WASAH

WESTERN AUSTRALIAN SOCIETY of AMATEUR HERPETOLOGISTS (Inc)
(Member of the Australasian Affiliation of Herpetological Societies)

NEWSLETTER

3 September 2000
(23)

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Australian Reptile Park Fire

The devastating fire that destroyed many animals at the Australian Reptile Park was poorly reported in WA – unless you perused the two-page report in The Australian *you may not be aware of this tragedy. WASAH sends its condolences to all involved in the park.*

Electrical fault sparked sanctuary fire

17 July 2000 - A fire investigation unit today blamed a $1 million fire that killed hundreds of rare and exotic animals on an electrical fault. A spokesman says an electrical wiring problem in warming equipment at the base of a goanna cage sparked the inferno that gutted the Australian Reptile Park and Wildlife Sanctuary on the NSW coast early yesterday. Priceless crocodiles, snakes, lizards, frogs, turtles and platypuses were killed after fire ripped through the park about 12.15 am. Devastated staff, which have spent years collecting the rare animals, yesterday underwent grief counseling as tours of the park were cancelled. The 50-year-old park is one of the nation's top tourist attractions, winning a number of awards including *1998 Best Regional Tourist Attraction in Australia*.
It is also home to Australia's top snake and spider venom milking station, responsible for saving hundreds of lives across the nation each year. Police yesterday estimated up to 1,000 animals died in the fire, but fire authorities put the figure at 400.

The following updates are from John and Robyn Weigel

I am just now back on line after the fire, which partially destroyed the Australian Reptile Park. The hard drive was salvaged from a melted computer box. For some reason, I have only messages for these four days since the fire - though I usually receive 20 or more, and due to the circumstances, I would have expected several times that. So if you have tried to contact me, or think that you did, please re-send.

The current situation is as follows. The entire indoor reptile area has been destroyed with almost all animals perishing. This included over 500 animals, many of which had been with us for more than 20 years. Many rare animals including several tuatara, as well as critically endangered species of frogs, and rare reptiles are gone. The five rough-scaled pythons, thankfully, were not housed at the Park's main building.

The lone survivor of the fire, which struck at midnight Saturday night - a large American alligator snapping turtle, has played a valuable role in the grieving process for the staff and volunteers, who participated in a memorial service at the Park this afternoon.

Our extensive herp library is about 50% water affected. My ten rifles and bows were destroyed. Our tissue samples for the king brown snake project were lost. My camera systems are gone, most awards, a lifetime of memorabilia, photos and so on are lost.

The process of preparing for rebuilding is underway and the support that we have been offered from zoos and relevant agencies, politicians and others will assist in seeing us reopened in a minimum time.

The insurance story appears to be a happy one, but the process is not instant.

The police and insurance investigators have ruled out foul play and have unofficially declared the situation 'cut and dry'. The policy appears to be sufficient for our survival. The building engineers representing the insurance company and us appear to be able to work together. The mayor has promised to aim for record-breaking red tape cutting.

The employment status of most of our 25 staff members will unfortunately be left on hold for the foreseeable future.

The priorities are to get the venom production work back online as quickly as possible, particularly the funnel-web spider venom, to ensure that there is no glitch in the production of antivenom at CSL.

We have overcome very big obstacles in the past, and we will overcome this one - much sooner than I think most will expect. For the last two years running, we have taken out the prestigious Australian Tourism Award for *Best Regional Attraction*, and I can promise all that we will be back at that level in sufficient time to make it three years running.

I will update this list of recipients in a week or two. For the time being, if you wish to communicate, Robyn and I would appreciate e-mail rather than telephone calls (er, other than family members that is).

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WASAH Meetings

To continue to give members the chance to plan ahead, the ordinary meeting dates for the remainder of 2000 are tentatively selected below subject to venue availability. Meeting time will be 7.30pm. These are the third Friday of the third month as follows -

15 September
15 December

Dear All,

As promised, an update regarding the progress at the Park. It has been three weeks since the fire. This will be the last gross mail out and I will communicate with everyone individually in the coming weeks/months.

Many issues remain a bit foggy, but following is an assessment of where we are at and how we will proceed from present circumstances.

Please note that I am back on my original e-mail address johnweigel@msn.com.au

The main building was truly nuked. The roof is now gone and what looks like the groundwork for a 65 metre long bowling alley remains. Restoration and re-development will require an extended period of planning, licensing i.e. Development Application (DA) and construction. A record breaking pace is underway with a target date of mid-December, 2000 for full completion. Key activities have been initiated to ensure the establishment of a building program that will be as contracted and cost efficient as possible. The building firm is committed to the project and the mayor is pushing along the Gosford City Council in the DA process at break-neck speed. If any good is to come from the process, it is that we have a lot of new ideas for a more exciting visitor experience, and we are currently working on reasonably detailed designs in some areas and initiation of development and construction of "in house" components. Robert has spent much of his time since the fire working on the process of importation of non-native reptiles and frogs from US zoos and collections. We are experiencing considerable political assistance in addressing the bureaucratic walls that always take so long to scale, and are hopeful of fair dealings this time around.

It is intended that the business will resume trading in an abbreviated format as soon as possible. A target date of 8 September 2000 has been adopted - the commencement of the NSW school holiday period. To meet that ambitious target we have already erected a massive rental modular building, which will house reptile displays and gift shop, as well as modular toilet blocks. Next will be construction of an interim admissions kiosk and food outlet. Construction of 30 small reptile displays is underway and the process of obtaining, primarily by loan, of appropriate display and demo animals.

Top of the list presently is re-establishment of the venom

production activities, and we have undertaken considerable publicity to re-invigorate the process of funnel-web donations to the network of 'drop-off points' from Newcastle to south of Sydney, with the hope that CSL production will not miss a beat. We are hopeful of assistance from the various state and interstate wildlife authorities in the necessary collection of approximately 200 venomous snakes as required in the snake program.

John

"If its feral, its in peril"
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Please bring your funnel webs (very gently) to us

By ANTHONY DENNIS

After the deaths of hundreds of reptiles in a fire at the Australian Reptile Park, the management received sympathy cards from children who had been to see Ralph the Burmese python and Monty the reticulated python during visits to the main building where the blaze occurred.

Ralph and Monty were just two of more than 500 rare, exotic and endangered animals, such as snakes and turtles, which perished in the blaze.

However, there were few, if any, condolences for more than 400 funnel web spiders, which also died. Yet the deaths of the spiders were in many respects just as depressing.

Until the fire, the park was the sole provider of the venom, which is used to make the antivenene to save the lives of spider bite victims.

Now Mr John Weigel, the owner of the park, has appealed to the public to help restock the colony of male funnel webs so that it can resume its supplies to the Commonwealth Serum Laboratory in Melbourne.

The park also provided venom to produce the antivenom for snakebites from more than 200 snakes.

Since the fire the park has received just a single male funnel web from the public for its venom extraction program.

Suction, via a glass pipette, is used to collect the venom droplets from the male spider. The venom is then diluted, frozen and packed in dry ice for courier delivery to CSL to produce antivenene.

"We want people to keep an eye out for male funnel webs in areas such as swimming pools, bathrooms and shoes," says Mr Weigel. "But the biggest appeal is don't get bitten and don't take any risks."

Since the antivenene program began in 1980 only a one death from a funnel web bite has been recorded in Australia although there are about five major bites a year, normally in summer.

It is only the male, smaller than the female, which has caused deaths. It is used in the program because it has six times more venom than the female.

The park is also determined to replace its reptiles. Mr Weigel says a previous application by the Australian Reptile Park to import four Asian king cobras took five years to be approved by the Federal Government, which strictly controls the importation of exotic species to Australia.

But since the fire last month there is more urgency. The management of the park, near Gosford, intends to lodge a "one-off" application to import between 50 and 60 reptiles to help renew its devastated stocks in its main display area.

The park intends to open early next month using a demountable building for the main administration area.
Mr Weigel said the gradual return of the funnel web spiders has its good and bad sides.

He's been accused of being an arachnophobe, but he prefers to say that he's just not very fond of spiders.

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UPDATE

We hope to have the public comment draft of the regs out in the next couple of weeks. Finishing the explanatory notes is taking some time (its hard to explain why regs are written the way they are and what they will actually provide for).

Unfortunately we are getting close to the election. I would therefore appreciate if you could ask WASAH members to get behind the draft regs and to support them for early implementation.

I will advise once we have a publication date for the public comment period.

Gordon Wyre, Acting Director of Nature Conservation, CALM

Care of Australian Reptiles in Captivity by John Weigel. Available from WASAH for **$17** - the bible on herp keeping in this country and a must for any personal library.

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Attracting Frogs to your Garden by K. Casey. Available from WASAH for **$15** - a must for people wanting to create an amphibian-friendly garden.

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IMPORTANT NOTICE!

The views expressed by contributors to the WASAH Newsletter *are not necessarily those of the Executive, the Society or its members. As editor I tend towards minimal censorship, as I believe everyone's opinions should be heard, but I will exercise this if I believe an article's content reflects poorly on WASAH.*

Brian Bush

ASX FROG FOCUS

The Australian Stock Exchange (ASX) is sponsoring the production of a Frog Focus CD Rom. This computer CD is targeting school children to about year 8 and will be launched during frog week.

A copy of the CD will be sent to every primary school in Australia and will give kids access to information about frog species, reproduction, habitat, conservation and how to get involved in frogs.

The Perth Zoo has been helping develop this information, and as part of this, they contacted WASAH to enquire at to whether our Association could be involved by being a frog contact group in WA. So WASAH will be listed in the CD as a WA frog group. The WA Museum and the Perth Zoo will also be listed.

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A PhD scholarship

Is available for a quality student interested in investigating 'Changes in the spatial ecology of the Water monitor, *Varanus mertensi*, due to disturbances of the waterways and riparian ecosystems'. The fieldwork will be undertaken in the vicinity of Kununurra in the north of Western Australia.

If you know of a student that might be interested in this scholarship and project would you ask them to email me (g.thompson@ecu.edu.au) and I will forward them details of what is proposed. Start time ASAP.

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Edith Cowan University
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Fungus alert: Hands off the frogs

Unhand me ... the Australian green tree frog, like other species, should not be handled without gloves.

By JAMES WOODFORD,
Environment Writer

From today, NSW children will be warned about a new form of stranger danger –don't pat the frogs!

The NSW National Parks and Wildlife Service, Hygiene Protocol contains the warning in a set of guidelines for the Control of Disease in Frogs. It is for the wellbeing of the amphibians – not the kids.

In an attempt to halt a fungal disease sweeping the nation's ponds, the parks service is urging youngsters not to handle frogs unless absolutely necessary and to return all tadpoles to their exact place of origin.

Schools and TAFE colleges will be given a licence to remove a maximum of 20 tadpoles from one location in their local area for life cycle studies.

Each school will require endorsement from an animal care and ethics committee.

And as soon as the tadpoles have transformed, they must be returned to their point of capture.

The disease worrying the NPWS, chytrid fungus, is known to be affecting at least 30 species nationwide. Even the despised and introduced toad has been known to succumb to the fungus.

The disease, thought to have been introduced to Australia some time in the 1970s, is considered to be a main contributor to declining frog numbers. Other factors may include climate change, the diminishing ozone layer and habitat disturbance.

Of about 2,000 species of frogs in the world, Australia boasts around 240 – 70 of them recorded in NSW.

According to the NPWS's threatened species officer, Mr Ross Wellington, the best way to prevent disease is, wherever possible, not to touch frogs and to treat each pond as a separate place.

Mixing water and amphibians from pond to pond should be avoided at all costs.

"Lots of things we used to do when we were kids we need to be a lot more careful about," Mr Wellington said.

The guidelines will also halt the practice of returning frogs to where they came from interstate when they are found in produce, such as bunches of bananas.

These "banana box" frogs will be treated as if they are carriers of disease and are no longer to be carried anywhere without permission. They will spend two months in quarantine and undergo an approved disinfection treatment before being released to a licensed frog keeper.

Scientists who are licensed by the NPWS to work with frogs will be required to comply with the guidelines, which will include provisions such as disinfection of footwear and vehicles.

Researchers handling frogs will be required to wear disposable gloves.

Meanwhile, the NSW Scientific Committee will soon list another of the State's frogs as an endangered species. Fleay's barred frog has disappeared in the past five years from its last strongholds in northern NSW.

MOUNT STIRLING CONQUERED

On the 9 July about 20 WASAH members met mid-morning at Yoting in the glorious wheatbelt. Mount Stirling was our target, and what an impressive granite outcrop it is. You need more then a day to search the area properly. Before we set off, a juvenile Gwardar (*Pseudonaja nuchalis*) and striped skink (*Ctenotus fallens*) were found beneath some junk. You beauty, and more herp to come.

Many hands make for light work. Members quickly set off in all directions to explore the outcrop. Sadly, and it always seems to be the case, you cannot help notice turned rocks not put back in their original position. The numerous smashed slabs lying at the bottom of the rock face is always disappointing to see. The world is full of irresponsible idiots. The ecological importance of these granite islands in a sea of agriculture cannot be underestimated.

The usual ubiquitous granite inhabitants were quickly located like mobs of Dtella Geckos (*Gehyra variegata*) and Ornate Dragons (*Ctenophorus ornatus*). Dave Pattison was rewarded with a beautiful adult Stimson's

Python (*Antaresia stimsoni*) under a slab and a nice Mulga Snake (*Pseudechis australis*) was grabbed basking on the granite. The only bloke to bring a rake, David Algaba showed how different kinds of reptiles could be located by targeting a different microhabitat. His efforts yielded a burrowing skink (Lerista macropisthopus) and Jan's Banded Snake (*Simoselaps bertholdi*).

After examining all the herp and obtaining photographs of a few of them, we checked out a derelict house down the road. Here a nice Gould's Hooded Snake (*Parasuta gouldii*) was found.

The day was great fun and thanks to those members who turned up.

Species found:

Granite Froglet (*Crinia pseudinsignifera*), Burrowing Frog (*Neobatrachus kunapalari*), Dtella (*Gehyra variegata),* Binoe's Gecko (*Heteronotia binoei*), Barking Gecko (*Underwoodisaurus milii*), Fraser's Snake Lizard (*Delma fraseri*), Ornate Dragon (*Ctenophorus ornatus*). Netted Dragon (*Ctenophorus reticulatus*), fence Skink (*Cryptoblepharus plagiocephalus*), Striped Skink (*Ctenotus fallens*), Leopard Skink (*Ctenotus pantherinus*), Burrowing Skink (*Lerista macropisthopus*), Dwarf Skink (*Menetia greyii*), Bobtail (*Tiliqua rugosa*), Black-headed Monitor (*Varanus tristis*), Stimson's Python (*Antaresia stimsoni*), Gould's Hooded Snake (*Parasuta gouldii*), Gwardar (*Pseudonaja nuchalis*), Mulga Snake (*Pseudechis australis*) and Jan's Banded Snake (*Simoselaps bertholdi*).

BM

ELLENBROOK BUSHLAND UPDATE

Some of you were on the Ellenbrook Bushland excursion late last year. Yeah that's right, the one where Busho was not present and more people turned up. Sadly this pristine 1000-hectare patch of bushland does face a bleak future with development plans and so on.

Since 1992 Busho, Rob and I have been conducting a herpetofauna survey and have revealed a diversity unrecorded elsewhere on the Swan Coastal Plain near Perth. The amazing thing is, that we have only skimmed the surface in what is a large area. This area could have up to 50 different species.

Anyway, we are in the process of collating all the data and will publish our findings. The perfect dream would be to have the entire area gazetted a nature reserve, though this seems unlikely. We want to thank all those people who have assisted with this survey; you know who you are. Thanks to Kingsley and Lyn Dunstan who live adjacent to this beautiful area and brought it to our attention.

Victorian Herpetological Society Inc

A new committee has put its hands up to take the society into the new millennium. We will remain committed to herpetology in the field and captivity; we have great speakers for future meetings. Meetings will evolve to include a more hands on approach with displays and discussions. First meeting scheduled for 4 Aug.

There will be three *Monitor* publications over the next year with the first aimed at early Christmas. I will take over the editor role and re-establish this great magazine format. If members or interested parties have articles they would like to contribute it would be greatly appreciated.

In this first year there are many challenges and hurdles we face as a society. If you have suggestions, would like to offer help or assistance feel free to contact us.

Correspondence should be directed to,
PO Box 523, Somerville 3912.

New VHS phone number:
(03) 9437 0755

E-mail inquires and membership forms can be requested at
grizard@ozemail.com.au

Simon Watharow

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ALL YOU NEED TO KNOW ABOUT BOBTAILS

Bobtails are great lizards and make good pets. Obviously before you keep any reptile or frog it is always best to learn something about it. Darren Green from Victoria has written a terrific little book on keeping shingleback lizards and published by Australian Reptile Keepers Publications. It is full of information on all aspects of their husbandry plus heaps more. There is an albino bobtail illustrated on the cover.

Price is unknown at this stage but it will be a cheap buy from Australian Reptile Keepers Publications PO Box 2189, Bendigo MC Victoria 3554. There are also several other books in the series.

REPTILE CAGES FOR SALE

I had my snake boxes built by Doug Anderson and can thoroughly recommend his work. All that Doug requires is a detailed diagram and he is away. At the moment he is offering the following to those interested in the perfect home for their scaly mates.

Glass-fronted wooden boxes made from 12 mm plywood of two sizes: -

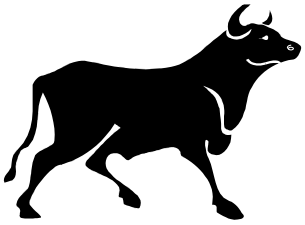
120 cm $295
90 cm $250

Features include easy viewing, light weight and transportable, can be custom built to be stacked as uni-model, hinged lids for easy access, feeding hatch for convenience and safety, all electrical fittings installed by qualified electrician, double-sided ventilators, hide-box included and removable front glass.

I have examples of these boxes at home for viewing. Doug can be contacted on **9418 6141**

Many members have also seen an alternative cage design at WASAH meetings by Dave Pattison. It comes in various sizes and can be stacked – give Dave a call on **9453 9623**

HERPTALES



Raking Finally Pays Off For Brad

Brad, as most of you know is a keen reptile photographer, and he has literally dozens of photos of one particular reptile species – the black-striped snake (*Neelaps calonotus*). All his photos of this beast have been taken of animals caught during pit-trapping surveys. This technique is by far the most reliable method on catching this snake. Raking in contrast is a much more hit-and-miss approach to finding Black-striped snakes.

Brad knows this all too well, but that has not stopped him hoping and trying to rake out *JUST ONE.*

In fact given the amount of herp raking that he does (and the Law of Averages), I would have thought that he had invested enough hours into this activity to rake out plenty, but to no avail. For years it has been niggling at Brad that he has never raked out this species. He has brought this to my attention on several occasions – as if I have the answer.

Well on Sunday 13/8 he hit the jackpot. While we were out at Ellenbrook (a previous WASAH excursion venue) Brad raked out two on the sandy raised edge of a firebreak.

So good on you mate it had to happen one day.

Other reptiles seen that day were: **Burrowing skink** (*Lerista praepedita*), **Elegant lerista** (*L. elegans*), **Fence skink** (*Cryptoblepharus plagiocephalus*), **Bobtail** (*Tiliqua rugosa*)

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LOOSE WEIGHT WITH BUSHO

Forget Jenny Craig's, exercise and low-fat diets. I have discovered the best way to loose weight. All you do is go away with Busho herping and forget about the extravagance come dinnertime. Hey, we head bush to herp, not to fill our tummies. I have been away with many different people over the years and always look forward to my crash diet of fresh air, tea and if I am lucky a delicious meat pie when I am with the lean and mean Perenty. Sometimes you have the opportunity to get a little fancy and put a can of baked beans on the fire. Otherwise, it is plenty of road spotting (during warm weather), bull-faeces and country & western music. A great life!

I recently spent a week herping with Busho up Exmouth way and bought two cans of baked beans and returned home with one. Be like a reptile and get efficient and economical.

I must admit though, Busho is getting sophisticated with his modern conveniences. On this last trip I was surprised to see a tilly lamp for use at night and a single burner stove to cook dinner, did I say that, no I mean boil the billy when wood is on the scarce side. We were on the coast where timber is a bit light on.

WASAH
GENERAL MEETING
7.30pm
Friday
15 September 2000
at
Perth Zoo Ed Centre
Labouchere Road, South Perth

Guest Speaker:

Robert Browne-Cooper
After his recent visit to Europe on,
"Keeping in Switzerland"

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Also
SEE EXCURSION NOTE PAGE 10

WASAH EXECUTIVE COMMITTEE

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WASAH is an informal group of people with similar interests - all wishing to keep for private study and "love", frogs, turtles, lizards or snakes!

WASAH joined the Affiliation of Australasian Herpetological Societies in 1994.

Address all correspondence related to this newsletter to:
The Editor, 9 Birch Place, Stoneville, Australia 6081

GENERAL MEETING

16 June 2000

MINUTES

1. **Convene Meeting** - 7.35 pm at Perth Zoo Education Centre

2. **Attendance** - 28 (head count) although only 18 members & 6 visitors signed book.

3. **Apologies** - Jamie Stuart, Eric Kidd, Bruce George.

4. **Correspondence Tabled** - None, but phone call from Peter Tight (ex Port Hedland herp raided by F&W in 80's). He is now living and keeping in QLD.

5. **President's Report** - Not much change/progress with new herp keeping regs since last meeting. Problems with "fine tuning" new proposed regulations. CALM is redrafting regs and working through issues such as animal importation costs versus need to have high value of reptiles.

6. **Vice-President's Report** - WASAH now paying for meeting venue hire.

7. **Treasurer's Report** - WASAH in the black. Some concern as to whether WASAH can afford financially ongoing purchase of journal "Herpetofauna" for members. Decided to continue as is for time being.

8. **General Business** - General open discussion and questions about new regs in terms of the vast change that will occur for herpetoculture in WA.
   Questions about the old heavy enforcement policy that has pervaded WA for so long, and the origin of this policy.
   Comments about local government culture and bureaucracy in terms of WA being significantly different to other Australian state governments.

9. **Editor's Report** - Editor been away on work a lot recently (see video for proof) therefore WASAH newsletter brief.

10. **Call for further business** - BM mentions the revised Frog Book by WA Museum will be available in a week or two.

11. **Speaker** - No guest speaker tonight. Two videos shown.
    First is *Outback Venom* by National Geographic on Brian Bush in the Pilbara Hunting Death Adders for venom research. Second on Anacondas of South America.

12. **Meeting Adjourned** - 8:45 pm prior to a relaxing look at the videos.

WASAH EXCURSION

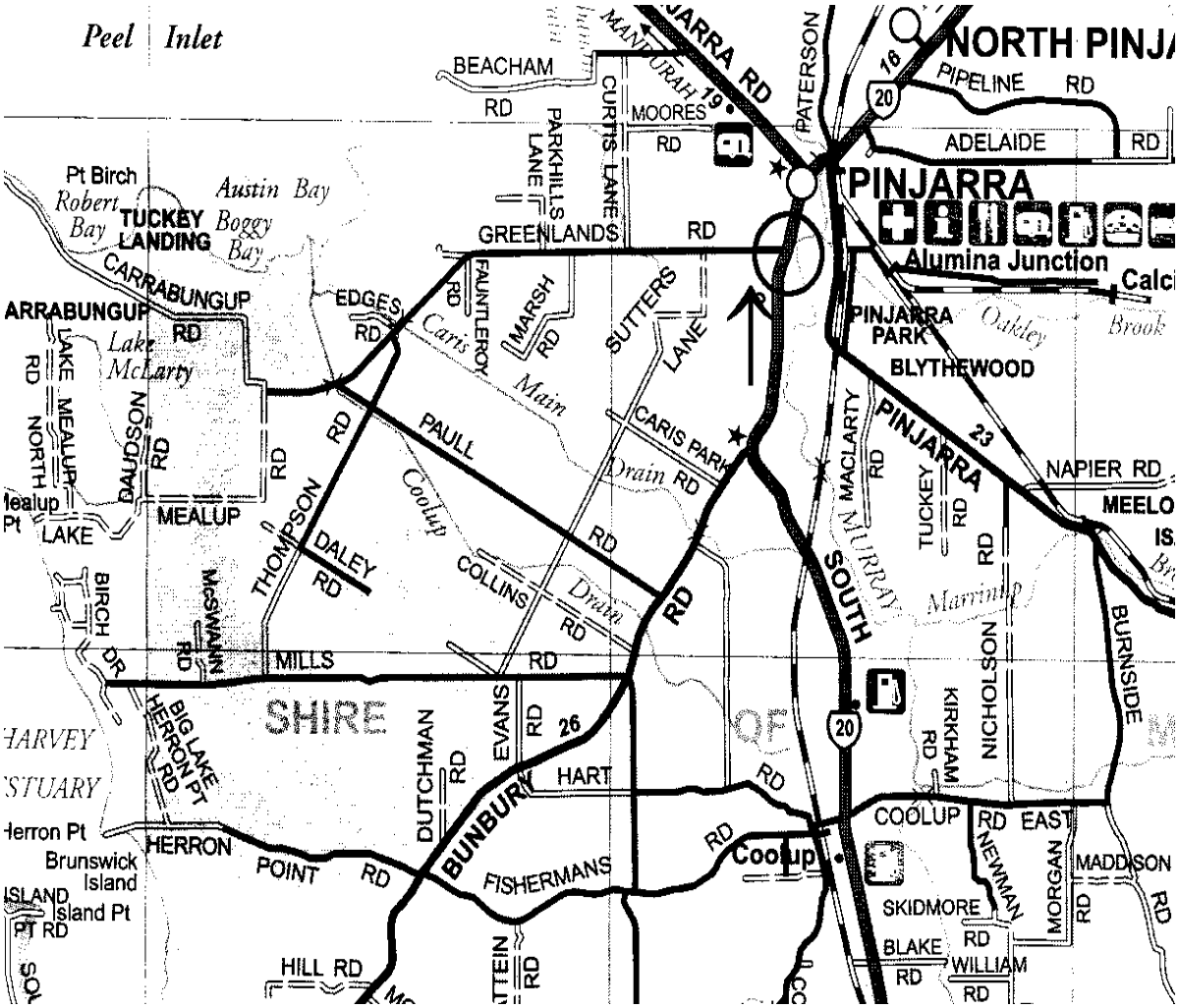
to

LAKE MEALUP

Sunday 15 October

Meet 10 am on Greenlands Road immediately after turning off South Western Highway

Situated approx. two hours drive from Perth via Armadale and Pinjarra or via Mandurah and Pinjarra off Greenlands Rd, this site has a unique population of the Jewelled Ctenotus (*Ctenotus gemmula*).



CARING FOR AUSTRALIAN FRESHWATER TURTLES IN CAPTIVITY

by Craig Latta, C/- Australian Herpetological Society, PO Box R79, Royal Exchange, SYDNEY 2000

INTRODUCTION

I can recall fond childhood memories of my father bringing home two snake-necked turtles that he found crossing the road. After careful consideration, a site was chosen in the backyard and my first turtle pond was built. From then on my interest in these fascinating creatures grew along with a thirst for knowledge. This article should assist those thinking of keeping freshwater turtles.

The classification of Australian freshwater turtles is: Class - Reptilia, Order – Testudines and Suborder – Pleurodira, for all except the pig-nosed turtle, which belongs to Cryptodira.

Side necked turtles (Pleurodira) have existed since the cretaceous period - some 135 million years ago. All have bodies encased in a hard shell, curl their heads back into the shell by horizontal movement and their pelvic girdle (Fig 1) is joined to the shell.

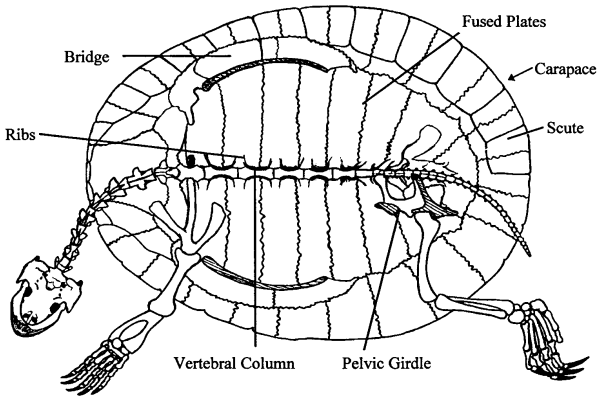


FIGURE 1. The bone structure of a turtle (Pleurodira) with plastron removed. Drawing by G. Scott

FRESHWATER TURTLE, TORTOISE OR TERRAPIN

Tortoises are terrestrial and possess thick legs and toes and require water for drinking only. There are no indigenous tortoises in Australia.

Freshwater turtles are aquatic and not capable of swallowing food or mating unless submerged in water. They possess webbed feet or paddle-shaped, flipper-like limbs (as in the case of the pig-nosed turtle) and will only leave the water to lay eggs, bask in the sun, or seek more favourable conditions if there is say a food shortage or drought.

Terrapin is merely a synonym for turtle and was derived from the North American Indian word ‘terrapene’.

TEMPERATURE CONTROL (THERMO-REGULATION)

Turtles are ectotherms regulating their body temperature by behaviour. Their body temperature can be considerably higher than that of their environment. On warm days turtles leave the water and bask, usually with the hind legs stretched out behind, retreating to the water periodically to cool down. Basking also aids in the control of skin complaints such as fungal infections, assists in shedding scales and helps restrict the growth of algae. Freshwater turtles are capable of gaining heat much faster than they lose it, through changes made to the direction of blood flow in their carapace and skin.

HIBERNATION AND AESTIVATION

In the winter months in southern Australia turtles kept in outdoor enclosures will hibernate. The length of time spent dormant is governed by climate, and in some regions (north of 26 parallel) turtles will not truly hibernate, just have periods of dormancy interrupted on warm winter days by periods of activity. Across the top end (Kimberley in WA) turtles will remain active throughout the year. Turtles hibernate either on land or in water, buried in soil, foliage or sediment. Turtles cannot survive under water for more than 2-3 hours when active, however those that remain beneath the water when dormant need very little oxygen. Sufficient oxygen is obtained by three methods of gas exchange, as follows: 1) Pharyngeal respiration - whereby a highly vascularised area at the back of the mouth will take oxygen out of the water and allow it to enter the bloodstream. 2) Cloacal respiration - is achieved through thin-walled sacs in the cloaca absorbing oxygen from the water. 3) Oxygen absorption through the skin.

Aestivation is when a turtle buries itself in the mud at the bottom of its waterhole or drinks as much water as it can then leaves the water and buries itself under dirt and foliage to escape drought conditions or dangerously low levels of water. During this time a turtle also enters a state of dormancy and slows its body processes down. Here it will remain until the water levels are restored or maybe perishing in the event of an extended drought.

DIGESTION IN TURTLES

All modem turtles lack teeth, instead using the tough edges of their jaws and clawed forelimbs to tear food apart. Long necked turtles are essentially ambush feeders. They strike with their mouths open, drawing in large quantities of water containing their prey. Most turtles cease to feed when water temperature drops below 15°C. Temperature also influences digestion time. For this reason it is not recommended to offer food to your turtles for several weeks prior to hibernation, as the food may rot in the gut and cause death. Food normally takes around 3 to 4 weeks to be completely digested and even in the case of a turtle with diarrhoea, it will take at least 5 days before waste is excreted. At the end of the intestinal tract is the cloaca (Fig 2) where faecal and urinary waste collects and is passed. Both the male and female genital openings are also located in the cloaca. Food digested that is considered excess to the turtles growth and energy requirements is converted to fat and stored as 'lumps' in the abdomen, rather than beneath the skin as in mammals. This may be because turtles are ectothermic and fat stored beneath the skin could act as insulation and interfere with thermoregulation.

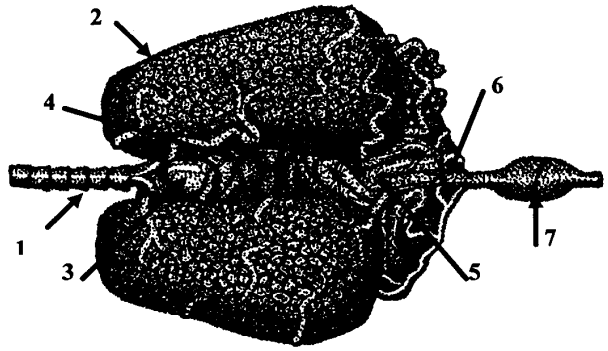


FIGURE 2. Internal Organs: 1) Trachea; 2) Lungs; 3) Heart; 4) Liver; 5) Small Intestine; 6) Bladder; 7) Cloaca. Drawing by G. Scott

THE SHELL

A turtle's shell is divided into two sections. The lower section is the plastron and the upper section is the carapace (Fig 1). The two sections are linked together by the bridges that are located either side of the body, between the fore and hind limbs. The strength of the shell comes from the fused plates, which are covered by shields called scutes. These shields are made from keratin that is produced by the malpighian cells, located just under the scutes.

CIRCULATORY SYSTEM

A turtle's heart (Fig 2) has only three chambers. Their heart rate is influenced by many factors including increased activity, temperature and increased pressure during diving. A rise in temperature will cause an increase in heart rate also. As a turtle dives, pulmonary resistance increases and the heart rate decreases. The scientific name for this is Bradycardia. The level of oxygen in the blood falls as the body uses it up. Anaerobic metabolism takes over causing an increase in carbon dioxide and lactic acid. Most aquatic turtles can tolerate extremely high levels of carbon dioxide in the blood. When the turtle returns to the surface this situation is rapidly reversed through hyperventilation. After about 20 minutes of being submerged and the oxygen supply depleted, the brain will switch as previously mentioned, to anaerobic metabolism. Here the brain can continue to function effectively for around 3 hours depending on the species and size of the individual.

RESPIRATION

Unlike the lungs of mammals, a turtle's lungs (Fig 2) are not maintained at positive pressure. The ribs of a turtle are joined to the shell (Fig. 1). Breathing is performed with the help of muscles that are located near the limb pockets at the 4 corners of the shell. These muscles create a negative pressure in the lungs and respiration takes place. Inspiration occurs as a result of the difference in pressure. Expiration, however, does take some degree of effort. When a turtle enters the water this situation is completely reversed, as its body is now being affected by water pressure. Inspiration now requires muscular activity, whereas expiration is aided by the water pressure and takes little or no effort. The amount of air in the lungs also affects their buoyancy. The volume of air in the lungs, and the transferral of fluids within the bladder and cloacal sacs control a turtle's state of buoyancy. Proof that the lungs help control a turtle's buoyancy is evident when observing a turtle with a respiratory infection. Turtles suffering from respiratory infection or pneumonia are unable to dive and can be observed floating at abnormal angles in the water.

SIGHT AND SMELL

A turtle's sense of smell and vision are highly developed for locating food, avoiding predators and finding suitable mates. It has been suggested that they possess colour vision and this may be why some turtles show colour preferences when feeding. Their sense of smell is achieved through the nose and also Jacobsen's organ. This is located in the roof of the mouth. Its function is to detect scent particles that are floating around in the air. The scent particles are moved around the mouth and throat by 'gular pumping'. Some species of freshwater turtles are able to perform this while submerged. All Australian turtles have four scent glands, one on each side of the bridge and one beside each back leg. The odour produced is used as defence against predators and possibly against other males when competing for a female during the breeding season.

KEEPING TURTLES INDOORS

It is recommended to keep small turtles up to 7 cm shell length indoors where they can be easily monitored. A 90 or 120 cm long aquarium is recommended. The aquarium should have 5 cm of river gravel covering an under-gravel filtration system and be 50% to 75% full of water. The aquarium should also contain a log that protrudes above the surface of the water, or an artificial platform, so the turtles may leave the water as they desire. Make sure the log is one that has been collected from a creek or as dry timber will float and discolour the water. A 40-60 watt light globe situated 15 cm above the log or platform will add warmth and help them to achieve their preferred body temperature. Turtles excrete much more waste than fish, so an additional filtration system should be included (eg *Eheim or Fluval* canister power filter). A thermostatically controlled submersible heater should also be added to maintain a constant water temperature of between 24°C and 27°C. The addition of a few water plants *(Vallisneria* is eaten by most

species) will make your aquarium more attractive and supplement your turtles diet. Once the aquarium is established the water should be checked frequently for PH levels using a PH test kit. A neutral reading of 7.0 is recommended, as levels outside this can be detrimental to your turtle's health. Ultra-violet rays in sunlight trigger the synthesis of vitamin D3 in the skin, so in spring and summer your turtles should be placed outside three to five times a week, for about 30-45 minutes at a time, **making sure to monitor the temperature of the water at all times as overheating may result in their death.** Place a plastic container that contains about 6 to 10 cm of water in a safe, quiet spot outside and shade about 35% of it. Add a small log to the container to allow the turtles to bask and then cover the container with netting or aviary mesh to help prevent dogs, cats and birds from attacking them.

Turtles kept indoors should receive eight to ten hours of artificial light each day. Fluorescent tubes that can simulate sunlight are beneficial to their growth and survival. Power twist tubes and reptile daylight tubes both simulate natural daylight and produce beneficial ultraviolet rays. Remove all glass lids from under the fluorescent tubes as glass filters out ultra-violet rays and this would be defeating the purpose. If possible, connect the power supply to the lights with an electrical timer so that they turn on and off at the same time each day. This will take the tedious task of turning them on and off away from you, and allow the turtles to become accustomed to a normal day and night cycle.

OUTDOORS ENCLOSURES

Turtles over 7 cm shell length should be kept in larger ponds outdoors. A fibreglass pond or pond liner, which can be purchased from most large nurseries, are both perfect for beginners. Make sure to choose a fibreglass pond without pebbles or stones covering the inside, or scarring to your turtles shell may result. For the serious enthusiast, a pond can be constructed of concrete. A builder should be consulted to determine the thickness of the walls, the amount of steel reinforcing to use and the best product to seal the concrete with. Water depth should be at least 60 cm (preferably 100 cm) to allow turtles to mate successfully and help prevent the water overheating during summer. The pond should be situated where it will receive as much sunlight as possible, especially the morning sun to allow turtles to obtain optimum body temperature early so they can begin their daily activities. Shade an area of the pond so they can escape from the harsh midday sun and hide when they feel threatened. Build a wall at least 80 cm high around your enclosure to prevent escape. Turtles are extremely good climbers. A large saw-shelled turtle has been observed escaping from its enclosure by climbing over a 200 cm barrier made of koppers logs.

An island of sand and/or soil should be provided to allow turtles to come ashore to lay eggs, bask in the sunlight and hibernate. A large log should be included as a ramp so they can leave the water at will. Grass and grass roots should be removed from the enclosure. Floating water plants should be included as these will provide some shade, serve as an additional food source and help keep the water cool.

Small fish, freshwater prawns and yabbies should be added once the water chemistry in the pond has been stabilised. The mosquito fish, *Gambusia affinis,* an introduced pest found in most creeks, ponds and lakes, is an ideal food fish and will stop mosquitoes from breeding in your pond. Under no circumstances should these fish be released into the wild as they are considered one of the main threats to frog colonies.

A filtration system should be incorporated into the design of the pond. At the heart of any good filtration system is the pump. There are two main types available - submersible and external. The volume of water your pond will hold and the flow rate of the pump should be taken into consideration. A good rule of thumb is to select a pump that will circulate all the water in the pond every hour. The submersible pump should have a pre-filter or screen fitted to prevent the entry of fish or turtle's legs. A pump with a built in, low water level cutout switch is preferable.

I have had success with the combination of an ultra-violet light filter and a large fibreglass, biological pond filter. Algal blooms can be prevented as the UV light kills them. The biological filter provides a large surface area of filter medium harbouring vast quantities of nitrifying bacteria. These break down toxic waste into less harmful substances.

DIET

A natural, balanced diet with plenty of variety should keep your turtles in a healthy condition. Large turtles require feeding only every 3rd day. Overfeeding is best avoided. A turtles diet should include small whole fish, worms, shellfish, insect larvae, liver (high in vitamin A), water snails, freshwater prawns, and raw saltwater prawns with their heads removed, freshwater mussels, crickets and small yabbies. Wh*iskas Go-Cat* pellets and *Whiskas Casserole* variety cat food may also be offered (after the chunks have been rinsed to remove excess gravy) as they contain added vitamins and minerals. Avoid feeding mincemeat as it is too fatty and contains chemical dyes and preservatives. Also avoid feeding raw meat as it lacks the vitamins and minerals necessary for healthy growth. If another pet food is to be offered, make sure to choose one that is preservative free, is low in salt and fat, and contains added vitamins and minerals. A turtle should have access to a wide variety of vegetation as most species regularly include some form of this in their diet. I occasionally feed mine a blended mix of kangaroo meat, broccoli leaves, watercress, parsley, carrot tops, alfalfa sprouts, celery leaves, apple, snow peas and rock melon. Duckweed and hyacinth, both floating water plants, are also recommended. In an outdoor pond, food should be offered mid-morning or mid to late afternoon, as turtles tend to hide when the sun is at its highest. Remove uneaten food before it rots and pollutes the water.

DISEASES AND TREATMENTS

It is important to realise that most diseases do not just happen; they are the result of stress, incorrect diet or poor husbandry. Newly acquired turtles should be quarantined in water that has been treated with *Bactonex*, made by Aquasonic, at a ratio of 10 ml per 40 litres of water for a minimum of 3 weeks, keeping an eye out for any signs of

sickness, disease or parasite infestation, and if recognised, treated accordingly. The water should be changed and treated daily. *DO NOT OVERDOSE WITH BACTONEX.*

EXTERNAL PARASITES
Leeches and mites, often found on turtles collected from the wild, can be removed by placing them in a strong solution of salt water until they drop off.

INTERNAL PARASITES (WORMS)
The most common types of worms found in turtles are the red nematode worm and the white Roundworm. They are usually detected when found wriggling at the bottom of the container. Infestations can be treated by orally administering *Panacur* (Fenbendazole) at 25 mg/kg once every second week for 8 weeks.

Note*:* Ivermectin, often used to treat worms in other reptiles, should **under no circumstances** be used due to its toxicity in turtles.

CUTS AND SCRATCHES
Parderm Lotion may be used to treat all superficial wounds including scratches, bites, cuts and abrasions. It is a very good antiseptic and is recommended by veterinarians. After treatment, keep the turtle out of the water for 1 hour.

SHELL INFECTION
A rough or sharp object in your turtle's enclosure usually causes this. Remove any sharp or abrasive rocks from the area and replace them with logs. Ensure that all exits are non-abrasive. Treat the shell by painting the damaged area with lotion and keep the turtle out of the water for 24 hours to help prevent infection.

SOFT SHELL
This is unfortunately common amongst young turtles kept indoors and will usually lead to their death. All neonates have soft shells upon hatching and will usually begin to harden within two weeks. If calcium and sunlight are not available then the hardening of the shell may not occur. The solution is to offer a natural diet of insects, fish, worms and water snails etc. and sufficient sunlight. The addition of a *Nutrafin* (calcium) turtle conditioner block to your aquarium will have some benefit.

SWOLLEN EYES
This is predominantly caused by dirty or contaminated water and is diagnosed by the swelling of the area around eyes. Treat the infected eyes with *Terramycin* ointment and keep the turtle out of the water for an hour after treatment. Change water and clean the aquarium or pond regularly to prevent re-occurrence. Swollen eyelids or eyelids that are stuck together indicate an even more serious problem - vitamin A deficiency, as seen in many hatchlings that are fed exclusively on red meat, causes the Harderian and lacrymal glands to enlarge and force the eyelids across the eyes causing blindness. An injection of vitamin A and a natural diet should lead to a speedy recovery.

FUNGUS
This mainly affects turtles that are housed indoors and a predisposing factor is a lack of sunlight. The first indication of fungus will be the appearance of grey or yellow patches on the skin. If the fungus is not treated quickly, it will spread over the entire body and may cause death. Paint the infected areas with *Parderm Lotion* and keep out of the water for at least two hours. Repeat this procedure 3 times a day until the problem clears up. *Fungonex,* made by Aquasonic, is an excellent fungicide and should be added to your aquarium water at a ratio of 5 ml per 40 litres of water.

SALMONELLOSIS
Salmonella bacteria are a normal part of a turtle's digestive system. When stressed, a bacterial imbalance may occur, causing infection and disease. Recommended treatment is 2.5 mg/kg *Neomycin* every 24 hours orally for 3 days. It is important that personal hygiene is maintained at all times. After handling your turtle, please ensure your hands are washed thoroughly with an anti-bacterial soap.

RESPIRATORY INFECTION AND PNEUMONIA
Turtles kept in continuously cold or draughty conditions may develop a respiratory infection. Some indications of this are loss of appetite, discharge from the nose in the form of bubbles, drooping of the head and wheezing. This condition can be fatal if not detected in its early stages. Outdoor ponds should receive morning and afternoon sun to allow turtles to bask and achieve a preferred body temperature. Indoor aquariums should be heated and have a constant temperature of between 24°C and 27°C. Do not place aquariums in front of open windows. A course of *Enrofloxacin* (injectable antibiotic solution) given at a dose rate of 2.5 mg/kg every 5 days should improve the situation. Vitamin and fluid therapy may also be necessary. A vitamin A deficiency can be a predisposing factor.

GASTROENTERITIS (DIARRHOEA)
This is a common complaint amongst freshwater turtles. It usually occurs because of stress or housed in unclean conditions. Suggested treatment is 2.5-5 mg/kg *Enrofloxacin* administered intramuscularly every 5 days. A veterinarian should determine the length of the treatment. Fluid and vitamin supplements may also be given. *Kaolin-pectin,* or other anti diarrhoeal preparations, may be used.

REPRODUCTION

SEXNG TURTLES
Short-necked turtles are relatively easy to sex as females have a much shorter tail than their male counterparts. Long-necked turtles are much more difficult. One method is to observe them while swimming around with their tails relaxed. A male long-necked turtle's tail is slightly longer and also thinner at the tip. Another method is to observe interaction during courtship and mating.

BREEDING
Turtles begin mating in early to late spring, depending on the species and the geographic location. When approaching a female, a male will sniff closely around her cloacal region.
This behaviour is for gender recognition amongst turtles. Before copulation, the male may exhibit aggressive

behaviour, frequently biting her on the limbs and back of the neck until she responds. Males have also been observed swimming backwards, fanning with their forelimbs for hours at a time, around the head and face of prospective mates. After adopting the mating position, the claws are used to hold the female around the edges of the carapace. A male eastern snake-necked turtle in my pond has been observed inserting his hind feet into the gap between the carapace and plastron, either side of the females tail, and locking them into position by twisting them horizontally. He then proceeded to gently caress the female's carapace with his front limbs. After acceptance, he released his front legs and floated vertically while still assuming the mating position for approximately 20 minutes.

In the wild, turtles deposit one or two clutches of eggs well above the high-water level. Clutches may consist of between 6 and 21 eggs depending on the species. It is impossible to ascertain the incubation periods due to fluctuations in climatic conditions. Saw-shelled turtle eggs artificially incubated at 28°C hatched after 60-62 days. Eastern snake-necked turtle eggs, also artificially incubated at 28°C, have hatched after 120-123 days.

ARTIFICIALLY INCUBATING TURTLE EGGS

One of the most rewarding aspects of successful husbandry is captive breeding. It is a good indication that your turtles are healthy and completely happy with your efforts in creating a suitable environment. From early September onwards, female turtles should be examined for eggs on a weekly basis by gently feeling the abdomen area in front of the hind legs. When it is apparent that she is gravid, you should keep an eye on the ground surrounding your pond for obviously disturbed areas. Turtles usually lay their eggs on overcast or rainy afternoons. After they have commenced laying, turtles lose their natural caution and become oblivious to their surroundings. Eggs are channelled into the nesting chamber by the careful positioning of the hind legs that prevent them from falling onto each other and breaking. The nest is then covered and compacted by the repeated lifting and dropping of her body over the site. The eggs should be gently uncovered and marked with a felt pen on the uppermost point before being removed for artificial incubation. They must sit for the duration of the incubation with the mark facing upwards.

Another method is to inject 1 ml of 10 I.U/ml synthetic oxytocin into the muscle of the hind leg, 7 to 14 days after the eggs feel sufficiently hard. The gravid turtle is then placed into a large container 2/3 full of heated water (26°C-28°C) and laying should commence within 5-15 minutes if she is undisturbed. Don't be too concerned if the eggs are turned within half an hour of being laid. The eggs can then be removed, marked, and placed in suitable preheated containers inside your incubator. The more experienced keeper should only attempt this method.

Vermiculite is the preferred incubation medium (available from most garden nurseries). It is mixed with water at a ratio of 1: 1 (preferred) by weight. The mixture should feel moist, but not wet, as the eggs may rot. Not enough moisture and the eggs will soon dry out. A level of around 90% humidity is recommended for eggs in incubator surroundings. The mixture can then be placed in an icecream container with a lid, or my choice is to use a decor 1.8 litre see-through container with lid to keep an eye on the moisture content and progress of your eggs. Half fill your container with the vermiculite mixture and place the eggs in it, either slightly buried or just slightly showing above the surface, allowing you to monitor the eggs more easily. NB It is wise to have the vermiculite and incubator already pre-heated to the correct temperature before adding the eggs. Every 3rd day test the moisture content of the mixture with your fingers and spray 2-3 light mist sprays over the eggs if the mixture appears to be drying out. Do not turn the eggs, and try to be as careful as possible when removing the lid of the container. The eggs will start 'banding up' or calcifying within 24 hours, usually starting from the centre and working outwards. Do not be alarmed if you notice 'windows' or uncalcified patches on the shells, as they may be present in viable or non-viable eggs. If an egg takes on a slimy or mouldy appearance it is best to remove it as mould may spread to viable eggs.

THE INCUBATOR

The incubator I recommend is made from an insulated plastic moulded esky that has a hinged or lock down lid, an electronic thermostat with digital temperature readout (LAE MTR4), and a small rotary fan to force air evenly throughout the incubator. A cheaper thermostat may be used but they are usually not as accurate or have a limited life expectancy. Have an electrician wire them all up using two 40-watt globes (placed well above your egg containers) as your heat source. It is best that the fan works only when the globes are on as the fan will generate its own heat thus effecting the inside temperature. If the ambient (outside) temperature is higher than your pre-set temperature then you must find a cooler position for the incubator or introduce a cooling source e.g. air-conditioner to the room. Always have a second thermometer positioned inside the incubator to check the accuracy of the thermostat.

If you have an expected hatching date then commence daily inspections ten days before they are due, just in case they arrive early. The young hatchlings, or neonates will usually take up to 24 hrs to escape from the egg after the initial tear is apparent. Eggs that fail to hatch 2-3 days after the rest of the clutch can be assisted with the use of a razor blade, delicately etching a slit in the egg. The neonates can then be removed to a food-grade plastic container that has approximately 2 cm of treated or filtered water in it (which should be changed daily) up until they are about 4-6 months of age, at which stage they can be moved to larger quarters. A suitable container is available from "Reflex" and measures 52.5 cm x 37.5 cm x 14 cm high. Increase the water level as your turtles grow. Surprisingly, many juvenile turtles have drowned as a result of inexperienced keepers housing them in aquariums that are too deep. A 'land area' or island must be provided so they can leave and enter the water at will. Nourishment is provided through the remnants of the yolk sac, which will continue to sustain them for the next few days, although they should begin to show some interest in

solid food within 3-5 days. It is best to offer live food including mosquito wrigglers or daphnia (water fleas) at this stage, until your neonates become accustomed to you feeding. Food should be offered daily for the first year of your turtle's life and varied as much as possible. Frozen foods such as plankton, blood worms, white mosquito larvae, brine shrimp and daphnia can be offered after defrosting and rinsing. Live foods including small crickets, worms, dragonfly larvae, freshwater shrimp, maggots and flies should also be offered. Place a special fluorescent light tube as previously mentioned over the container and have it on for 8-10 hrs per day. Whenever possible 'sun' your turtles outside, providing it is not too hot, for about 20-30 minutes each day, 3-4 days per week. Monitor them at all times while they are outside.

Reference: Cann, J. 1978. *Tortoises of Australia,* Angus and Robertson, Sydney.