

# The Australian Frog Decline

by Raymond Hoser



## Introduction

When I was a young kid, I grew up in the inner Sydney suburb of Greenwich. During the warmer months, I'd go down to the nearby Gore Creek and catch large numbers of Green Tree Frogs (*Litoria phyllochroa*). These frogs bred in their hundreds and it was common for me to bring home fifty or more after just a few hours searching along the creek. Over a

spring/summer period, I'd make many such trips to the creek in search of frogs and so too did many others. None of our efforts seemed to have any real impact on the frog population. You see, besides those that we missed, the creek was always full of tadpoles of these frogs, which served to replenish lost stocks of frogs the following year. The *Litoria phyllochroa* were the only frog to be found in the upper reaches of Gore Creek. Lower down the creek, below a large waterfall were native fish in the form of Galaxias, Gudgeons and Empire Fish all of which evidently ate the tadpoles, for it seemed that frogs in this area were rare. A similar pattern was found in other creeks around Sydney's lower north shore.

In the swampy areas, such as Lane Cove golf course, the Striped Marsh Frogs (*Limnodynastes peroni*) dominated. These large frogs bred in drainage ditches

and similar habitats, beside the smaller more common (*Ranidella signifera*).

It was time in the mid 1970's other creek in Greenwich lost its *phyllochroa* population, or most of it anyway. You see someone started putting this bluish-grey coloured effluent down the creek and that appeared to kill off the tadpole population and everything else with it. The only native wildlife that seemed to survive along that creek were a few native Water Rats (*Hydromys chrysogaster*). Even after the creek's water appeared clean again, no frogs were to be seen.

This disappearance of frogs was of course just a local extinction and I as-

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sumed was one of the prices of increased urbanisation and industrial activity.

Perhaps you might ask, what did I do with all those tree frogs I caught in Gore Creek. Well I fed them to my pet Long-necked Tortoises (*Chelodina longicollis*). I'd throw them into the pond in their cage and watch the tortoises grab the frogs and rip them to pieces. Quite often two or more Tortoises would have a tug-of-war over a given frog, each with its jaws clamped firmly around one of the frog's limbs. While it may now seem that to feed frogs to Tortoises is an extremely wasteful thing to do, my actions must be looked at in the context of the time. You see in those days the number of frogs seemed limitless. There was no statutory protection for them, nor was there thought to be any need for it.

In 1975, my family and I moved to St. Ives, which was a more outer suburb of Sydney. The local creek was called Rocky Creek and it ran under Arterial Road in an area of bushland that separated St. Ives from the suburb of Killara. Rocky Creek ran into the upper reaches of Middle Harbour. Few frogs were to be found in Rocky Creek. You see the pollution in that creek had killed off all the frogs there long before I arrived on the scene. However there was a walking track that ran parallel to the creek along a hillside of virgin bush, and along the track were numerous little creeks, seepages and soaks. All these were unpolluted and filled with Freshwater Crayfish (Yabbies) (*Euastacus serratus*) and frogs. The two species were Common Froglets *Ranidella signifera* and Red Crowned Toadlets (*Pseudophryne australis*). The latter species is endemic to the Sydney Sandstone region.

On a rainy day, I was able to go down to these small creeks and soaks and capture a hundred or more adult frogs within a few hours. Of course for every frog I took, there were many more I'd miss. Again it may be asked, what did I do with all these frogs? Well the answer is that I fed them to my Green Tree Snakes (*Dendrelaphis punctulatus*) and

some small elapid snakes for which I had greater difficulty in finding skinks to feed them.

Also in the mid 1970's my family holidayed at Strathhaven Holiday house at Wyong, New South Wales. One night there it rained and we found the lawn area adjacent to the rooms seething with Green and Golden Bell Frogs (*Litoria aurea*). No doubt similar scenes occurred throughout New South Wales. In 1977, myself and some mates from school collected and saw huge numbers of these frogs in Wyong, Wyea, and other sites on the NSW Central Coast. At about the same time, Professor Grigg and others from Sydney University were collecting vast numbers of other frogs on rainy nights in the Wyong area, including huge numbers of the newly-discovered Green-thighed Tree Frog (*Litoria brevipalmata*).

In the late 1970's I was able to drive along roads to the north and west of Sydney spotlighting for frogs on wet nights and finding so many frogs on the roads that to attempt to swerve to miss the frogs was pointless. Even major thoroughfares such as the Pacific Highway had so many frogs on them that the roads would invariably end up a grave for huge numbers of frogs. It seemed that the world would never run out of frogs.

Over the years I frequently camped in bush locations throughout New South Wales. Wherever I went there always seemed to be frogs and vast numbers of them. Even dry nights seemed to be punctuated by the deafening sounds of frogs calling.

By the late 1980's something had changed. From my own point of view, I can't remember exactly when things started to change, but I think it began in the early 1980's. All Sydney froggers know about Ourimbah Creek. Located on the NSW Central Coast, this area is perhaps one of the best frog spots in Australia. It is not rare to have been able to find over 20 different species of frog in one night by driving around this and adjacent areas on a wet night. For example on one night I found

the following species:- *Litoria dentata*, *L. phyllochroa*, *L. chloris*, *L. lesueurii*, *L. freycineti*, *L. caerulea*, *L. latopalmata*, *L. vereauxii*, *L. citropa*, *L. fallax*, *L. peronii*, *Limnodynastes peronii*, *L. ornatus*, *L. tasmaniensis*, *L. dumerilli*, *Helioporus australiacus*, *Adelotus brevis*, *Pseudophryne bibroni*, *Mixophyes iteratus*, *M. balbus*, *Ranidella signifera*. Several other species known to the area were not found.

But when I returned to the area in the mid 1980's, the numbers and variety of species found had started to decline. Whereas the roads used to be crawling with frogs, there were now far fewer to be seen. Now before I hear readers saying to themselves, 'but he must have gone on a dry night, or at the wrong time of year', I must stress that all these searches were at the best time of year and in the best possible conditions. Wet nights in spring and early summer with steady rain and water everywhere. The composition of species also started to change. The percentage of *Litoria chloris* had taken a tumble, along with *caerulea* numbers while the *Limnodynastes* species seemed to have held their own to a greater extent.

When I started taking photos for my book *Australian Reptiles and Frogs*, I really started to notice a decline in frogs. In 1987, I drove to a swamp at Oberon to take photos of *Litoria verauxi alpina* and *Litoria raniformis*. I'd found both there in huge numbers in 1978. Now when I went there in 1987, it was raining heavily and I couldn't have asked for better conditions. Not only did I not find what I was looking for, but I didn't even hear a single frog call. I saw no *Limnodynastes dumerilli*, which had also been common there, and all I caught was a pair of Spotted Grass Frogs (*Limnodynastes tasmaniensis*) resting under a rock during the day. If ever silence was deafening, this was it.

At the same time I took it upon myself to drive to a series of swamps between Nevertire and Nyngan in New South Wales to find some other frogs, namely *Limnodynastes salmini*, Holy

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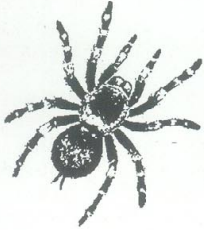
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Cross Frogs (*Notaden bennetti*) and Burrowing Frogs (*Cyclorana platycephalus*). I'd been to this place several times in 1976-78 and always found all three species. Now this was in dry as well as wet conditions. When I got to this area in 1987, it was dry. While it had been raining in Sydney, Oberon and nearby ranges, the rain hadn't got this far. Even so, I still expected to find my frogs under cover near the swamp - just as I had done before. In spite of my best efforts, I found nothing.

Was it a case of me losing my magic in terms of finding frogs, or was there really something going wrong? It was also in 1987 that I went in search of the Brisbane Torrent Frog (*Taudactylus diurnis*) from the streams near Mount Glorious, just outside Brisbane. I picked the perfect conditions to go searching for the frog. I looked on a night with torrential rain in the height of the summer breeding season. I searched the exact location where the frogs were known to have come from. Besides a few large *Mixophyes* frogs, I saw nothing. The most notable feature of the night was the silence in the forest. I never heard a single frog call. What was going on?

When I returned to my trusted spots in Wyong/Ourimbah in search of Green and Golden Bell Frogs (*Litoria aurea*) in 1987, again I found nothing. A dam which had previously had a thriving colony of *L. aurea* was now silent. I found nothing. In the end, I managed to secure a *L. aurea* to photograph from a Sydney pet shop. The owner told me the frog was from Wyong but couldn't tell me anything more. At the time of writing this article in October 1995, Dr. Graham Pyke of the Australian Museum in Sydney is on the

trail of the *aurea* decline. He has been checking out many previously known sites for *aurea* in a bid to ascertain just how many frogs are left.

I have also been advised that around Sydney numbers of other frogs have also taken a pounding. Red-crowned Toadlets have become more scarce along with the tree frog *Litoria phyllochroa*. Thus, two species I once upon a time saw as food for other reptiles have now assumed a far greater importance.

Those of you who have read the June 1995 issue of the Australian journal *Herpetofauna* are probably aware of what has happened to the *L. aurea* and many of our other frogs, (see the papers by Garry Daly and Deborah Pergolotti). The question worth asking is when did the decline start and what frogs are involved.

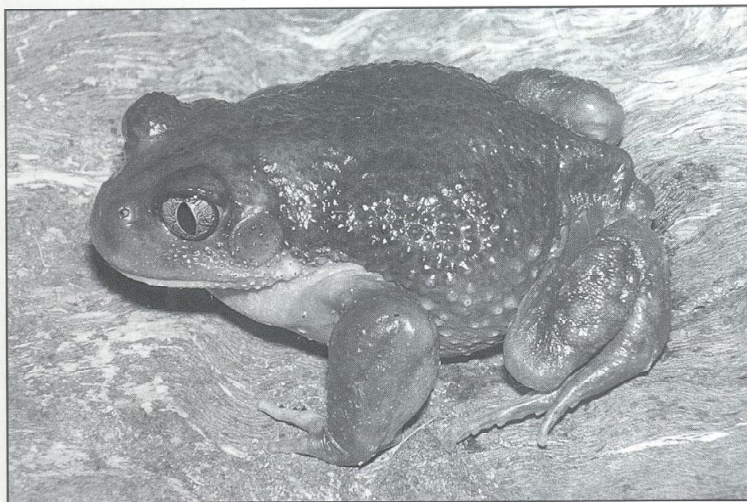
**The History of the Decline**

Frog declines appeared to start in Australia in the late 1970's, continued through the 1980's and are still continuing. While the causes of some localised declines can be readily attributed to a given factor such as urbanisation, introductions of fish into streams and so on, the causes of most frog declines are not known.

Perhaps more worrying is that the decline of the frogs seems to be a global, rather than just an Australian problem. Scientists attending conferences told similar stories of frog declines and soon a number of trends became evident.

Certain species of frogs appear to have suffered more than others. Species from highland and cool temperate areas appear to have suffered most. Likewise for those which bask diurnally, such as *L. aurea*. Within Australia, tropical species appear to have been spared much of the decline affecting their southern cousins, although there appear to be some notable exceptions to this trend. Many species appear to have declined and become extinct within a remarkably short period - often just one or two years..

In Victoria and New South Wales, species in the *Litoria aurea* complex seems to have copped a major hiding. This includes *Litoria raniformis* and probably *L. flavipunctata*, *L. cyclorhynchus* and *L. moorei*. Formerly regarded as common, *L. aurea* is now listed as Endangered by the NSW National Parks and Wildlife Service. Formerly numbered in their millions, this species was in 1995 estimated by Arthur White to have a wild population of as little as five hundred adult frogs from known



*Helioporus australiacus* - photo Raymond Hoser



Plates:  
Title page & facing page:  
Golden Bell Frog (*Litoria aurea*), from Wyong, New South Wales. Fifteen years ago it was regarded as a common species. There may now be less than a thousand adults left in New South Wales.  
This page:  
Top: Giant Burrowing Frog (*Helloporous australiacus*), from West Head, New South Wales. Some populations of this frog have declined in recent years. This animal photographed is a male.



Centre: Red-crowned Toadlet (*Pseudophryne australis*) from Terry Hills, New South Wales. This is a Sydney region endemic whose numbers have dropped sharply.  
Bottom: Cane (or Marine) Toad (*Bufo marinus*), from Bundaberg, Queensland. This introduced pest is not believed to be responsible for the most recent population crashes in most Australian frogs.  
Photos: Raymond Hoser.





sites in New South Wales. While *L. raniformis* hasn't declined as sharply as *L. aurea*, the species continues to decline and the long-term future of this species is by no means secure.

Not long after they were scientifically described in 1973 and 1984 the two species of Gastric Brooding Frogs (*Rheobatrachus silus* (described in 1973) and *R. vitellinus*) apparently disappeared and are now thought to be extinct. This is particularly tragic as these frogs produce an enzyme (Prostaglandin E2) that may be useful for the treatment of stomach ulcers (Tyler, 1989). The last time a *R. silus* was seen in the wild was in 1981. The last time *R. vitellinus* was seen in the wild was in 1985-6 (Hoser, 1991).

For this and other frogs, conservation doesn't just assume an aesthetic role, but also one of pure economics. Here we are talking about a valuable resource that is of vast potential benefit to humanity.

Within Victoria the frog that may be most at risk of extinction from recent declines may be the Spotted Tree Frog (*Litoria spenceri*), known now from less than ten sites. The numbers of this frog have declined sharply in recent years (Tyler, 1992).

#### The Causes of the Decline

If I could tell you this, I would. There are many theories being put forward, most of which seem to have flaws in them. One theory is that the decline in the ozone layer has caused the decline of frogs. Most people reject this theory on the basis that a number of species that have disappeared are nocturnal and thus wouldn't appear to be directly affected by any ozone depletion. Acid rain has also

been postulated as a cause of decline for frogs, but again has been rejected on the basis that many populations have appeared to decline in pristine areas and sites where acid rain does not fall. Many of the areas where frogs have declined are not only remote in the absolute sense, but also not in the pathways of weather conditions that could bring acid rain or other pollution. Unseasonable and severe droughts were initially postulated as the reason for some declines in Queensland frogs, as a number of species appeared to disappear after the 1982-3 drought. However as species continued to decline in the decade following this drought at a time of more normal rainfall, the drought theory has been rejected by most people.

While the introduced Cane Toad (*Bufo marinus*) has been shown to have caused declines in numbers of native frogs throughout Queensland, the latest population crashes cannot be attributed to the Toads. You see in most cases, Toads were not present in the areas where the frog populations crashed. It has been suggested that trace compounds in pesticide/s could be causing declines in frogs. The declines may be either as a result of

the compounds themselves or the compounds weakening the frogs so that they become vulnerable to other environmental threats such as disease. There is presently strong evidence to suggest that disease may in fact be a major cause of decline in some frog populations.

Recently a scientist at James Cook University was working on frogs in the Townsville area. He noted that a number were dying of a virus and took an infected frog to his lab to identify the virus that was causing the mortality. He named it Bohle virus after the Townsville suburb from which the infected frog came. Since then other sick and dying frogs have been found elsewhere in North Queensland displaying the same symptoms as seen in the frogs infected with Bohle virus. However the scientists have as yet been unable to positively identify this virus from these frogs, being unable to successfully culture the virus from these other dead frogs. Instead they have been forced to rely on circumstantial evidence to suspect that the same virus is at work.

In the laboratory situation, Bohle virus is a major killer of Cane Toads (*Bufo marinus*) that are injected with the virus. Whether Bohle virus is responsible for



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Photographs - left and below:  
**Southern Bell Frog (*Litoria raniformis*)** from Bundoora, Victoria. A close relative of *Litoria aurea*, this species has also declined sharply in recent years. The status of this frog has not improved since being listed as endangered as this now prohibits widespread keeping and captive-breeding of the species. The protection laws, however, do nothing to protect the frog in its wild state.  
 Raymond Hoser.

deaths of other frogs in other areas is not yet known, nor is it known if other similar viruses are at work against other frog populations. Certainly frog declines have spread northwards in Queensland through the 1980's and into the 1990's. The Rainforest Torrent Frogs (*Taudactylus diurnis* and other species) populations in Southeast Queensland crashed first (explaining why I couldn't find any in 1987), and this decline has spread to other populations of *Taudactylus* frogs in a northwards manner. Those in Cape York have been most recently affected in the early to mid 1990's. Such a scenario is consistent with a virus such as Bohle Virus being the chief culprit. *Rheobatrachus* populations also declined in southern Queensland before the northern populations were affected about five years later. It is thought that the Bohle virus may only affect frogs and not their tadpoles. Glen Ingram of the Queensland Museum has seen large numbers of metamorphosing frogs dying from some virus. As an extremely keen frog enthusiast, he was particularly disturbed to observe such mortality.

In June 1995, an Animal Health Research Laboratory at Geelong, Victoria joined in the search for one or more unknown viruses causing the death of frogs. The frogs that were dying had come from Cooktown in far north Queensland (Anonymous, 1995). Whether or not this laboratory or others in other countries are successful may end up determining the



fate of many frog species.

In 1993, thousands of frogs in the UK had been found dead as a result of a mystery virus which appeared to cause limbs to rot. Frog Mortality Project biologist Tom Langton, based in Suffolk, England stated that although dead frogs had been found in all parts of the UK, most reports had come from the south-east (Anonymous, 1993).

A perusal of recent issues of *Journal of Herpetology* published by the Society for the Study of Amphibians and Reptiles, *Herpetologica*, published by the Her-

petologist's League and *Copeia*, published by the American Society of Ichthyologists and Herpetologists all contain a number of papers by people investigating amphibian declines. All this shows that a substantial number of people are attempting to solve the problem of amphibian declines.

Where the virus or viruses that are believed to be killing off frogs has come from isn't known. The virus/es are believed to be water borne and may be spread by fish or other animals. It is possible that the virus/es may have been introduced into Australia via pet tropical fish

brought in from elsewhere being released into streams or perhaps just tipping infected water down the drain. A similar scenario may apply in other parts of the world such as Europe and North America, where major frog declines have also been noted. However, I should again stress that what I have just outlined is just one of a number of theories currently being looked at.

#### The Future

Frog declines are continuing and are likely to remain a problem for some time yet. It is thought that within Australia over thirty species of frog have become extinct over the past 15 years. Ten of these are the two Gastric Brooding Frogs (*Rheobatrachus silus* and *R. vitellinus*), Brisbane Torrent Frog (*Taudactylus diurnis*), Sharp-snouted Day Frog (*Taudactylus acutirostris*), Tinker Frog (*Taudactylus rheophilus*), Mountain Mist Frog (*Litoria nyakalensis*), Yellow-spotted Thighed Frog (*Litoria flavipunctata*), Peppered Frog (*Litoria piperata*), Southern Tablelands Bell Frog (*Litoria castanea*), and the Thornton Peak Tree Frog (*Litoria lorica*).

While it is hard to decide what is the best method to save declining frogs, there are several things that will not help save threatened frogs. Bans on collections of wild specimens will not help save species. None of Australia's threatened species have been threatened or exterminated as a result of collecting by people. All have died out as a result of some unknown cause. Prior to extermination, all these frogs lived in large numbers in apparently healthy populations. Dr. Keith MacDonald of North Queensland made

a point of telling a TV Programme (Quantum) in 1995 that the populations of these frogs were huge and "going great guns" before they crashed.

Had some of these frogs been collected and maintained in captivity before these crashes, then perhaps these species, which may now be extinct, would instead still be with us.

As a knee-jerk reaction, the New South Wales National Parks and Wildlife Service (NPWS) have listed the Green and Golden Bell Frog (*Litoria aurea*) as endangered, by placing it on Schedule 12. That may well be the most counter-productive conservation measure possible for this species.

You see, by declaring it endangered, NPWS have now effectively prohibited widespread keeping and captive breeding of this frog. Just a few years ago, this and all other frogs were unprotected - which in real terms meant that you didn't need a licence to collect or keep them. Being large, green, attractive and hardy, few species of frogs would better lend themselves to being bred in captivity. "Protection" laws are best described as licensing laws and do nothing to protect these frogs in the wild state. Knowing full well that this species is in serious decline in the wild, it is likely that the only protection for this species will come from specimens being in captivity. However due to the strict licensing conditions now imposed on anyone from New South Wales who dares to keep this species, the Green and Golden Bell Frog may soon join the ever-growing line of extinct Australian frogs.

Pergolotti (1995) counted 2,486

eggs in just one road-killed adult Green and Golden Bell Frog. With that sort of fecundity it wouldn't take long for a few private breeders to produce more than enough frogs to replenish all sites where the species formerly occurred. That is of course after the cause of decline has been either removed or neutralised. Assuming NPWS allowed legal trade in this species, it would be fairly safe to say that they'd never become extinct. But that would require a total reversal of current policy.

Too often, captive-breeding projects are started when it is too late to save a species. Projects are started when there are only a few specimens of a species left and there is no room for a mistake which could lead to death of just a few specimens. The last Sharp-snouted Day Frogs (*Taudactylus acutirostris*) in the wild appeared to die from a virus in 1993. This population was at O'Keefe's Creek, south of Cooktown in far north Queensland. A few live specimens were held by Queensland NPWS at a facility on the Atherton Tableland in a small field tank (Milburn, 1995). Some were later shipped to Melbourne Zoo in a bid to save the species. All specimens later died, taking the species with them. Had more frogs been taken from the wild earlier and these been spread to several institutions and private breeders, then perhaps the species may have had a better chance of survival.

To save declining frogs in Australia and elsewhere requires decision-making based on logic and not ideology. This applies to all sections of government and fauna departments, who at the present time have control of the destiny of most of Australia's fauna. It is a fact of life here that government officials have by legislative means taken control of what is and isn't done to save native wildlife. While in some cases this has been beneficial, in others, such as for frogs, the effect may have been counterproductive.

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