being prepared for its first open day in February 2024.

This year we were able to hold more field trips. The fields trip program will not start until October, as earlier trips have been too weather affected and many have been cancelled in the past. We are hoping that this year the field trips will occur without too many disruptions. We are looking for new field trip leaders so if you have a favourite frogging site and would like to show other FATS members around, please let us know.

Frog rescues are increasing again. Frog rescues declined during COVID, but since road and train transport have resumed, frogs are again stowing away on trucks and trains. If you would like to be a frog collector or frog carer please let us know.

The flagship of FATS has been FrogCall, our bimonthly newsletter. Monica Wangmann, our long-serving Editor has managed somehow to continue to produce FrogCall six times a year on time. For thirteen years, Marion Anstis has produced the collector's edition, bumper, glossy, colour December FrogCall issue and will be producing another special December colour edition this year. For members who can't make it to the meetings, FrogCall, together with the FATS Facebook page (monitored by Monica), has been their only contact with events our society attends and the wider frogging world.

FATS remains financially strong, thanks to our long-standing Treasurer Karen White. Karen not only looks after our books but also deals with the banking and regulatory details regarding our finances.

FATS awarded one student research grant this year – to Roy Farman. You can read about his work in this edition of FrogCall.

FATS completed the annual Bell frog auditory surveys at Sydney Olympic Park in November and December 2022. Thanks to SOPA for supporting FATS and thanks to the members who came and helped on the night surveys.

Robert Wall organised a great series of field trips. Some had to be cancelled at short notice. He is planning a full programme for the upcoming spring and summer but again we cannot guarantee that they all will run. Floods, fires, drought and various other factors can prevent the field trips taking place.

Kathy and David Potter organise most of our events programme and do a sterling job on behalf of FATS.

Punia Jeffery and Marion Anstis shared the role of meeting spokesperson and both help out with various other activities of Council.

Phillip Grimm has two roles, membership officer and webmaster and does both with great efficiency.

Jilli Streit has been our secretary and has done a good job in that role.

Many thanks to our other executive members: Andre Rank and Luc Streit. Each has contributed whole-heartedly and helped keep FATS alive and well.

Finally, I have to point out that I have been in this position for 25 years and that is too long. FATS must have new blood if it is to survive.

FATS needs your help!

At the recent Annual General Meeting, I addressed those present to inform them of a dire situation facing FATS. The executive of FATS was re-elected without any new faces. This is not new - the same people get re-elected to the same positions year after year. A number of FATS councillors have been running the Society for more than 25 years. It is not good for any Society to have the same people in charge for a long period of time.

While saying this, I acknowledge that the executive is very competent and willing - but they (and I) have been there too long.

I have asked the membership for a number of years now to consider stepping up and joining the executive. This request has not produced new blood. Quite the reverse, the members keep telling us that they are happy with what we are doing and for us to continue on.
We have reached crunch time. A number of the executive (including myself) have indicated that they will stand down at the next AGM. If there are no people prepared to take up the vacant positions, the Society will fold. FATS is an incorporated society and must have a number of designated executive officers.

So, this is a call for help and a warning. Societies survive through the input of its members and not through the input of the same people over and over again.

Please think carefully about how you might help FATS. If you are worried about not being able to do the tasks at hand, don't. The outgoing executive will still be around to help you with the work and to show you the ropes. A new executive may choose to operate FATS quite differently to the present administration and may choose to drop a number of our current activities, or they may choose to add new ones.

The future of FATS is in your hands. As a member of FATS, you need to think carefully about how much you value the Society and whether you want to see it continue as an organization or not.

IF you want to discuss any of this, feel free to contact any of the FATS executive (including myself). Be brave and do what you can for FATS.

Arthur White
President
1999–2023

Book Review: Frogs of Victoria

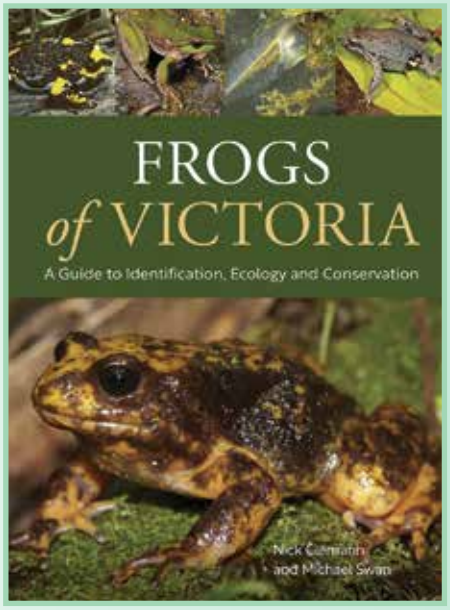
A Guide to Identification, Ecology and Conservation

Nick Clemann and Michael Swan

CSIRO Publishing, 2023

I am impressed with the efforts put into this book! It covers classification, biology, the various regions and ecosystems in Victoria where frog species occur, and provides an invaluable emphasis on the habitat needs for the frogs and their important conservation issues.

The introductory sections are excellent and include frog names and classification, frog biology, documentation of Victorian frog fauna from a historical perspective, zoogeographic regions and ecosystems (including really great grid maps of these regions), and the conservation of Victorian frogs. In the back is a glossary, thoroughly selected bibliography and indexes of both common and scientific names.



Obviously, the main factor in frog decline, apart from chytrid fungus, is habitat loss, and the authors have given this strong emphasis both in their very thorough, well-illustrated introductory section and throughout this book, which is great. There is a comprehensive list of the National and Victorian status of each threatened Victorian species. More significantly, they have had the courage to outline key threats to Victorian frogs including politically sensitive areas such as logging, invasive species and ill-advised planning decisions, all of which have led to great declines in frog populations. This story of threats and frog decline is indicative not only of the situation in Victoria, but also throughout Australia. Earlier Victorian frog champions including Murray Littlejohn and Angus Martin must feel the loss of frogs so deeply (as I and many others do), given their ready encounters with most species in the 1960s before chytrid took hold, and the other threats listed above had resulted in such widespread impacts on frog ecosystems.

In the main section of frog descriptions, the features of each genus are well summarised and species accounts include identification (with key features in bold), eggs and tadpoles, similar species, distribution and habitat, breeding biology and conservation status, together with a selection of relevant photographs. I like the fact that the authors not only provide thorough descriptions of adults, mostly showing adult dorsal and ventral views, but also give a good summary of species' biology, including some egg and tadpole photos. The distribution maps for each species are very clear, showing where each frog occurs in red grid squares overlain on the green map. Distribution text provides both the species full Australian distribution as well as where it occurs in Victoria. So, should you add this book to your amphibian library? Absolutely without a doubt, I highly recommend it!

Marion Anstis

Borneo at Last!

Marion Anstis

The dense forest surrounded us at each site we visited.

I have long wanted to visit Borneo to see and photograph the wonderful wildlife, many species of which are found nowhere else, and I finally managed to get there in July 2023! I joined a wildlife photography trip organised by Craig Greer Photography workshops, and Craig was assisted by the very competent photographer and videographer, Nicola Rakopatare (also an amphibian and reptile specialist!). The good thing was there was a limit of only four clients in our group, so that meant more chances to line up animals in front of the lens, with less disturbance from too many people and only the one vehicle when wheels were required. Craig and Nico had organised great local wildlife guides too, who really knew the best places for us to look, and they had marvellous spotting abilities during day and night. I was keen to photograph anything we found in the rainforest, as were we all.

So, armed with suitable camera gear, including telephoto, macro, landscape lenses and flash, I set off for the long 8-hour flight to Kuala Lumpur,

Our sites: 1. Sepilok Forest Reserve; 2. Kinabatangan Wildlife Sanctuary; 3. Deramakot Forest Preserve; 4. Mt Kinabalu National Park

connecting with a second 3 hour flight to the Sandakan airport in Sabah, Borneo – a total of 16 hours travel time (including a 5-hour early morning stopover at Kuala Lumpur!)

Our first place to stay for two nights was the

Rhinocerous Hornbill hunting for grubs

Canopy Walk, Sepilok Forest Reserve

Sepilok Forest Edge Resort, a very pleasant lodge with plenty of birds and mammals around, some of which took advantage of the fruit provided for them to feed on right near our meal tables. From here we visited the Sepilok Forest Reserve with its famous Rainforest Discovery Centre trails and tree-top walk. We walked forest trails and the canopy walkway, which was a massive construction allowing great views of the forest below and above. The incredible diversity of the trees and understory vegetation was astounding. From this we also had access to tall towers with many steps leading to tree-top canopy level where birds of prey, other birds and giant and gliding squirrels were visible. Some of the birds we saw included various woodpeckers, hornbills, birds of prey,

Keeled Green Pit Viper

broadbills, sunbirds, kingfishers, a Black-crowned Pitta, bee-eaters and many more. It was a thrill to watch a huge Rhinocerous Hornbill land on a large dead tree branch and use his extraodinary beaks to dig for insects in the rotting wood. And a

Cream-coloured Giant Squirrel

A very patient mother and baby

Purple Sunbird

Green Crested Lizard

Black-capped Pitta

female Wallace's Eagle Hawk at the top of the tower in the canopy was feeding with her young chick. There we were given an uncommon visit from a Cream-coloured Giant Squirrel as she checked out berries on a shrub at the canopy top. And along the forest trails at ground level we came across a beautiful Keeled Green Pit Viper awaiting prey to descend from a nearby tree. But, as for all visitors to this place, the orangutans in their Rehabilitation Centre were a must see! We photographed some that had been released in the large area of forest surrounding the centre, where they were provided with fruit and vegetables daily while adjusting to being free in the forest. Later on they can be transferred to live back in the wild in remaining protected forest parks in Sabah. A young baby captivated me as he played on and near his mother, showing me just how wonderfully patient these mothers are!

Our second stay for three nights was at a well-appointed lodge on the shore of the Kinabatangan River. The mighty Lower-Kinabatangan River sustains one of the world's richest ecosystems. It

Rhinocerous Hornbill flying across the river

Wrinkled Hornbill flies above our boat

Pig-tailed Macaque peeps at our boat from a bridge

Large male Proboscis Monkey watches nearby

Female Proboscis Monkey watches junior anxiously

is also recognized as Sabah's first, and Malaysia's largest, RAMSAR site. Other than being home to Borneo's indigenous orangutan and proboscis monkey, the surrounding forest is one of only two known places in the world where 10 species of primates can be found. It is Malaysia's second-longest river with a massive length of 560km from its source in the Southwest Sabah to its outlet at the Sulu Sea, on the East Coast. A total of 26,000 hectares was gazetted as the Kinabatangan Wildlife Sanctuary under the State's Wildlife Conservation Enactment of 1997.

From here we took river cruises in a small motorised boat, giving us access to colonies of primates including the Proboscis Monkeys and the Pig-tailed Macaques as well as many bird species. Of the 8 species of Bornean hornbills, we encountered the Rhinocerous, Black, Wrinkled, and Oriental Pied Hornbills during feeding, courtship or in flight. We went on night boat cruises too, and

Wallace's Rainbirds cuddled together at night

Asian Palm Civet feeding on figs at night

Silver Leaf Langur and golden baby, Kinabatangan River

saw Asian Palm Civets feeding on fruit beside the river, Buffy Fish Owl, Brown Wood Owl, and the beautiful Wallace's Rainbirds.

And peeping out from leaf litter on the ground was this Lowland Litter Frog, *Leptobrachium abbotti*

File-eared Tree Frog, *Polypedates otilophus*

Bornean Leopard Cat glances at us for a split second in Deramakot before disappearing into undergrowth!

Leaving the river, we headed for our third stay at **Deramakot Forest Reserve**, where we stayed for another three nights. Deramakot Forest Reserve is rich in wildlife with 75% of Sabah's mammal species found within its 55,507 hectares of mixed forest. Wildlife found at the reserve includes iconic species such as orangutans, pygmy elephants, proboscis monkeys and clouded and spotted leopards. Although Deramakot is classified as 'logging concession', it is one of Sabah Forestry Department's flagship projects where 'reduced impact logging' is practised, which means selected trees are taken periodically, but the forest is given time to recover in that area, and regrowth is quite quick in the tropical climate. This forest reserve is also the longest Forest Stewardship Council certified tropical forest in the world, having been first certified in 1997. There are 49,711 hectares set aside for logging, with 5,778 hectares for conservation and 18 hectares designated for

Harlequin Frog, *Rhacophorus pardalis*

The intriguing Coluga, a gliding mammal in its own family. They have comb-like teeth and lick and scrape lichen and moss from trees, as well as feeding on leaves.

A very small Horsfield's Fruit Bat hidden behind leaves

community forests. All five species of Bornean cats – Sunda Clouded Leopard, Marbled Cat, Bornean Bay Cat, Flat Headed Cat and Leopard Cat – are found in Deramakot. We were lucky to see just one of them, as all are very elusive. One night on our spotlighting drive, a Bornean Leopard Cat paused very briefly when crossing the forest road and looked back at us. Camera shutters were frantic for a few seconds before he disappeared into the undergrowth. I was very surprised how small he was – about the size of a small domestic cat! We

The smallest Bird of Prey in the world, the White-fronted Falconette stretches his wings on this cable. These little raptors are incredibly fast and feed on flying insects.

Among the 14 wild Orangutans we saw in Deramakot was this big male reaching toward us, then moving on.

This beautiful Whiskered Treeswift lives in the forest

Dark-eared Frog, *Polypedates macrotis*

had Borneo's top mammal expert as our guide on our forest drives, so we missed very little of the animals active at the times we passed through.

We encountered 14 wild orangutans in this forest, including four large males and some females with teenage offspring. But they were often high up, in deep shade and behind branches, so photographing them was very much a challenge. One big male was lower down and resting not far away from us, so at least he was an easier subject. We also came across three species of frogs, a porcupine, a binturong, a giant gliding squirrel, Red Langur monkeys, bats and many bird species. We got some wonderfully closer views of the intriguing Coluga (see page 11), which is a gliding mammal (quite distinct taxonomically) with comb-like teeth that feeds on leaves and also lichen and moss on tree trunks.

And at Deramakot we saw frogs, at last! The four species we saw were each very different – three tree frogs, the Harlequin Frog (*Rhacophorus pardalis*), File-eared Tree Frog (*Polypedates otilophus*) and Dark-eared Frog (*Polypedates macrotis*), plus one ground frog, a Lowland Litter Frog (*Leptobrachium abbotti*). As we were on the back of an open landrover, we had to photograph them with long lenses under a spotlight, but this allowed everyone to get a photograph without disturbing the frogs unduly.

Of the birds, one favourite was the smallest living raptor in the world, the Bornean White-fronted Falconette. These feed mainly on insects and are skilled enough to catch them on the wing. Another beauty was the Whiskered Tree Swift, with striking white lines on its blue face. The Red-bearded Bee-eater was a further good find, but we only came across him at dusk.

The two bat species were very different – the largest flying fox species in Borneo, and one of the smallest fruit bats. And a large Porcupine crossing the road was determined to avoid the spotlight as soon as possible!

Leaving Deramakot we had a long drive to our next and final lodge stay at Mt Kinabalu National Park, the famous and highest mountain in Borneo. **Kinabalu National Park** has some unique and very colourful birds and despite the extremely low light in the forest during two dull days, we managed to get some shots of Whitehead's Trogon and a number of other colourful subjects, including the Grey-chinned Minivet (red male and yellow female) and the blue Velvet-fronted Nuthatch. This little bird was a huge challenge to photograph, as he was never still for longer than a second, flitting from tree trunk to tree trunk seeking little moths hidden under the bark. But I was especially pleased

Close-up of Mt Kinabalu rocky peaks

Mountain Horned Frog, *Megophrys kobayashii*

Kuhl's Creek Frog, *Limnonectes kuhlii*

Kinabalu Slender toad, *Ansonia hanitschi*

Velvet-fronted Nuthatch with moth

Whitehead's Trogon

because we went out at night, on foot this time, looking for frogs above and beside a little creek in the forest after some light rain. Here we found the amazing Montane Horned Frog, *Megophrys kobayashii*, with its fascinating projecting eyelids, huge eyes and perfectly camouflaged body in his leaf litter home. Kuhl's Creek Frog (*Limnonectes kuhlii*) was also out, sitting quietly above a small creek, and an interesting toad, *Ansonia hanitschi*. Another small species of tree frog (possibly of the genus *Philautus*), could not be photographed without yours truly falling into the creek...

So overall, we had an amazing 11–day adventure. Not long enough, but full of exciting encounters and so well worth it. If you ever get the opportunity to go on one of these trips, or similar expeditions, I can highly recommend it!

From Horses to Frogs -

How we transformed our acres

Margot Pickering

The cleared horse dressage area in 2017

When we bought our 8 acres with a house on the Mid North Coast hinterland of NSW in 2016, just over 6 years ago, we fell in love with the space, the privacy, and foremost – its potential. The rear 4 acres had been used to hold horses, so it was relatively denuded of any native vegetation such as old growth rainforest, except for a small strip to the rear, and a larger area which forms part of our right boundary that had thankfully been protected by fencing. It also included a rather large dressage arena, and a quantity of near empty drums that contained the remnants of weed killer previously used everywhere, in abundance.

A tidal water course that runs along the left and the rear boundaries makes these rear acres prone to flooding. And in 2017, a year after moving in, we experienced our first flood.

With over 100 mature eucalypts, mainly flooded gums that shed copiously amounts of bark as they grow, the rushing water displaced not just this bark, but also a fair amount of leaf litter and soil, depositing it all along the boundary fence we shared with the neighbour to our left. The water, up to half a metre deep, remained stagnant all along that boundary for a number of days, making it quite impassable for us, and difficult or impossible – and also deadly - for most wildlife to traverse.

But what the flood started, was the beginning of what I knew could be achieved - a total regeneration of this land, akin to the principles of Peter Andrews OAM, whose work and principles I have followed for the past 20 years. **https://www.peterandrewsoam.com/**

We started adding a few seedlings of endemic trees along the edge of the sparse rear rainforest, hand-pulling the bad weeds (in our case, copious amounts of fireweed), letting the beneficial ones grow and 'managing' any that could become invasive. We discovered native basket grass (*Oplysmenus hirtellus*) and Scurvy weed (*Commelina cyanea* – often sadly mistaken for *tradescantia*). Both are actually seasonal, dying off in winter, coming up dense and lush again in Spring. In addition to a variety of native reeds and grasses and undershrubs such as 'Koala Bells' (*Artanema fimbriatum*) with its pretty blue flowers,

Flood area on right creek border, 2017

taller native rainforest species such as Red Ash (*Alphitonia excelsa*), Water gums (*Tristaniopsis laurina*) and Blueberry Ash (*Elaeocarpus reticulatus*) started to emerge. Medium rainforest species such as *Breynia oblongifolia*, Elderberry Panax (*Polyscias sambucifolia*), and Cheese Tree (*Glochidion ferdinandi*) also started to come up in abundance, thus ensuring an ample food supply for the birds. The growth of all these grasses and vegetation provided not only food for our Eastern Grey Kangaroos, Red-necked Wallabies, Bandicoots, *Antechinus*, Blue-tongue Lizards and Goannas, but also for a myriad of bird life, butterflies, native bees and other pollinators. And most importantly, for us, it also provides shelter and food for our variety of frog species. We initially only heard and saw two types – Green Tree frogs and lots of Striped Marsh Frogs. To date, we have heard and seen 12 types of frogs on our property - *Litoria caerulea*, *peronii*, *dentata*, *wilcoxii*, *latopalmata*, *fallax* and *gracilenta*; *Crinia signifera*; *Uperoleia fusca*; *Pseudophryne coriacea*; *Mixophyes fasciolatus* and *Limnodynastes peronii*. So where previously our summer nights were relatively

Flood area on right creek border transforming, 2022

Frog pond after rain, 2022

quiet, they are now filled with a cacophony of frog calls - not just from our large pond near our house, but increasingly more and more from our rear regenerated 4 acres. Where previously the water rushed across the ground taking any debris with it to the fence line, removing any ground cover and soil along the way, the vegetation now slows down that rush, letting the water meander, giving it time to seep into the ground, keeping the ground vegetation moist, and so importantly, creating pools that last long enough for frogs to spawn, tadpoles to grow, and our frog population to multiply.

Fallen branches, leaf litter and bark are left as they provide cover for the fauna, and nutrients to the soil with emerging insects as they decay. What we achieved, and continue to build upon, is possible on any property.

I would like to encourage everyone with a few bare acres to set aside some space to regenerate, revegetate, add a pond, and create a frog and fauna habitat. This is needed now more than ever, in our changing climate.

Horse dressage area, 2022

Top two images: regeneration along left fence line; bottom two images: native Basket Grass and Koala Bells

Fossil Frogs of Australia –
How looking at the past can shape our future
Roy Farman

The first fossil frog found in Australia was discovered by the now late Mike Tyler in 1974, and since then many discoveries of Australian fossil frogs have been recorded. A fossil is any geological remains of an organism and/or it's behaviour that has been preserved for 10,000 or more years. In Australia, our oldest frog remains come from a small town in Murgon, Queensland, that preserves 55-million-year-old frog fossils. Globally though, the first proto-frog, *Triadobatrachus massinoti* was discovered from a deposit in Madagascar dated to ~250 million years ago (Early Triassic). The fossil frog record in Australia is relatively recent, in comparison to the worldwide fossil frog record, and includes lineages of frogs that are still alive today.

All Australian fossil frogs to date fall within the living families of Myobatrachidae, Limnodynastidae, Pelodryadidae and potentially Microhylidae. However, we also have species from two extinct generic lineages named Australobatrachus and Etnabatrachus from the family Pelodryadidae. Presumably these species went extinct at the end of the Pleistocene time period, when big prehistoric animals such as Diprotodon and Megalania went extinct as well.

Australian fossil frogs are identified from isolated bones known as the ilium. This bone is one of three bones that form the pelvic girdle, along with two other bones such as the ischium and the pubis. The ilium is a unique bone that when observed in a fossil deposit, indicates the presence of fossil frogs within the deposit. Another unique bone that is indicative of frogs within a fossil deposit is called a urostyle and is an elongated modified vertebra. Both of these bones have been used by palaeontologists to identify the frog fossils to their different taxonomic levels including family, genus, and species. However, the ilium is the only bone to date, that has been used to describe Australian fossil frogs. This is because the ilium is usually the most diagnostic and can identify individuals to species level. Despite the ilium being the only bone used for Australian fossil frog taxonomy, other bones are also informative and can tell us about the ecomorphology of the organism and still await further study to be able to compare extant and extinct Australian frog fauna.

When I set out to start this project, there was not a lot of comparative material available in Australia to compare fossil frog bones recovered from

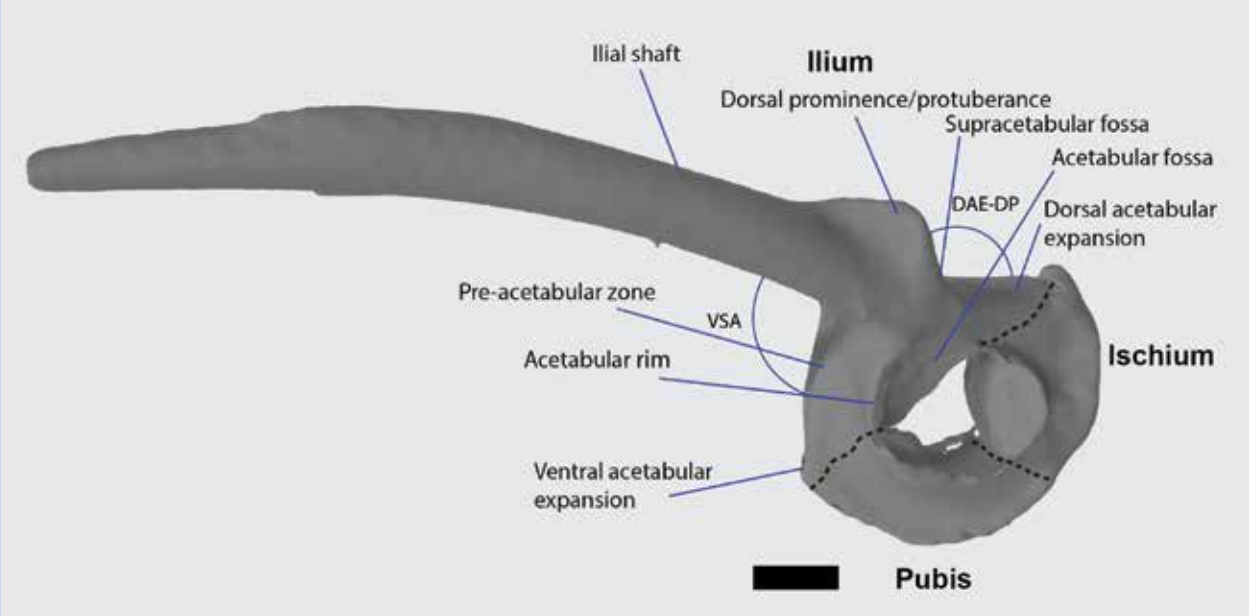


Fig. 1: *Adelotus brevis* pelvic girdle showing ilial features

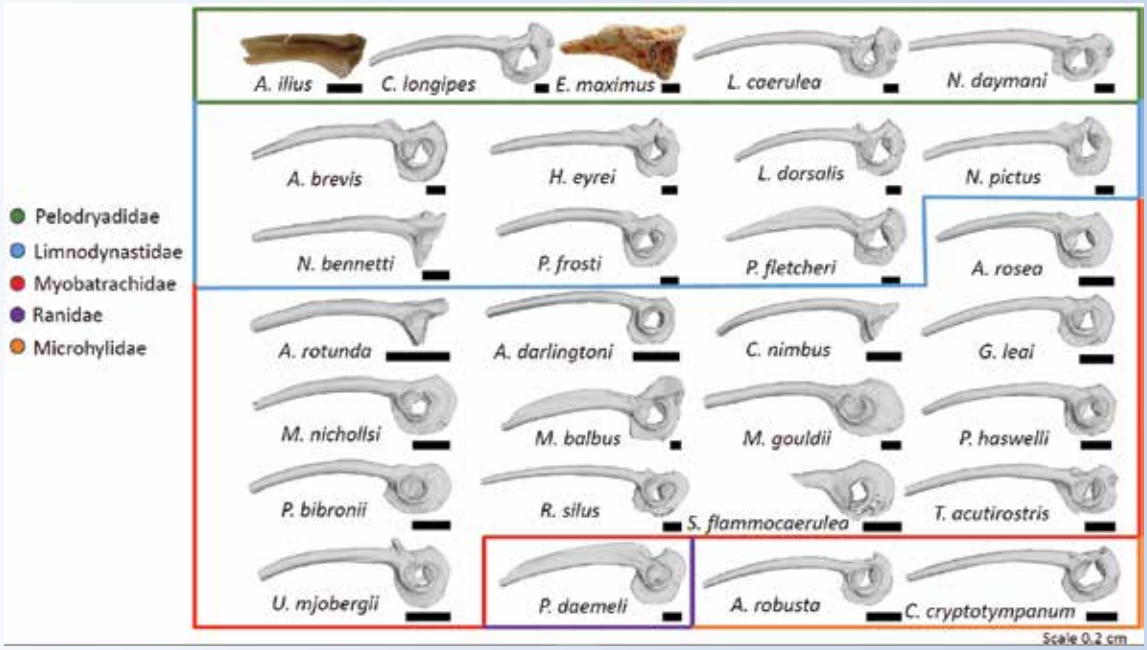


Fig. 2: Micro-CT scans of the ilia of a species from each generic frog group in Australia

Murgon and the World Heritage Area, Riversleigh in Queensland. This is because most specimens are preserved in spirits and kept for herpetologists to use the soft-bodied remains for identifications or to extract DNA for phylogenetic analyses. Moreover, many old publications only have drawings depicting fossil frog species and often do not provide enough information to compare the fossil species with the living species. Hence, in order to accurately determine what species is which and how family or generic groups are different, I used micro- computed tomography scans to

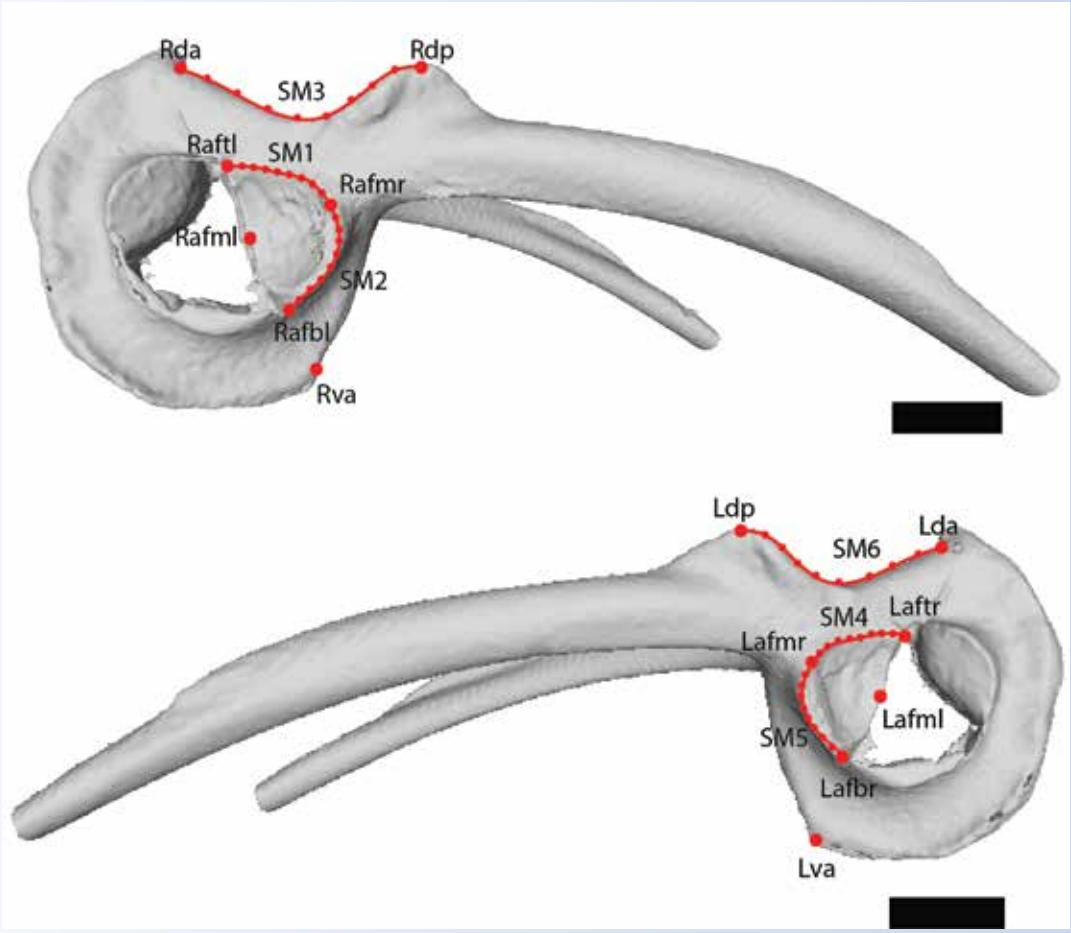
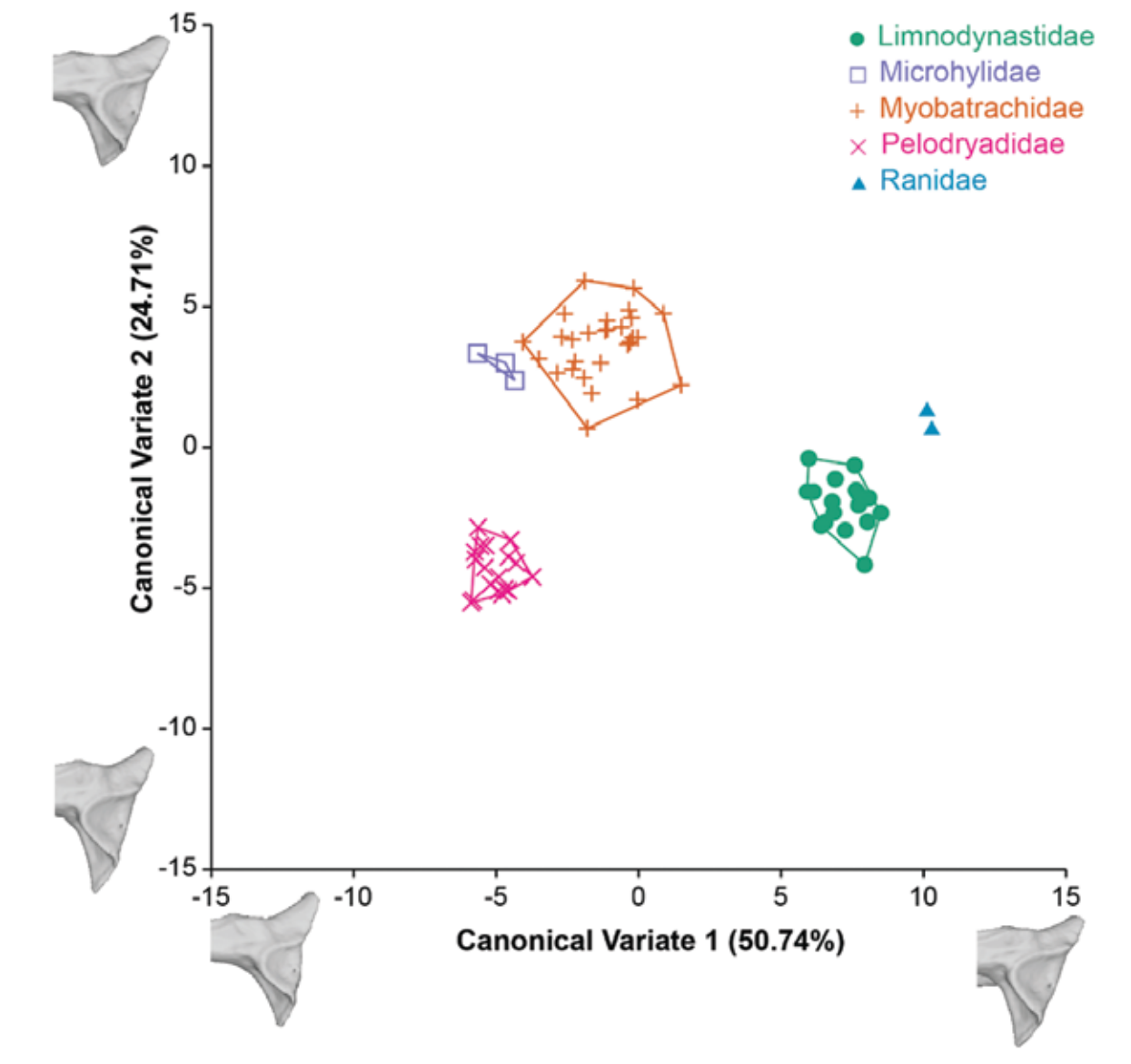


Fig. 3: Landmarked micro-CT scan of *Adelotus brevis* pelvic girdle

visualize the ilium from each family and genus. I also used a method called three-dimensional geometric morphometrics which allowed me to place landmarks (points) on the 3D surface of the ilium of each generic and family group. I could then compare those same points for each ilium in my sample – (Fig. 2). Then using some statistical analyses, I can make predictions for how strongly each one of my ilia that was scanned fits within their familial groups.

The results of my statistical tests showed that there was a strong predictive model for determining different family level groups using CT scanned ilia. The idea was that if I had a strong enough dataset, I should be able to use this same method with fossil frog ilia and be able to assign them to one of the five native frog families we have in Australia. This worked, not only for a Murgon fossil ilium, but also for Riversleigh fossil ilia and I was able to classify them into families in concordance with my descriptions. This is a first for using this method on fossil ilium in the world which will undoubtedly help improve our ability to identify fossil frogs. The method will also help with improving our understanding of morphological evolution of frogs worldwide.

Using both the concordance of qualitatively comparing the ilia of all Australian generic groups, and using three dimensional geometric morphometrics, I was able to determine the identity of a new tree frog species known from the early Eocene deposit Murgon from Queensland. This new fossil tree frog extends the antiquity of known fossil pelodryadids by 30 million years to 55 million years. It also importantly adds another molecular calibration point for phylogeneticists



Canonical variate analysis (CVA) separating five native Australian frog families

to accurately date the time of divergence between the South American tree frogs (Phyllomedusidae) and the Australian tree frogs (Pelodryadidae) that are said to have diverged around 40 million years ago, in some recent estimates. This suggests that the most recent common ancestor between the South American and Australian tree frogs was at minimum, 55 million years ago, and could have been earlier.

Often Palaeontologists will get asked why studying the fossil record is important. Palaeontology is a window into the past that can explain how organisms on earth have changed through time. Palaeontology can also give us insights into the mechanisms that have caused extinction events and help us implement measures to mitigate these effects in the future. Understanding the biodiversity within fossil deposits can then lead to larger questions and improve our understanding of how Australian frogs survived through different climate change extinction events.

From my preliminary findings, I have compared the fossil distributions of all known fossil frogs recorded to date with modern distributions and found that we are seeing a range constriction for many of these frogs. It is especially evident from the Pleistocene period to now because our Pleistocene record in Australia is very well known in comparison to older sites, but also most extant frogs either fall within the same extant generic group, or are the exact same species alive today. As we know, the eastern coast and northern coast of Australia are the most species rich areas for frogs. What I have found, when comparing the fossil frog distributions, is that they are disappearing from the centre of Australia and moving coastally in response to a drier climate. We may see further declines in species towards the centre of the Australian continent and we may also see a larger amount of species competition amongst frogs along the coastal margins of Australia.

Currently, we have a limited number of representatives for this study, with only nine generic groups identified so far from the fossil record, equalling less than half of the generic groups known in Australia. Improving the knowledge of these groups and being able to compare many more species from a larger number of generic groups will help better inform us as to what is going on with species within the centre of Australia, but also what is happening with the frogs constricting towards the coastal margins. Understanding these patterns in Australia's evolutionary history as early as possible means that we can better inform conservation policy for groups that are known in the fossil record to struggle through these environmental climatic phases.

Further reading

Farman, R. M., Archer, M., & Hand, S. J. (2023). A geometric morphometric analysis of variation in Australian frog ilia and taxonomic interpretations. Journal of Morphology, 284, e21642. https://doi.org/10.1002/jmor.21642

Acknowledgments

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Green-eyed Frog
Litoria serrata
© George Madani

FATS Frog-O-Graphic

BEST IMAGE: Dainty Tree Frog, *Litoria gracilenta* **Marion Anstis**

BEST IMAGE: Green-eyed Tree Frog, *Litoria serrata,* beautifully camouflaged **George Madani**

Competition WINNERS

MOST INTERESTING IMAGE: Tyler's Tree Frog, *Litoria tyleri*, infested with frog-biting flies **Cassie Thompson**

PEOPLE'S CHOICE: Red-crowned Toadlet, *Pseudophryne australis* **Josie Styles**

Frog-O-Graphic Winners

BEST PET IMAGE: Above: Tasmanian Tree Frog *Litoria burrowsae* **Craig Broadfield**

PEOPLE'S CHOICE VIDEO: Green and Golden Bell Frog metamorphs in New Zealand, see story next page
Charles Timm

My Green and Golden Bell Frog Project in New Zealand

Charles Timm

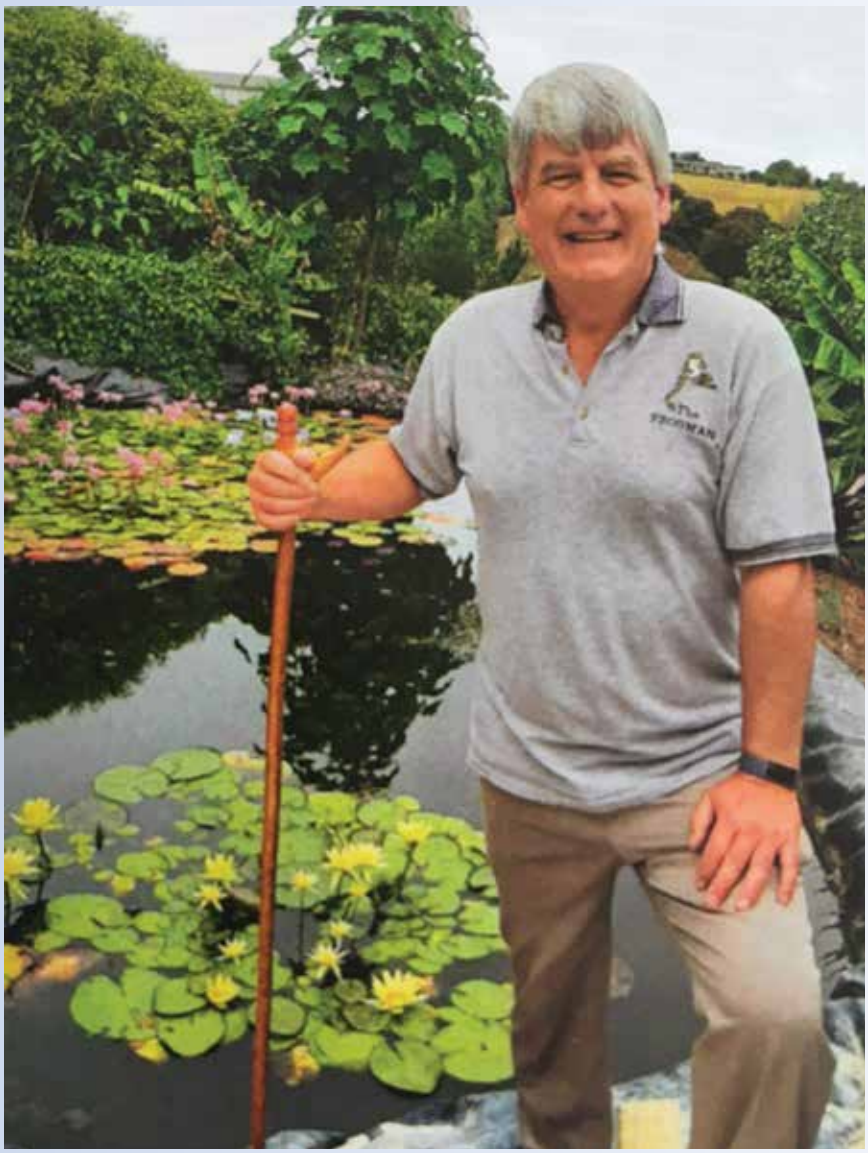
A beautiful adult frog Arthur White

I was in New Zealand for about 18 years and lived on two properties during that time. The story of my first encounter with tree frogs in England is not relevant here, but I wanted to continue my UK successes with understanding and breeding tree frogs when I arrived in NZ. I was emphatically told on arrival in the Bay of Islands that the only frog there was *Litoria aurea* and that, even though they had been common thirty years ago, they had since mostly died out. I adopted the "build and they will come" attitude at this point!

As I had originally trained as a plant scientist at Wye College, London University, I took a much more detailed approach to understanding what the frogs would actually want. As a horticulturalist, I also based the entire project on starting with the soil, as this is the basis of the whole food chain for any gardening or wildlife conservation project. I first researched what has been there, what is there and then put myself into a herpetological trance and imagined what the species in question would like in order to encourage a visit, settlement and breeding.

For *Litoria aurea* the most important factors seemed to be an absence of chemicals, clean and well oxygenated water, appropriate water plants for both egg-laying and sunbathing (the latter maybe slightly different to here in Australia), lots of large-leaved plants to provide cover and the best plant/flower diversity possible to encourage maximum insect species. The first steps were to create a

Pair in amplexus on the pool edge



Charles Timm on his New Zealand property showing his large frog ponds

healthy soil biome and this meant lots of leaf litter and tons of semi-composted mulch. The latter added humus to the soil, food for micro-organisms and resulted in a vast number of insects, beetles, worms; basically frog food! I also planted many high-nectar plants amongst the natives as this attracted many more insects; basically frog food!!

Blue-green colour variation in one young frog

I always use butyl rubber pond liners (or equivalent) as it is generally an easier and long-lasting solution and eradicated the seepage into the pond of any ground chemicals. It also does allow great flexibility for appropriate shapes etc.

At my second property I converted a hillside of gorse and tobacco weed to a meandering walk through trees, shrubs, herbaceous plants and annuals with inter-connecting ponds. I had one artificial pond (one of those instant swimming pools from the big discount stores) for protected rearing of tadpoles and was able to provide some protection from bird attacks to the ponds by using some netting and appropriate planting. Lots of water weed, water lilies, marginals and sunken

Numerous metamorphs sunbaking above a pond

pipes provided many hiding places for both frogs and tadpoles.

At this second property I ended up seeing about twenty frog spawnings per year, and the natural release of thousands of young froglets per year. Although there was substantial natural food, I did supplement this with quality fish food for the tadpoles. This may promote discussion, but I was able to compare the activity and size of morphs with someone else who did not really have the same supply of natural food (more of a controlled environment) and who underfed his tadpoles. The results were highly significant, but I feel the large supply of natural, aquatic food was particularly relevant. An endangered species must see an unnatural survival rate of eggs if the population is to be restored, in my opinion.

The aim was to learn how to create a safe and "happy" environment for *Litoria aurea* and, with some limited protection within the natural environment, provide ever-increasing numbers of froglets that could move out into the surrounding environment. Genetic diversity was secured by exchanges with safe sources (not allowed here, I know) and I was able to facilitate the set-up of alternative "safe houses" with carefully vetted, qualified people. Establishing healthy and appropriate sites where the species can breed is essential to counteract natural disasters, disease etc.

I do believe that the project was worthy, as an apparently disappearing species was successfully encouraged to breed very naturally in an area where the species had formerly been common. I am more than aware that native plant purists and standard scientific herpetologists may be a little "nervous", but with no chemicals and hormones and as natural and healthy an environment as possible, the end result of massive numbers of froglets where a species was disappearing is a great result, even if vegetation was not 100% native and a little food supplement was added.

Since coming to NSW, I have embarked on a similar project in Armidale. I am on year two of feeding the soil, have put in ponds, logs, rocks, streams and diverse planting. I have not yet attracted any rare frogs, but I currently have *Litoria fallax*, *Litoria peronii* and *Litoria verreauxii* calling more and more frequently, and have had *Limnodynastes tasmaniensis* and *Crinia signifera* breed here. ALL THESE HAVE ARRIVED NATURALLY!!!!!!!! Of course, my long-term dream would be to establish a colony of a rare species but, as Arthur White said, I may have to wait a long time!!!!!!

Drought, Fire, Floods, Recovery..... and Drought?

Grant Webster

The 2017–2019 drought saw some of the driest years recorded for south-eastern Australia, along with some of the hottest summers on record. Most of us will remember that this drought culminated in the Black Summer 'mega-fires' of 2019 and 2020. Those who paid closer attention to the environmental response to such stressful conditions would have noticed the once-flowing creeks reduced to stagnant pools, dry and near-empty dams, hill after hill of dead and dying eucalypt trees, and frogs few and far between. And this was all before the fires hit. Considering the stressed state of the environment, this was possibly also not the best time to be looking to buy a property…

However, this was the exact time that my partner Sarah, and I, had chosen to start our search for a property where we intended to eventually move to and raise a family. We were after something different from the lives we knew growing up in Sydney, we wanted a large bush-block well away from any big town, somewhere we could 'connect' with the natural world and act as custodians, but we also wanted somewhere that we could live somewhat self-sufficiently. This primarily meant we needed reliable access to water, as well as good fertile soils on which we could grow an abundance of food plants. With a future under climate change in the back of our minds, we also knew the land we would end up buying had to be suitable in the long term. After checking out a few less ideal properties we ended up settling on a 300 hectare block at Nulla Nulla on the New South Wales Mid-north Coast.

Nulla Nulla isn't somewhere you will find easily on a map – about halfway between Kempsey and Armidale and nestled into the foothills of the eastern escarpment of the New England Tableland. We first visited the property in October 2019, when the drought had well and truly pushed all the way to the coast and was biting hard. I remember on the trip up there, stopping in to checkout "Bird Tree" on the way through, driving through the hills up Middle Brother National Park and encountering swathes of mahogany, tallowood and stringybark forest that was pushed to the brink of its tolerance. Entire canopies were browned and defoliating, only the understory of *Pittosporum undulatum* seemed

Creek pre fire

able to hold on to any shade of green. But the scene we were met with at Nulla Nulla couldn't have been more of a stark contrast to this.

The forested hills were still green with healthy eucalyptus trees, the grassy meadows were yellowing but not dried, there were growing dense thickets of native raspberries, and above all the creek fronting the property was flowing with beautiful crystal clear water. It was almost difficult to believe considering the backdrop of smoky skies rising from large fires burning only 20 km away. Unsurprisingly, I also wanted a property with a good diversity of frog species, so during our visit I was tuned in to whatever frogs were around – which comprised choruses of Tusked Frogs (*Adelotus brevis*) and juvenile Stony Creek Frogs (*Litoria wilcoxii*) along the creek. It was a piece of paradise and we were sure this was where we wanted to buy.

Over October and November 2019 the drought continued and the fire situation became dire. In the second week of December a westerly wind change took the nearby burning "Carrai East" fire right across the property, burning much of the land from rainforest to woodland and even the riparian corridor, with the fire in some places burning all the way into the canopy of 50 m high *Eucalyptus grandis* trees. I visited the property a couple of weeks after the fire went through and a recent heavy shower had doused much of the fire, even promoting some new grass growth, but at the same time some areas of ash were still smoldering. The scene was apocalyptic and nothing like the lush oasis I had visited two months earlier. The creek had stopped flowing and was reduced to scattered, though deep, pools, and the hills of eucalypt and forest oak looked like they had been hit by a nuclear bomb. The rainforest gully that bisected the property was burnt to a crisp, and rich black water trickled over the rocks. I wasn't sure if much could have survived this.

In February 2020 the drought broke, and it broke with a vengeance. It would have been about the 6th or 7th of February when an intense low pressure system brought the first widespread heavy rain that NSW had seen in years, and the landscape that was parched and burnt only months before was now renewed – flushed out with fresh running water, though water which was still thick with ash and debris. Although the fires still felt like yesterday, this was the start of the environment's recovery.

I began regular visits to the property in June 2020,

Gully post fire

Hill, 3 years post fire

Hill, one year post fire, epicormic growth on Eucalypts

Creek post fire

Litoria wilcoxii males beside creek

and by this time the regeneration was well and truly underway. Compared to what I had seen in December 2019, it looked nothing alike; epicormic growth coated the trunks and crowns of trees, even filling the canopies of large eucalypts on the lower slopes. Successive wet summers due to an extended La Nina, that delivered some of the wettest years on record, in 2021 and 2022 ensured the nurturing of the ecosystem's recovery and re-establishment. By the start of 2023 it was even hard to tell a fire had decimated the same area only a few years earlier – only the steepest slopes of the hills, those hardest hit, still bear obvious scars of fire. Even the rainforest gully, once singed and lifeless, was now lush and green with clear water pooling on white and grey quartz.

Mixophyes iteratus

Creek looking good, 3 years post fire

But what about the frogs? How did they fair in all this? While I unfortunately only had one day's worth of baseline data before the fires, which included only two species encountered diurnally, a good friend of mine grew up a few kilometres away on a property at Millbank, from which he had recorded 18 frog species. This gave me a rough idea of a benchmark number of species to expect, at least as things were in the absence of a mega-fire at this time.

By the first visits in spring 2020 I was already surprised by the resilience of the local frog population. Our single dam, along a small gully in grassland that saw the brunt of the fire, was alive in chorus, hundreds of Dwarf Tree Frogs (*Litoria fallax*), along with other frog species (though mostly *L. peronii* and *L. tyleri*), had seemingly survived the fire to return less than a year later to breed. How had all these Dwarf Tree Frogs survived, which were calling from and living amongst grasses that were hot ashes only months ago? And these Bleating Tree Frogs (*Litoria dentata*) calling from burnt out tree hollows and turning up in droves around my camp. Life along the creek seemed as impressively resilient – Giant Barred Frogs (*Mixophyes iteratus*) galore, and Tusked Frogs calling in similar numbers as I remembered pre-fire. It didn't take us long to spot our first platypus either. Remarkably, by February 2021, I had already recorded 16 frog species from the property! All of which had apparently survived the inferno of December 2019.

By the end of summer 2022, I again recorded the same 16 species as the previously year, though still a couple species short of my mate's property at Millbank. My next 'new' frog for the property wouldn't come until a dreary day in May 2022, when we were checking out our proposed house site and I heard a familiar call coming from the dam – the Whirring Tree Frog (*Litoria revelata*)! A species anyone who has been on a FATS Smith's Lake Field Trip will know, and one I spent my Honour's year working on. I was now up to 17 species, and only the second year post-fire.

The wet conditions continued through the spring/summer of 2022 and 2023. While I encountered many of the 'regulars' over this time, my next 'new' species wouldn't come until 2023. While sitting around the campfire with a couple friends, including long-time FATS member Brad McCaffery, on a cool damp evening in January 2023, Brad said he could hear a frog calling off in the distance but wasn't sure what it was. I couldn't hear it at first but walked over to edge of the slope to have a better listen. There it was, a loud 'aaarrrrk, arrrrrrk, arrrrrrk' followed by a soft trill. I couldn't believe what I was hearing, it was the Red-eyed Tree Frog (*Litoria chloris*)! Species 18 for the property, and knowing the habits of this species, surely one that would have not appreciated a canopy topping fire burning through its tree-top shelter. These frogs had either survived the fire or re-colonised from somewhere else close by in the valley.

Litoria barringtonensis, species no. 19!

I was now up to the number of species that I expected for the area, but I still thought there could be a few more frogs around. By the time autumn 2023 had crept around, the Whirring Tree Frogs in the dam were back, but this time at least a dozen or so calling, compared to the two or three of the previous year, while clearing works for a new dam allowed me access through thick post-fire regrowth to the rainforest gully that was now almost completely rejuvenated.

One group of frogs that I was yet to find on property was the Leaf-green Tree Frogs, and although the main creek was a bit big for them, the little rainforest gully looked perfect. While I had looked here in the first couple years and found a variety of frog species, including *Mixophyes iteratus, M. fasciolatus, Adelotus brevis, Crinia signifera, Pseudophryne coriacea* and *Litoria wilcoxii*, I hadn't yet found a Leaf-green Tree Frog (*Litoria barringtonensis*). That was until one night when I was walking up the gully, again with Brad McCaffery, I picked up the eyeshine of a small tree frog on the bank of the stream – it was a Leaf-green Tree Frog! A long sought species for me here and now the 19th species of frog for the property!

By now it is evident to me that the local frogs are more capable of surviving fire and extreme drought than we might have expected, and I even think I could get a 20th or 21st species for the property in the future – time will tell. While the land has suffered, and more-or-less recovered from, catastrophe in the past few years it will be interesting to see what the future holds, especially under some of the climate change scenarios that are projected. As I write this now, the Mid-north Coast region has seen five months of near record low rainfall, dry conditions which carry unsettling similarities to the peak of the drought in 2019. Around here it's been so dry that once again the more arid slopes and steeper hills are becoming dominated by dying eucalypts with browning canopies, just like they were in 2019. With a month and half of spring left, and the forecast looking dry, for the summer, I'm sure the next big fire is just waiting around the corner....

All photos in this article taken by Grant Webster.

FATS Tadpole Hunt, Darke's Forest

Shannon Kaiser

PhD student, Macquarie University

Maddens Creek falls, Darkes Forest Shannon Kaiser

The FATS group went on a tadpole hunt at Darkes Forest in January 2023. Organised by Marion Anstis, the group started their trip at Darkes Appleshed on Glenbernie Orchard, where we met with Jo Fahey our contact at Darkes Cider, as well as her daughter and a new worker, all very keen to chat about frogs on the property. We prepared our gear, cleaned our boots to avoid spreading chytrid disease, and headed shortly afterwards to a nearby dam on the property (coordinates: -34.23668, 150.91716).

Using large nets, we started scooping around in the water but had no luck finding any tadpoles – the likely reason being that they had already turned into frogs and moved away. Jo explained that the previous November she had seen large numbers of tadpoles in this dam, and they were quite big, so unfortunately we were too late.

We also tested the water quality using a research-level multi-probe. The pH was 6.52, ORP (oxidation reduction potential) 208.1, µS/cm

Finding the first tadpoles Ken Griffiths

(micro siemens per centimeter) 84 and water temperature 21.94°C at about 1.30pm, all of which are at acceptable levels for a healthy pond. Water in the area is expected to be slightly acidic, given the geology of the region. The ORP tells us how well the water is processing organic matter, and a number above 120 or so is often considered to be ideal, however the number is somewhat relative. The µS/cm, where the current between two probes spaced 1 cm apart is measured, tells us the concentration of salts in the water and can be used to infer electrical conductivity or salinity. A number below 350 is considered 'safe' for aquatic life.

Our merry group then moved up to Maddens Creek Falls (coordinates: -34.23883, 150.91394), where we looked for tadpoles in the rock pools at the top of the falls. Below you can see pictures of us finding and examining tadpoles. We were much luckier finding them here, with many of the pools containing various species, including tadpoles of *Litoria citropa*, *Litoria lesueuri*, *Litoria freycineti* and *Crinia signifera*.

These tadpoles were at variable life stages, from recently hatched stages to Gosner stage 45 (tail almost gone). At stage 25 tadpoles are generally free swimming and feeding and are considered to be beginning their tadpole feeding life. A tadpole with its hind legs extended and all toes visible is considered to be almost fully developed, and once a tadpole has its front legs emerging it's almost ready to go onto land. A fantastic example of this is in this picture from Ken Griffiths, showing a *Litoria*

Litoria lesueuri stages (from bottom left) 29, 38 and 40 Ken Griffiths

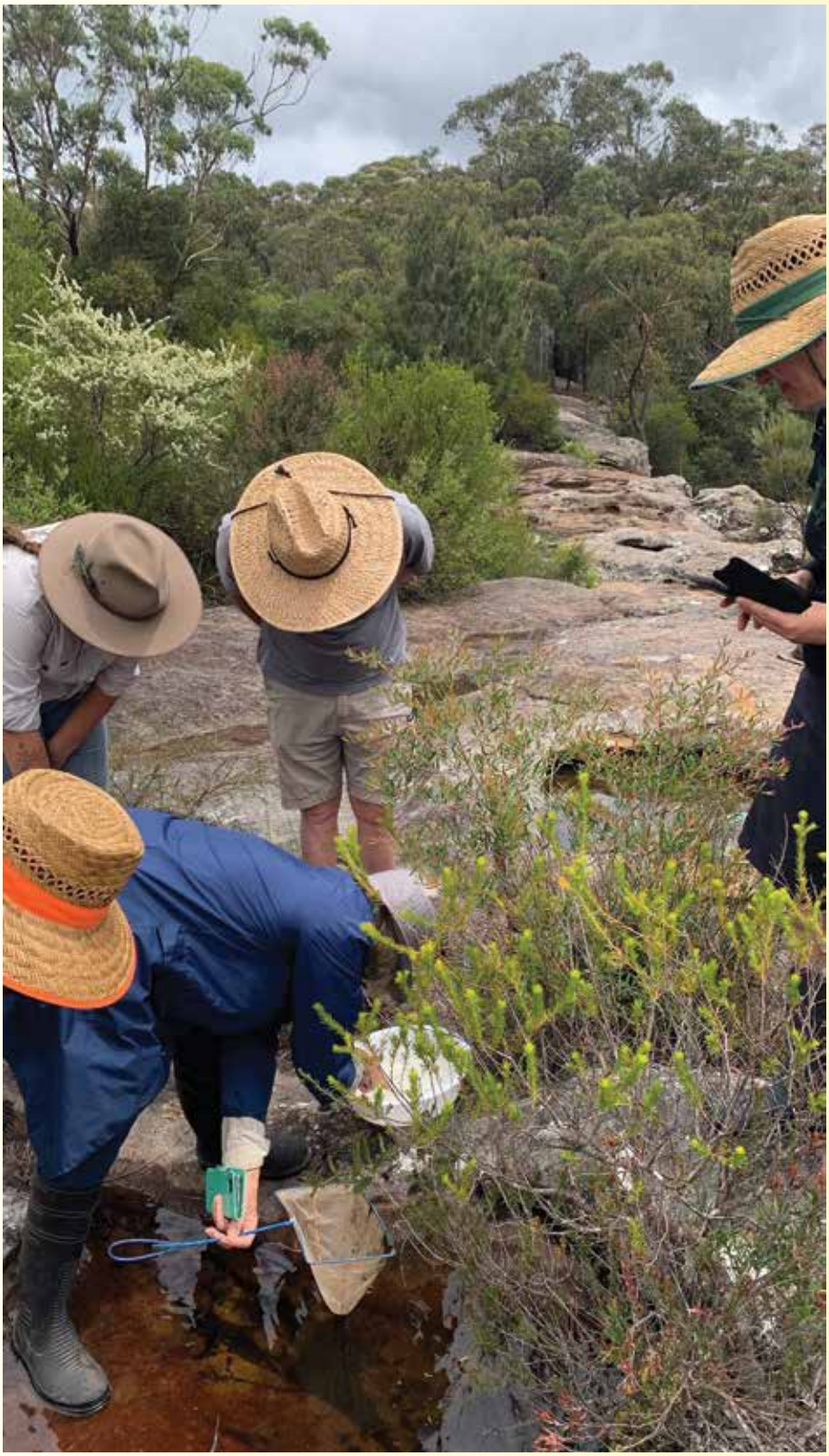
freycineti at Gosner stage 42 ie. 4 legs, but still a long tail).

Despite appearing in immediately adjacent pools, the same species was at different life stages. Frogs are somewhat unique in their development, because individual tadpoles from eggs laid at the same time by the same parents will develop to metamorphosis at different rates. Competition for food and aspects of the habitat affect individual growth rates. Many of the tadpoles we saw at Maddens Falls were around Gosner stage 27, but several were almost ready to metamorphose because the eggs had been laid earlier than other species. This is obvious in the larger *Litoria lesueuri* tadpoles we see below, where we see stages 29, 38 and 40, the larger tadpoles in order from left to right in this photo above from Ken Griffiths. For comparison, there is also a near metamorph of *Litoria citropa* at stage 43 behind the three *L. lesueuri*.

In terms of water quality, these tadpoles were in noticeably more acidic water (pH of 5.76), the

Litoria freycineti stage 42 Ken Griffiths

The group explores rock pools above the falls



The group watches as Marion catches some tadpoles for identification Shannon Kaiser

streams were of slightly lower ORP (157.8), similar electrical conductivity (89) and higher temperature. The more acidic nature of the water is likely due to increased contact with more acidic geology, and the increased temperature is attributable to the small pools being quite shallow and more exposed with less vegetation cover and a rocky surface retaining the heat more effectively.

Our next and last site was a dam on the other side of the highway, opposite the Boomerang Golf course and near Maddens Creek (-34.25332, 150.94481). This was a relatively large dam, with dense vegetation in the centre, and it looked promising for tadpoles. We heard *Crinia signifera* calling and saw water beetles on the surface of the water. The water seemed similar to our previous

sites, with similar acidity to the Glenbernie Orchard dam (pH = 6.50), yet similar ORP to the falls (168.7), slightly lower conductivity (81) and the highest temperature. The high temperature is likely attributable to the water being warmed up from the sun for the entire day – nearby sites would likely be similarly warm. Our group got busy with their tadpole nets, but only one small tadpole of the burrowing frog, *Limnodynastes dumerilii grayi*, was found. This species will overwinter in this pond and metamorphose in late spring. Once again, it is likely that any tree frog species that had bred in these dams would have metamorphosed by this time.

Overall, I found the trip really exciting and educational. I'm currently doing research on Striped marsh Frog and Green and Golden Bell frog tadpoles, and this trip helped me learn more firsthand how to find, identify and age tadpoles in the wild, which has helped get my research going. Huge thanks to Marion Anstis for running this trip, and a massive thank you to the FATS group for being so welcoming and supportive of me and my research.

Above photos: Marion points out some of the differences between species to the very keen group
Top photo: Ken Griffiths; bottom photo: Shannon Kaiser

FATS Greenacre Bell Frog Project

Arthur White

Fig. 1: Early view of Cook's River Claypan woodland

Fig. 2: Greenacre Brickpit, 1996, during de-watering

In the beginning, prior to European settlement, Green and Golden Bell frogs (*Litoria aurea*) were widespread across Sydney and parts of the eastern seaboard (Figure 1). With land clearing for housing and industry and the rapid rise in urban pollution, sensitive creatures like frogs were quickly lost from these areas. By the late 1970s, Green and Golden Bell frogs were so greatly reduced in number and range that that were listed as a threatened species. Efforts were made at various sites to try to conserve these frogs from imminent extinction.

Greenacre Brickpit Site

Green and Golden Bell Frogs were historically widespread throughout the catchment of the Cooks River in southern Sydney. Unfortunately, the Cooks River suffered the fate of many of Sydney's smaller waterways: the catchment area became industrialised and toxic pollutants were introduced into the river water, the river banks were cleared of vegetation and the river bed was eventually sealed in concrete. The river lost nearly all of its aquatic habitats and served primarily as a flood mitigation drain.

At Greenacre in the early 1990s, there were only two known sites where Green and Golden Bell frogs still occurred: a small patch of remnant Cooks River Clay Plain Forest called the Coxs Creek Reserve, and the old PGH Brickpit site just west of the Enfield Rail Marshalling Yards.

The old Brickpit site was to become the location of the Greenacre Green and Golden Bell frog Project. Clay was mined at Greenacre for more than seventy years before it finally ran out. What was left behind was a huge, abandoned pit that eventually filled up with rainwater (Figure 2).

Unbeknown to many of the local residents, a small colony of Green and Golden Bell frogs colonized the edges of the brickpit lake but they were not to be able to use the site for long.

In the early 1990s, the pit and surrounding land became available for re-development. The pit was to be filled in and the site developed for small, industrial lots. The Green and Golden Bell Frogs that lived in the lake would have to be moved or get buried by land fill. Efforts were made to relocate the frogs from the pit to a small artificial site created alongside the railway yards. Unfortunately, this relocation appeared to fail.

Dis-use and Opportunity

The pit was filled in and the industrial lots were created. The small area of land set aside for the frogs remained disused and became heavily overgrown by invasive weeds. In 2020, Strathfield Council and the Frog and Tadpole Study Group of NSW (FATS) joined forces to see if the site could be salvaged and the Bell Frogs returned to Greenacre.

Fig. 3: Greenacre Brickpit, 1996, during de-watering

The site was in such a bad condition, that all of the exotic vegetation had to be removed and the surface re-profiled and re-landscaped (Figure 3).

To see if any Green and Golden Bell Frogs still survived in the local areas, FATS undertook widespread surveys throughout Greenacre, Enfield and Strathfield. To everyone's delight, a small colony of Green and Golden Bell Frogs were found at the Cox's Creek Reserve in Greenacre. These frogs could form the basis of the new colony – but how best to do this? Should these frogs be taken from the Cox's Creek Reserve and forcibly moved into the new habitat? Should the frogs be allowed to choose if they preferred the new habitat to their old habitat? We opted for the latter approach.

Frog Music

During late 2021, the new site was ready to receive frogs. In the evenings, small amplifiers were used to direct Green and Golden Bell Frog mating calls towards the Cox's Creek reserve, about a kilometre away (Figure 4). The mating calls of Green and Golden Bell Frogs were broadcast in the early evening across the industrial sites to let the Bell frogs in the Cox's Creek Reserve think that other Bell Frog breeding sites existed in the area.

Fig. 4: Broadcasting Bell frog calls. December 2021.

For Bell frogs to travel from the Cox's Creek Reserve to the Greenacre site involved some dangerous movement. The area between is mainly residential but there were several roads that would have to be crossed and many dangers to be faced. If the frogs could fly, it was only about 1 kilometre to the new habitat area. More likely, the Bell frogs will need to zigzag between houses with bushy gardens and dark corners. How far they will need to travel is probably more like 2 kilometres – was this too far for a Bell Frog?

We know from other studies of Bell frogs that they are a highly mobile species and distances such as these are within their capability. But this is a dangerous trip and one that the Bell frogs may not be able to make. In addition, they may find the new site not to their liking when they arrive and they may go elsewhere or return to Cox's Creek.

After 4 weeks of regular broadcasting of Bell Frog mating calls, the first Green and Golden Bell Frog appeared in the new site. It didn't stay, but came and went over the next four months. Eventually other Green and Golden Bell Frogs began visiting the site and some even bred there!

Fig. 5: Adult Bell Frog at site Arthur White

The Return of the Green and Golden Bell Frog

In 2022 and 2023, Green and Golden Bell Frogs continued to return to the site and breed. There is now a small resident group of Bell frogs on site (Figure 5) but others continue to come and go as they please. The site has been slowly modified to make it more suitable for Green and Golden Bell frogs and the aim is to establish a self-sustaining, viable population at this site. Multiple ponds have been established and basking boards and ramps created for the frogs to better use the site. In addition, slightly saline ponds have also been established to help control the spread of Chytridiomycosis at the site (the frogs can tolerate very slight salinity). We also physically discourage other frog species from utilizing the above ground

Fig. 6: FATS workers take a well-earned tea break

ponds in an effort to reduce competition and slow the spread of disease.

FATS members have attended several working bees (Figure 6) where weeding, pond maintenance, and further site clearing has taken place. In addition, we have installed a shed on site to hold our tools and frog equipment.

More recently, we have had to install bird netting over the ponds (Figure 7) to try to restrict the ibis from eating the Bell frog tadpoles and adult frogs. The site has been slowly modified to make it more suitable for Green and Golden Bell frogs and the aim is to establish a self-sustaining, viable population at this site. Multiple ponds have been established and basking boards and ramps created for the frogs to better use the site. In addition, salt-treated ponds have also been established to help control the spread of Chytridiomycosis at the site. We also physically discourage other frog species from utilizing the above ground ponds in an effort to reduce competition and slow the spread of disease.

The long-term maintenance of the Bell Frogs at the Greenacre site does not require the frogs to be confined to this site. Bell frogs are dispersers, so a better approach is to create safe movement corridors to surrounding suitable habitat areas and let the frogs come and go safely as they choose. For this to occur, other areas of Bell Frog habitat need to be created nearby. Bell Frogs are a highly mobile species and will not survive in a solitary, confined site.

Green and Golden Bell Frog habitat has been created in the Enfield Marshalling Years (by NSW Ports) and plans are underway to extend the amount of habitat available in the Cox's Creek reserve. The movement corridors between these sites need to be made more frog-friendly as too many frogs are killed while crossing roads or are preyed upon by cats and night birds.

Residents living between this site and the Cox's Creek reserve will be asked to help make their backyards more frog friendly so as to make the movement of frogs around Greenacre less dangerous for the frogs.

There is still lots to do at Greenacre but the first few years have been very encouraging and we are very hopeful of creating a permanent habitat area for these special frogs.

Fig. 7: Bird netting installed over the breeding ponds at Greenacre, September 2023 Phillip Grimm

Field Trips held in 2023

***Please book your place on field trips*. Due to strong demand, numbers are limited. Be sure to leave a contact number. We will schedule and advertise all monthly field-trips as planned, but in the event of bad weather or other issues, we may have to cancel. It is YOUR responsibility to re-confirm in the last few days as to whether the field trip is proceeding or has been cancelled. Phone Robert Wall on (02) 9681 5308.**

Saturday 28th October. 7.30pm Darkes Forest Leader: Ken Griffiths.
Take the Princes Highway south (not the freeway), then take the Darkes Forest Rd turn-off. Meet 200m from the corner. The early French explorers and naturalists contributed much to the understanding of Australian natural history. Amongst other things, they discovered and described many species of frog. Today, many frogs retain a scientific epithet (i.e. scientific name) honouring these French naturalists. Many frogs also bear common names such as Peron's Tree Frog, Lesueur's Frog and Bibron's Toadlet. Tonight, we will look at some of our frogs in an historical context, and we will examine some of those species first discovered by, or named in honour of, the French. We will also discuss the importance and enlightened scientific role of French exploration in Australia. Ken will also be on hand to provide tips on photographing frogs in their natural environment, so a good opportunity for all those budding photographers in our society.

Friday to Sunday, 10–12th November 2023: Smiths Lake Leaders: Karen and Arthur White
Our Smith's Lake trip has become such a popular field trip destination that changes are needed to ensure that everyone gets a chance to go. Previously, it has been first in goes to the head of the list, but this approach has meant that the same people often get to go and newcomers miss out. In addition, we have people cancel late so their place goes unfilled. To overcome both of these problems we have changed the booking arrangements in recent years, including a non-refundable pre-payment for the booking. Most people will still be able to attend. This arrangement is in case we have too many people wanting to go on the field trip.

1. For the next field trip, you must email Karen White white.kazzie@gmail.com by the 8 October and indicate that you (and others in your group) want to attend and what day you intend to arrive. Karen will then put your name on a list. If you attended the previous Smith's Lake field trip you will automatically go on the Reserve List.
2. Karen will send you a reply email to let you know which list you are on. If you are on the A list you must pay your accommodation by 13 October to confirm your booking. If you do not pay by this date you will be removed from the A list. You can pay electronically to the FATS account:- Account Name: Frog and Tadpole Study Group - BSB 082 342 Account No. 285 766 885. Cost is $20 per person, per night.
3. Karen will send you confirmation of your booking when your payment has been received.
4. Karen will email people on the Reserve list, at least 2 weeks before the field trip dates 27 October. You will be told if there are spaces available for you or not. If are able to go, you will now need to forward your payment to guarantee your place. Payment must be received by the 3 November. If not, your place will be given to the next person on the list. We think that this will be the fairest way to ensure that everyone gets a chance to go to Smith's Lake.

Saturday 18th November 1.00pm – 4.00pm Darkes Forest Tadpole Hunt Leader: Marion Anstis
Take the Princes Highway south (not the freeway), then take the Darkes Forest Rd turn-off. Meet 200m from the corner.
The award-winning book "Tadpoles of SE Australia" needs no introduction to frog lovers. Today, we have author, Marion Anstis, on hand to help us look more closely at tadpoles. Identifying tadpoles can be a very useful method of determining frog populations and can be carried out in the more comfortable daylight hours. Today, we go in search of taddies. Marion will guide us through the sometimes difficult task of identifying tadpoles. Please note the afternoon start time. We will look at both stream-dwelling tadpoles as well as some pond-dwellers. We may be visiting private property on this fieldtrip. We will definitely require contact phone numbers and email addresses of all participants so that we can co-ordinate the day's activities. Please leave all details when booking your place on the fieldtrip.

In the event of uncertain frogging conditions (e.g. prolonged/severe drought, hazardous and/or torrential rain, bushfires etc.), please phone 02 9681 5308. Remember, rain is generally ideal for frogging! Children must be accompanied by an adult. Bring enclosed shoes that can get wet (gumboots are preferable), torch, warm clothing and raincoat. Please be judicious with the use of insect repellent. Frogs are very sensitive to chemicals! Please observe all directions that the leader may give. Children are welcome, however please remember that young children especially can become very excited and boisterous at their first frogging experience – parents are asked to help ensure that the leader is able to conduct the trip to everyone's satisfaction. All fieldtrips are strictly for members only. Newcomers are welcome to take out membership before the commencement of the fieldtrip. All participants accept that there is some inherent risk associated with outdoor fieldtrips and by attending agree to; a release of all claims, a waiver of liability and an assumption of risk.

Directions to Meetings
FATS meets at 7pm, on the first Friday of every EVEN month at the **Education Centre, Bicentennial Park, Sydney Olympic Park.**

An easy walk from Concord West railway station and straight down Victoria Ave. By car: enter from Australia Ave at the Bicentennial Park main entrance, turn off to the right and drive through the park. It's a one way road. Just follow it and turn right at the P10f parking sign. Or you can enter from Bennelong Road/Parkway. It is a short stretch of two-way road. Park in P10f car park, the last car park before the Bennelong Rd exit gate. Take a good torch in winter. It is a short walk from the car park to the Education Centre, which is a single storey building with an adjacent tall tower. Both can be seen from the car park.

Directions from your home:
http://www.sydneyolympicpark.com.au/maps/getting-to-the-park?type=venue&id=384059

FATS has student memberships for $20 annually with electronic FrogCall (but no hard copy mail outs).

https://www.fats.org.au/membership-form

THANK YOU to the committee members, FrogCall supporters, talented meeting speakers, Frog-O-Graphic competition entrants, events participants & organisers, David, Kathy and Harriet Potter, and Sarah and Ryan Kershaw. The FrogCall articles, photos, media and webpage links, membership administration and envelope preparation are all greatly appreciated. Special thanks to the many newsletter contributors, Robert Wall, Karen & Arthur White, Andrew Nelson, Wendy & Phillip Grimm, Marion Anstis, George Madani and Punia Jeffery. Special thanks also to Marion Anstis who has produced our glossy colour collector's edition of FrogCall each December.

The FATS meeting commences at 7 pm, (arrive from 6.30 pm) and ends about 10 pm, at the Education Centre, Bicentennial Park, Sydney Olympic Park, Homebush Bay. FATS meetings are usually held on the **first Friday of every EVEN month** February, April (**except Easter Friday**), June, August, October and December. **If the FATS meeting falls on Easter Friday, then the meeting will probably be one week earlier**. Call, check our web site, Facebook page or email us for further directions. We hold 6 informative, informal, topical, practical and free meetings each year. Visitors are welcome. We are actively involved in monitoring frog populations, field studies and trips, have displays at local events, produce the newsletter FROGCALL and FROGFACTS information sheets. FATS exhibit at many community fairs and shows. Please contact Events Coordinator Kathy Potter if you can assist at any of these events, even for an hour. No experience required. Encourage your frog friends to join or donate to FATS. Donations help with the costs of frog rescue, student grants, research and advocacy. All expressions of opinion and information in FrogCall are published on the basis that they are not to be regarded as an official opinion of the FATS Committee, unless expressly so stated. Credit cards can now be used for raffle and other purchases over $10.

FATS ON FACEBOOK: FATS has about 4,640 Facebook members worldwide. Posts vary from husbandry, disease and frog identification enquiries, to photos and posts about pets, gardens, wild frogs, research, new discoveries, jokes, cartoons, events and habitats from all over the world. The page was created 12 years ago and includes dozens of information files – just keep scrolling to see them all. **https://www.facebook.com/groups/FATSNSW/**

RESCUED FROGS are at our meetings. Contact us if you wish to adopt a frog. A cash donation of $50 is appreciated to cover care and feeding costs. FATS must sight your current amphibian licence. NSW pet frog licences can be obtained from the NSW Department of Planning, Industry and Environment (link below). Please join FATS before adopting a frog. This can be done at the meeting. Most rescued frogs have not had a vet visit unless obviously sick. Please take your formerly wild pet to an experienced herpetological vet for an annual check-up and possible worming and/or antibiotics after adoption. Some vets offer discounts for pets that were rescued wildlife. **https://www.environment.nsw.gov.au/licences-and-permits/wildlife-licences/native-animals-as-pets/frog-keeper-licences**

NB: FATS has student memberships for $20 annually with electronic FrogCall (but no hard copy mail outs). https://www.fats.org.au/membership-form

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