

# FROG CALL



THE FROG AND TADPOLE  
STUDY GROUP OF NSW INC.

NUMBER 45 - January 2000  
PO Box A2405  
Sydney South NSW 1235

THE NEXT MEETING: 7 PM, FRIDAY 4<sup>th</sup> February 2000  
for a 7.30 pm start at the AUSTRALIAN MUSEUM (WILLIAM ST ENTRANCE)

Meetings are held on the first Friday of every even month  
(February, April, June, August, Oct. and Dec.).

2000/2001 membership fees will rise by \$5.

Smiths Lake Field Trip reminder  
weekend of 18 to 20 / 2 / 00 contact  
Arthur and Karen White 9599 1161



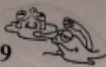
## MEETING FORMAT for 4<sup>th</sup> January

- 7.30pm Guest speaker:  
Trent Penman "Factors that affect the growth and  
development of Green and Golden Bell Frog tadpoles".
- 8.15pm 5 favourite frog slides or 5 minutes
- 8.40pm Guessing competition and Auction
- 9.00pm Finish for tea, coffee & biscuits

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Arthur White opened our last meeting and advised us that the Australian Reptile Park at Somersby had again invited FATS members to free entry and BBQ at the ARP for Christmas on the 5<sup>th</sup> December 1999. Announcements included Manly Ocean Care Day display in December and the Annual Herpetology meeting at Alice Springs. A venture concerning Cane Toad Awareness has been established between the National Parks and Wildlife Service and FATS focusing on Northern New South Wales, including Lismore, Balina, Yamba and Port Macquarie. There have been 50 Cane Toads collected in Sydney over the last 2 years, probably transported in landscape supplies from the North Coast of NSW. Woodchips, compost, hollow concrete, bessa bricks convey Cane Toads to building sites and garden supply outlets. Please don't kill them. Other ground frogs are being mistaken for Cane Toads. Do contact Arthur. If they get into the Western River System they will go berserk - a disaster waiting to happen.

Thomas Franco, a year 8 student presented his project on tadpole development. Thank you for an excellent, mature and scientific presentation. He studied *Limnodynastes peronii* Striped Marsh Frog tadpoles in July '99. Box 1 had only tap water and water ager, box 2 included water plants and live gravel and box 3 contained frog pond water, mull, with mudeyes (dragonfly larvae) removed. Box 2's tadpoles grew the fastest and boxes 2 and 3's tadpoles were double the size of box 1 tadpoles. Thomas concluded that environment affects growth.

Arthur White spoke about Frogs as Bio-indicators. Bio-indicators are organisms that are responsive to environmental changes. These changes may be subtle and not immediately obvious to an onlooker. The most famous bio-indicator in history was the canary in the coal mine; these birds were particularly sensitive to methane gas. If the bird stopped singing, or worse still, if it fell off its perch, the mine was quickly abandoned. Some soft-bodied animals have been used as bio-indicators in aquatic environments. In Australia, aquatic insects and crustaceans have been used extensively in this way. They have been used in preference to chemical or laboratory methods of water testing as they are cheaper to survey and more reliable. After all, aquatic insects develop and mature in water and pollutants that are presents are more likely to show up in organisms that live in the test environment than in one-of water samples taken for laboratory analysis. Bio-indicators may respond to a single pollutant (such as the canary and methane) or respond to a whole litany of compounds (as occurs in cases of water pollution).

In Australia, there has only been one case of frogs being used as bio-indicators and this was at the Ranger Uranium mine in the Northern Territory. During the wet season, flood waters around the mine carried unknown substances away from the mine site out into the creeks and flood plains nearby. Laboratory testing was inconclusive but regular surveys of the tadpoles in the creeks showed a high incidence of abnormalities. These abnormalities were later linked positively to metal pollution from the mine and paved the way for stringent environmental controls to be put in place.

In 1998, the Blue Mountains City Council, Sydney Water, NSW National Parks and Wildlife Service and other agencies banded together to form an urban run-off task force for the

been prolific but residential land sites are confined to the upper ridges. The lower ridges, valleys and creeks receive the run-off from these areas. Sydney's drinking water is mainly collected in Lake Burragarang which was believed to be impacted by the run-off from the Blue Mountains cities. I was asked to prepare a submission for the task force about the possible ways that frogs could be used as bio-indicators of this run-off. In December 1998 I was given the go-ahead to embark upon a program of testing the creeks and swamps of the upper Blue Mountains using a method based on frogs.

As the use of frogs as bio-indicators is not well established, it was important that their usefulness could be determined in an objective manner. To do this a range of sites across the Blue Mountains were visited, the purpose here was to find streams and swamps that were suspected to have urban run-off effects and identical sites that could not be run-off effected. 22 pairs of sites were eventually selected; one member of the pair being in an urban-affected area the other well outside of urban impacts. Sites were matched for elevation, aspects, vegetation, topography, catchment size and flow characteristics.

Each pair of sites were surveyed on the same night of the year. This was done to reduce any weather effects on frog results between sites. Groups of keen volunteers were recruited and trained to carry out the bulk of the survey work. Each site was monitored in three ways: a transect was made across a fixed distance and all of the frogs seen and heard along the transect were recorded; secondly, a frog-call survey was done over 15 minutes, and finally, a tadpole survey was carried out.

Ten frog species were found during the surveys: all ten were found in non-urban sites whereas only five species were present in the urban-affected sites. The total number of frogs found was very similar between sites but the urban-affected sites were dominated by two species only; whereas the non-urban sites had many more species present but with different species dominating in different areas. Calling frequency and calling species were much less in the urban-affected sites and tadpole were also fewer.

On the basis of the results, the urban sites could be ranked according to how badly affected they were (from the frogs' point of view). These sites were later re-visited and chemical analysis strongly supported the frog data. The ten frog species could be ranked according to how sensitive they were as bio-indicators: the most sensitive species were never found in urban-affected sites; some species were able to exploit moderately affected sites while some flourished in urban-affected areas. The two frogs species that were intolerant of urban impacts were Red-crowned Toadlets *Pseudophryne australis* and their close cousins Bibron's Toadlet *Pseudophryne bibronii*. The species that actually increased in urban-affected sites were the Striped Marsh Frog *Limnodynastes peronii* and the Common Eastern Froglet *Crinia signifera*. Clearly, frogs can be used as bio-indicators but more work needs to be done to establish which pollutants each frog species is responding to.

Slides included stuttering, great barred, mixophyes and hip pocket frogs. Thank you Lothar Voigt for announcements and Arthur White for the presentation, and Frogcall text. Danie Ondinea our Botanist/ecologist spoke about the fast disappearance of wetland plants. The nursery for native plants is at 2a Barker St Randwick. Guessing competition winners were Jennifer Clark and Denise De Vreeze. MW



## THE PLAGUE MINNOW (*GAMBUSIA HOLBROOKI*) MENACE.



**G**ambusia holbrooki commonly called Mosquito Fish or Plague Minnow was first introduced into Australian waters as a mosquito control agent in 1905. It gained wide spread as a mosquito control during the 1920's and 1940's by both military and civilian authorities worldwide (Lloyd, 1990). The introduction of *G. holbrooki* provided our waterways with the water equivalent of the rabbit and fox as exotics on land. *Gambusia holbrooki* reproduces like a rabbit and eats almost anything like a fox. *G. holbrooki* will consume aquatic and land invertebrates, the eggs, and larvae, of native species of fish, tadpoles, and will even eat their own young if given the opportunity or if other food sources are scarce. These fish are easily observed, they are the little fish infesting almost every waterbody and swarm in shallow and surface water.

The fact that little work had been conducted on the potential impact of *Gambusia* is highlighted by the fact that there has been some confusion over which species of *Gambusia* is present in Australia. Lloyd et al (1985) discussed that fact that all *Gambusia* in Australia are a subspecies of *G. affinis* that is *G. affinis holbrooki*. Then Lloyd (1990a) stated that Australia has only *G. holbrooki* and references his 1985 paper (Lloyd and Tomasov, 1985) and Wooten et al (1988) as recently separating *G. affinis* into two subspecies. Confused? I know I was. For me the question arose do we have *G. holbrooki* or *G. affinis holbrooki*? Tom Trnski from the Australian museum provided me with the explanation: The subspecies *G. affinis holbrooki* has been upgraded to species status *G. holbrooki* so for now at least Australia's *Gambusia* population is thought to contain only *G. holbrooki*. So the common and scientific name of the species is the Plague Minnow (*Gambusia holbrooki*).

Arthington et al. (1990) demonstrated that introduced species particularly *G. affinis* (actually *G. holbrooki* see above) seems to have a competitive advantage over other Australian native species especially in disturbed habitats. It is able to tolerate a range of salinities from completely freshwater to full seawater, however, it prefers low salinities. It can tolerate a range of temperatures from 0.5 to 38°C but prefers warmer water around 31°C. During winter months in southern NSW a marked reduction in population occurs from the colder water and perhaps a reduced food production in water bodies. They can also tolerate water acidity and pollution levels that would kill native species. Their upward facing mouth allows them to utilise the higher oxygen surface layer in the water so it can survive in hypoxic (low oxygen) water (0.2 mg/L dissolved oxygen). These wide environmental tolerances make it a very hardy fish. During the 1950 to the present *G. holbrooki* has been kept as an aquarium fish by beginners due to its hardiness. This has provided it with further opportunities for introduction to waterways as these fish may be released. NSW fisheries now strictly prohibit the release of *Gambusia* species and they have been declared a threatening process in NSW by National Parks and Wildlife. *G. holbrooki* produce from 20 to 200 live young depending on the size of the female. They can potentially reproduce in three weeks but are more likely to reproduce at about 2 months, taking 6 months to reach maximum size. Since they produce live young the larvae immediately have a competitive advantage over egg laying natives fish species. The negative impact of *G. holbrooki* on native fish species (Howe et

al., 1997, Lloyd, 1990A) and frogs species (Web and Joss, 1997) is well established and indicates the potential damage this species can cause, often almost or completely eradicating the natives. Once established in an area *G. holbrooki* has the potential to stop the recruitment of native fishes due to the effects of pre-emptive (competitive exclusion), by occupying habitats and consuming resources, or by simply consuming larval fishes. Adult fishes may be excluded from an area due to harassment from *G. holbrooki* as they nip or eat the fins. *G. holbrooki* will attack much larger less aggressive species such as sea mullet (*Mugil cephalis*). This is fairly impressive since *G. holbrooki* reach a maximum size of around 50mm whereas the Sea Mullet reaches a maximum size of 7600mm.

Moyle and Light (1996) suggested that environmental factors are likely to have a bigger impact on the successful invasion of exotic fish species than animal interactions in California. Floodgates in tidal areas create desirable *G. holbrooki* habitat, as *G. holbrooki* prefer slowly moving water. In estuarine environments the restoration of tidal flow in saline areas is likely to decrease the numbers of this pest species in Australia by increasing saline tidal flow and allowing movement of predators. Arthington et al. (1990) suggested that introduced species were rarer in natural habitats compared to disturbed habitats. So habitat rehabilitation might provide the means for controlling introduced species. Many native gudgeons such as the Flathead Gudgeon (*Philypnodon* species), Striped Gudgeon (*Gobiomorphus australis*) and Empire Gudgeon (*Hypseleotris compressa*) will eat the young of *G. holbrooki*. So rehabilitation of waterways and wetlands to provide greater species diversity may allow native species the opportunity to control their numbers. **By Alan Genders.**

Reference List Arthington, A. H., Hamlet, S., and Bluhdorn, D. R. (1990). The role of habitat disturbance in the establishment of introduced warm-water fishes in Australia. Introduced and translocated fishes and their ecological effects, Bureau of Rural Resources. Australia: Australian Government Printing Service

Howe, E., C. Howe, R. Lim, & M. Burchett. (1997). Impact of the introduced poeciliid *Gambusia holbrooki* (Girard, 1859) on the growth and reproduction of *Pseudomugil signifer* (Kner, 1865) in Australia. Marine and Freshwater Research (Australia), 48(5): 425-434.

Lloyd, L.N., & J.F. Tomasov. (1985). Taxonomic status of the mosquitofish *Gambusia affinis* (Poeciliidae), in Australia. Marine and Freshwater Research (Australia), 36: 447-451.

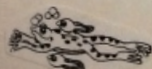
Lloyd, L. N. (1990). Native fishes as alternatives to the exotic fish, *Gambusia*, for insect control. Introduced and translocated fishes and their ecological effects, Bureau of Rural Resources. Australia: Australian Government Printing Service

Lloyd, L. N. (1990a). Ecological interactions of *Gambusia holbrooki* with native fish species. Introduced and translocated fishes and their ecological effects, Bureau of Rural Resources. Australia: Australian Government Printing Service 94 p.

Wooten, M.C., M.H. Scribner, & M.H. Smith. (1988). Genetic variability and systematics of *Gambusia* in the southeastern United States. Copeia, 283-289.

Moyle, P.B., & T. Light. (1996). Fish invasions in California: Do abiotic factors determine success? Ecology, 77 (6): 1666-1670

Editor: Alan is completing Masters on fish ecology in estuaries at the University of Newcastle. He is also founding treasurer of the Society of Frogs and Reptiles.







▲ Larval stage  
of the Giant  
Burrowing Frog

photos and diagram below from Ken Griffiths' book  
"Frogs and Reptiles of the Sydney Region"



▲ GIANT BURROWING FROG *Heleioporus australiacus*

## FROG INFORMATION PROFILE

**Scientific Name:** *Heleioporus australiacus*

**Common Name:** Giant Burrowing Frog or Eastern Owl Frog

**Distribution:** This large frog is found along the coast and adjacent ranges from the Watagan Mountains north of Sydney down into eastern Victoria. Individuals have been found at above 800 metres right to the edge of the sea.

**Physical Description:** Males grow to 100 millimetres in length and, unusually for frogs, are larger than the females as they only reach 80-85 millimetres. They are a grey-brown, grey or blue-grey colour above and creamy coloured below. Individuals can have varying amounts of yellow spots and blotches along the sides and thighs, ranging from nothing at all to striking yellow patches. Southern individuals tend to have more yellow than northern frogs, but any population can have the complete range of markings. Southern frogs generally have a yellow ring around the tail area, but this should not be used as a certain identifying feature. Males are notable for having greatly enlarged forearms (like Popeye the sailor) and numerous black spines on the fingers. Most notably, they have a prominent black thumb spike that may be used for both defence and in male-male combat. The tadpoles are rotund beasts and can grow up to 80mm long. They are more often about 60-70mm before metamorphosis and are black above with a steel blue belly.

**Breeding Biology (including call):** The breeding activities of this species can best be described as unpredictable. Calling and egg laying appears most likely to occur from November to March after heavy rainfalls, but no activity takes place on many apparently suitable nights and calling can be heard at any time of the year. Most usually, the males call from within burrows constructed in the banks of ephemeral and permanent streams. They do sometimes also call from burrows or above ground adjacent to permanent pools. The call is a rapidly repeated set 4-6 notes forming an owl-like "who who who who who" (which gives it one of its common names). The males can also use a very long drawn out ascending "whooooooooop" call as an apparent territorial call and distressed frogs can make a very mechanical sounding squeak. Eggs are often laid in a chamber at the end of a burrow (10-40cm in depth). Egg numbers are variable, 250-1000, but very few egg clutches have been found. The eggs become inundated after heavy rain and the tadpoles are washed out of the burrow into a watercourse or dam. Eggs have also been found laid directly into a fire dam and creek under overhanging fern on the edge of the stream.

**Habitat Requirements:** The giant burrowing frog can be found in heathlands, open woodlands, dry sclerophyll and wet sclerophyll forests (the latter most notably in the south) and gully rainforest. It does not appear to survive in areas where native vegetation has generally been cleared. When not breeding, individuals will roam extensively and can be found several kilometres from water. At this time they shelter under logs or burrow just below the surface of the ground where they may stay for several days until suitable conditions (usually rainfall) allows them to start foraging again. They eat invertebrates and will tackle almost anything including items likely to be avoided by other frogs such as centipedes and bulldog ants. Nobody is sure how long individuals can live for.

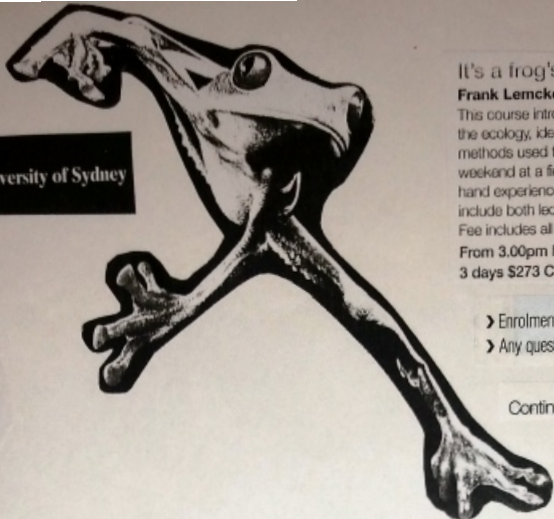
**Similar Species:** This frog is similar in appearance to the banjo frog (*Limnodynastes dumerilii*) and these two species are often confused. The giant burrowing frog is distinctive for not having a large tibial gland (gland found about the middle of the hind leg of the banjo frog).  
**Jacqui Recsei and Frank Lemckert**







The University of Sydney



### It's a frog's life

**Frank Lemckert**

This course introduces the world of Australia's frogs. Topics include the ecology, identification and conservation of frogs and the methods used to locate frogs. The course will be run over a weekend at a field studies centre where participants will gain first-hand experience with these little-known creatures. The course will include both lectures and work in the natural environment. Fee includes all meals and dormitory-style accommodation. From 3.00pm Friday Jan 28 - 10.30am Sunday Jan 30  
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- › Any questions? [info@cce.usyd.edu.au](mailto:info@cce.usyd.edu.au)

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### Spawn to rule: Ms McLean admires a green tree frog with Dr Napthine during her campaign visit to the Burwood electorate yesterday

**MISHA SCHUBERT**

**LANA McLean** launched herself on the political world yesterday first by being piddled on by a live frog in a pet shop, then buying chocolate frogs and finally talking about her own pet frogs, Freddo and Frieda.

The Liberal candidate for Jeff Kennett's former seat of Burwood revealed herself as a frog obsessive in her first streetwalk of the electorate yesterday.

The amphibian obsession surfaced time and again as she met the locals — sporting a gold frog lapel badge. "God save the frog," she said, urging all Victorians to buy a frog badge to fund research into the endangered species.

It was a surreal start to the Liberals' by-election campaign, following Ms McLean's surprise preselection win over high-profile contender Helen Kroger, former wife of party powerbroker Michael Kroger.

Ms Kroger's loss on Monday night was regarded as a serious blow to the many senior party figures who privately campaigned for her endorsement.

With Labor's single-seat grip on government, the Liberals must retain Burwood to keep the pressure on Premier Steve Bracks, who relies on the votes of three Independents for every piece of legislation.

While the Liberals hold the seat by a 6.8 per cent margin, Ms McLean said she expected

the campaign to be tough. "I don't take anything for granted," she said.

The 47-year-old education consultant and company director is the party's South Yarra branch president and was Liberal candidate for the safe Labor seat of Melbourne in the September 18 election. She said she would campaign on issues of health, police, planning and education.

Although she now lives outside the electorate, Ms McLean has promised to move into the area, where she lived as a child.

Opposition Leader Denis Napthine said he would ask Mr Kennett to campaign for Ms McLean, but later suggested Burwood voters were hoping for more personal attention than they received during Mr Kennett's 23-year tenure.

"This electorate had a very high-profile member for a number of years, both as leader of the Opposition and as premier. I think they are now looking forward to having a local member who can represent their local interests," he said.

Dr Napthine described Ms McLean as "frontbench material", but said the first step was to install her as the member for Burwood.

Labor candidate Bob Stensholt, campaigning with Mr Bracks, declined to comment on the local frog population.

"We want to concentrate on the real issues — health, education, community safety and openness of government."

## Lady of the frogs steps into shoes of fallen prince



Picture: ALAN FUNNELL

THE AUSTRALIAN

[www.news.com.au](http://www.news.com.au) Wednesday November 17 1999





## FROGBITS AND TADPIECES

### LIST OF FROG FRIENDLY VETS

Can you add to this list?

Taken from the Internet :

Teri Bellamy 9604 9792 / 9604 9300 at  
Canley Heights or 9606 9312 at Austral.  
Clayton Night from the Deception Bay Vet Clinic.  
directory.<http://vahrper.future.easyspace.com/pages/australia.htm>



### CHYTRID

An article that gives the details on how to use histological sections of amphibian skin to diagnose infection with *Batrachochytrium dendrobatidis*, the amphibian chytrid fungus. Follow the link at the Amphibian Diseases Home Page <http://www.jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm>. The article is an original one, available at the moment only on the WWW. We have made it available as a step in assisting others to gain the skills to diagnose chytridiomycosis.

The article is Berger L, Speare R, Kent A. Diagnosis of chytridiomycosis in amphibians by histologic examination. <http://www.jcu.edu.au/school/phtm/PHTM/frogs/histo/chhisto.htm>

At the Amphibian Diseases Home Page we have also added a link to a paper just published on line in Emerging Infectious Diseases. This is by Daszak et al. and reviews the evidence for *B. dendrobatidis* and *ranaviruses* playing a role in amphibian population declines. URL for this link to emerging Infectious Diseases can be accessed from the Amphibian Diseases Home Page or directly at <http://www.cdc.gov/ncidod/EID/vol5no6/daszak.htm>.

### 'SOFT CAGES' FOR HOLDING FROGS

Happy new year frognet colleagues! We are trying to develop a holding enclosure for rehabilitated frogs which are nearly ready for release back to the wild. Such frogs often bang their way around the plastic and glass tanks they are kept in, injuring the snout - this prolongs release as they have to be held longer while the injured snout is treated. We would like to develop an enclosure with an external frame and a removeable internal fabric lining which would be easy to clean, not interfere with air circulation and not injure the frog when it jumps into the sides. Has anyone seen or already created such an enclosure? Cheers, Deborah Pergolotti  
[frogcrusader@north.net.au](mailto:frogcrusader@north.net.au) Cairns Frog Hospital P.O. Box 2731, Cairns, FNQ 4870 (0418) 152 199 mobile



The Giant Burrowing Frog spins backwards into the ground, using its powerful back legs.

photo from Ken Griffiths' book  
"Frogs and Reptiles of the Sydney Region"

## MAN WANTS TO BECOME REPTILE

ALBANY, N.Y. (Reuters) - Philosophy doctorate student Erik Sprague wants to explore the meaning of life as a reptile. Sprague has had his teeth sharpened, bumps implanted into his forehead and green scales or swirls tattooed across his face and body in his quest to become a reptile. "I like reptiles, especially sea crocodiles, although many of them don't make great house pets," said Sprague, 27, who is taking a break from his studies in the State University of New York in Albany to appear in circus shows, like the Jim Rose Circus. Sprague claims he is one of five people in the world who have undergone what he calls "single-theme conversions" and appear in circus side shows. The others have appeared as a zebra, tiger, leopard and a gigantic blue puzzle known as "The Enigma." He is the first to choose a reptile. He does not consider himself odd, he says, because many people tattoo themselves. Sprague counts sword-swallowing, fire-breathing, tapping nails into his nose and piercing needles into his cheeks among his other talents. He also picks up bar stools with ropes attached to his ears and swings them around. Another of his tricks is to lift car batteries with chains attached to his nipples. He is scheduled to appear next month on Turner Broadcasting System cable channel's new "Ripley's Believe it or Not."

With comp Martyn Robinson

[martynr@austmus.gov.au](mailto:martynr@austmus.gov.au), Ruth and Dennis King and Eric Pianka

### FERTILIZER REPORTED DEADLY TO FROGS

CORVALLIS, Ore. (AP) - Fertilizer levels the EPA says are safe for human drinking water can kill some species of frogs and toads, according to a new study. Oregon State University researchers found some tadpoles and young frogs raised in water with low levels of nitrates typical of fertilizer runoff ate less, developed physical abnormalities, suffered paralysis and eventually died. In control tanks with normal water, none died. In addition, the fertilizer runoff may be encouraging the growth of algae that feeds tiny parasitic flatworms called trematodes, blamed for causing deformities in frogs around the United States. Scientists internationally have reported a sharp decline in the numbers of frogs, toads and salamanders in many locations.

<http://www.infobeat.com/stories/cgi/story.cgi?id=2563085798-dcb>

Warwick Smith <[warwick.smith@npws.nsw.gov.au](mailto:warwick.smith@npws.nsw.gov.au)>

### DECLINES AND DISAPPEARANCES OF AUSTRALIAN FROGS

Dear Frognetters, Just to let everyone know - we printed 500 copies of this publication -and I did a quick mail out on Xmas eve (one copy to all authors and reviewers and various frog groups etc). Also copies have been deposited via the Library deposit scheme to all major libraries etc. We will also be posting a pdf file of the publication on the EA website shortly If you would like a copy please contact me, copies are available by ringing Environment Australia's Community Information Unit on 1800 803 772 cheers  
Alastair.Campbell@ea.gov.au



## CONFERENCE/WORKSHOP ON REDUCING RISKS DUE TO DISEASE

I have posted a preliminary announcement about a conference/workshop we intend to host next year in Cairns. The topic will be diseases of free-ranging amphibians, particularly strategies to reduce the impact on amphibian populations.

<http://www.jcu.edu.au/school/phtm/PHTM/frogs/feedback.htm>.

Very few things about this event are set at this stage. We are looking for comments on dates, structure, and what questions should be addressed particularly from the management and policy viewpoint. The importance of the management outcomes has been demonstrated by the initial funding support from the National Heritage Trust specifically to hold a workshop on management strategies and policies to reduce risks of disease to Australia's natural amphibian populations. Please visit the site and tell us what you want from this event. Rick Speare School of Public Health and Tropical Medicine James Cook University Townsville 4811

## Monitoring Frogs in New England

The University of New England Environment Group is hoping to establish a community based frog monitoring program in conjunction with interested individuals, landholders and community groups. Anyone who is interested in more information about New England's frog species, or how to become involved in frog monitoring programs, can contact the UNE Environment Group, UNE, Armidale NSW 2351, or David Paull on (02) 6773 2885.

Threatened Species Network NSW "The Web" December 1999



## NORTH QLD THREATENED FROG RECOVERY TEAM MEETING MINUTES: TOWNSVILLE AUGUST 1999.

QPWS staff informed the Team that an automatic frog recorder (AFR) was installed at the *Taudactylus rheophilus* site on Mt. Lewis. It was set to record for 25 days for 2 minutes each day, from 18:00 to 18:02. The initial period of recording was 11th June -5th July. The tape was replaced on the 12th July and continued for a further 25 days till the 5th August. The second tape has yet to be picked up.

No frog calls were recorded on the first tape. It is thought that a AFR would be more effective at the *T. rheophilus* site on the summit of Mt. Bellenden Ker because there is less background noise at this site.

## INFECTIOUS DISEASE ON THE RISE AMONG WILDLIFE

Crowded living conditions, moving to new places and eating unusual foods can spread disease – among wild animals, too. A new study warns that when it comes to the globalization of the planet, animals face a lot of the same hazards as people, including so-called emerging infectious diseases. "We call it pathogen pollution," said Peter Daszak of the University of Georgia, lead author of a paper appearing in today's edition of the journal *Science*.

A sentence I thought of interest to us was, "For example, researchers have determined that a type of herpes virus that is harmless to African elephants can be fatal to their Asian cousins." The rest is at <http://www.cnn.com/2000/NATURE/01/20/pathogenpollution.ap/>

The actual paper, "Emerging Infectious Diseases of Wildlife— Threats to Biodiversity and Human Health Peter Daszak, Andrew A. Cunningham, and Alex D. Hyatt *Science* Jan 21 2000: 443-449." is at: <http://www.sciencemag.org/content/current/ASalzbergherp-1@ucdavis.edu> WASHINGTON (AP)

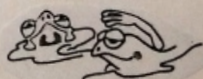
## FROG FOLLIES

At the start of November, we heard that a Browns Plains housewife, unknowingly put one of her frogs through the family wash. After a clean in OMO suds, it was rinsed and finally spun dry – no wonder it emerged with its head to one side.

After resting for the day, it moved off to hunt during the night, apparently able to cope with the necessities of life again.

## SOME FROGGY SITES

<http://dency.com/bombina/froglinks/>  
<http://dency.com/bombina/multiverse/>  
Berger L, Speare R, Kent A. Diagnosis of chytridiomycosis in amphibians by histologic examination.  
URL: <http://www.jcu.edu.au/school/phtm/PHTM/frogs/histo/chhisto.htm>  
Amphibian Diseases <http://www.cdc.gov/ncidod/EID/vol5no6/daszak.htm>.  
contaminants: Herptox page: <http://www.cciw.ca/green-lane/herptox/>  
<http://www.mindspring.com/~davidceeee/Frogs.html>  
Amphibian Malformations  
<http://www.npwrc.usgs.gov/narcam/info/malbib.htm>  
setting up water falls and streams for dart frogs.  
<http://www.mindspring.com/~davidceeee/Frogs.html>  
Reptile Database 7907 species <http://www.embl-heidelberg.de/~uetz/LivingReptiles.html>





## SHOULD I STOCK MY PONDS WITH OXYGENATING PLANTS?

There is an idea around that if you put underwater 'oxygenating' plants in your pond, like 'Elodea' or 'Egeria', such plants will help keep your pond water oxygenated. Not so, according to Nick Romanowski, of 'Dragonfly Aquatics' in Victoria. He says people may have made that assumption because the plants sometimes (in warm weather) produce bubbles of oxygen. But he says the water is too warm for those bubbles to dissolve in the water; and in cooler water, little oxygen is produced by the plants anyway. He argues that the movement of water will oxygenate your pond, not so called 'oxygenating' plants. Consider the following:

\* "In the narrow confines of aquaria... it has been known for many decades that waterplants don't make any difference to the stocking capacity of an aquarium."

\* "On the other hand, a fast-moving stream of bubbles can increase the carrying capacity of the same aquarium by an estimated three times."

- But Nick explains it is not the bubbles dissolving into the water which do the oxygenating, but the movement of the water on the surface. And that is his main message - move the water in your pond and you'll help to keep it aerated. He argues that even a slight breeze in a reasonably large pond can give a reasonable exchange of oxygen and carbon dioxide.

\* Bear in mind also that it is not just the amount of oxygen in the water you should be concerned with - your pond might have plenty of oxygen in it, but if there is also too much carbon dioxide you will still have problems. Again, the solution is to keep the surface of the water moving. And don't have too many oxygenating plants! Your plants are little help, because although they will remove carbon dioxide during daylight, at night they use oxygen and create CO<sub>2</sub>. Thus on a warm night too many plants could use all the oxygen, and the non airbreathing creatures in your pond could die. Nick recommends, for Australian conditions, "not more than around one third of the volume of a smaller or more sheltered pond should be taken up by underwater plants."

\* Be aware that cooler water can hold more gas (oxygen) than warm water. Therefore, the deeper (and thus cooler) the water is, the better.

\* Bacteria also use oxygen. So if in your pond you have a lot of decaying material, the resultant bacteria could use up the oxygen.

\* Despite his scepticism about the oxygenating qualities of underwater plants, Nick agrees that provided you don't have too many of them, they do have benefits.

(1) "...the finely-divided plants are an important attachment site for bacteria which break down poisonous, nitrogenous wastes."

(2) "Plants also use some of the by-products of animal metabolism once they have been processed by bacteria and fungi."

(3) They serve as security and shelter for underwater animals.

(4) They help maintain a pond's PH balance to some degree.

Much of the information in this article has been presented in past editions of FROGCALL. I'm bringing it up again to draw attention to Nick Romanowski's point, that underwater plants don't really oxygenate water; and that to help keep your pond water fresh keep it moving. In summary, (and in addition, from previous FROGCALL articles), to keep your pond water fresh:

\* Keep the water on the surface moving in some way.

- Try two ponds connected by a waterfall.

- A submerged pump can simply move the water around.

- A breeze might be sufficient for a reasonably sized pond (at least 10 square metres suggests Nick. The depth isn't that important.)

Don't stock your pond with too many underwater 'oxygenating' plants.

Don't let too much organic matter (or fish food) decay in your pond.

Remember, deeper the better. Cooler water can hold more oxygen.

Keep a shallow pond out of the sun.

If you must have fish, don't overstock your pond with them, or your pond will build up nitrogen and ammonia. Build up your stock gradually, to allow the chemical processes to occur which will make the water habitable.

Keep an eye on the water's PH balance.

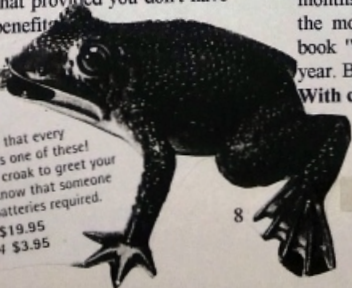
Keep fertilisers and manures from the pond. (If you use them with your waterlilies ensure the holes at the base of the pot are blocked with newspaper and place a 3cm layer of sand on top of the soil.)

Naturally, don't put chlorine in your pond.

The Sydney Waterboard puts chloramines in our tap water - chloramines do not evaporate as does chlorine, and remain poisonous until treated. Treat the water with a chemical purchased from an aquarium. Nick Romanowski states that a large dose of chloramine will make the water toxic for months. Nick Romanowski has written a number of books, the most recent being 'Planting Wetlands and Dams'. His book 'Water Garden Plants and Animals' will be out next year. Both have sections on creating habitats to attract frogs.

With compliments Mark Avery

It's our aim to ensure that every house in Australia has one of these! Our 'guard-frog' will croak to greet your friends and let you know that someone is coming. Two AA batteries required.  
IBM Frog Croaking \$19.95  
HiFi Batteries AA x 4 \$3.95



AUSTRALIAN GEOGRAPHIC STORES



## APPROVAL FOR FROG SITE

A development application to build a cold storage facility at the former sanitary depot at 229 Roberts Road Greenacre was approved by Bankstown Council at its last meeting.

Following last week's concern about the site's affect on the habitat of the endangered green and gold frogs, further opinions were heard but in the end it was decided that the development would not, indeed might possibly enhance, the frogs chance of survival.

Residents believe that the frog's habitat will be affected during demolition and construction work but an expert who addressed the meeting said the development would enhance the frog's habitat - and the council voted accordingly.

The residents believe that Bankstown Council and the National Parks and Wildlife were not supplied with, or did not supply all the information about the proposal.

The National Parks and Wildlife Service and Council had said the development would take place on the same footprint as the previous building, thus it could not newly affect the frog's habitat.

But this has since been disputed by residents.

There was some heated debate at Bankstown Council last Tuesday before the DA was approved.

A green and gold bell frog researcher said the frog would not be affected by the development while a nearby resident and member of an international endangered species group at the meeting said it could.

Mr Graham Phipps, a former Principal curator of the Zoological Parks Board of NSW and part of the original study team that located green and gold bell frogs on the site in question, addressed the meeting.

"This site, ladies and gentleman, is a highly valuable national resource."

"I urge council not to approve this development application. There are very serious flaws in it indeed," he said.

Mr Phipps said an eight point environmental plan for the site was not enough and that there should be a comprehensive environmental study of the site.

"Bankstown council has a duty of care with respect to threatened species. We're not just talking about any species," he said.

"The species itself will go down the tube unless it is managed. Every one of these little frogs are so incredibly important."

Ms Michelle Christie, who has carried out a PHD on the Green and Gold Bell Frog, spoke to the council on behalf of the developer Benkirk Pty Ltd.

Ms Christie said she spent 20 hours on site researching the frogs.

"There is not a massive amount of vegetation there, so twenty hours in the right kind of conditions is considered adequate."

The frogs were subject to day and night surveys and Ms Christie said that the recommendations put forward would enhance the site for the frogs.

There was going to be revegetation and there would be an elevated slab for easier movements for frogs underneath the buildings: "The times the frogs will be most susceptible will be during demolition of existing buildings and during the building of the new buildings, these frogs will not survive in the area without management."

"From what I've seen and doing the eight part test... if the habitat is created and maintained the way I have verbally been told... then I think the frogs will benefit."

A spokesman for Benkirk, developer of the site, Mr Conrad Bennett said: "There will be very few trucks running at night."

Trucks running refrigerators at night would park further away from residents, he said.

1/12/1999 Bankstown/Canterbury

District newspaper "Torch"

forwarded to Frogcall by Richard Newman



Freedom: A Botany Council worker releases Green and Golden Bell Frog tadpoles.

# Breeding program aims to save threatened frog

By By TONY MAGUIRE

THE Green and Golden Bell Frog has survived the industrialization of Botany, holding out against the odds in Sir Joseph Banks Park.

It is now fighting for its future, classified as an endangered species and found in less than 30 sites in NSW.

The Botany community has rallied to save the threatened amphibian through a special project called Frog Focus Botany, which has seen schoolchildren working closely with staff from Taronga Zoo, where a special tadpole breeding program has been implemented.

In the coming fortnight students from J.J. Cahill High School, Botany Public School

and John Broche Pre-School will be releasing 460 tadpoles reared at the zoo into Sir Joseph Banks Park.

Meanwhile, the children and their parents will continue a program of frog-spotting around the two ponds in Sir Joseph Banks Park where the amphibians are found.

Taronga Zoo education officer Melissa de Britt said Frog Focus Botany was at the cutting edge of conservation education programs, marking the first time school students had been involved in the release and management of an endangered frog species.

"It gives community ownership to the regeneration of this species and we see it being ad-

apted for other conservation programs around Australia," Ms De Britt said.

She said Botany Council had been a vital partner in the frog project and welcomed the recent announcement of a \$20,000 Natural Heritage Trust grant to the council to improve the frog's habitat.

The grant will go towards regenerating bushland around the frog's habitat in Sir Joseph Banks Park and building walkways with interpretive signage.

When more funds become available, the council plans to create more ponds in the park, giving the frogs the best possible chance of continuing to survive against the odds.

THE Green and Golden Bell Frog is alive and hopping in Botany and schoolchildren are doing their bit to keep it that way. In the next fortnight, 460 tadpoles will be released into ponds at Sir Joseph Banks Park by youngsters from Botany schools. The frogs-to-be have been bred at Taronga Zoo, which is overseeing a unique conservation initiative called Frog Focus Botany. Under the Frog Focus program, Botany's community will take responsibility for preserving the habitat of the endangered species.

The Eastern Suburbs Messenger 25 / 11 / 99 forwarded on to Frogcall by Liz Maher





**T**HE frog sat there, big and blinking in the car headlights, until we tenderly moved it to the roadside and took a photograph of it. A couple of weeks later, my daughter received a handwritten note informing her "your frog" was a species confined to the folded foothills of Perth. We both felt strangely elated — it was our local frog and it was living at our place, our informant told us, because our moist and mulched garden was "frog friendly". Clever us, clever it.

The man who sent the letter had won a young convert to the cause of Frogwatch, a remarkable success story from Western Australia. It is the brainchild of Dr Ken Aplin, who began his professional life as a mammal paleontologist, "but like frogs, I'm adaptable". Since arriving in Perth in 1989 to take the job of curator of reptiles and frogs at the Western Australian Museum, Aplin's work has involved long field trips and he wondered if a community-based frog monitoring network could help him keep track of frogs.

In mid-1995, Alcoa World Alumina Australia came up with some money and Frogwatch was launched. Both parties assumed the response would come from a small, probably eccentric group of frog enthusiasts: "Alcoa thought about 50 people might sign up, I thought about double that," says Aplin. In the first week, 600 requests to join poured in. "And despite my periodic efforts to keep quiet about it, it's grown ever since."

Last week, Frogwatch notched up its 3221st member; each participant receives a Frogwatch kit — regular newsletter, audio tape of frog calls and identification sheets. Until some dedicated helpers took over, it was Aplin who bundled up hundreds of kits and sent them off to anyone who asked.

Aplin only half-jokingly refers to the collateral damage to his family life that Frogwatch has inflicted, and frog fatigue hits him now and then. "The most

stressful thing is that I've run Frogwatch in addition to my job at the museum, although things turned round when half a dozen people came to me and asked to help." But he still spends two or three weekends a month running workshops and giving talks. "It has required a great personal effort from me. It doesn't help (me) get grants or publish (scientific) papers. You do it because you feel you have to. So I just went ahead."

Vivienne Alanta and her partner John Croft are at the moderately eccentric end of the Frogwatcher spectrum, having converted their entire neighbourhood to the cause of "Frog-a-culture", as Aplin calls it. It all began with "a swimming pool that went feral every winter",

**Though some scientists are not sure whether it is good science, Western Australia's pace-setting Frogwatch is proving to be good for threatened frogs. And, reports Victoria Laurie, it is just as good for the growing public army tracking their lives**

explains Alanta. "We'd have 3000 to 4000 tadpoles to party with friends." When the lander arrived for a house inspection, she couldn't bear the thought of poisoning the tiny pool guests with chlorine. So she bailed them out, passed them on to a friend, and vowed to build a frog pond or two in her future home. "We've now got 15 frog ponds in our street ... When you live between two busy roads, you don't hear the frogs over the traffic, although they only croak during breeding season. The golden bell frogs start calling on the first full moon after the spring equinox. We've got an inbuilt seasonal clock."

Alanta is now familiar with all her frog species' endearing habits — and the not-so-cute cannibalism of local green tree frogs ("we're a bit worried about that"). She and Croft have stopped using pesticides in their garden, and they talked the local council out of spraying in their street. "Frogs don't have an immune system, so they're especially susceptible to things like that. But, in return, we've got no slugs or snails and we had quite a plague before the frogs. Frogwatch works because people are aware of the environmental crisis and they want to do something about it. People are being badly let down by their government. And

## FROGGIES GO A-WOING



**How Australians are improving their lives by helping to save a threatened amphibian**

Frogwatch is something where they can see a result for what they're doing."

Says Aplin: "People have said it's the best thing the museum's ever done." And three months ago he got museum permission to hire a laboratory assistant as Frogwatch membership took another upward spiral, the result of dire news from the frog kingdom. A mysterious parasitic fungus had begun attacking frogs nationwide, latterly in Western Australia. Although research is yet incomplete, scientists suspect the fungus originated overseas, perhaps in South America, where frogs have died in catastrophic numbers from a chytrid fungus genetically similar to the Australian organism.

Researchers in Western Australia needed to know how widespread the infection was in the state's frog populations. So last September Aplin posted an F-file (frog fungus facts) alert to his Frogwatch army, asking them to help by delivering him dead and dying frogs. Again they rallied around, providing 70 specimens in the first month. More than 2000 frogs have now been examined, half from the museum's existing collection. Aplin once thought the fungus arrived in the west in only the past year or two, but tests now suggest it has been there since the late 1980s.

"It made sense because people have told me frog populations made sudden declines before this, when huge populations were swarming on the roads north of Perth." If people were observing changes 10 years ago, why didn't they say so then? "Because there was no environment in which to say those things," he counters.

Frogwatch has proved to be the perfect conduit to the public. That's why Aplin, who admits he once tolerated public input into science through gritted teeth,

**'It began with a pool that went feral. We'd have 3000 to 4000 tadpoles to party with friends'**



**Mealtime:** the green tree frog is not averse to eating its own



**Convert:** Ken Aplin's work has taken a giant leap thanks to his legion of volunteer watchers

Picture: Andy Lynch

has become a total convert to community participation. "If Frogwatch hadn't already been going, we wouldn't have made any progress at all on the fungus." He's now aiming for a network of 15,000 Frogwatch members. "We can't use professional resources to monitor (frog populations) and the required scale of rehabilitation of frog habitats is so big. Much of the frog habitat is on private property, and without community support it's impossible."

The Frogwatch phenomenon is about to enter a new phase in the west, to further spread the message about "getting frogs back into our everyday lives and keeping them there". Commercial nurseries, the irrigation industry and river catchment groups have all signed up to help promote frog-friendly habitats across the suburbs. "Frogs are very adaptable, and they'll use any artificial environment," says Aplin.

Sandy Pate, spokesman for the Nursery Industry Association of Western Australia, says Aplin's timing was "impeccable" when he approached them for help. Commercial nurseries were looking for new ways to attract people to buy plants, and erecting frog-friendly garden displays fitted well with the industry's cherished "clean and green" image.

While Perth's pet shops sell tadpoles for fish food, Pate says garden nursery owners are investigating ways to stock suitable tadpoles for breeding in home ponds. Frogwatch "is a worthy thing to do, and if there's a dollar in it, that's perfect."

Not everyone is convinced by the feell-good frenzy of Frogwatch. If Aplin believes even tiny backyard ponds can help to significantly bolster frog numbers, Dr Dale Roberts isn't so sure. The senior zoology lecturer at the University of Western Australia, Roberts agrees the program has tapped into the public's enthusiasm for frogs; it was Roberts who provided the audio tape of frog calls that accompanies the Frogwatch kit. But he warns that strong public awareness does not amount to sound science.

"Getting the public to send in pages of observations is one thing, but lending them credibility is another." And he's not convinced that Frogwatch's alarmist message about the danger of fungal infection is valid. Dead and dying frogs are not new, "and have we rigorously assessed what the cause is or whether it was a problem before?" In Western Australia, for example, there was a long summer and very late drenching rains this year, following two equally dry years. "So there are other things that might precipitate deaths."

"And what could you do about it anyway? If it's already widespread, perhaps it's not worth the cost and effort of doing anything about it. Even if it's causing high death rates, I can still find every frog species found over the past 10 years in the south-west."

Western Australia is different, says Roberts. Unlike most other states, new frog species are still being discovered here. Like the sunset frog, accidentally discovered only five years ago. "It's bright purple, blue and orange." "How in the hell did we miss that one?"

Roberts says the almost overnight disappearances of frog types in Queensland and NSW (such as the green and gold bell frog, now hanging on at the Homebush Olympic site) are not occurring in Western Australia, although three south-west species are on the endangered list. And no



amount of garden ponds in Perth will help those species, such as the white-bellied frog, which lives in isolated habitats earmarked for development in the Margaret River area.

Aplin's response is that increasing frog-friendly habitats is important for the very reason that many West Australian frog species are found in small, highly restricted locations. The local frog my daughter and I found, for example, is the western marsh frog, which is limited to the clay soils at the base of Perth's Darling Scarp. Aplin's argument is that pesticide-free gardens and ponds can offer a greater chance of survival to animals battling habitat disturbance, environmental pollutants, climatic variation, and now fungal disease. "I say we should use the precautionary principle in cases where you don't know enough about it... Usually diseases sort themselves out naturally and some frog fauna will co-evolve [with the fungus]. Given time, some balance may be restored, but in the shorter term, we're seeing negative impacts and the risk is with isolated, fragmented populations."

**L**IKE the frogs themselves, frog watchers know no state boundaries.

In Victoria, for example, a Frogwatch program began in 1991 but folded three years later when government funds dried up. It was a mixed success, says biologist Gerry Marantelli, who runs a private Amphibian Research Centre in Melbourne. Improbable amateur sightings of frogs saw scientists excitedly heading off on wild goose (or frog) chases: "The public is very good at finding frogs, they're just not very good at identifying what they are."

These days, a 400-strong Victorian Frog Group carries out more specific tasks, like retrieving some of the astonishing 8000 to 10,000 tropical frogs a year (in metropolitan Melbourne alone) that hitch a ride south on banana bunches.

Rostered frog rescuers drive considerable distances to retrieve the frogs, acclimatise them and give them for adoption to a good home in a school or zoo. Marantelli explains why the stow-

The sunset frog, accidentally discovered in Western Australia five years ago, is bright purple, blue and orange. 'How in the hell did we miss that one?'

aways can't be sent back home: "By the time you find one hopping across the floor of Safeway, you can't ask it whether it came out of the bananas from Coffs Harbour or the mangoes from Broome."

There's a serious ecological motive behind this froggy welfare; the hapless hitchhikers could be carrying the chytrid fungus around the nation. Marantelli wholeheartedly supports Frogwatch's call to arms over the disease: "For now, we should act as if it's as bad as it could possibly be. If we don't, there'll be a lot more species dead. We should assume the worst, and hope we're wrong."

The nationwide spread of the chytrid fungus is being mapped by Dr Rick Speare, a specialist in amphibian disease at Townsville-based James Cook University's school of public health. Speare also tests the accuracy of Aplin's fungus diagnoses and says Frogwatch is "an amazing and under-acknowledged sentinel system... the best lay program in Australia for harnessing public interest in frog biology... Ken has lots of eyes out there looking for dead or sick frogs, beyond the power of any biologist to collect." And Speare is convinced Frogwatch members can play

an important role in "optimising the environment and conditions for frogs". He says a conference will be held in Cairns next year to debate management of the frog fungus threat; meanwhile, the World Wildlife Fund is considering plans for a Frogwatch-type monitoring program around Australia.

"Never underestimate the importance of having a community base, especially when governments want to cut [research] funds; people can protest in ways that a handful of scientists hiding in a laboratory can't do. For just about every environmental problem in Australia, community involvement is fundamental," Aplin says. "Frogwatch is a social phenomenon as much as anything else. We simply didn't realise the number



Neighbourhood watch: 'We've now got 15 frog ponds in our street,' says Vivienne Alanta, seen here with neighbour and fellow frog enthusiast Brian Courtney

Picture: Ross Swanborough



of people who want to get some part of the natural environment back into their lives." And the frogs themselves should be credited, he adds. "They're appealing, and ordinary people know they're the barometer of the environment's health."

Vivienne Alanta says frogwatching has given her neighbours an excuse to talk to each other. And having "a primordial soup" in her frog pond at spawning time is reassuring. Her partner John Croft thinks the psychological pull of frogs lies "in childhood memories, an innocence of keeping tadpoles — it's symbolic of transformation, and resonates with the collective unconscious".

Whatever it's doing for my daughter's collective unconscious, Frogwatch responds to her childhood desire to improve the world. Her scrawled observations may not be good science, but they are an act of faith in the future, a declaration that we, the world and our frogs are not entirely going to hell in a handcart. ☺



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## Thank You to all those who contributed to this newsletter

We hold six informative, informal, topical and practical meetings each year at the Australian Museum, Sydney (William Street entrance). Meetings are held on the first Friday of every **even month** (February, April, June, August, October and December) at 7 pm for a 7:30pm start. **NO MEETINGS ARE HELD ON GOOD FRIDAY so check newsletter for alternate dates.** 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.