

FROG CALL

THE FROG AND TADPOLE
STUDY GROUP OF NSW INC.

NUMBER 35 - May 1998
PO Box A2405
Sydney South NSW 1235

THE NEXT MEETING

6.30 PM, FRIDAY 5th June 1998 for a 7pm start
AT THE AUSTRALIAN MUSEUM (WILLIAM ST ENTRANCE)

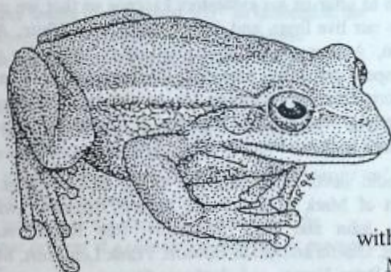
Please Note



ANNUAL MEMBERSHIPS ARE DUE FOR RENEWAL NOW

and

The Annual General Meeting for FATS will be held at 7pm followed by Michelle Christie speaking on the Study of Green and Golden Bell Frogs




with compliments
Martyn Robinson

MEETING FORMAT for 5th JUNE 1998

- | | |
|--------|--|
| 7:00pm | Annual General Meeting |
| 7:30pm | Guest Speaker Michelle Christie
Studying the Green and Golden Bell Frog |
| 8:15pm | 5 favourite frog slides <u>or</u> 5 minutes |
| 8:40pm | Raffle and Auction |
| 9:00pm | Finish for tea, coffee & biscuits |

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FOSSIL FROGS

Arthur White, our guest speaker, provided us with an account of the world of fossil frogs (and other fossil amphibians): "dead so long they don't smell anymore!". Frog palaeontology has only recently flourished in Australia. All of the work prior to the last twenty years was done by American scientists who visited this country. Frogs do not fossilise easily because there is little bone in the skeleton, most of it is cartilage which decomposes quickly after death. One bone that does fossilise is the ilium (a hip-bone). Frog fossil work has concentrated on using the features of ilium to determine the ancient frog faunas of Australia.

Frogs are amphibians (creatures with an aquatic young stage and a land-dwelling adult stage). The first amphibians appeared about 350 million years ago. They were salamander-like creatures. One group of these early amphibians (called labyrinthodonts) flourished in Australia and many fossils of these creatures have been found. In Australia, labyrinthodonts survived much longer than elsewhere in the world, persisting through the Triassic and Jurassic into the Cretaceous (co-existing with dinosaurs). Labyrinthodonts were extinct elsewhere in the world by the end of the Triassic, so they survived an extra 80 million years in Australia, why?

Frogs don't appear on the scene until about 150 million years ago. The early frogs looked like a cross between a lizard and a frog. Frogs resembling modern-day frogs don't appear until the Cretaceous (about 100 million years ago). Fossil frogs in Australia do not go back this far. The oldest fossils that we have are Miocene, about 20 million years ago, and they are from central Australia desert deposits and Riversleigh in northwest Queensland. Australia has lots of frog fossils for the last two million years. By the Miocene all of the early lineages of the modern ground frogs and tree frogs were well established.

One fossil site at Murgon in southern Queensland has produced some unusual fossils which may be salamanders. If so, this would be revolutionary as salamanders are unknown in this country and they are presumed to have evolved in the northern hemisphere.

Thank you Arthur for treating us to observations of the fossil frog situation in Australia, bringing those excellent specimens, the frog slides and stories of the Green and Golden Bell Frog population that existed at Bathurst. Prizes given to the FATS member who can identify the most endangered item: frogs, research grant holders, or active fossil sites in Australia.

Ken Griffiths provided many great slides including the Red-eyed Tree Frog and Giant Barred frog. We continued on with a lively auction followed by refreshments MW



The Annual General Meeting is to be held at 7pm on Friday the 5th June 1998 at the Australian Museum. Nomination forms are included in this mail out. Anyone interested in nominating for a position is greatly encouraged to do so as the committee is always short at least a couple of people. Moreover the organisation could always do with some fresh viewpoints and ideas. Nominations should be directed to Frank Lemckert, Giselle Howard or the Secretary c/- our Post Office Box at least one week prior to the AGM. MW



ROYAL EASTER SHOW FATS DISPLAY

Ten thousand people went through the Frog and Tadpole Study Groups' exhibition in the cat pavilion, at the Royal Easter Show this year, with about 50 live frogs and toads, as well as fish, axolotls, tadpoles, turtles, and a cane toad (ugh thanks Arthur?). A BIG WELL DONE to all those who assisted with the success of this exhibition.

Special thanks go to Anthony Stimson who was kind enough to offer us his exhibitors Licence so that we could display our live frogs, and Arthur and Karen White, Anne Peaston, Anthony Nicholson and Lothar Voigt for their hours spent preparing, providing live specimens, 16 tanks, transport, erecting, manning (or is that personing?) and dismantling. And to Karen Thumm, Katherine Wangmann and Sarah Ingham who provided live frogs, as well.

We could never have survived the 2 days without the support of Mark Avery, Punia Jeffery, Adam Crawford, Cecily, John and Peter Spadbrow, Ray Roper, Annie Neilsen, Giselle and Grant Howard, Frank Lemckert, Missy White, Peter Varga, and Anthony Stimson, who manned the FATS Exhibition and/or Landcare FATS display.

Much appreciation is also extended to the RAC and Vanessa for use of the cat pavillion, free parking, meal vouchers and free passes into the grounds and to Bill Fairbanks Landcare, security staff, Matthew Crane from the Agriculture Department for expediting the permit, Jeff Hardy from the National Parks and Wildlife Service for NPWS approvals, Martyn Robinson for the terrific frog drawing on our banner, the Australian Museum for photocopying. Apologies if someone was overlooked!

We have responded to over 100 written enquiries left for us, when the Landcare display was unmanned. The exhibition was shown on TV with Burt Newton and written up in the Wentworth Courier. Frog facts, FATS memberships applications, information by our Frog Explainers, Frog kits and Frogs badges were also provided. ALL IN ALL A WONDERFUL DISPLAY.

CAMPHOR LAUREL AND FROG DECLINES IN NORTHERN NSW

While exploring the ranges behind Terrania Creek, (The Channon), bushwalker Joe A Friend (this is his real name) was astounded to find two creeks in the forest, one creek was deafening with frog calls, the other silent. The two creeks were close to each other and drained the same range of hills. They appeared to have clean water and they were both fully forested. The only difference that was apparent was that the silent creek was lined with stands of camphor laurels. In a mini-experiment Joe tested tadpoles from the noisy creek in the water from the silent creek and found that the tadpoles died after some hours. Camphor laurels are not native to Australia and have been used by pharmaceutical companies to extract a range of bio-toxic substances. The silent creek contained broken branches and leaves from the camphor trees. Most gardeners will tell you that to compost camphor leaves is the best way to kill all the earthworms and invertebrates in your compost bin. Is this what is happening in some of the northern forests? Are camphor laurels killing tadpoles and destroying egg-laying sites?

Joe A Friend can be contacted @ P-FAX 02 66 886150 (Passed on by Martyn Robinson and edited by Arthur White)

FIELD TRIP 3rd January 1998

Dear Editor, I'm involved in organising events for the Double Helix Club, a science club for kids run by the CSIRO. Ken kindly agreed to take us to Karloo Pools at Heathcote to look for frogs.

Our advertised frog hunt was very quickly over subscribed by enthusiastic biologists. We unfortunately had to reschedule due to bushfire danger but still ended up with 22 keen hunters. They had to be keen as the rain was coming down fairly hard by 7.00pm when we started down the track to Karloo Pools, a pleasant walk of about 40 minutes. We sheltered under overhangs besides the pools waiting for dark to fall as Ken explained how to spotlight and what we were likely to find. Kangaroo Creek forms a large rock pool here and a smaller creek joins it so there's a combination of water, rocks and grassy banks.

We didn't even need to go looking for our first frog, a Lesueur's frog which hopped in out of the rain. We saw several more during the night. Ken also found a diamond python that impressed the kids. We could hear some frogs calling and ventured out into the rain. In the pools we found some Eastern Froglets and tadpoles. As we started back home it stopped raining. Ken found a beautiful Green Leaf Treefrog then another larger frog with green speckles on his back. In the heathland further up we were amazed by Ken's method of finding a frog - yell and wait for a reply. Sure enough a frog replied and Ken tracked him down in the mulch.

Everyone agreed it had been a great night out. Many thanks to Ken for his expertise finding frogs and all the fascinating information about them. Pam Jackson



FROG SPOTTING on EASTER SATURDAY

With the heavy rains of Easter Thursday and Good Friday came the long awaited call from Ken Griffiths "it's on" he said. Instead of sitting home keeping watch for the Easter Bunny we were going FROG SPOTTING. After spending the afternoon searching for the long disused gumboots, we were off.

We met Ken at Heathcote Station at 7.00pm and also another family who were keen for an Adventure. With 5 excited young children between us we set off for Engadine swamp. Upon arrival we were greeted by an almost deafening chorus of *Crinia*. We saw lots of amplexing pairs of *Crinia* swimming and hopping about near the entrance to the swamp. This greatly impressed the kids. However, the appearance of a few leeches sent my leech attracting daughter hopping in the opposite direction.

Also heard were some Red Groined Toadlets *Uperoleia laevigata* which we were unable to locate easily, but we knew that we would come across more at the other swamp. As we made our way around to the back of the swamp we heard the Striped Marsh Frogs starting up their calls. This was all pretty pleasing, as the swamp had been fairly dry the week before.

As we were making our way around to the second swamp at Heathcote Ken heard the Banjo Frogs calling so a small party of us set off to try and locate them. We managed to find the swamp but the way was getting a bit tough so we decided to abandon the mission, I wasn't going to argue as it was like going where no man had been before and I had no idea where we were. After our intrepid leader led us back (were we really so close the whole time) to the main party we continued on to the second swamp.

Here we heard the Banjo Frog, Red Groined Toadlets, Perrons Tree Frogs, Striped Marsh Frogs and caught 2 Dwarf Green Tree Frogs. One of the Dwarf Tree Frogs were so tiny, about the size of a small finger nail, that I was amazed that Ken could spot it. The Red Groined Toadlets were all around us and after much searching, only Ken was successful at finding one for us to look at. When Ken was returning from putting the toadlet back he was just watching one of the elusive Banjo Frogs hopping along beside where we were standing chatting, we were oblivious to the fact. We only knew it was there when Ken dived in amongst us and came up with frog in his hands (Anyone want to hire any expert frog spotters? We thought we were doing well till then).

We ended the night on this high spot and went home in search of Easter Eggs (at least I knew where to find those). Thank you Ken for a great night, we all really enjoyed ourselves and can't wait to go again. Marie Gillon



A FIELD GUIDE TO FROGS OF AUSTRALIA: FROM PORT AUGUSTA TO FRASER ISLAND INCLUDING TASMANIA by Martyn Robinson.

Published by The Australian Museum and Reed Publications, Hong Kong 1995. Softback, 118pp., available from the Museum Bookshop \$19.95 + \$3.50 P&H.

This field guide for frog-o-philes is fantastic. A winner of a Whitley Award from the Royal Zoological Society of New South Wales, it describes and shows frogs from as far north as Fraser Island, the southern tip of Tasmania and west to Port Augusta in South Australia.

The forward by Hal Cogger, who is probably the pre-eminent Australian expert on frogs (count the citing of his work in any academic publication on frogs!), says this book will make the task of identification of frogs easier and more accurate for those with an interest in these 180 million year-old creatures.

Another wonderful feature is the explanation of Latin terms. Other books often fail to do this, but it can be really helpful for identification. For example *citropa* means "lemon coloured". Therefore, you know that the flamingo pink frog you found under your box of cereal this morning cannot be a *Litoria citropa*, unless the taxonomist was colour-blind!

At such a cheap price, this book is more than just value for money, it is essential. Carl Spears

FROG'S REVENGE



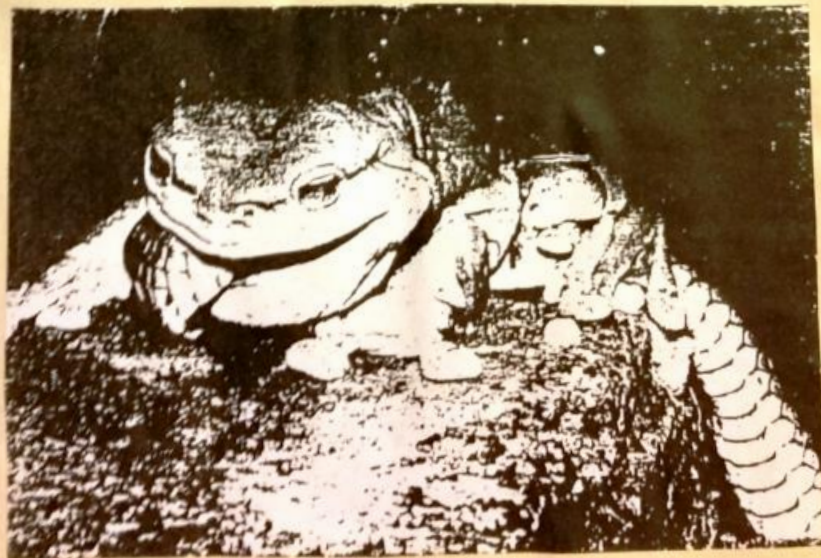
Story taken from The Croaker Quarterly December 1996

This is the most amazing story sent to the editor of Croaker by M. Schmitt, a RANA member from Maclean in NSW. This story is originally from the Coffs Harbour newspaper, The Advocate, and the editor confirmed it by speaking to Mr Harvey Reid who actually witnessed the whole thing. In June 1996 there was a large *Litoria caerulea* (Green Tree Frog) inhabiting a drainpipe at Mr Reid's home at Emerald Beach NSW, and it appears that a brown tree snake thought this might be a nice place to be.

The frog, however, was obviously less than impressed at ending up as the snake's dinner and forestalled the whole thing by swallowing the snake's head before the snake could bite him! As the frog was rather large and the drainpipe rather small, the snake could not wrap itself around the frog and crush it. By the time Mr Reid saw the frog he estimates that 1 foot of the snake had already been digested, with another 2 feet to go.

The frog then sat just outside the drainpipe and over the next four days proceeded to digest his meal. Mr Reid said the entire neighbourhood came to look at the extraordinary sight, and is quite certain that something like this will never be seen again. Staff at The Advocate tells me there was an incredible response to their story with enquiries coming from all over the state from various wildlife groups, most of whom had never heard of anything like it. Mr Reid was contacted in early November, and the frog was still alive and well, and had just recently been seen happily sitting in a flower pot.

Thanks to Chris Pos and AHS for supplying the article and Chris Brown for the enlarged photo.



FROGS, ALLIGATORS AND PESTICIDES

"Since 1993, scientists worldwide have been trying to understand why frog populations are reported to be steeply declining in relatively unspoiled environments on several continents.....

They include introduction of exotic predatory fish; stocked populations of bass, for example, can clear a stream of all frog eggs and tadpoles in short order habitat destruction (draining wetlands, for example) landscape changes (clearing woods, building roads, etc.) that isolate particular frog populations; increased ultraviolet radiation, caused by industrial chemicals that have thinned the stratospheric ozone layer; clearing wild lands for agriculture, acid rain; humans eating frogs' legs; global warming, causing elevated temperatures, drought and pesticides.

The identified causes of deformed frogs include: Increased numbers of amphibian surveys, thus more and better reporting; parasite infestations; a parasite called a trematode may be involved in some frog deformities. Trematodes burrow into the limb buds of tadpoles and can, in fact, cause at least one of the deformities seen in Minnesota frogs. Toxic contamination (pesticides, heavy metals, acidification); predation (partially-successful predators may remove parts of frogs, which may then grow back incorrectly); ultraviolet radiation; pesticides.....Industrial toxins -especially agricultural biocides are implicated in frog population declines and in frog deformities.....

The 1996 RED LIST OF THREATENED ANIMALS, published by the International Union for Conservation of Nature lists 156 amphibian species as extinct, critical, endangered, or vulnerable to extinction. This represents 25% of all the amphibians on Earth.

Researchers at Widener University in Chester, Pennsylvania, and at Benedictine College in Atchison, Kansas, have shown that acid rain can stress frog populations by harming their immune systems.

Frogs raised in water with a pH of 5.5 had significantly more bacteria in their spleens, and a significantly higher death rate, than frogs raised in waters with a pH of 7.0. The researchers attribute the increased numbers of bacteria to reduced efficiency of bacteria removal by white blood cells, part of the frogs' immune defenses.

Researchers at the University of Windsor in Ontario, Canada, have correlated high levels of organochlorine pesticides with reduced frog populations in several parks and wildlife reserves along the northern edge of Lake Erie. At Point Pelee National Park in Canada, only 5 frog species remain, and DDT residues in these frogs average 5000 to 47,000 micrograms of DDT per kilogram of body weight.....

In 1988, a survey of a farm had revealed that leopard frogs were nearly absent, but the population rebounded quickly as soon as pesticide use ceased. Researchers reported that the number of different frog species on the farm also increased after 1988.

The Australian government in 1997 took an unprecedented action, banning 84 herbicide products for use near water because of their harmful effects on tadpoles and frogs. All of the 84 banned products contain Monsanto's glyphosate as the active ingredient. However, the harmful component appears to be not the glyphosate itself but an "inert" ingredient -a detergent or wetting agent added to the herbicides so that droplets of liquid spread out and cover the target leaves. Detergents interfere with the ability of frogs to breathe through their skin, and tadpoles to breathe through their gills. Michael Tyler of the Department of Zoology at the University of Adelaide says, "Although the herbicide [glyphosate] is claimed to be 'environmentally friendly,' it is clear that users have been lulled into a false sense of security." Researchers in Sri Lanka report that frogs are nearly absent from tea plantations where herbicides are heavily sprayed, but their populations rebound shortly after spraying stops.....

According to the Minneapolis Star Tribune, Swiss researchers reported earlier this year that a fungicide used heavily in Minnesota can stunt the growth of tadpoles and retard the sexual development of frogs. The Swiss researchers have not produced the kinds of deformities seen in Minnesota frogs, but they say the fungicide triphenyltin could harm frog populations by delaying their growth, which would allow more time for predators to eat them.

At least one pesticide, methoprene, acts like a retinoid. Methoprene is an insect growth regulator that prevents young insects from maturing. Researchers some years ago identified a pesticide spill into Lake Apopka as the cause of mature alligators with penises so small that they could not reproduce. Scientists assumed the trouble was confined to that one lake. But recently alligator problems have come to light all across southern Florida. In the Everglades, which are contaminated with numerous pesti-cides, full-grown alligators weigh hundreds of pounds less than alligators elsewhere in Florida. And in Lake Okechobee, Florida's largest lake, juvenile alligators have levels of reproductive hormones in their blood that are far below normal -another possible sign of disruption by pesticides.....

Evidence continues to accumulate indicating that amphibians and reptiles are being harmed by industrial chemicals released into the environment. Are humans exempt from similar harm? It seems very unlikely." extracts from RACHEL'S ENVIRONMENT & HEALTH WEEKLY 3.1998, offered by Frank Lemckert, Karen Thumm, Stan Orchard and Australian FrogNet erin.gov.au



Bradfield, K.S.* & Ross A. Alford. The effects of behaviour and group size- structure on vulnerability to predators.

Many species exhibit size specific vulnerability to predators; small individuals are often more vulnerable than large ones. It is thus possible that an individual's use of antipredator strategies such as aggregation and changes in activity level or pattern may change with body size. Within size-structured aggregations, the benefits of these strategies may vary among individuals. We used *Bufo marinus* tadpoles, which form size-structured aggregations, to investigate the effects of (1) group size-structure on size-specific predation risks and (2) predator presence on size specific activity levels. Small and large tadpoles exhibited similar activity levels when predators were absent, and both classes significantly reduced activity in the presence of a predatory odonate naiad (*Hemianax papuensis*). Naiads preyed at higher rates on small tadpoles when prey of both size-classes were present. Predation rates on small and large tadpoles decreased with increasing group size. Our results thus indicate that (1) small groups of tadpoles of either size class can reduce their risk of predation by joining other groups and (2) small groups of tadpoles of either size would maximise this gain by joining groups of small individuals. This produces a conflict between the interests of tadpoles of different sizes.

Broomhall, S.* and W. Osborne. Comparative effects of ultraviolet-B radiation on two sympatric species of Australian anurans, *Crinia signifera* and *Litoria verreauxii alpina*.

Increased levels of solar ultraviolet-B radiation (UV-B) (280-320nm) due to ozone depletion may be involved in the declines of a number of amphibian species in the last decade. The research reported here compared survivorship of embryos and tadpoles of a declining anuran species, *Litoria verreauxii alpina*, with a sympatric non-declining species, *Crinia signifera*, under natural UV-B levels in a replicated and controlled experiment established at three different altitudes (1 380 m, 1600 m and 1930 m). At all altitudes the exclusion of UV-B radiation significantly enhanced survival for the declining species *L. v. alpina* and the non-declining species *C. signifera*, with the effect being particularly pronounced in *L. v. alpina*. Overall, the probability of dying was highest in the unshielded, open treatments and lowest under the UV-6 blocking filter for both species over all altitudes. The probability of dying was considerably higher in *L. v. alpina* than in *C. signifera* for a given treatment without exception. The lower temperatures evident at high altitudes appear to have augmented any deleterious effects of UV-B radiation, although the exact mechanism for this is unknown and requires further study. The results support the hypothesis that ultraviolet radiation is a potential factor in the disappearance of *L. v. alpina* at high altitudes in Southern Australia.

Browne, R.K.*, J. Clulow, & M. Mahony. Cryopreservation of sperm from the cane toad (*Bufo marinus*). Sperm cryopreservation has the potential to play an important role in the conservation of genetic diversity in wild and captive populations of endangered amphibians. We know of no published protocol for the preservation of sperm in any amphibian species. Therefore, we investigated possible protocols for freezing amphibian sperm using the cane toad as a laboratory species. Sperm were collected by the maceration of cane toad testes (following euthanasia with MS222) in an isotonic amphibian Ringer. Two cryoprotectants (glycerol and DMSO) were tested at various concentrations in protocols employing fast and slow cooling rates. The results of preliminary experiments showed that rapid cooling to the temperature of liquid nitrogen (-196°C) was detrimental to sperm viability. It was found that cane toad sperm have a high level of tolerance to glycerol and DMSO, and thus it is not critical to minimise the time in solutions containing cryoprotectant. High post-thaw recovery of both sperm motility (> 50% motile) and fertilizing capacity was demonstrated in sperm frozen in DMSO and glycerol based diluents with concentrations varying from 10-20% v/v. The highest fertilization rate was achieved with sperm frozen in 20% glycerol (post-thaw mean fertilization rate of 77 ± 17%).

Bradbury, M.R. Fungal infection and embryonic death in *Crinia signifera*.

Amphibians are considered reliable indicators of environmental condition. Shrinking populations have been reported around the world but declines are irregular and often occur in relatively undisturbed locations. Local and global factors, including UV-B radiation, pH and pathogenic fungi, have been associated with frog declines. In this study mould was observed on embryos of the frog *Crinia signifera* at several locations in South Australia. Fertile *C. signifera* eggs held in the laboratory died as a result of fungal infection. The mould *Rhizopus microsporus* was identified from samples taken from these eggs. It is suggested that the presence of a mould such as *Rhizopus microsporus*, when combined with stream pollution or other stressing factors, has the potential to increase mortality of *C. signifera*.





with compliments Ken Griffiths

Bufo marinus



Byrne, Phillip. Multiple male mating reduces fertilisation efficiency in the West Australian myobatrachid frog *Crinia georgiana*.

Multiple mating by females is a common phenomenon in animals. One hypothesis for the adaptive function of this behaviour is that it ensures fertilisation by avoiding any risk of low sperm number, poor sperm quality or problems of incompatibility. This hypothesis was tested in the West Australian myobatrachid frog *Crinia georgiana* whose mating behaviour is characterised by multiple male single female mating assemblages. The results of the investigation did not support the fertility insurance hypothesis. Comparison between the fertilisation efficiency of egg clutches derived from single and multiple male matings revealed that the involvement of extra males drastically reduced fertilisation efficiency. When a female mated with a single male there was an average fertilisation efficiency of 94%. In matings where females were amplexed by two males, however, there was only 68% fertilisation and where females were amplexed by 3 to 5 males there was only 64% fertilisation efficiency. This result demonstrates a major reproductive cost to females of mating with multiple males and raises questions about the adaptive significance of this behaviour. Alternative hypotheses to explain the evolution of multiple male mating in this species are discussed.

Clark A.K., M. Mahony* and J. Clulow. Triploidy and survival rate of cane toad (*B. marinus*) eggs subjected to cold shock.

The release of sterile males into wild populations has been used successfully with some invertebrate species as a means of biological control. Some characteristics of cane toad biology (such as mating with only one male per spawning) indicate that the sterile male approach may be applicable as a method of biological control for cane toads. One mechanism for producing sterile individuals that has been demonstrated in a number of amphibian species is the induction of triploidy in developing embryos, usually by the application of cold shock to newly fertilized eggs. We examined the feasibility of producing triploid cane toads using cold shock by subjecting freshly fertilized cane toad eggs to cold shock at 0-40C for 0 to 120 minutes. Ploidy was determined in metaphase spreads of chromosomes from the tail tips of tadpoles directly after hatching. The results (20 tadpoles examined per treatment) demonstrated that triploidy could be induced at a high rate (0, 53, 50 and 77% respectively for eggs subjected to 0, 15, 30 and 60 min. cold shock). Survival, however, was inversely proportional to the cold shock interval (and hence rate of triploidy) being respectively 75, 54, 54 and 23%. Chemical induction of triploidy using cytochalasin B was also demonstrated, but the rate achieved was low.

Meyer, E.A.* and C.E. Franklin. Acid tolerance in larval *Litoria fallax* and *Litoria cooloolensis* (Amphibia: Anura).

Disrupting sodium balance, acidic waters of pH 4.5 or less are toxic to most gill- and skin- breathing vertebrates. Nevertheless, there are frog species which naturally reproduce in acidic waters of pH less than 4.5. Amongst these are the 'acid' frogs of the wallum (east Australia's coastal sandy lowlands). Breeding in waters as acidic as pH 3.2, these species provide an excellent model for the study of the mechanisms underlying tadpole acid tolerance. Comparative ion flux, morphological and morphometric data from laboratory-reared acid-frog (*Litoria cooloolensis*) tadpoles and acid-sensitive *Litoria fallax* tadpoles indicate the involvement of resistance mechanisms enabling the maintenance of sodium balance in low pH waters. Such mechanisms include an efficient and presumably high affinity Na⁺ uptake system and increased mucus production at respiratory surfaces (i.e., the gills and tail) with mucus acting as a physical and/or chemical buffer to H⁺ ions in the external environment and/or Ca²⁺ attractant.

Roberts, J. Dale*, Rachel Standish & Paul Doughty. Multiple paternity in the frog *Crinia georgiana*.

Multiple paternity may have both costs and benefits to both males and females. Multiple paternity is apparently rare in anuran amphibians. Only one study, using DNA fingerprints in the phyllomedusine frog, *Agalychnis callidryas*, has conclusively demonstrated that more than one male can fertilise eggs from a single female when both males are in simultaneous amplexus. If focal males are excluded in the rhacophorid frog, *Chiromantis xerampelina*, secondary males can fertilise eggs but no data are available to exclude the possibility that normally, only focal males fertilise eggs. In the myobatrachid frog, *Crinia georgiana*, multiple males amplex a single female simultaneously in a third to a half of matings. Genetic analysis of paternity using gel electrophoresis - yes it still works - showed that at least two males fertilised eggs in two matings, both involving a single female and three males. Males in the standard inguinal position and amplexed ventrally had about equal fertilisation success. Third males amplexed over the right leg apparently fertilised no eggs but may have had a low level of paternity.

Shoulder, J.* and R. Shine. Effects of temperature on developmental patterns in the cane toad *B. marinus*.

The thermal conditions experienced by eggs and tadpoles of the cane toad (*Bufo marinus*) were experimentally manipulated to investigate phenotypic plasticity of development in this species. A single clutch of *B. marinus* eggs was split into three groups and incubated at 170C, 220C or 280C. Tadpoles hatching from each of these treatments were again divided into groups, and raised at each of the incubation temperatures. I monitored morphological traits of the offspring during tadpole life and shortly after metamorphosis. Anti-predator behaviour and locomotor performance of the tadpoles were also quantified, at three trial temperatures. Analysis showed that the temperature at which tadpoles were maintained affected their rate of growth and differentiation, their body shape, anti-predator behaviour and swimming speed. Egg temperature had similar effects on tadpole morphology with incubation at 220C producing larger and faster developing tadpoles. More surprisingly, egg incubation temperature also exerted powerful and long-lasting effects on the phenotypes of the young toads. Individuals incubated as eggs at 220C metamorphosed earlier and at a smaller size than their siblings incubated at 280C.



New at the zoo . . . this eastern dwarf tree frog -2-5-98

Sumner, Joanna. The effect of rainforest fragmentation on reptiles and microhylid frogs in the wet tropics of Australia

The effect of fragmentation on reptiles and microhylid frogs has been little studied. This study investigates the effect of anthropocentric forest fragmentation on the Atherton Tableland in the Wet Tropics of Australia. Two late Wet season and two late Dry season trips have been completed to survey 11 rainforest fragments ranging from 1 to 75 hectares, as well as 7 sites in nearby continuous rainforest. Timed searches were completed at each site, measurements were taken on captured animals, and tail tip, or toes were removed for genetic analysis. Comparisons between continuous and fragmented forest sites show that individual capture rate per hour is related to fragment size for some species, but there is no relationship for other species. Comparisons of morphological characters between conspecifics in fragments and continuous forest found that on average individual* are significantly smaller in fragments. Mark-recapture data shows no evidence of dispersal between sites, and very little movement within an area indicating high site fidelity.

DEFORMED FROGS

In a cluttered UC Irvine science laboratory about 2,000 miles from the bucolic lake where the alarming amphibians were first spotted, the mystery of the deformed Minnesota frogs may be close to being solved. David Gardiner and Susan Bryant, husband and wife biologists, identified their "prime suspect" in the now-famous case of the six-legged frogs--or nine-legged or legless or any of the many other varieties of bizarre deformities that have since been found in frogs in several states. And it is here, in the university's "leg lab," that little tadpoles are growing, swimming about in tiny petri dishes and getting ready to metamorphose into frogs. When they do, Gardiner and Bryant try to duplicate in the lab what some Minnesota school children found in the wild more than two years ago.

The suspected culprit in the deformities, Gardiner announced last month to a conference of scientists in Milwaukee, is retinoids, hormone-like substances that are essential for limb growth but cause major deformities when an organism is exposed to amounts. Derived from vitamin A, retinoids are found in humans, frogs other vertebrates naturally, and are produced by lake plants and other natural organisms. They also can come from pesticides, Gardiner and Bryant said. More experiments are now underway by their partner Bruce Blumberg at the Salk Institute in La Jolla to definitively determine whether retinoids are at work. The experiments will make clear whether chemicals in the lake water are acting like retinoids and binding to retinoic acid receptors, which activate the developmental pathways for limb growth.....

"It's incredible all the stuff they are doing, but you know what? Nobody looked at the frogs," said Gardiner,whatever it was that was affecting the developmental pathways here could have an effect on humans as well," Gardiner said.suddenly they saw a common malformation: The bones, in one frog after another, formed triangular patterns. Instead of growing straight, the bones doubled back in the middle, so that the two ends were near each other and the middle was bent, like an elbow. They knew from their own work and from published studies that a bony triangle is the signature of retinoid exposure, Gardiner said.....Although the EPA is focusing its investigation on ultraviolet rays, Gardiner believes that the culprit is clearly in the water. Species of frogs whose eggs and larvae spend little time in the water are less affected than those whose eggs and larvae spend long periods developing in water, he said.

The deformed frogs have garnered publicity nationwide, but reaction varies, Gardiner said. "People in Minnesota want to know: 'What should I do?'" he said. "They're worried about their kids, about themselves.He was reflecting on the argument posed by some scientists that the culprit cannot be pesticides because those chemicals are used everywhere..... Maybe frogs in Southern California have not been affected because this area does not have the same climate or lakes, but perhaps the chemicals have different effects on different terrain.

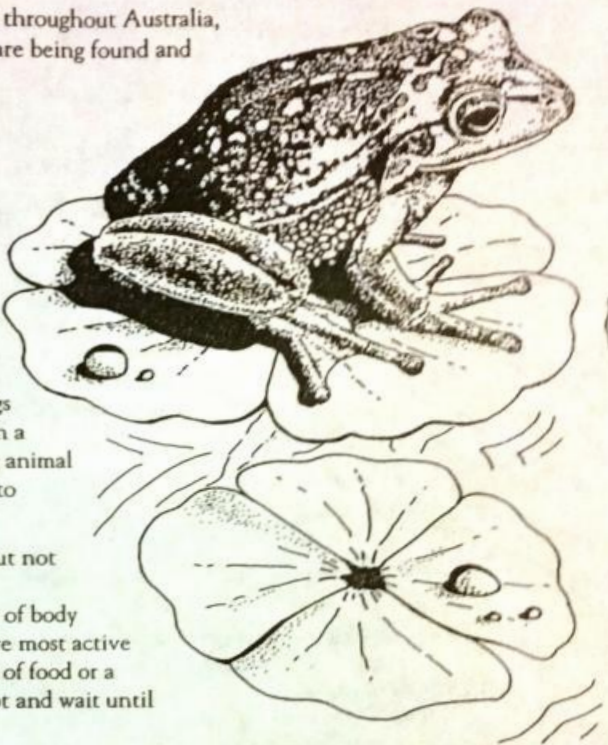


Tadpoles and Frogs

Over 150 species of frogs are known to exist throughout Australia, from rainforests to deserts, and new species are being found and described almost every year.

The Life Cycle of a Frog

Most common frogs live in or around freshwater and lay their eggs in water. The eggs hatch into small tadpoles which grow and develop into frogs over a period of months. This change from tadpole to frog is called metamorphosis. The process involves not only the growth of legs, arms and loss of the tail, but internal gills are replaced by lungs and the digestive system changes to cope with a diet of insects rather than algae and decaying animal matter. The aquatic tadpole metamorphoses to become a land-dwelling frog.



Frogs are able to survive away from water, but not for long. Their thin, permeable skin is not waterproof, which means they can lose a lot of body water on warm days. For this reason, frogs are most active at night when they will hop about in search of food or a mate. During the day, they find a hiding spot and wait until the heat and light of the sun has passed.

Most people only realise that frogs are about when they hear frogs calling near a pond or stream.

Each frog species makes its own peculiar sound, but it is the male frog that does all of the calling to attract the females. If the female frog is also ready to breed, she will approach the male frog, he will climb onto her back (this embrace is called amplexus) and she will carry him to the egg-laying site. As she releases her eggs, the male frog releases sperm over the eggs. Fertilisation occurs outside of her body, usually in pond water. The fertilised eggs develop and hatch to produce tiny tadpoles.

Frogs Are an Indicator of a Healthy Environment

Frogs and tadpoles are sensitive creatures as they have thin, porous skins that absorb chemicals from the air and water. For this reason, frogs are good indicators of environmental damage. In areas where water or air pollution has occurred, the local frog community will be affected. If you go to an area where there are lots of frogs, this area is likely to be unspoiled. In a polluted area there are very few frogs. In some mining and industrial sites, surveys of frogs in the local area have been used to detect accidental pollution of waterways.

**NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE**

A World-wide Decline in Frogs

Scientists have reported the disappearance of many frog species all over the world. There are many reasons for the decline of frogs world-wide, but all are related to human activities.

- 👉 Swamps and ponds are being filled in or the water is so polluted that the tadpoles and frogs cannot survive.
- 👉 Industrial gases released into the air react to form "acid rain".
- 👉 Chemicals such as pesticides, herbicides and fertilisers are misused.
- 👉 Damage to the ozone layer increases the levels of ultra-violet light.
- 👉 Exotic fish which eat frog eggs and tadpoles are being introduced.

Frogs are also disappearing in Australia. Eight frog species have become extinct in the last 25 years and several more are likely to become extinct in the near future. The destruction of the environment will result in the loss of more species, and perhaps lead to the Earth being a place where no creature can live.

Keeping Frogs

All frogs and tadpoles are protected in NSW. Never take frogs from the wild, damage their ponds or habitat. Some frogs and tadpoles, which are available from societies (such as the Frog and Tadpole Study Group), can be kept as pets. These have either been bred in captivity or cannot be released back into the wild.

Frogs are sensitive creatures and are easily killed (sometimes merely by picking them up). To successfully keep frogs you need to know how to look after them. They need live food, and will not readily eat dead or non-moving food items. Frogs need clean water, an environment with shelter and feeding space.

Tadpoles are a little easier to keep. They need clean water (tap water needs to be treated to remove chlorine compounds to make it safe for tadpoles) and a diet of suitable plant food. Their pond needs rocks to climb onto when they metamorphose and areas to escape from the sun.

Licences to Keep Frogs

To keep a frog or tadpole, you need a licence from the NSW National Parks and Wildlife Service. There are various categories of licence, depending on how hard it is to keep in captivity and whether it is an endangered species. You will receive a log book to keep records of your animals, and information sheets on where to get advice or how to look after your pet.

Children and institutions may collect small numbers of tadpoles to observe them changing into frogs, without requiring a licence. The frogs that develop must be returned and released in the areas where the tadpoles were collected.

For further information, please phone the NPWS Information Line on (02) 9585 6333 or the FATS Group Frogwatch -Helpline on (02) 9371 9129 or (02) 9599 1161. You are welcome to attend FATS Group meetings, which are held every first Friday of every even month at the Australian Museum in Sydney at 7.30 pm (William Street entrance). www.fats.org.au

Jlmo. 298/0309

PO Box 296 Rockdale NSW 2216

GREEN warriors

THE SUN-HERALD

By SARAH FORD

DANIEL Avis, 20, Lisa Newman, 20 and Jesse Richardson, 21, love the outdoors but they never planned to become guardian angels of the nation's environment.

That was before they joined the ranks of nearly 1,300 other young Australians who last year planted more than half a million trees, built 1,000 kms of walking tracks and destroyed 1,200 rabbit warrens in projects to save and preserve the country's natural heritage.

They are known as the Green Corps: Young people who battle away in the bush to protect natural species such as koalas and wallabies and preserve Aboriginal cultural sites for future generations to enjoy.

The trio didn't know what to do when they left school but decided to test their passion for the land last December by signing up as members of Green Corps, a Federal Government program for volunteers aged 17 to 21 who are keen to work on an environmental project for six to 12 months.

MOST projects are in rural and remote Australia but their 20-strong group weeds, digs and plants in an area overlooking Sydney Harbour at Taronga Zoo. Young people involved in the projects tear weeds from the hillside and replace them with plants that form a friendly habitat for local frogs, skinks and birds.



February 22, 1998

get another job," he said.

Ms Newman, from Greystanes in Sydney's west, and Mr Richardson, from Hobart, both said the project had taught them to respect the environment and realise the impact people had on it.

They spent one week in fire-ravaged bush near Lithgow in western NSW re-establishing a walking track that was burnt out in fires last December.

Their project manager, John Hilliard from Australian Trust for Conservation Volunteers, said the group worked from 8am-6pm every day replacing wooden steps and bridges.

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Scientists give corroboree frog chance to dance again

By SIMON BENSON
Environment Reporter

SCIENCE may have saved one of Australia's most endangered amphibians.

The striking black and gold southern corroboree frog was thought to be near extinction.

A radical captive breeding program, where frog eggs taken from the wild were artificially reared into tadpoles, a process largely seen as the frog's last chance for survival, has proved successful.

The captive tadpoles, recently released into the bogs and woodlands of the Snow Mountains in NSW, have all metamorphosed and "crawled away into the bush".

A census last year by the National Parks and Wildlife Service found



The southern corroboree frog ... back from brink

only 102 male frogs were left in the wild.

Their major theoretical threats have been hypothesised as habitat disturbance, prolonged drought, increased UV radiation and even global warming. But last year, bushfires near the

colony threatened to wipe out the entire population in a single blow, including the captive tadpoles just released.

Scientists feel that it is now safe to say the tadpoles survived and the frog species has another chance.



INVITATION TO GO FROG SPOTTING

Our Field Trip Co-ordinator, Ken Griffiths is continuing his invitation to all FATS members. Join him frog spotting. Please call Ken on 9520 9961 between 7pm and 8pm. He regularly goes on long and short, easy and rigorous excursions and would be very happy to include enthusiasts. Families welcome. So don't be shy. Give him a call! MW

Three children who owned frogs went to a pet shop. The owner charged them \$30 for 3 bags of crickets. So each paid \$10. A little while later the pet shop owner realised the crickets cost only \$25, so she sent the shop assistant back to the 3 children with \$5. On the way to the frog owners, the assistant couldn't figure how to split the \$5 between the 3 children so she just gave each one of them \$1 and kept the other \$2. That left the 3 frog owners paying \$9 each for the crickets. $3 \times 9 = 27 +$ the 2 that the petshop assistant kept = \$29.

WHERE'S THE OTHER DOLLAR?????

Think about it, where is it?????

with compliments Ken Griffiths



Litoria fallax

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Vacant	Editorial Panel		
Vacant	Editorial Panel		



ENVIRONMENTAL TUNNEL VISION

Worried that we are losing too many frogs, toads and other amphibians under the wheels of cars, environmentalists from Texas to Germany have hit upon a dubious solution building express tunnels that let the crossing critters crawl underneath the highway. These aren't Chunnel-size public works projects. Most amphibian tunnels are variations on a run-of-the mill drainage culvert, but that doesn't mean they're cheap to build. Florida State University professor Bruce Means is spending two years and a \$40,000 grant while he figures out how to design a tunnel that will bisect a stretch of U.S. Highway 319 outside Tallahassee. The City of Davis, Calif. spent \$12,000 on a toad tunnel, but no one knows if it has worked. Part of the problem: figuring out how to guide the gopher frog and striped newt through the portal. Means thinks the Florida Department of Transportation may need to build a 3-foot-high, 200-yard-long retaining wall to guide the animals. Best to plan ahead with this sort of thing. The city of Davis, Calif. spent \$12,000 on a toad tunnel in 1996, but no one seems to know if it has worked. "I don't really know, and I don't know if anybody's gone over there to check," admits Davis Mayor Pro Tem Julie Partansky, who first advocated the tunnel when she was on the city council. Partansky suggests that anyone else who builds a tunnel somehow simulate starlight in the passage to help lure the animals through. Peter Kafka HERPDIGEST 9/5/98 Editor A. Salzberg

We hold six informative, informal, topical and practical meetings each year at the Australian Museum (William Street entrance) in Sydney. Meetings are held on the first Friday of every even month (February, April, June, August, Oct. and Dec.) at 7 pm for a 7.30 start. Visitors are welcome. We are actively involved in monitoring frog populations and in other frog studies, and we produce the newsletter FROGCALL and FROGFACTS information sheets. All expressions of opinion and information are published on the basis that they are not to be regarded as an official opinion of the Frog and Tadpole Study Group Committee unless expressly so stated.