Issue 5 | March - April 2018
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# iHerp Australia

## A MONITOR THAT ROCKS!

*Varanus glauerti* in captivity.

## BUCKET LIST

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## MORPH IT OR LEAVE IT

In defence of unnatural selection.

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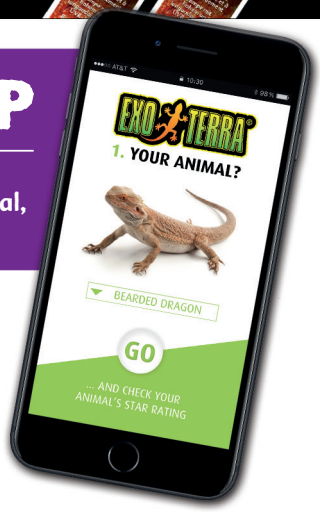


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# The 'Wrangler' Writes...

Welcome to another FREE issue of your favourite reptile magazine! The breeding season is now giving way to 'expo season' right around the country. If you have never been to a reptile expo and have the opportunity to do so, it's a great way to meet like-minded people and find out what's going on in your hobby. Mind you, they can get pretty hectic! iHerp Australia will be attending as many expos as we can; we are locked in for Melbourne and Brisbane and will have a presence in Penrith, thanks to our mate Rob Grabowski at Ironbark Aussie Pets (who is enabling us to be in two places at one time) . So make sure you say 'G'day' when you see our table; we'd love to hear from you.

We have so much great material at the moment – and the really pleasing thing is that much of it comes from talented new writers. So we have expanded this issue by four pages (we are really pushing the envelope as far as the souvenir printed copies are concerned). We lead off with an article about morphs by Andy Horlor. Morphs have quickly become a big part of the captive scaly landscape in Australia, and it's easy to see why, because Andy's snakes are crackers! Simon Fearn is at it again - this time he has broken the six-foot mark with a Tiger Snake – and Nick Gale takes us on a whirlwind herping trip west from Melbourne.

Following on from our last issue, which featured the amazing Emerald Tree Monitor, this time we are showcasing another stunning and highly sought-after species of varanid, the Kimberley Rock Monitor. Plus Kit Prendergast proves that dinosaurs are alive and well in the 21st century, and we meet taxidermist Lauren Hundloe, who is quickly establishing herself as a reptile and bird specialist. Ben Dessen is along to explain and evaluate the various merits of a host of live food items, and more. You'd better get comfortable....there's a lot to get through!

Don't forget to check out our new-look website. There are regular blogs to satisfy your weekly reptilemania cravings, a gallery of work from some fantastic photographers, and new items in the shop, including our exclusive, limited edition posters, with all proceeds to support conservation and research.

We'll be looking for you at an expo.

Happy Herping!

*John McGrath*


# iHerp Australia

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# Morph it or leave it:

## in defence of unnatural selection.

Andy Horlor is the vice president of the Illawarra Reptile Society and owner of Fuzzy Fox Reptiles and Rodents that specializes in breeding pythons, monitors and rodents. But what made a diehard purist become mad about morphs?

I have seen many changes in the reptile hobby over the years, but the one that sticks out in my mind more than any other was the introduction of morphs. As the first morphs began to enter the Australian market, it became clear that the hobby was becoming divided; you either loved the 'new and improved' animals or you were more than happy with the colour forms that evolution had blessed us with. I was to be found in the latter group – the 'purists'. Like many others in this camp, my mind was made up; no one should be altering our native animals in such dramatic fashion. The mere thought of putting two different subspecies together for breeding purposes would send me into a cold sweat!

For nearly 10 years I looked at morphs as nothing more than monstrosities and scoffed with self-righteous disbelief whenever I heard the word 'Jag' mentioned aloud. However, about eight years ago that was all about to change, and by crikey change it did! Today my collection consists of over 100 animals and about two-thirds of them are morphs.

So what happened? How could someone that was completely devoted to the keeping and breeding of animals that needed to be found under the same rock in order to be paired and bred together become so comprehensively converted? Allow me to set the stage....

One day I had a clutch of Diamond Pythons (*Morelia spilota spilota*) hatching; these were Gosford locality animals and I was excitedly setting them up in their new tubs. I looked through the clutch and found one I liked. I placed it in the first tub in the rack as a 'keeper' and proceeded to do the same with two more individuals.

Then I started to think about what I had done - how I had 'selected' what I deemed to be the best out of the clutch. This began a compounding thought process as I

***Left:*** *Axanthic Jaguar Carpet Python. All images by Andy Horlor.*

***Below:*** *Axanthic Zebra Carpet Python.*

started to think more and more about the animals I had held onto over the years of breeding; animals that fed better, seemed calmer, had brighter colours or different patterns. The inescapable conclusion was that I was altering these 'pure' or 'natural' animals in the same way that morph breeders might! Sure, I was only working at a polygenic level, and not with dramatic mutations with proven modes of inheritance, but nonetheless, animals were being selected and therefore modified by human intervention. There was nothing natural or pure about it.

I also started thinking over my many years of selling snakes; no one had ever contacted me asking for a dull and boring looking animal. Even if they wanted a wild type, they would always ask for the one with the best colours – and it had to be feeding well on an artificial diet of captive-bred rodents, plus possess a calm demeanour.

A few months later I decided to compare the hold-backs from my clutch of Gosford Diamond Pythons to the original pair that founded this line. One was wild caught and the other a first generation captive, as pure as you could get. The offspring I held in my hand were five generations removed from these animals and looked

**‘The reality is that there is nothing natural about what we do in the reptile hobby.’**

nothing like them. I hadn’t realized that all along, through all those years of breeding pythons, I had been selecting for what I deemed to be the best-looking snakes – nature no longer had a say in it!

It was from that moment that I started to investigate the other side of the hobby; the ‘dark side’ had me in its grip! It became clear to me that I was also turning away from the world of genetics, not just because I thought I was a purist, but because I didn’t understand it. I decided to take the plunge and went and purchased my first albino Darwin Carpet Python (*Morelia spilota variegata*) at a time when they still cost an arm and a leg and a left testicle! Once I had that animal in my collection it didn't take me long to get my head around how the recessive mode of inheritance worked, and it all snowballed from there.

Morphs are not going anywhere and will always be a permanent part of the hobby, but you still hear the purists condemn them with cries of, “It’s not natural," "It’s a threat to our native populations," "I wouldn't breed anything that didn't come from the wild," etc.

The reality is that there is nothing natural about what we do in the reptile hobby. We keep reptiles in boxes, heat them with electricity, use artificial lights and feed them prepackaged food. Humans have been modifying captive animals for literally thousands of years, so why the outrage when we do it with reptiles? You don't see people walking wolves down the street. Furthermore, humans, cats, dogs and foxes, to name a few, pose far bigger threats to our native species than the occasional, escaped, brightly-coloured snake that will stand out so vividly in the natural environment that it will stand little chance of survival, even if climatic conditions are favourable.

With the advent of these brightly-coloured animals entering the hobby we have seen an explosion in the popularity of keeping reptiles as pets, and that in itself can only be a good thing. There’s no doubt that many

**Morph** ('more-f', n. from Greek *morphe*: form): one of a number of different forms of an animal or plant; an aberration; the best-looking snake you will ever see!

more colourful reptiles will be produced in years to come, and I can only see the positives that the 'morph market' will bring. The obvious one is that morphs can only be bred in captivity, so poaching will become pointless, thereby reducing stress on native populations. Attitudes within the community are changing for the better, and even those with a deep-seated fear of snakes may be enticed to take a second look at animals that are so visually appealing. The notion that the 'only good snake is a dead snake' is disappearing and people are becoming increasingly interested in the conservation of our scaly friends.

So, am I of the opinion that the purists should get with the times and give up with this nonsense of trying to keep animals as natural-looking as possible? Absolutely not! Pure, wild-type bloodlines are essential to retain vigour in captive populations – as any self-respecting morph breeder will tell you. I still have locality-type animals in my collection and probably always will. I breed them every now and then simply because I like them, but that doesn't stop me selecting the best of the hatchlings. If I can continue to convince the odd person to put the shovel away and come have a look at one of my designer animals, in the hope that it may change their mind about reptiles, then I will continue to breed morphs for many years to come.

***Above:*** *Caramel Zebra Jaguar Carpet Python.*
***Right (slide show):*** *albino Spotted Python; Centralian Carpet Python with Zebra Jungle; albino Darwin Carpet Python with Diamond Carpet Python.*

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# A Monitor that ROCKS!

## *Varanus glauerti* in captivity.

***Rob Grabowski details his success with a beautiful species of monitor that is rare in captivity.***

For many monitor keepers in Australia *Varanus glauerti*, otherwise known as the Kimberley Rock Monitor, is a highly sought-after addition to the collection. However, these animals have always been hard to come by, especially in viable pairs. A little under two years ago I was fortunate enough to have the opportunity to acquire an adult pair; I thought it would have taken me many more years to track some down.

In preparation for the monitors' arrival we set up an enclosure 2m long by 1m deep and 1.2m high. The entire length of the back wall was covered with a fake rock structure with many ledges and tight crawl spots. The substrate selected was a mix of top soil, coarse coir peat and yellow brick sand to a depth of approximately 10cm. This was based on the assumption that in the animals' natural habitat soils consist predominantly of decomposed sandstone, and on the requirement for some retention of humidity. A small 'Retes stack' constructed from sandstone pavers was located at one end, while the rest of the enclosure was landscaped with artificial plants and hollow logs, which were placed at roughly 45 degree angles to create vertical perches and hides. Lighting was provided via a 75W GU10 Halogen over the Retes stack and a 70W external ballast metal halide UV (UVME; product to be released in Australia soon) over one of the hollow logs. Two water sources were provided, along with a lay tub/humidity hide consisting of a 35cm long by 50cm wide and 45cm deep tub fitted with a plywood lid and filled to within 5cm of the top with a similar mix to the substrate, but using finer coir peat and a higher ratio of sand. This was located near the metal halide lamp. Humidity in the enclosure was maintained at around 50-70%, while ambient temperature in the hot end reached 35°C in summer, with hot spots of 50-55°C on the log, and approximately 60°C on the Retes stack.

On the day of the monitors' arrival you can imagine I was quite worried that they may be harmed or lost in transit, but all went well. I couldn't wait to unbag these magnificent animals and release them into their new terrarium. The male exhibited bright green speckles on

***1.*** *The Kimberley Rock Monitor has a very long, thin tail with striking bands of black and cream.*
***2.*** *The female had dull, rusty red bands on her body, whereas;*
***3.*** *The male exhibited bright green speckles.*
*Photos of pair by Rob Grabowski.*

1.

2.

3.

the rear half of his body, whereas the female had dull, rusty red bands. She also appeared to be relatively low in weight, apparently from a recent clutch. In order to re-establish condition, she was fed on pinky mice, wood roaches and a special mixture I use for my monitors, along with supplementary vitamins and calcium powder.

## Breeding and Laying.

After the first month I noticed the female gaining weight at an increased rate; mating had not been witnessed but as the pair were housed together this could not be ruled out. Two weeks later, the female began to show interest in the lay box, and would spend several hours at a time either in the box or in its vicinity. Inspection of the lay box showed multiple test burrows had been excavated and the female could often be found sitting in the burrows. Another two days later, the female was found deflated and basking on the log near the lay tub, and so my first clutch of glauerti had been laid.

The female used the full depth of the lay box, depositing the eggs on the bottom in a slightly separated formation. A total of 13 eggs were laid; one being infertile and two others being fused together. An interesting note is that the male appears to be quite inquisitive about the laying process. He will stay in the general nesting box area and show curiosity at any movement, but has never attempted to enter the nest box. The female tends to stay in the box for a day after laying and observe the location for another day before showing a lack of interest.

I have had another three clutches from this pair since, with the frequency of mating not appearing to be subject to seasonal changes. Other observations worthy of note consist of:

- The second clutch also totalled 13 eggs, of which two were fused together.
- The third clutch contained only four viable eggs from another total of 13, and just one made it to term and hatched. I believe this was due to the lay site being dryer than on previous occasions.
- The fourth clutch comprised 10 viable eggs.

In my experience, if females take longer than two days to find a suitable lay site, this is reflected in a marked drop in the viability of eggs. I believe this applies across multiple species.

## Incubation of eggs.

The first clutch of eggs was incubated using perlite in two separate containers at a steady temperature of 30°C.

The eggs in the first container began to hatch at 84 days, and after three days, all six eggs had hatched. The second container showed no response, so after four days, I decided to slit several eggs; this resulted in a hatch rate of 11 out of 12.

All hatchlings were left in their containers in the incubator for a minimum of three days after birth to allow the remainder of yolk to be absorbed in a clean and humid environment before being transferred to their enclosure. This was furnished with a five-layer Retes stack, with fine washed sand as substrate and a 50W halogen globe to provide heat.

After two weeks it became apparent that several of the hatchlings would still not exhibit a food response. Various attempts were made to feed them, but although initial results appeared promising, these were ultimately unsuccessful. I have since come to the conclusion that slitting monitor eggs is not beneficial to the hatchlings and may result in higher mortality rates.

All following clutches have been incubated in specific reptile incubation tubs using the 'over water' method, however hydrated water crystals are used in the base of the incubation tray instead of simply water alone. The hatch rate using this method has been near 100% with none of the previous issues experienced using perlite. This is now the only incubation technique I use for *V. glauerti*.

## The next generation.

As the first hatchlings matured it was evident that there was a variation in colour that has since proven to hold true for subsequent clutches. A higher proportion of the progeny tend to exhibit the rusty red bands and black and grey colouration of the adult female. However, a small number display the same lime green across the lower body as the original male. These animals have been held back to determine if it is possible to refine this trait. Unfortunately, the locality of the original pair is unknown, making it impossible to back track and confirm whether the colour variation is evident in a single local population. This is possibly something that could be researched in the future.

'A colour variation was evident in progeny, with a small number displaying the same LIME GREEN MARKINGS as the original male.'

At around two months old, juveniles were separated into smaller groups in enclosures measuring 90cm in length and 65cm wide. Again, these were fitted with the UVME metal halide kit as a primary source of heat and light. Slate tiles were used to create the Retes stacks; loose bark sheets were stacked for vertical perches, and the substrate consisted of a mixture of fine coir peat, sand

***Below left and right:*** *Purpose-designed enclosures for Kimberley Rock Monitors. Note the bark and fake rock covering walls, and the angled branches to facilitate optimum use of vertical space. The Retes stack is built by an offset method to provide tight crawl spaces at any height. Images by Rob Grabowski.*

and leaf litter. This new arrangement also coincided with a move to our new reptile room. It was starting to cool down for winter at the time and the new room, while being well insulated, did not have enough enclosures running to build up ambient temperature sufficiently, so I chose to run the lights on a 24-hour cycle for the next few months.

During this time the young Kimberley Rock Monitors grew rapidly, and at one year of age they were transferred in their respective groups to much larger enclosures. These contain multiple hollow logs, with bark covering three walls to permit additional use of vertical space and large Retes stacks built in an offset fashion. This is something I have been experimenting with; the levels are stacked with only a single spacer or riser on one side, in such a way that the tiles lay on an angle. The animals therefore have the opportunity to find a tight spot at any height. Substrate is a mix of sand and coir peat, lighting and heating is once again


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provided by the UVME metal halide, and additional light comes from a GU10 LED lamp.

Shortly after this last move, one of the young females was noticed to be persistently digging. A humid lay hide was installed and she promptly laid four eggs overnight, three of which were viable. This therefore confirmed that *V. glauerti* become sexually mature at around 12 months of age! A week later a second female deposited three eggs, however all of these were unviable. I believe this was more likely to be due to the unsuitability of the lay site provided rather than an issue of maturity. The lay box has since been replaced with a larger container and I await the next clutch….

Kimberly Rock Monitors appear to be quite social animals, and no aggressive behaviour has been observed in any of our groupings. Likewise, we have never witnessed predation of eggs by males; as recorded with the original pair, if anything the males seem to take an interest in the laying process and watch the lay box intently throughout this period.

*Varanus glauerti* are a rewarding species to work with, as each animal exhibits personality, inquisitiveness and intelligence. Even from a young age they appear to identify routines and quickly become accustomed to human interaction - most juveniles can be hand fed from quite early on. Adults are generally very relaxed and tend not to possess the skittish nature typical of some other *Odatria* species. This also means they are often out and about in their habitat during the day, rather than hiding and leaving you with an enclosure that looks perpetually empty.

Breeding appears to be relatively straightforward so long as basic requirements are met, but I would like to see success in a few more viable clutches from various animals and in different enclosures in order to hone in on a more specific list of what is needed for a 'perfect' environment. The variation in colour and pattern amongst clutches may see some interesting lines developed in the future, and I look forward to seeing more of these amazing monitors in the hobby in coming years.

***Above (slide show):*** *each animal exhibits personality, inquisitiveness and intelligence. Images by Rob Grabowski.*

# Bucket List:

## 1. Grow out Tiger Snake more than six feet long.

***Simon Fearn's*** *obsession with oversized elapids has borne some record-breaking fruit....*

*'This shot gives an idea of how long his body is. His SVL is more than 1600mm.'*
*Photo: David Maynard.*

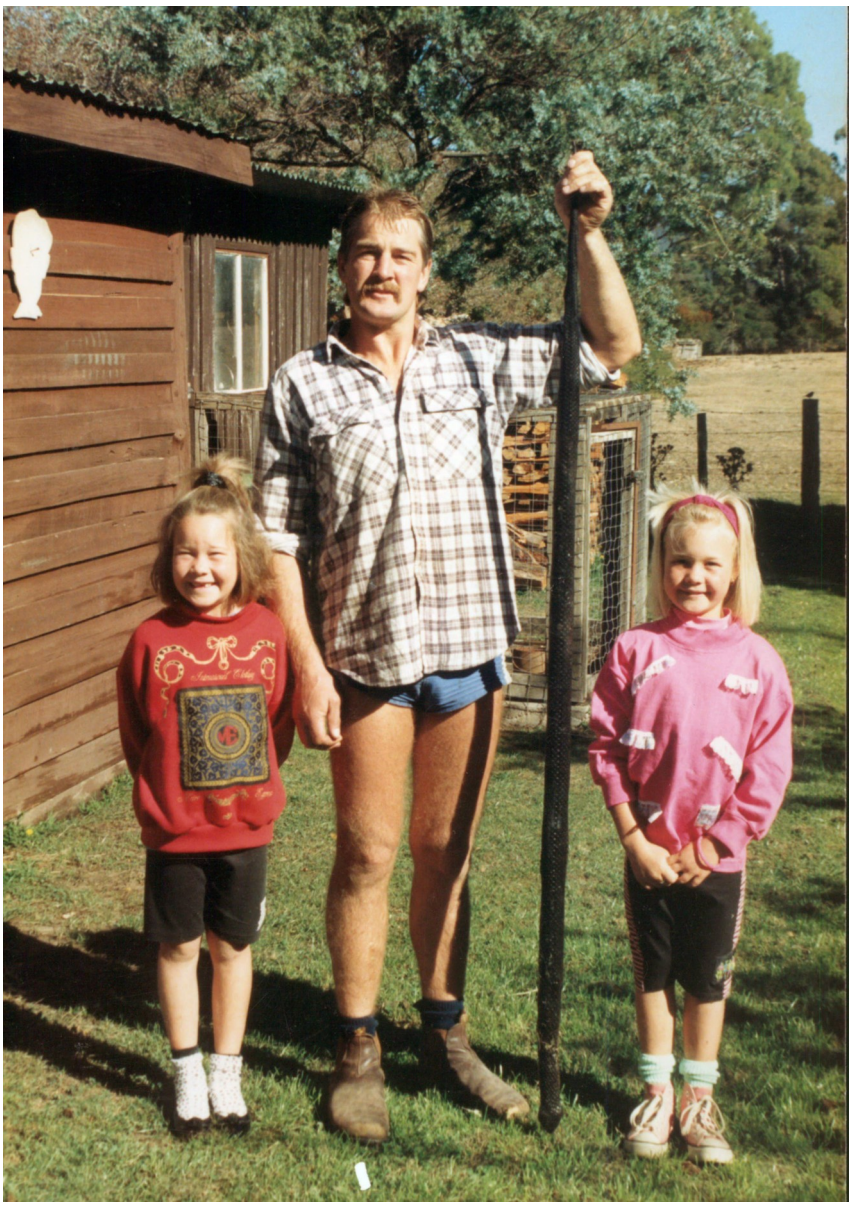
Mick Thow would be the first to admit that he is an excitable chap with boundless enthusiasm for anything he does. One hot evening in March 2009 I was driving back to base after a long day in the field when Mick rang me almost breathless with excitement. He had just checked on his heavily-gravid female Chappell Island Tiger Snake and discovered that she had given birth to monsters! Mick was trying to explain to me the dimensions of the 22 neonates and the size of their heads. I had been keeping Tiger Snakes much longer than he had at this stage and was a little jaded and so I didn't treat his report with the gravity it deserved. I had, after all, seen some pretty big neonates over the years - including 13g, 300mm newborn snakes on Chappell Island itself. Several days later I visited Mick at his home in Ulverstone on Tasmania's north-west coast and was overjoyed to be able to select some of the new babies to rear. They were indeed exceptional, with enormous heads. In particular, I noticed immediately that their heads were longer than any other neonate Tiger Snakes I had ever seen, and I knew that this characteristic would facilitate a larger gape and thus allow them to swallow much larger food items than typical Tiger Snake neonates. This proved to be the case and these babies went straight onto large pinky rats and were taking fuzzy rats not long after.

'Mick's Chappell Island Tiger Snake had given birth to MONSTERS.'

I have previously described at length how I rear snakes (Fearn, 2014a; Lowe and Fearn, 2015), so will resist the temptation to go into details again here, but my goal was to get these snakes to a size where they could be placed in my outdoor enclosures as quickly as possible. I was employed in a job that kept me very busy and away from home quite a bit, so having snakes indoors at that time was problematic. These neonates grew so fast that I was able to get them outdoors the following August when they were only five months old. In hindsight, I wish I had had the time to collect more detailed information on the size of these snakes at birth and their subsequent growth rates. What became clear to me quite quickly was that these snakes represented the best chance I was going to have of ever growing out a genuine 1830mm or 'six-foot' Tiger Snake. The 'six-foot' Tiger Snake became a beast of legend in my mind, because throughout my life I have heard endless stories of the existence of such creatures in the Tasmanian bush but never actually seen one. There was just enough evidence to suggest to me that they might still exist (the odd skin, the occasional grainy photo) and of course there were also plenty of wild and captive-raised snakes that got close to the magic mark. It seemed that lots of Tiger Snakes throughout the Tasmanian region could grow to between 1706mm and 1760mm (5' 6" to 5' 8") and many captive specimens had. However, that last four to six inches to get to six feet seemed like a massive hurdle. The more I researched the maximum size of Tiger Snakes the more I realised that 'six feet' was a rounded up, rather meaningless figure applied willy-nilly all over the place and really had very little solid basis in fact. No one could present me with any good evidence of the current existence of such

creatures, in spite of the universal acceptance that six feet was the 'typical' size Tiger Snakes grew to in Tasmania.

That was until April 1990, when word got to me that a genuine six-footer was on display in the Bracknell shop. Bracknell is a tiny town near the foot of the western tiers about 60km west of Launceston. It is surrounded by a rich mosaic of farming land interspersed with remnant forest patches and regrowth. Just to the south of the town the Liffey River meanders through this habitat. Its edges were largely bordered by remnant forest and scrub; big log jams from floods occurred along its length and rocks cleared from paddocks were dumped along its margins. The mix of natural and man-made habitats provided ideal conditions for a host of introduced and native small to medium-sized mammals to live in high densities. In other words, it was exactly the sort of place where big Tiger Snakes would live. As luck would have it, I lived nearby at an even smaller settlement called Liffey at the time and was soon able to get my hands on the snake. Dennis Chilcott was born in Bracknell and worked on several family farms in the district. Tiger Snakes were plentiful and he and his family had killed many in the time-honoured tradition in rural Tasmania. On the afternoon in question, he was horse riding through a rough, semi-cleared paddock beside the Liffey River when he noticed a very large snake making its way to a log pile. Without a moment's hesitation he immediately dismounted, grabbed a hefty piece of eucalypt branch and clubbed the snake to death. One well-aimed blow just behind the head was all that was required and the snake was perfectly



***Left:*** *my record-sized tiger at three months of age. He was born a head and the rest of him grew on to it! Photo: Simon Fearn.*

***Right:*** *one of the giant tigers from Mick Thow's clutch at three months of age, pictured with a typical Tasmanian neonate of the same age for size comparison. Both snakes were fed as much as they would eat. Photo: Simon Fearn.*

***Above right:*** *Dennis Chilcott and daughters with the 1810mm male Tiger Snake he killed near the Liffey River at Bracknell in April 1990. This was (and still is) the only Tasmanian Tiger Snake I have measured close to 'six feet'. It weighed 2kg and allowed me to dream the impossible dream. Photo courtesy of Dennis Chilcott.*

intact. I was able to measure it while it was still limp, and thus a very accurate relaxed length of 1810mm was recorded. This perfect example of a male Tiger Snake wasn't quite six feet, but just an inch or so under. However, it was obvious to me immediately that this was no old snake; its overall build and very low number of rodent bite scars indicated that it still had some growing to do. It was then that I knew for certain that such creatures did exist: albeit that they were apparently very rare. In a previous work I documented credible historical evidence of giant Tiger Snakes in excess of 1830mm in Tasmania during the rabbit plague era prior to 1954 (Fearn, 2014b and 2015). The Chilcott tiger showed me that those genes still exist today - even if the millions of juvenile rabbits do not. A couple of years ago I looked Dennis up and he still vividly remembered his big Tiger Snake and admitted that with the wisdom of passing years he would not kill a snake like that today.

My next foray with really big Tiger Snakes was on Chappell Island in the Furneaux Group, but even there genuine six-footers are hard to come by. Recently I amused myself by getting out all my relevant books and magazine articles and playing 'spot the six-foot Chappell Island Tiger Snake'. It's a game the whole family can play, but sadly no one wins! There are lots of pictures of men of relatively

.***Above left:*** *one of my 12-year-old, captive-bred Chappell Island Tiger snakes. This specimen is 1725mm long and weighs 2.9kg. It's growing in length very slowly now and has commenced 'blocking out'. Because it is kept out-doors it has good muscle tone and is a very powerful snake. Photo: David Maynard.*

***Above right:*** *the giant's father. A lovely tiger from Boat Harbour in north-west Tasmania. Photo: Mick Thow.*

short stature holding large snakes, but none of them are clear six-footers and the vast majority obviously much less. There was a lot of rounding up to the nearest foot going on back in the day and claims of seven and eight feet snakes cannot be taken seriously without good corroborative evidence. I then had a look at the hundreds of images I have collected from the Terry Schwaner research era on Chappell Island between 1988 and 1993. There are heaps of big fat snakes in the 1760mm size range being held triumphantly aloft, but maybe two that would go six-feet and only one animal that just exceeded that length. All these animals (around 1500!) were very accurately measured, but sadly Terry never published much of the data that was collected. I have been to Chappell Island for extended periods on multiple occasions and caught hundreds of snakes there. While it is true that on

average they are longer and heavier than any other known population to date, genuine six-footers are uncommon and snakes longer than that are rare.

It was with all this in the background that I dared to dream of producing a giant with Mick's outsize babies. I believe the formula for success is genetics *plus* first clutch of young virgin female *plus* food *plus* time. The Mick Thow clutch of young possessed a good genetic mix for large size. The mother was a young, second-generation, captive-bred Chappell Island Tiger Snake and the father was a large wild-caught specimen from Boat Harbour, north-west Tasmania, with a big head. Genetic research (Keogh et al., 2005) clearly indicates that all the disjunct Tiger Snake populations (including many offshore islands) created when sea levels stabilised after the last ice age a few thousand years ago are very closely related and constitute a single taxon - *Notechis scutatus*. Localised conditions of climate but especially prey type and seasonality have resulted in rapid and repeated selection for different body sizes across these populations. While not being separated for long enough to warrant specific or sub-specific status, some of these populations appear to have diverged sufficiently from the parent populations on the mainland and the main island of Tasmania to display some apparent 'intergrade vigour' when crossed. I discussed this phenomenon in relation to Tiger Snakes at greater length in a previous article (Fearn, 2014a) and given the frequency of reports of Tiger Snakes being seen in the sea between islands, rare but natural interbreeding probably occurs between islands in close proximity with favourable wind and current conditions for migrating snakes. It would seem obvious that if you want to grow out really big Tiger Snakes, you would simply breed and raise pure Chappell Island specimens. However, this strategy often appears to result in disappointment because many people simply don't understand how the ecology of the island works. The selection for size is laser-like in its intensity and results in a near 100% death rate among the 20,000 or so neonates born on the island each year. Only a tiny fraction of the biggest and fastest-growing neonates survive to adulthood. Bridging the gap from skinks to a 60g Mutton Bird chick is simply beyond the capacity of the vast majority of young snakes. If you breed Chappell Island tigers in captivity and raise the young it is a statistical

'Only a tiny fraction of the biggest and fastest-growing neonates survive....'

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***Left:*** *two years old and starting to get my hopes up. Not only is he beautiful, but he always had a very long-looking body. Photo: Simon Fearn.*

***Below right:*** *getting ready for a work out - you can see I need it! About to stretch the big boy to get his SVL, ably assisted by a rather nervous Peter Maynard. Photo: David Maynard.*

certainty that most wouldn't make the grade on the island. Over several captive generations the situation only gets worse. That is probably why I have never seen any captive-bred Chappell Island tiger grow as long as the largest specimens in the wild, regardless of how long they live and how much food they eat.

I believe that one of the reasons Mick's neonates were so large was because it was the mother's first clutch. I have seen this phenomenon in captive Tiger Snakes on a number of occasions. There is a strong correlation between maternal body size and clutch size in Tiger Snakes - that is, larger females give birth to greater numbers of neonates, possibly because they simply have more room in their body cavities. A relatively small female's first clutch tends to consist of a small number of larger neonates. As stated earlier, Mick's clutch were able to ingest pinky rats right from day one and the animals I raised have all been good feeders. The extra length of their jaws has allowed them to get down rats that standard Tiger Snakes



cannot swallow regardless of their size. My record-breaking snake can take the largest breeder rats that other keepers willingly give to me because they have no snakes capable of consuming them. The fact that it is a strong, regular feeder and has been provided with the best food available has undoubtedly assisted it to attain prodigious proportions, but this would not have been possible without favourable genetics and size at birth. In my experience, Tiger Snakes kept outdoors in good conditions (this precludes a ‘tick farm’ that just happens to have some snakes in it!) typically take a decade to grow as long as they are ever going to be. From that point on they start to 'block out' - shunting more energy into bulk and head size. A classic example is a snake in my collection from Lake Sorrel in Tasmania's central highlands that was wild caught as a young adult in 2004. It grew quite quickly to around 1370mm but then slowed down dramatically. Between April 2011 and January 2018 it has only grown from a total length of 1482mm to 1521mm, in spite of being a good feeder, and it will be lucky to make five feet. My giant tiger on the other hand was 1346mm long at two years of age with a weight of 720g, and by December 2017 was 1858mm long (a little under 6' 1") and 2.8kg. The amazing thing is that he is still growing rapidly and has not yet started to block out. I suspect that he will reach a peak of between 6' 4" and 6' 6" in another three seasons and weigh around 3.5kg. He will be a challenge to measure by then as I only just had the arm span to stretch him out along the tape measure for his most recent snout to vent measurement (for a discussion on the best way to measure snakes, see Fearn, 2007). The giant also has a brother in my care who is shorter (1709mm and 1.9kg) but with a bigger head. I suspect that he too will eventually attain 6 feet but he does not feed as consistently for as long, as he enters into a sexual frenzy and goes off his food by mid-January every year.

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# Shinglebacks, small brown skinks and an elusive pygopod.

**‘The Shingleback was still basking in the same spot, without having moved an inch.’**

## ***Nicholas Gale*** *takes us on a herping adventure from Melbourne west to South Australia.*

For me, there are always three key steps to a successful herping trip:

1. Picking a target species.
2. Researching and planning in order to have the best chance of encountering the target species.
3. Sending daily messages to my mate and fellow herper and keeper Dan Mangano in an attempt to convince him to drive me somewhere ridiculous to find a small brown skink (or something similar).

On this particular occasion, I rolled out of bed on a rather sunny Saturday in excited anticipation of what the next couple of days would hold. I waited for what seemed like an eternity for Dan to pick me up, and after a couple of wrong turns we were on the road to our first destination, stopping only briefly to pick up some last minute supplies and to admire the beauty of the Giant Koala of Dadswell Bridge! Later we passed through Horsham (Victoria's tidiest town in 2016 – who would've thought?), and then found our first herp, in the form of a dead Shingleback (*Tiliqua rugosa*). We were both disappointed to see this absolutely beautiful, yellowish lizard squashed on the road, and were soon to discover that Shinglebacks would be the most commonly encountered species over the duration of our trip.

We had arrived at our first area of interest, being Mount Arapiles-Tooan State Park. I had vaguely sussed out the road using Google Earth (Herping Hack 101), but was still unsure where we could find our target species. We first explored a more wooded area; smaller skinks including Ragged Snake-eyed Skinks (*Cryptoblepharus pannosus*) were running around fallen logs, and we also saw a few Boulenger's Skinks (*Morethia boulengeri*). Opting to search for more favourable habitat for small dragon species, we drove further up the road and eventually found a nice dune-covered verge that was worth investigating. Almost immediately we began to spot darting shadows out of the corners of our eyes – we had found the right area! Getting up close to these lizards would prove to be a challenge, however, as we barely saw them for more than a second or so. Dan stumbled across an animal that wasn't quite so speedy; another Shingleback. We got some phone photos of the lizard, which was missing some digits from one of its front legs.

After walking for another half an hour so we had still not managed to get a good view of any dragons. I had chased what I thought was a Painted Dragon, only for it to turn out to be an Eastern Striped Skink (*Ctenotus orientalis*). Small skinks were again relatively prolific, with large piles of sticks providing refuge for many Common Dwarf Skinks (*Menetia greyii*) and a new species for me, the Shrubland Skink (*Morethia obscura*). Dan suggested that we try a different track that we had passed before, and on the walk back to the car we stopped to see the Shingleback still basking in the same spot, without having moved an inch. We hiked along the new track without seeing anything of interest other than more Shrubland Skinks. Finally, I caught sight of something moving behind a small bush. A beautiful male Painted Dragon (*Ctenophrous pictus*) in full breeding colours was sitting on the sand at the side of the track. I called Dan over, and soon we were both gazing at the magnificent animal, trying to work out how we could possibly get any closer to get some better photos. As I began to creep towards the dragon, it took off at full speed for a large shrubby tree, hiding within the fallen twigs at its base. Fifteen minutes later we were forced to admit defeat as we couldn't find the dragon again, so we returned to the car. Only seconds after getting back into the vehicle, another Painted Dragon an across the road in front of us – almost deliberately taunting us! Although we weren't able to obtain any photos of the lizards I was still quite content, as Painted Dragons are not commonly seen this far south of the Mallee. On the way out of the park I spotted another Shingleback eating a dandelion on the side of the road, and we quickly jumped out to get some more phone shots.

**'Almost immediately, we began to spot darting shadows out of the corners of our eyes.'**

We left Tooan with unfinished business, but we had other things on our mind, namely food! The closest town was Edenhope, but nothing was open. Desperate, and running off merely Red Bull and muesli bars, we finally crossed the border, and arrived at the town of Naracoorte in the Limestone Coast region of South Australia, where we managed to locate a petrol station cafe. After indulging in some local delicacies (potato cakes and chicken rolls) we hit the road again in pursuit of another dragon species. I had found a single record of the Mallee Tree Dragon (*Amphibolurus norrisi*) within one of the many reserves that make up the Naracoorte Caves National Park. We began our search at the end of a dirt road, the sides of which were littered with tin and burnt-out cars. The tin only concealed more of the small skink species we had previously seen, along with some centipedes and ants. Eventually we headed back to the car; sweaty,

frustrated and covered in burrs, and almost ran into a huge emu with three adorable chicks. The chicks decided to do a runner, and we breathed a sigh of relief knowing we wouldn't have to fight off their defensive mother in order to get to the vehicle, as the larger emu followed her young back into the scrub.

We turned south toward Mount Gambier, in order to search for the most anticipated herp of the trip. I was reminded that we were getting closer to our target species when we drove past one of the many pine plantations that dot the Limestone Coast. Later, we jumped out of the car within another plantation and soon found an area that appeared perfect for the elusive reptile we were chasing. Gently we began to search, making sure not to damage the delicate microhabitat that these animals occupy. We found several species of skinks; absolutely massive Bougainville's Skinks (*Lerista bougainvillii*) and Four-toed Earless Skinks (*Hemiergis peronii*) seemed to be very common, erupting from the soil when disturbed. We also found a pair of Southern Grass Skinks (*Pseudemoia entrecasteauxii*) together - another pretty skink when in breeding colouration. The sun began to wane as we continued our search, and our spirits dampened slightly as we neared the end of the patch of native vegetation. Then Dan let out a shout when he discovered the shed skin of what appeared to be a very long and limbless reptile. Seconds later we were both rewarded with the sight of a beautiful male Eared Worm-lizard (*Aprasia aurita*).

**'Dan let out a shout, and seconds later we were both rewarded with the sight of a beautiful Eared Worm-lizard.'**

Originally thought to be restricted to a few small, isolated populations in the Mallee region of north-west Victoria, this Critically Endangered species of pygopod was only discovered in South Australia in the last twenty years or so. The population within the 'Reedy Creek range' of the Limestone Coast were once believed to be a variation in pattern of the far more common Lined Worm-lizard (*Aprasia striolata*). With the disjointed nature of its known distribution, together with the fact that this South Australian population is hundreds of kilometres away from the Victorian range, it is not unlikely that more populations of the Eared Worm-lizard exist as yet undetected. After a short photo session, we decided to check into the cabin we were staying at in Millicent, as we still had one last species to find as day turned to night.

After finding our accommodation and a quick and well-deserved feed at a local pizza restaurant, we were soon driving down a road that was straight out of a horror movie. Large willow trees that rustled overhead coupled with very little phone reception to produce some extremely creepy vibes. Up ahead we spotted two headlights coming out of the dark that eventually proved to belong to a white van.

*Eared Worm-lizard (*Aprasia aurita*).*
*All images by Nicholas Gale.*

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‘This Critically Endangered species of pygopod was only discovered in South Australia in the last twenty years or so.’

***Above:*** *Mallee Spadefoot Toad (*Neobatrachus pictus*).*
***Below:*** *Sudell's Frog (*Neobatrachus sudellae*).*

Although the owner returned a wave, it was strange to come across company on this road that led nowhere other than a swamp, and I had my doubts that the other driver was also interested in frogs.

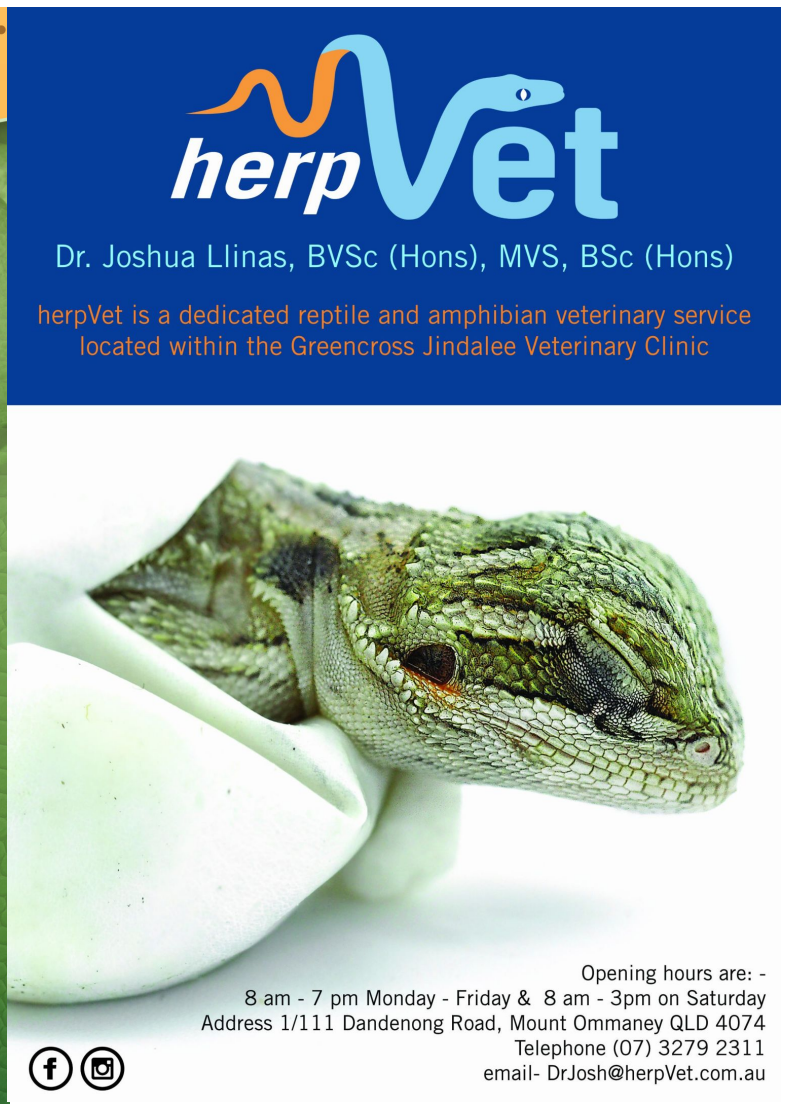
Nevertheless, we arrived at our destination and in the distance heard several species of frog calling. I assembled my camera gear and we began hiking toward the sounds of the frogs. First we checked a small outflow trench that looked like perfect Growling Grass Frog (*Litoria raniformis*) habitat, but nothing seemed to be active. The temperature had dropped dramatically since the afternoon, and our exhaled breaths condensed in the cool air. We worked our way closer to the swamp itself, following a worn gravel track into the darkness. After a few minutes, Dan called out to say that he'd almost stepped on a small frog. From a distance I thought it was a small Pobblebonk (*Limnodynastes dumerilii*) but on closer inspection it turned out to be a young Sudell's Frog (*Neobatrachus sudellae*). This was a new species for both of us. These burrowing frogs only surface following periods of hard or persistent rainfall, and this made sense as the previous few days had been quite rainy. Dan soon discovered another frog, this time a Mallee Spadefoot Toad (*Neobatrachus pictus*). On the way to the swamp we found several more Sudell's Frogs that exhibited considerable variation in patterning. The swamp itself was anticlimactic, and nothing of interest was found, so we retraced our footsteps back to the car, hoping there wasn't a white van waiting to greet us. Thankfully we were alone, and began the journey back to civilisation. We were driving along at the breakneck speed of about ten kilometres an hour, when suddenly a confused kangaroo or large wallaby jumped out and smacked into the passenger-side window. Both the car and the kangaroo were fine, but I almost required a change of underpants after the ordeal! Luckily the rest of the drive back

**'Our exhaled breaths condensed in the cool air as we began hiking toward the sound of the frogs.'**

was relatively uneventful, with Dan stopping a few times to move more Mallee Spadefoot Toads off the road. We arrived back at the cabin after a day full of driving and small brown skinks. Collapsing into bed, I had the best sleep I have had in a quite a while.

We woke up bright-eyed and bushy-tailed at 7am on the Sunday morning, and after a hearty breakfast of noodles, hit the road at 7:30, racing against time to get to Warrnambool ahead of the heat that was expected in the early afternoon. We planned to meet up with Warrnambool's premier herper and reptile keeper Stephen Goodfield, a good friend of





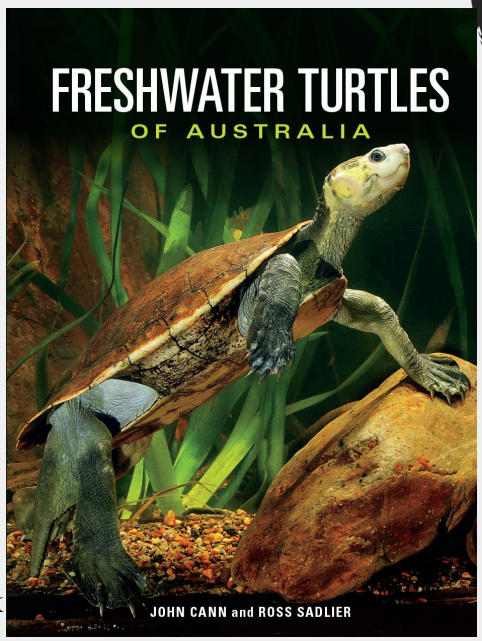
ours who had offered to show us around the area - even excusing himself from a family lunch to do so. We arrived at Steve's place around midday, and it was already getting very warm. After a tour of Steve's large collection of epic skinks and dragons, we were off on the trail of the Swamp Skink (*Lissolepis coventryi*), as Steve had found a large population of them not too far from his house. Dan and I had been on many trips to eastern Melbourne and down to the Mornington Peninsula to see these skinks, but every time conditions had been wrong, and we had failed to see any. Steve had shown me around Warrnambool several times before, so I already photos of this species, but Dan had not and was very keen to shake off his curse. We hiked along a very overgrown creek line, with the only indication of the skinks being a constant rustle in the deep vegetation. Swamp Skinks prefer cool, overcast days, and since it was 26 degrees and extremely sunny, we were somewhat out of luck. However, Swamp Skinks weren't the only inhabitants of the creek, and soon either Dan or Steve spotted a gorgeous red-coloured Tiger snake (*Notechis scutatus*) basking in some reeds. Unfortunately it wasn't keen on sticking around for photos, and slithered off at the slightest disturbance. On the walk back, I spotted another snake crossing the path maybe 50 or so metres ahead of us. I raced ahead in the hopes of finding a copperhead, but instead it was just a regular banded Tiger Snake - not that I was complaining!

Our next destination was a large extinct volcano just outside Warrnambool. As our car descended into the crater, I spotted a large lizard just beside the road. It turned out to be a Blotched Blue-tongue (*Tiliqua nigrolutea*) covered in ticks. We tried our best to remove the parasites, and released the skink back into the bush. On a cooler day in this location, you could expect to see up to a dozen copperheads basking, but the heat had unfortunately inhibited most snake activity and, to our amazement, nothing was to be seen. However, we did spy a nice-sized Shingleback up ahead on the track, and then another, and another. All up we found half a dozen Shinglebacks of varying sizes within an hour or so of walking.

We had had a good run - although we were extremely sunburnt - and sadly had to say goodbye to Steve. Handshakes all round, and then Dan and I travelled back to Melbourne.

***Above:*** *Swamp Skinks (*Lissolepis coventreyi*) prefer cool, overcast days.*

# A Good Book.




What's NEW!

CSIRO Publishing; Hardback; 464pp; 235 x 305mm; AU $150; ISBN 9781486308248.

It should be noted straightaway that this magnificent volume is a compulsory acquisition for anyone with an interest in Australian turtles – or natural history for that matter. It represents a comprehensive update of John Cann's landmark publication *Australian Freshwater Turtles* (1998), which has become so sought after that a quick online search reveals secondhand copies are exchanging hands for upwards of $300, and a 'new' copy will set you back more than $1,000.

On this occasion, the doyen of Australian turtle field research is joined by Ross Sadlier, who had a distinguished career at the Australian Museum. The result is a beautiful publication including hundreds of colour photos, line drawings and historically important illustrations. Our knowledge of the biology of Australia's freshwater chelonians has advanced significantly since Cann's 1998 opus, with the most important revelation being the extent to which 'cloacal breathing' is employed. The conservation status of the various species is also reviewed; many are in decline due to a variety of threats including loss of habitat, predation, destruction of nests, and disease. The authors also inject some clarify into taxonomy which is notoriously difficult to navigate.

This definitive volume also features a large section on the freshwater turtles of New Guinea, including several undescribed species. The natural history accounts benefit substantially from the authors' vast experience in the field, as they are embellished with anecdotes such as the female *Chelodina (Chelodina) longicollis* nesting in hard mud that was observed to discharge fluid from her cloaca on several occasions while excavating the nest. Presumably this made digging easier.

The species accounts are also incredibly detailed, with that of the Cape York Long-neck Turtle, *Chelodina (Macrochelodina) oblonga rugosa*; including notes from a specimen obtained from an island in Torres Strait. The first inkling that this species may hybridise with *Chelodina (Chelodina) canni canni* stemmed from an unusual individual photographed by - you guessed it – John Cann.

This book will stand as an absolute benchmark for future publications, and is testament in particular to one man's lifelong passion for Australian turtles. Get one, before a used copy costs you three times the price!

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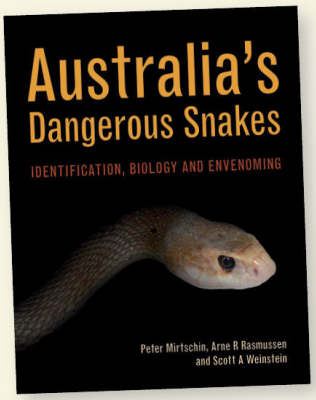


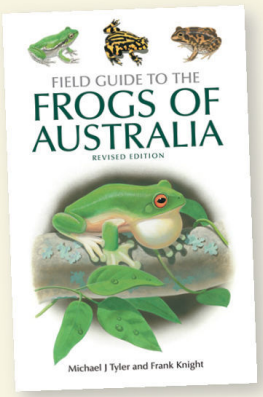


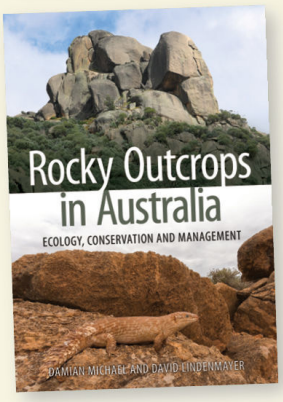


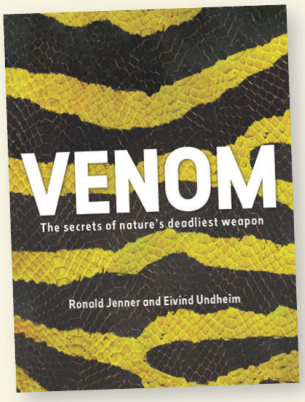


CSIROPUBLISHING


*Conservationist and wildlife advocate **Ben Dessen** is Reptiles Department Manager at Kellyville Pets and is passionate about educating newcomers to the reptile hobby. In this article, he discusses the merits of the large variety of live foods now available to hobbyists.*

# Live Foods for Reptiles.

Live invertebrates are an important part of the natural diet for many native Australian reptiles and amphibians. Captive reptiles require a varied and nutritious diet to grow, reproduce and thrive, and many of the species commonly kept in captivity should be fed on a range of live insect foods. We are fortunate to be at a stage in the Australian reptile hobby where an abundance of commercially-bred invertebrate foods are readily available to keepers. With so much variety it is important to understand the nutritional values of the various feeder insects, as well as how to source and maintain a steady supply of delicious bugs for your reptiles.

**Know your species.**

Successful reptile and amphibian keepers develop a real understanding of the species they are working with, in order to cater for the specific needs of the animals in their care. Knowing what a reptile's natural diet consists of can help us to replicate this as closely as possible in captivity. Australian native reptiles vary considerably in their feeding habits with some being insectivorous, some being omnivorous and others being carnivorous. Whether it's a species of dragon, skink, gecko, monitor, turtle or frog, ensure that you thoroughly research which types of live insects they require and how often they should be fed.

**Sourcing live food.**

Specialist reptile stores generally have a wide variety of fresh live insects for sale. Small tubs of insects are convenient and affordable for first-time reptile keepers and those with a small number of pet reptiles at home. For keepers with larger collections and many more mouths to feed, some specialist stores and online businesses will also offer bulk packs of insects. These can be much more economical in the long run, however, the insects must be properly maintained in order to keep them alive and in good condition.

A number of feeder insects can also be bred and produced at home, including 'woodies', silkworms and mealworms. Woodies, or Wood Cockroaches, are perhaps one of the easiest feeder insects to breed and can be housed in a 60-litre plastic storage container stacked with egg cartons for the cockroaches to hide amongst. They can be fed a range of dry pelleted foods, fresh vegetables and specific insect supplement mixes. Woodies are great climbers, but a product called Fluon can be painted around the rim of their container to ensure they can't get out. Parts of the plastic lid should also be replaced with flyscreen mesh to ensure adequate ventilation.

**Supplementation.**

Whilst some feeder insects have much better nutritional value than others, it is often necessary, and in some cases essential, to supplement or 'dust' insects before feeding them to your reptiles. There are a number of balanced, all-in-one calcium and multivitamin supplements available, most commonly in the form of powders but also as liquids.

A breakdown of the most essential vitamins and minerals includes:

**Calcium.**

Reptiles require dietary calcium for proper bone growth, nerve and organ function, and reproduction. Some of the most commonly used live insect foods, including crickets, have a very poor calcium to phosphorus ratio. Whenever a reptile ingests phosphorus (which is found in many feeder insects), it needs an equal amount of calcium to process the

***Right:*** *the Brown or House Cricket is the most commonly used feeder insect in the world. Image courtesy of Livefoods Unlimited.*
***Below right:*** *Wood Cockroaches are Another popular option. Image by Ed Baker.*
*Source: Creative Commons (https://creativecommons.org/licenses/by-sa/3.0/deed.en).*

phosphorus. On average, feeder crickets have a calcium to phosphorous ratio of 1:9, which results in a calcium deficit in your reptile's diet. This is why crickets must always be dusted with a calcium supplement prior to feeding. The optimal calcium to phosphorous ratio is 2:1, which not only allows a reptile to process the phosphorous it consumes, but also provides sufficient additional calcium for healthy function, growth and development.

**Vitamin D3.**
This is perhaps the most important vitamin for a reptile's overall health, and is vital for the transport of calcium. In the wild, exposure to ultraviolet (UV) light from the sun is essential to enable many reptiles to synthesise vitamin D3. In captivity, a good quality UVB globe or tube must be provided, however, in some cases this is insufficient and further vitamin D3 supplementation is required. For some nocturnal species that do not receive any UVB exposure, dietary vitamin D3 supplementation is important. It is important to note that vitamin D3 can be toxic to reptiles if supplied in excessively high doses, so keepers must be careful to manage this according to the species involved and its specific requirements.

**Vitamin A**
Necessary for good skin and eye health in reptiles, a deficiency of vitamin A can result in shedding problems as well as issues with eyesight.

**Gut Loading**
Rearing feeder insects on wholesome and nutritious foods is another key consideration for optimum reptile health. Any nutrition consumed by and contained in the insects will ultimately benefit the reptile as well. Whilst many live insects are 'gut loaded' when you purchase them fresh, after a day or so that nutrition has been lost as waste and must be replaced. There are a multitude of 'gut load' or 'insect booster' products available, which should be fed to feeder insects prior to offering them to your reptiles. It is essential to provide a balanced diet to your feeder insects; a piece of carrot will give them little more than just moisture. Gut load products come in a range of forms including powders and gels.

**Live Foods for Reptiles**

**Crickets.**
Undoubtedly the most commonly used feeder insect in the world, the Brown or House Cricket makes a popular food choice for a variety of reptiles and amphibians. Crickets are widely available, come in a range of sizes and are readily accepted by many different species. Whilst crickets are an easy feeder insect option, they do have limitations and it is important that they do not comprise the sole insect food source for your reptile, but rather form part of a varied insect diet. Because of their very poor calcium to phosphorous ratio, crickets must be dusted with a calcium and multivitamin supplement before every feed. Adult crickets also develop a hard wing-casing made from chitin, which is indigestible and may cause gastrointestinal block-ages in young or very small animals. Therefore, it is important to select appropriately-sized crickets to feed your animals.

**Wood Cockroaches.**
Woodies are another popular live insect food option. They are easily bred in large colonies and are a great way to offer variety in your animals' diet. Wood Cockroaches have similar nutritional benefit to crickets; they are slightly lower in protein and must also be dusted with a supplement before being fed to reptiles. Woodies move much faster than crickets, so some smaller animals may struggle to catch them.

***Left:*** *The Common Mealworm should not make up a large portion of the diet. Image by MarioM.*
*Source: Creative Commons (https://creativecommons.org/licenses/by-sa/3.0/deed.en).*
***Below left:*** *Black Soldier Fly larvae are extremely high in calcium. Image by Dennis Kress.*
*Source: Wikimedia Commons (MD-Terraristik – Laut [1] ist Dennis Kress Mitinhaber des Unternehmens).*
***Bottom:*** *silkworms are also one of the most nutritious feeder insects available.*

**Mealworms.**

**Common Mealworm (*Tenebrio molitor*).**
Mealworms are yet another widely used and commonly available live insect food source. However, they should not make up a large portion of any reptile or amphibian's diet due to their limited nutritional value. Mealworms are very high in fat, low in calcium (1:7) and have a hard, indigestible, chitinous exoskeleton. Mealworms should only ever be offered as a treat to your reptiles and never fed to young or very small animals. Many lizards will eagerly take mealworms, but if overfed they may become obese and there is also risk of impaction due to a build up of chitin in the digestive tract. There is a common myth that mealworms can chew their way out of the stomach of an animal once consumed. This is untrue and there is no need to crush or remove the head of a mealworm before feeding it to your reptile or amphibian.

**Giant Mealworm (*Zophobas morio*).**
The giant mealworm is another mealworm alternative and is a great supplementary food for large dragons and monitors. With a slightly better calcium to phosphorous ratio than the common mealworm, these insects should still only be fed in moderation. Giant mealworms must not be stored in the fridge, unlike the common mealworm, as they do not tolerate cooler temperatures and will die.

**Silkworms.**
Silkworms are one of the most nutritious feeder insect options available to any reptile or amphibian keeper in Australia. The superior nutritional content of silkworms should never be underestimated as they offer the perfect variety of vitamins and minerals in a neat, easily-digestible package. Silkworms are very high in calcium, protein, magnesium, iron and sodium, as well as vitamins B1, B2 and B3. Furthermore, silkworms are low in fat and do not have a hard exoskeleton like many other live feeder insects, so they can be fed to animals of any age or size. An enzyme found in silkworms called serrapeptase has many beneficial properties and promotes increased calcium absorption and the breakdown of arterial plaque, as well as acting as an anti-inflammatory agent.

**Black Soldier Fly larvae.**
When it comes to live feeder insects, the Black Soldier Fly larvae (BSFL) takes out the number one spot. These insects have only become readily available to Australian hobbyists in recent years but can now be purchased from good specialty reptile stores and online. The larvae are extremely high in calcium and are the only feeder insect that naturally offers the perfect calcium to phosphorous ratio. BSFL are very high in protein and low in fat, resulting in accelerated growth rates for any animal fed on a diet of these grubs. They also contain lauric acid, which

has a number of antimicrobial properties and can assist in fighting infections in the gut, including the coccidiosis organism. BSFL should form an important component of any insect-eating reptile or amphibian's diet and can be fed to animals of any age.

**Domestic House Flies.**
These can be a suitable food source for small species of amphibians. Although not always available from commercial suppliers, flies can be easily caught or propagated by keepers wanting to add some variety into their animals' diet.

**Snails.**
The common Garden Snail is a favourite amongst many skink species, most notably those in the genus *Tiliqua*. Snails provide a great source of protein in any skink's diet, however, securing a regular supply can be difficult. Some specialty reptile stores will sell commercially-bred live or frozen Garden Snails and this is definitely the safest option. If you collect snails from your garden it is important to make sure that they come from an area where no snail baits or chemicals have been used.

**Earthworms and Bloodworms.**
Earthworms contain plenty of natural moisture and can be used as a supplement or treat for some species of lizards, frogs and turtles. They do not provide much nutrition other than some protein, so should not be used as a staple food item. Aquatic Bloodworms or Blackworms can also make a good live treat food for turtles.

**Termites.**
Although not commonly used as a live insect food source, termites should certainly be considered by many more keepers. Termites provide a rich source of protein, zinc and iron, and are high in beneficial fats, making them ideal for very small dragons, geckos and frogs. Termites can be harvested from the bush by cutting away a small portion of a mound (without damaging the nest) and storing this in a plastic garbage bin or container. Pieces of the mound can then be placed in a dish inside the reptile's enclosure; many species will readily pick off the termites.

**Fish/Yabbies/Molluscs.**

Live fish, yabbies and molluscs should be included in the diet of any aquatic or semi-aquatic reptile, including turtles and some species of monitors.

**Locusts.**
Whilst not currently commercially available in Australia, locusts are frequently used as a feeder insect in many overseas collections. Locusts can be collected, gut loaded and fed to larger species of lizards as a supplement or treat.


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# Best Blogs.

Head over to the **iHerp Australia** website for your weekly serve of news and comment. Here is one of our recent blogs:

# Mass poisoning from cobra venom?

In early February 2018, news outlets around the world reported on a disturbing incident that occurred at Mpoza village in Eastern Cape Province, South Africa. Approximately 60 people were taken to a hospital in Tsolo suffering from diarrhoea, stomach cramps, vomiting and headaches after apparently eating meat from a cow that had died after being bitten by a cobra. A number of children and elderly patients were subsequently transferred to Nelson Mandela Academic Hospital, while the remainder were treated at Mthatha Regional Hospital.

The Eastern Cape Department of Health spokesperson, Sizwe Kupelo, advised that another hospital had been placed on standby for additional patients. Mr Kupelo was widely quoted as saying that local communities had been urged to, 'stop consuming meat from dead animals you find as it is dangerous to do so', although a couple of sources also quoted him as warning villagers, 'never to eat any livestock that had been killed by poisonous snakes'.

Most reports tacitly implied that the villagers from Mpoza were suffering the after-effects of the cobra's venom, however a couple of the more sensationalist pieces went so far as to state that they believed this to be the case, surmising that the venom had spread through the cow's flesh and 'contaminated' the meat. The toxic nature of cobra venom also received some attention.

This makes for interesting reading, but obviously most of the journalists involved were either incredibly lazy or operating under the principle of never letting the truth get in the way of a good story. Did none of them think to ask a herpetologist or other scientist whether it was possible for cobra venom to have such a far-reaching effect? Because venom toxins are typically large proteins that are relatively unstable and easily broken down by the digestive system, so unless you have an open wound somewhere in your gastrointestinal tract, ingestion is not likely to cause any problem. Furthermore, as I was reminded when discussing this case with a friend, there is no mention of the villagers cooking the meat, which would also quickly denature the venom proteins.

So I kept looking through the reports of this episode, until at last I found one (at m.health24.com) that made sense. The first thing that caught my attention was that this account likened the villagers' symptoms to gastro. It went on to quote Sizwe Kupelo as saying that, 'health officials have classified the cases as food poisoning', something which all other reports conveniently left out. The Health24 journalist then consulted Dr Ernst Baard, a herpetologist, who confirmed that, "Unless a human has a serious stomach or mouth ulcer, the ingestion of snake venom is mostly not dangerous." He also said that in his opinion it was more likely that the meat was off! These sentiments were echoed by a toxicologist who urged people to ensure that meat is properly preserved or prepared.

I get it. I mean, I could have entitled this blog, 'Villagers sick after eating rancid cow', but that wouldn't have had quite the same impact. Unfortunately, most of the hyped-up reports concerning the 'shocking' events at Mpoza may also serve to unnecessarily drive irrational fears of venomous snakes.

**A sample of reports:**

https://www.news24.com/SouthAfrica/News/over-50-rushed-to-hospital-after-eating-cow-that-reportedly-died-from-snake-bite-20180202

https://www.dailystar.co.uk/news/latest-news/679112/cobra-snake-cow-dead-meat-poison-south-africa-mpoza-village-tsolo-eastern-cape-province

https://m.health24.com/Medical/Digestive-health/Gastroenteritis-and-food-illness/50-rushed-to-hospital-after-eating-cow-snake-venom-or-bad-meat-20180202

***Below:*** *Snouted Cobra (*Naja annulifera*), Waterberg, South Africa. Image by Ryanvanhuyssteen.*
*Creative Commons Attribution-Share Alike 4.0 International license.*

*You knew that Australia was home to one of the weirdest assemblages of herps in the world, right? Welcome to:*

# A BREED APART....

# *Snakes that Stand Out!*

**vermicelli** (n); *vur-me-CHELL-ee*; type of pasta similar to spaghetti; Italian from Latin, *vermicello* (pl. *vermicelli*), 'little worm'.

**Vermicella**; genus of elapid snakes endemic to Australia, known as 'bandy-bandys'.

Why would anyone name a snake after some sort of noodle? Well, the short answer is that both names were derived from a Latin word meaning 'worm-like' or 'little worm'. And bandy-bandys certainly appear worm-like; with their short, blunt tails, rounded, featureless heads and lack of a distinct neck it's not easy to work out which end is which. No surprise really, given their burrowing lifestyle.

There are five or possibly six species of bandy-bandys, but the most widespread by far is *Vermicella annulata*, which inhabits most of the eastern third of the continent, as well as parts of the Northern Territory, and reaches a maximum total length of about 75cm. Although widespread they are seldom seen, as they live a secretive existence underground; the exception being that they are sometimes encountered above ground at night after rain.

Bandy-bandys have a unique and striking appearance, with starkly contrasting black and white bands that vary somewhat according to species, location and gender. All are believed to prey exclusively on blind snakes (family Typhlopidae), and although weakly venomous, are considered harmless to humans and are unlikely to bite.

So how do bandy-bandys protect themselves, and what is the purpose of the conspicuous patterning that makes them stand out like prawns on a pizza? When threatened, bandy-bandys will twist their bodies into hoops, which are held off the ground. The ensuing gyrations cause the bands to blur, something like the effect of a cinema film reel, confusing potential predators by a form of visual deception known as 'flicker fusion'.

# what's UP

## The latest herp happenings from Australia and around the world.

## Expomania strikes Sydney!

The Sydney Reptile Expo (previously referred to as the 'Castle Hill Expo') kicked off expo season in fine fashion on the 18th February 2018. This year marked a move to the brand new Blacktown Leisure Centre (near Parklea Markets). Expo organiser Adrian Hemens reports that it is not far from the old venue at Castle Hill, but represents a significant upgrade, being bigger, fully air-conditioned and with plenty of parking. It is also right next to the Stanhope Village Shopping Centre, which has plenty of ATMs and food vendors.

It sounds like the expo's new home went down well with reptile enthusiasts, as the show was a resounding success, with vendors reporting some good sales. iHerp Australia's Ben Dessen had a big day on the Kellyville Pets stand, and informed us that initial estimates put attendance at about 4,000.

Adrian is enthusiastic about the new venue, "All round it's a great location to help grow a bigger and better show for the future."

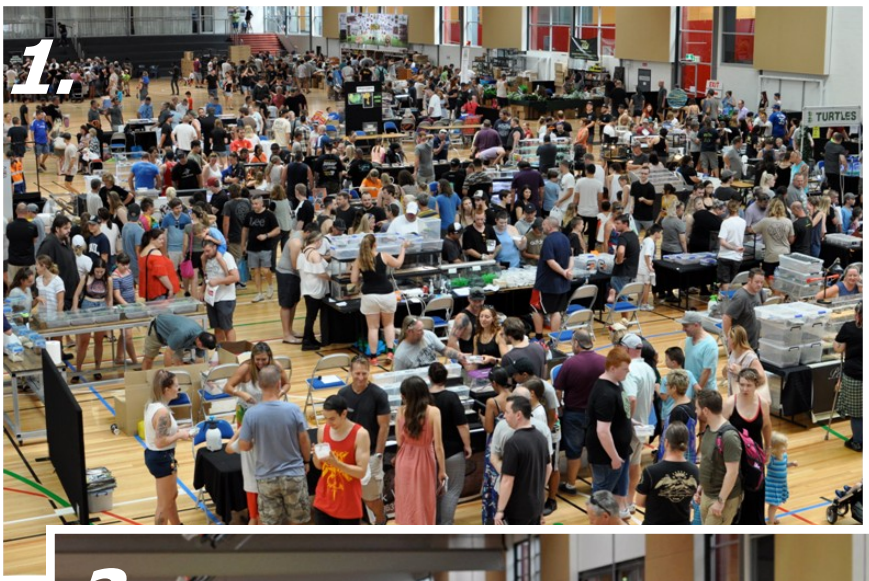
Next year's show is already being planned for Sunday 17th February 2019. Visit https://www.facebook.com/SydneyReptileExpo/

## Coming Up VERY Soon.

Within a couple of days of the release of this issue of iHerp Australia, two more expos will be held in Melbourne and Sydney.

The 2018 VHS Reptile and Amphibian Expo will be held in the Expo Hall at the Melbourne Showgrounds on Saturday 3rd March from 9.00am until 4.00pm. John and Andy will be manning the iHerp Australia stand, so be sure to come and have a chat. The VHS is also conducting a pre-expo dinner at The Anglers Tavern, Maribyrnong, on Friday 2nd March (the release date of this issue!) with guest speaker Steve Wilson. The event is currently shown as being restricted to members only, but there may be some tickets left. For further information go to https://www.vhs.com.au/events/2018-pre-expo-dinner/

Not to be outdone, the Hawkesbury Herpetological Society is holding their annual Penrith Reptile Expo at the Panthers Marquee, in Mulgoa Road, Penrith, on Sunday 4th March, also from 9.00am until 4.00pm. There will be a special guest appearance by the legendary 'Last Snake Man', John Cann. Rob Grabowski, of





***1.*** *The Sydney Reptile Expo's new venue was well received by reptile enthusiasts.*

***2.*** *Vendors reported some good sales. Images supplied by Adrian Hemens.*

***3.*** *&* ***4.*** *Joe Ball is a special ambassador for RepX Brisbane and will be bringing a bunch of his amazing blue-tongues along on the day.*

***5.*** *'The Reptile Doctor' Shane Simpson is presenting a series of informative talks on reptile viruses.*

Ironbark Aussie Pets, will be flying the flag for iHerp Australia on the day – good on ya Rob! For more details check out https://www.facebook.com/PenrithReptileExpo/


## RepX to have a big impact in Brisbane!

After a couple of lean years in Brisbane without an expo, the RepX Brisbane Reptile Expo 2018 will be held at the Royal International Convention Centre, Brisbane Showgrounds, on Sunday March 25th from 10.00am until 5.00pm. Presented by iHerp Australia and Virides Reptile, RepX promises to be bigger than anything previously seen in Queensland, with an extravaganza of reptiles from the very best breeders, demonstrations, talks, live podcasts, a world-class birds of prey show and special invertebrates exhibits. Plus, all the leading manufacturers and distributors will be on hand to showcase their latest products. There will also be the opportunity to meet special ambassadors Neville Burns, Joe Ball and Michael Cermak. Discounted advance ticket sales are available online at https://www.repx.com.au/tickets/


## Vet vs Virus.

One of our favourite reptile vets, Dr Shane Simpson ('The Reptile Doctor') of Karingal Veterinary Hospital is giving a series of informative talks about viral infections of reptiles in Melbourne (on Tuesday March 20th and Wednesday March 21st) and Brisbane (immediately prior to RepX on Saturday March 24th).

Shane will be presenting the latest information regarding viruses that have particular relevance for Australian keepers, including repatarenavirus, ferlavirus, sunshine virus, bornavirus and nidovirus in snakes and adenovirus and nidovirus in lizards, as well as some viruses that can affect turtles and crocodiles.

Viruses have been a hot topic in recent years, and for good reason, as some have potentially devastating effects. These talks therefore represent an important update, and are essential for any serious breeder or hobbyist. Tickets can be purchased via the website, www.thereptiledoctor.com.au, with $2 from every ticket being donated to research into reptile viruses.

Incidentally, Shane will also be attending RepX whilst in Brisbane, and will be assisting our other favourite veterinarian, Dr Josh Llinas, on the 'herpVet' stand. Make sure you check it out.

# 60 Years a Herper.

**Neville Burns** celebrates a significant landmark by remembering, as best he can, a life devoted to reptiles.

I am often asked by people who hear that I have been bitten by venomous snakes, "Why do you still like them?"

How does one explain to someone who doesn't understand or like snakes the fascination that these creatures have for a keen herper? Any animal has the right to defend itself, and if you work with them you must accept this and always be as careful as possible. I find myself looking back at a life that has been driven by a passion for all animals, but particularly reptiles, and despite some serious envenomations, to me the good far outweighs the bad.

The 21st of October 2017 marked 60 years since I first became involved with reptiles. Sure, it wasn't clever of me to catch a small Eastern Brown Snake as an eight-year-old kid – and I am always telling children to avoid snakes in the wild – but I still remember the thrill of discovering that little snake, and the absolute joy it brought me. Then when I was 12, I felt a driving need to tell people the truth about reptiles, and attempt to share with them an enthusiasm which 56 years later has never dimmed.


*1. Neville with his grandfather 'Bumpy' c. 1840.*
*2. With his grandmother's dog , ''Mickey'. Cute, huh? (the pooch, not Nev).*
*3. At Tom Crutchfield's place, a couple of years back, with one of Tom's large iguanas. The alligator tooth necklace was given to Neville by Albert Killian, a Florida snake handler.*

Looking back now I know that if I had my time over again I would not change my life, except for perhaps studying for a degree to increase my knowledge of herpetology, but would I have had all the adventures I have enjoyed if I had done that? On a field trip to look for Broad-headed Snakes with Rick Shine and other scientists, I told Rick that I envied his knowledge, but he replied, "Nev, you are doing a job educating the public that National Parks and Wildlife cannot pay someone to do."

I was grateful for the encouragement and support, and realised that this was my niche. I've always taken pride in trying to present reptiles to people in a positive light, attempting to the best of my ability to overcome the damage done by myths and fallacies. The fascination on the faces of school children when I lectured at schools, the pleasure they got from hands-on experience with live reptiles, and the chance to shape an appreciation of nature gave me a sense of accomplishment that money could not buy.


From my first public shows at 17 right up until the present time the pleasure I get from conducting my shopping centre displays and pit shows has never waned, and travelling to country shows is like, in many cases, visiting old friends. Overall, it has been a gratifying life in many ways: I have travelled extensively across the country to many remote and beautiful places; seen wildlife that many Australians will never see; worked in some of the premier wildlife parks in the country; produced DVDs and written my autobiography, all of which has given me a sense of satisfaction and great pleasure. If anything, my own appreciation of nature has increased with the years and I have learned to value the simple things in life and the need for conservation of our environment. I have seen people who attended my training courses go on to successfully keep and breed elapid species and appreciate the unique appeal of venomous snakes. I have made lifelong friendships with people who in many cases I have looked up to and were role models to me, and having their respect means more than making money or gaining a questionable notoriety.

‘If anything, my appreciation for nature has increased with the years, and I have learned to value the need for conservation.’

Over the last three years in particular I have been able to attend reptile expos in America, Germany and Canada and make new friends in all of those countries. I went behind the scenes at foreign zoos and reptile parks and simply had a lot of fun with like-minded people. As a boy I dreamed of handling some of the exotic snake species that most Australian herpers never get to encounter, and thanks to people like Tom Crutchfield, Tom Mason and Grant Ankerman, I have realised these aspirations, and have been out in the field in both America and Canada. I have been offered matchless hospitality by respected herpers everywhere I have travelled, with invitations to return whenever I can. Someone at a reptile expo asked me once if I had any plans to retire. As Tom Crutchfield said to me one day, “How do men like us retire? I can’t imagine another life.”

Seeing my name in the acknowledgements of books written by men like Bob Irwin and Bill Love is humbling but at the same time heart-warming in that perhaps I have done my small part for herpetology and conservation in a world largely controlled by corporations and governments that put profit before any concern for our wildlife and environment. If I can do it, so can you!

# iHerp at **LARGE.**

## A trip to the Amazon.

***Amazing Amazon** was amongst iHerp Australia's original supporters, and is one of the best-known reptile retailers in Melbourne. Recently, we caught up with owner Paul Stokes for a chat:*

**iHerp:** Paul, I believe you were previously in the building trade. What made you decide to venture into retailing reptiles? Was it a struggle in the early days, and were you active in the hobby before that?

**Paul:** I was actually into fish and had progressed into a big marine set up. I had had enough of the building game as it was taking its toll on me physically. I guess any new business is something of a punt, and Amazon took a long time to really get established. I remember vividly the last few nights before we opened – I was frantically building racking for aquariums and got very little sleep. It was touch and go whether we would finish the fit out in time.

**iHerp:** Who came up with the name 'Amazing Amazon'?

**Paul:** We were sitting around with friends one night and someone came up with it; I can't remember who. I liked it immediately.

**iHerp:** The store has been around for about 15 years now and seems to be flourishing. What are the secrets to your success?

**Paul:** We have a good location and spent a lot of time and money in the early days investing in the brand, so that people knew who we were and what we were about. We've always been reliable; we stock a comprehensive range of reptiles and equipment and we have the best brands at great prices. Plus our staff have a fantastic knowledge base – we have people with higher degrees in the biological sciences, and others that are prominent in the hobby, some of whom are regular contributors to books and magazines. They all have a solid background in keeping reptiles. We cater to all levels of experience; we spend time with our customers, and pride ourselves on providing the best possible advice.

> 'We cater to all levels of experience, and pride ourselves on providing the best possible advice.'

We make sure our animals are in good health and feeding regularly and on their own before they go on sale, and are always here to provide follow up assistance should it be needed. And we can put together full enclosure set ups and talk our customers through their operation. We have a large number of regular clients who we know by name, and I think that is a good measure of the success of our approach.

**iHerp:** You would have seen a lot of changes in the industry since you first opened.

**Paul:** At first, some of the gear was a little rudimen-

tary. Some of the advances in husbandry equipment are amazing, and have definitely helped reptiles to become more 'mainstream'. It's not difficult now to put together an awesome-looking display cabinet with all the accessories that caters beautifully to your animal's needs and would look great in the lounge room!

Plus when we opened, every animal was a 'wild type'. Now there is a huge range of morphs and mutations available. We have developed relationships with some of the best breeders around the country, and some of the beardies and pythons we are seeing, in particular, are incredible.

**iHerp:** Have you ever thought of broadening your market to sell other types of pets?

**Paul:** We're a specialty store – we don't sell rabbits and guinea pigs, and I think people appreciate that! You can't be an expert on everything. Often we have people come in who have received conflicting advice from general pet stores and online, etc. – turtles are a good example. To some extent we are uncompromising, in that we won't leave out important elements of a set up in order to make a sale, because long term the outcome is not going to be good for the animal or the keeper. We're not going to tell people they can keep a Murray River Turtle in a 30cm aquarium without UVB, and we may lose some business because of it, but overall I think that has overwhelmingly worked in our favour, and has kept people coming back.

**iHerp:** Where do you see the hobby going, and what changes would you like to make?

**Paul:** I think there is still potential for a lot of growth. Native reptiles make unique Australian pets, and their popularity is still growing. If I could make one change I guess it would be to remove some of the most common species from licensing requirements. I mean, the bearded dragon is the most popular reptile pet in the US and if you could purchase one without having to obtain a licence in Victoria, that would improve accessibility, especially for first-time keepers. It wouldn't have an impact on poaching - it's not like anyone can pick up a red phase Leatherback beardie in the wild!

In order for the hobby to continue to prosper, we need responsible breeders, retailers and reliable sources of information. That's also why we need a platform like iHerp Australia – keep it up guys!

**1.** *Amazing Amazon is one of the best-known reptile retailers in Melbourne.*
**2.** *Part of the reptile section.*
**3.** *The staff all have a solid background in keeping reptiles. Images by Andy Round.*


# Living Dinosaurs.

Want to meet a real live dinosaur? **Kit Prendergast** explains that nothing could be simpler?

Approximately 66 million years ago, Earth underwent a catastrophic mass extinction, known as the K-T (Cretaceous-Tertiary) Extinction, the trigger for this event being a massive, 10km-wide meteorite that slammed into our planet at Chicxulub in Mexico. This theory was first proposed by physicist Walter Alvarez and his geologist son Luis, based on evidence of iridium in the earth's crust and the discovery of the impact crater which spans some 118km in diameter. The collision of this meteorite released an amount of energy equivalent to 100 trillion tons of TNT or several nuclear bombs, causing a global heat-wave pulse, widespread fires, earthquakes and tsunamis, and precipitating volcanic eruptions; in short, hell-on-Earth ensued! Debris was blasted into the atmosphere, blocking out the sun and causing the climate to swing from extremely hot to being plunged into the depths of a nuclear winter. Plants were largely prevented from photo-

*A rather conventional-looking dinosaur—and a much more modern one! Images by metha1819 and KAWEESTUDIO.*

synthesising, and in the wake of this disaster, 80% of all terrestrial animals became extinct, including the dinosaurs, which until then had ruled the land.

Indeed, the Mesozoic Era (from 245-66 million years ago, and encompassing the Triassic, Jurassic and Cretaceous Periods) is commonly referred to as the 'Age of the Dinosaurs', since during this time dinosaurs dominated the planet, occupying a wide variety of ecosystems. Yet this mighty reign came to an abrupt end when they were completely wiped out by the consequences of the meteorite strike. Or were they? Remarkably, one lineage of dinosaurs not only survived, but prospered to the extent that they are still the most species-rich and arguably successful group of vertebrates on this planet. In fact, look out of the window and you'll probably see one!

## Avian dinosaurs.

It is well established amongst zoologists that birds are simply a lineage of dinosaurs – the avian dinosaurs, with the rest of the Dinosauria being known as non-avian dinosaurs. Hundreds of shared traits in behaviour, reproduction, the skeleton and soft tissues clearly reveal that birds and dinosaurs have a close evolutionary relationship.

Fossil and comparative morphological evidence indicates that birds evolved from a theropod dinosaur of the Maniraptora clade; most likely a small dromaeosaur. These creatures are commonly known as 'raptors', which only evokes confusion as this term is also used to describe modern birds of prey (owls, eagles, hawks and falcons). Dromaeosaurs were popularised in *Jurassic Park* as fierce, agile, intelligent dinosaurs with grasping hands and huge slashing talons on their feet. Skull fossils reveal a large brain case, indicating that, like modern birds, dromaeosaurs were probably highly intelligent. They had long, flexible forelimbs, most likely an adaptation to swiftly seize prey, however this turned out to be a handy exaptation to produce the powerful flight stroke of birds today.

## Shared Features.

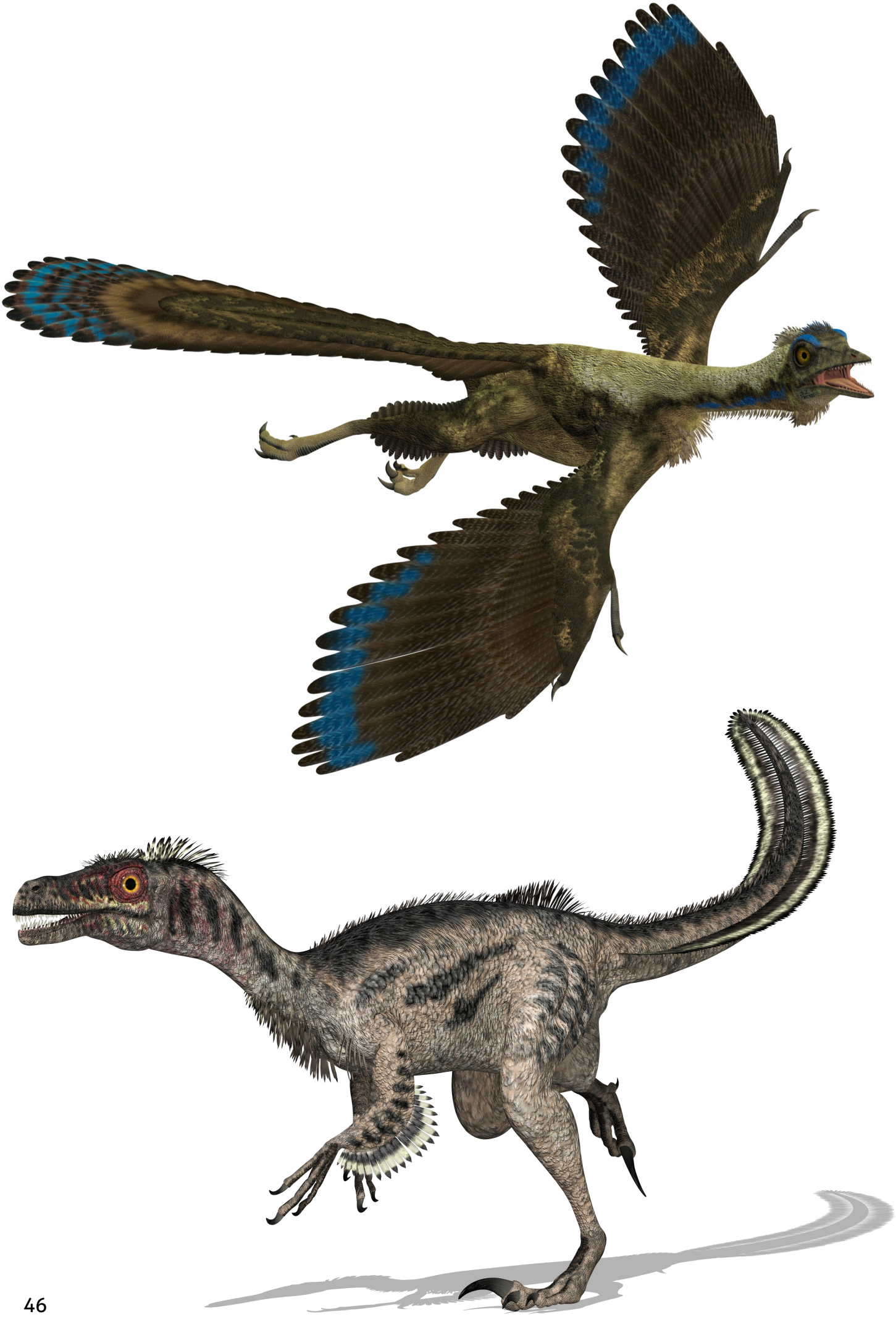
Birds are united with theropod dinosaurs by having a bipedal posture and associated skeletal modifications of the legs and ankles; weight is borne on only three digits, the first and fifth toes having become reduced and lost respectively. They also have only three main digits in the manus, or hand, with the fourth and fifth becoming highly reduced. Another diagnostic feature of the bird-maniraptor clade are hollow, thin-walled bones. The latter trait was co-opted during evolution and exapted by birds for flight, given the need to reduce body weight to become airborne. Their indisputable membership of the therapod clade also means that birds are related to arguably the most infamous and fearsome of dinosaurs, the giant hyper-predatory *Tyrannosaurus rex*!

Numerous other common traits include: aspects of the skeletal structure in the pubis, wrist, scapula, clavicles (which are fused to form a 'wishbone') and vertebrae; musculature around the arms and the pectoral girdle; microstructure of the eggshell; and a reduced, stiffened tail. Many of these characteristics are exaptions that were to predispose these animals to a life on the wing. Further examples include expanded sinuses in the skull (thereby reducing weight), and a secondary bony palate, which allows for more efficient respiration and therefore also a highly active lifestyle. Large orbits (eye openings) are also an exaption for navigating a complex, three-dimensional, aerial environment.

And there is one other important common feature….feathers. We tend to think of birds being the only feathered animals, yet literally thousands of fossils have been discovered of bone fide dinosaurs clearly sporting feathers of some kind – definitive proof of the dinosaur-bird evolutionary relationship.

## Feathered dinosaurs.

*Archaeopteryx* has for a long time been considered the 'first bird'; a 'missing link' between dinosaurs and birds that fully validated Charles Darwin's theory of evolution, published in *On the Origin of Species* only two years before the discovery of the first *Archaeopteryx* in 1861. Known initially only from a single feather, fossils of *Archaeopteryx* have been found in deposits dated at being 150 million years old. As well as feathers, fossilised specimens exhibit clearly reptilian features such as a full set of teeth and a long bony tail. But in light of new fossil evidence, the current consensus is that other taxa



may have knocked *Archaeopteryx* off the perch --so to speak - as being the earliest bird, a title for which there are now many contenders. The discovery of *Archaeornithura* in 2015 dates 'true' birds as having arisen a little over 130 million years ago.

But the evolution of filamentous 'protofeathers' preceded powered, feathered flight by at least 100 million years. Based on fossil evidence, the first feathers, in the form of simple, fibrous, single filaments, had evolved in non-avian theropods by 190 million years ago. These were by no means suited to flight, and are most likely to have been used for thermoregulation and display, although a variety of other possible functions include crypsis, tactile-sensation, physical defence, water-repellency, communication, and species or mate recognition or selection. Feathers function as an incredibly good insulating body cover, which is very important in aiding modern birds to maintain a high body temperature, driven by the high metabolic rate necessary for powered flight. They can help regulate body temperature and prevent overheating by being raised and lowered to alter the amount of insulation, and can shed excess heat through the blood that flows through their vanes.

*Sinosauropteryx prima* is known from a fossil dated at about 130 million years ago, and was a small, lightly-built coelurosaur with relatively long legs and tail. It was covered with tufts of thick filaments that projected a few millimetres above its skin, suggesting an insulating and possibly thermo-regulatory function. This contrasts with another coelurosaurian therapod that also existed approximately 130 million years ago. *Beipiaosaurus* only measured 2m in total body length, but boasted integumentary filaments up to 150mm long. Their structure (single and broad – up to 2mm wide) and localised distribution on the head, neck and tail means they would function poorly as insulation, but would be well suited for display. Analysis of the melanosomes (pigment-containing cells) of fossil dinosaur feathers reveal that feathers were not uniform in colour, but rather came in a great range of hues. The fact that Late Jurassic and Early Cretaceous dinosaurs with pinnate feathers exhibited sexual dimorphism in plumage and colour patterning likewise presents a strong case that mate attraction and display functions were a key role for these more advanced feather types.

'Late Jurassic and Early Cretaceous dinosaurs exhibited **SEXUAL DIMORPHISM** in **PLUMAGE** and **COLOUR PATTERNING.**'

The limitation of fossils of carbonized impressions is that although they indicate the presence of feathers, they are often poorly resolved; in contrast, specimens preserved in amber (despite being extremely rare) exhibit extremely fine structural detail. Amber-preserved feathers from the Late Cretaceous reveal the evolution of a great diversity of feather types, which were likely to have served a range of functions in avian and non-avian dinosaurs. Many feathered dinosaurs retained scales,

***Above left:*** Archaeopteryx *has for a long time been considered the 'first bird'. Image by Catmando.*
***Below left:*** *this depiction of a* Velociraptor *is at odds with the traditional view of dinosaurs. Image by Linda Bucklin.*
***Right:*** Beipiaosaurus *boasted integumentary filaments up to 150mm long. Image by Catmando.*

and had feathers on just certain body regions (especially the forearms, hind legs and tail), and whilst some species had just one type of feather, others featured a number of different types. By the Early Cretaceous (124-128 million years ago) for example, *Sinornithosaurus* and *Microraptor gui* had both plumulaceous as well as pennaceous feathers.

The most likely scenario for the evolution of feathered flight is that as lineages became increasingly arboreal, this would have favoured more aerodynamic feathers that assisted in leaping amongst branches. The development and modification of pennaceous feathers on the limbs and tail would have enhanced arboreal locomotion by permitting first parachuting, then gliding, and finally powered flight.

## Birds are reptiles too!

Not only are birds dinosaurs, but they, like dinosaurs, are also reptiles. Surprisingly, based on multiple lines of evidence – DNA, fossils and various embryonic and morphological features – birds are classified within the group Archosauria, which includes crocodiles! This means that crocodiles are more closely related to birds than they are to other reptiles, like snakes and lizards. Molecular and fossil data date the divergence of the lepidosaurs (including snakes and lizards) from archosaurs at about 270-275 million years ago, whereas crocodiles and dinosaurs last shared a common ancestor about 230-220 million years ago. Despite superficial appearances, crocodiles share more features with birds than lizards, in particular in relation to their bone and muscular structures. Another common feature is a single penis (for those birds that have not lost the penis as an intromittent organ), whereas lizards and snakes have two hemipenes.

‘Based on DNA, fossils and other evidence, **CROCODILES** are more **CLOSELY RELATED TO BIRDS** than snakes and lizards!’

More broadly, there are multiple features that birds share in common with reptiles. These include eggs with a calcareous shell, the protein beta-keratin (in feathers and scales), a ‘diapsid’ skull (which differs to that of mammals), scales (retained on birds’ legs), and the production of uric acid in order to eliminate nitrogenous waste. It is well established among zoologists that birds are completely nested within the reptilian clade; over a century ago T. H. Huxley, a renowned zoologist and close colleague of none other than Charles Darwin, was moved to declare birds to be ‘glorified reptiles’.

This points to the inaccuracy of the field of ‘herpepology’: our organisms of interest, the herpetofauna, are thus a group inconsistent with evolutionary relationships. Combining amphibians and reptiles, these two disparate clades, which diverged approximately 360 million years ago, were grouped together as those ‘creeping’ animals (the name being derived from the Greek *herpeton* or *herpein*; to creep). This makes herpetofauna a polyphyletic clade, while the traditional view of Reptilia, excluding birds, is consequently a paraphyletic clade (i.e. a grouping with a common ancestor but that does not include all descendents).

These evolutionary relationships reveal another inaccuracy in the very name of the group we know as dinosaurs, for the name Dinosauria derives from the Greek words *deinos*, meaning terrible, and *sauros*, meaning lizard. Dinosaurs, especially of the avian kind, are hardly ‘terrible’, and are strictly not lizards either. These flaws are unsurprising given that the term dinosaur was coined by Richard Owen, a religious man opposed to his contemporary Charles Darwin’s theory of evolution.

## The successful survivors.

Birds were not entirely immune to the cataclysmic consequences unleashed when the ancient asteroid crashed into Mexico. By the end of the Cretaceous, a number of distinct

***Left:*** *specimens preserved in amber (like this grasshopper) exhibit extremely fine structural detail. Image by Roy Palmer.*
***Above right:*** *pterosaurs had mastered flight well before birds.This species of* Zhenyuanopterus *dinosaur lived during the Cretaceous period in China .Image by Linda Bucklin.*

# Reptile Viruses

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lineages of archaic birds had evolved, yet only a few members of a single lineage, the Neornithes, survived. The avian dinosaurs that did persist across the K-T extinction event survived into a world where many niches previously occupied by the dominant dinosaurs were left open for them, and they evolved, radiated, and diversified; giving rise to the spectacular diversity of birds we see today, with over 10,000 species.

But against the background of mass extinction that also wiped out countless numbers of their close, feather-covered relatives, why is it that neornithine birds survived? Well, the answer remains something of an enigma. Prior to the discovery of feather impression in a diverse range of dinosaurs, it was believed that feathers held the answer, by providing both insulation and flight. However, given these features are by no means unique to birds, this hypothesis is no longer supported. It may be that neornithine birds, with their aerodynamically-contoured feathers, and advanced flight muscles, were particularly proficient flyers, and that they were better able to escape from poor-quality environments and efficiently search for safe and productive habitats following the turmoil generated by the meteorite. Still, a key flaw in the 'flight' hypothesis is that pterosaurs (which were not in fact dinosaurs, but a related lineage) had fully mastered flight well before birds did, yet they too were victims of the K-T extinction. Likewise, other archaic birds such the enantiornithines were both highly successful and capable of flight, yet were snuffed out along with the dinosaurs in the wake of the asteroid's impact.

Another hypothesis (linked to the ability of feathers to provide insulation) is that birds had an edge over non-avian dinosaurs in being endothermic; able to generate metabolic body heat to maintain a constant temperature independent of the vagaries of the environment, and therefore capable of activity across a range of conditions. This contrasts with ectothermy, the thermoregulatory strategy of all other extant reptiles today, in which the regulation of body temperature is limited to behavioural mechanisms, and body temperature must conform largely to that of the environment. But there is ongoing dispute as to whether dinosaurs were in fact ectothermic or endothermic. The latest consensus is that they were in between, or 'mesothermic': that is, they used their metabolism to generate body heat, but did not regulate their body temperatures at a constant, high temperature. So, it may have been that the evolution of full endothermy gave birds an advantage, however this hypothesis must again be balanced against the fact that many archaic birds also perished in the aftermath of the meteorite.

A key feature that distinguishes modern birds (Neornithes) from other birds as well as dinosaurs is the presence of teeth, or more correctly, the lack thereof. Not only are teeth heavy structures, reducing aerodynamic efficiency due to the extra weight, but a keratinized, lightweight beak is also highly adept at consuming seeds, whereas teeth are more suited for consuming flesh or vegetation. Herein lies a clue to why neornithines survived – it may be related to diet. After analysing thousands of dinosaur teeth, Larson and his colleagues concluded that, preceding the K-T impact, dinosaurs

had a huge diversity of tooth sizes adapted for meat and plant matter; primitive enantiornithine birds were also endowed with teeth. Only the advanced lineage of birds, the neornithines, had lost teeth and instead evolved a beak which most likely was adapted for consuming seeds. This represents a highly compelling hypothesis, for in the wake of the extinction, when most animal and plant matter was destroyed, seed (which can withstand very harsh conditions) would still have been available. Furthermore, seed-eating birds are recognised to be among the first species to recolonise disturbed sites. So the loss of teeth and the adoption of a granivorous (seed-eating) niche may have been the key for neornithine birds surviving the K-T Armageddon. This may also help explain the survival of the lineage that gave rise to us – the Mammalia.

Another compelling hypothesis for the differential success of neornithine avian and non-avian dinosaurs in surviving the K-T extinction relates to developmental rates. A study published just recently (in 2017) by Erickson and colleagues analysed embryonic growth in dinosaurs based on tooth development, and revealed that dinosaurs had exceptionally long incubation periods - from three to six months! Most birds today have an incubation period lasting about three weeks. Analysis of bone microstructure also suggests that dinosaurs and primitive birds had slow growth rates, whereas contemporaneous birds had supercharged growth rates, affording them resilience in the face of environmental upheavals. These factors would combine to make non-avian dinosaurs much more vulnerable to extinction.

Parental behaviour, almost ubiquitous among birds, may also have contributed. Although there is a lack of conclusive evidence to demonstrate differences in parental behaviour among neornithines and the rest of the dinosaurs, if non-avian dinosaurs typically 'abandoned' their eggs in large mounds in the ground, as opposed to personally incubating and guarding the eggs as most birds today do, keeping them safe from the rigours of the environment, this may have aided in the survival of the neornithines, and the demise of other species. Even for those dinosaurs that did attend their eggs, their lengthy incubation would mean prolonged exposure (for both eggs and parents) to a destructive environment after the crash of the meterorite.

'Snakes and lizards suffered **DEVASTATING LOSSES**, with 83% of species **BECOMING EXTINCT**, and many **KEY TAXA ELIMINATED.**'

Rather than being mutually exclusive, it is most likely a combination of these traits that set neornithines apart from their non-avian dinosaurian relatives; enabling them to persist across the K-T extinction and go on to radiate into the highly-successful group of feathered, avian dinosaurs we see today.

## What of other reptiles?

So, some lineages of avian dinosaurs survived the K-T extinction, but what of the other reptiles (crocodilians and lepidosaurs)? For we still have lizards, snakes and crocodiles, all of which had ancestors that were present during the reign of the dinosaurs, but survived the extinction event that completely wiped out their cousins.

The truth is that snakes and lizards also suffered devastating mass extinctions coinciding with the Chicxulub asteroid impact: 83% of species became extinct, with many key lizard taxa being completely eliminated. Associated with this species-level loss was a loss in morphological diversity; recovery was prolonged and lizard diversity did not approach that in the Cretaceous period for another 10 million years after the K-T extinction event. It appears that the ancestors of extant lizards were advantaged by their small body size, as only lizards and snakes under 500 grams persisted into the Paleogene. Their smaller size would have given them an edge by requiring less energy, and combined with ectotermy and an ability to brumate or aestivate, meant that they could survive long periods of food shortages, and hide in burrows or shelters where environmental conditions were less adverse. They also, like most lizards today, were adapted to a diet of insectivory or scavenging. With most vegetation being eliminated, this removed the food base for large herbivores, and thus also for larger predatory carnivores. However, the decaying organic matter would have still provided food for insects to feed and breed in, and thus provide a food source for small insectivores, as well as for scavengers. The small ancestral lizards also almost certainly had short incubation periods, and also short generation times, meaning that they could reproduce and evolve rapidly.

And what of the dinosaurs' closest relatives, the crocodilians? At the time crocodiles were, like today, relatively large-bodied reptiles, and so their ability to persist across the K-T boundary cannot be due to any 'economy of scale'! It is likely that, along with being ectothermic and able to withstand long periods without food, crocodiles also were able to avoid some of the extreme environmental adversities by being able to shelter in water. In addition, they had the opportunity to forage and scavenge on both land and water, and were higher order predators in detrital food chains. These were buffered from the crash in productivity after the meteorite collision and its effect on photosynthesis, which caused terrestrial food chains based on living plant-matter to crash.

***Left**:* Citipati *was a genus of bird-like dinosaurs that lived during the Late Cretaceous Period in what is now Mongolia. Inage by Linda Bucklin.*

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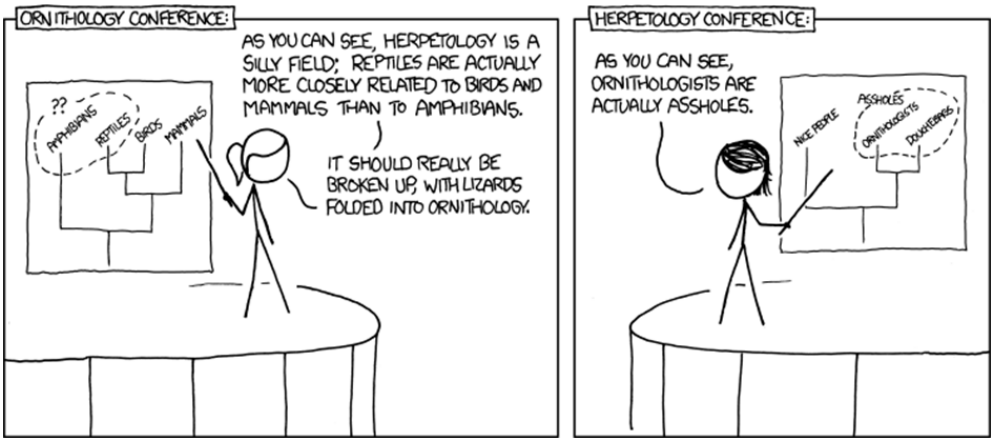


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# Creating ‘Eternal Creatures’.

## Taxidermy for unusual pets.

***Lauren Hundloe*** *is forging a successful business reincarnating reptiles, and other animals….*


When animals die, we often overlook the option to preserve them - most people go down the usual path of burial or cremation without knowing or considering that preservation through taxidermy is a possibility. It’s usually seen as something reserved for natural history museum pieces, or the deer trophy up on the hunter’s wall, but among keepers of unusual pets, there is a rising trend to have their animals preserved.

As a taxidermist based in Brisbane, I have noticed a growing popularity amongst pet owners and breeders seeking to preserve birds and reptiles. A few years back I might have got one or two enquiries about it a month; now I get them every few days. It seems the negative stigma that existed in the past is evolving and that taxidermy is now being seen more as a celebration of wildlife, rather than the destruction of it; and it is carving out new territory somewhere between the realms of art, education and commemoration. It's coming to be recognised as work that respects animals and is focused on capturing and preserving the beauty of living things.

My name is Lauren Hundloe, taxidermist at Eternal Creatures Taxidermy Studio. Just four years ago I was part of the corporate world, but in 2014 I took a voluntary redundancy, packed up my life in Australia and moved to San Francisco, keen for a career change as far removed from a desk job as I could find.

With nothing more than a mild curiosity about taxidermy and time up my sleeve, I thought it would be cool to learn to bring things back to life. I'd joked about it in the past, but purely because being a taxidermist seemed a more interesting talking point than my career as a policy officer with the Government. So I did some searches online and was disappointed that all I could find in the way of taxidermy schools in the San Francisco area was a couple of one-day bird and squirrel classes. I signed up for the squirrel class and went along not knowing what to expect. Despite my initial trepidation, I quickly settled in to the class and was surprised to find that I found the process somewhat cathartic. At the end of the day, standing back and looking at my creation, I felt a huge sense of achievement at the tangible outcome my hard work had produced. I realised that day, the feeling of true accomplishment, and having something physical to show for my efforts, were the very things that had been lacking in my previous career. Suddenly, I was hooked.

I pestered the teacher of the squirrel class to take me on as an apprentice, and a short while later I was under his wing learning both traditional and modern techniques covering birds, small mammals and large game, fish and reptiles, and methods ranging from traditional wrapping of forms, to carving and casting forms, and freeze-drying. I found that the work I enjoyed most was reptiles and birds, so focussed on honing my skills in those areas.

I fully immersed myself in the world of taxidermy. When I wasn't at the studio, I spent time volunteering at America's first wildlife refuge, the Rotary Nature Centre in Oakland, where I prepared taxidermy mounts and study skins for displays, and delivered bird and snake taxidermy demonstrations to the public. I began teaching others and presented small mammal and bird taxidermy classes in San Francisco. I also volunteered with and was mentored by Oakland Museum of California taxidermist, Alicia Goode, who trained me in the traditional methods of specimen preservation for museum collections as well as restoration and conservation techniques. The contrast between what I learned from my two mentors and the experience I gained in the United States provided me with a solid grounding to return to Australia where, in March 2016, I opened my own taxidermy studio.

'Fox Studios NEEDED PROPS for the latest instalment in the ALIEN FILM FRANCHISE; I produced six pieces of taxidermy in seven days.'

To start with it was tough: I didn't know where to get specimens in Australia; I had to learn the laws around taxidermy, which differ from state to state; and getting straight answers from anyone was harder than I could have anticipated. I had assumed there would be a tannery nearby, but there wasn't, so suddenly there was a pretty significant gap in my training that I had to deal with by teaching myself to tan skins in my garage. Despite the initial struggles, it wasn't long before I was inundated with work. There are a handful of other taxidermists in South East Queensland – a few that cater to the hunting crowd and a fish specialist. My training allowed me to fill the small niche in the market for reptiles and birds.

Within my first 12 months in operation in Australia, I hit what may be the pinnacle of my

***Below left:*** *'I focused on honing my skills with reptiles and birds.'*
***Right (slide show):*** *Lauren's workshop.*
***Below right:*** *'The feeling of true accomplishment had been lacking from my previous career.'*
*All images supplied by Lauren Hundloe.*

taxidermy career. Fox Studios got in touch with me – they needed props for the latest instalment in the Alien film franchise, *Alien: Covenant*. I set to work and produced six pieces of taxidermy for them in seven days. It was a well-paid week! I joked at the time that I may have peaked too soon in my new career, but since then my business has continued to go from strength to strength and I've now had my work feature in four television shows and counting.

In addition to the immense feeling of satisfaction I get at giving creatures a second chance at life, the thing that I love most about being a taxidermist and wildlife artist is that every day is totally different. I get lots of weird enquiries. One guy left half a deer on my driveway while I was out - legs and all. It was a Monday afternoon and I had planned on having a relaxing night, but ended up having to drop everything to skin it whilst my partner was inside frantically searching Gumtree to find a secondhand freezer in which to store it at extremely short notice. Another guy wanted me to taxidermy his 'rat's tail', which was still attached to the back of his head! I get some really cool restoration work - I restored a vintage macaque recently and currently have a lioness in my studio for restoration as well. She belongs at Irish Murphy's Pub in the City and apparently patrons have been asking where she's gone, so the pressure is on to revive her to her former glory and get her back where she belongs. It's a really great feeling to be able to give creatures another chance at life….albeit in a different form.

An average day for me now can be spent planning a diorama, preparing for an upcoming taxidermy workshop, teaching my apprentice, posting photos of my latest work on Facebook and Instagram, travelling around picking up dead stuff, fielding enquiries, and taking time to talk to people when they drop off their pets – getting to know what the animal was like in life. It's nice to know something about my subjects when I am working on them. I like to know their name, what their personality was like and their individual quirks. I still have administrative work that I need to take care of: ordering supplies, glass eyes, forms etc., and packaging up finished pieces to post home to interstate clients. Some days I head a few hours up the road to work with another taxidermist. Other days I get to sit down and work uninterrupted from start to finish on one piece. Starting out in the morning with a critter that's been defrosted, and by the end of the day it's upright again, looking very much alive. Those are my favourite days! I can listen to audio books or podcasts at the same time, so I can be working on one thing and learning about another. The whole process can be very meditative and oddly therapeutic.

I find that a large part of my role is providing comfort to people who are grieving at the loss of a pet. I have been through it myself and know how profoundly devastating it can be - it's not uncommon for me to end up in tears over the loss of someone else's pet that I never knew. The part that I find the most meaningful and rewarding is when those same pet owners come back and see the finished product; their snake wrapped around its favourite branch or bird back up on its perch. To have people cry with happiness when they return to pick up their pet is an incredible feeling. It's at these moments that I realise that this is what passion is. And it's as much about the people as it is about the animals. To do work that brings people joy, to have children visit my workshop and look around wide-eyed in amazement; I'm very lucky to derive so much pleasure from my work.

When I first started out I was worried about how I would obtain specimens, because I don't hunt and I don't want to harm any living creature at all, let alone for the sake of my work. The vast majority of animals I work on are pets that have died of natural causes, or that were sick or injured and had to be euthanased. Very occasionally I take on pieces that have been hunted – I'm fine with that so long as taxidermy was not the primary purpose. If it's for food and the skin is a by-product, then that fits with how I feel about it morally – no waste. Restoration pieces such as the lioness; I have a sense of duty to them - I feel for the animals. If they've been neglected it's a great honour to restore their lost grandeur, or to build them a new diorama and refresh their surroundings.

In addition to commissioned work, I also have specimens donated to me from around the country by family and friends, breeders, rescue centres, and people responding to my ads on Gumtree. I also trade critters with other taxidermists. Thankfully, due to the Express Post next day delivery network and courier services, I'm able to offer my services well beyond South East Queensland.

All specimens need to have been held/obtained lawfully and need to be accompanied by the relevant permits/licenses and moved and processed in accordance with state/territory laws. In Queensland, for example, if you have a snake that is covered by your Recreational Wildlife License, you can transport it to me once a Wildlife Movement Advice form has been completed. Once received, I am lawfully able to have it in my possession and work on it under my Commercial Wildlife License. I get a lot of phone calls from people who have picked up roadkill or had a bird fly into their kitchen window and

> 'To have people CRY WITH HAPPINESS when they pick up their pet is an incredible feeling.'

unfortunately have to turn many people away because the animal has not been lawfully obtained. As a rule, in Queensland any native wildlife that was not held under an appropriate wildlife license needs to be left where it was found. In other words, put it down and back away slowly…

In terms of the taxidermy and preservation process, people expect blood and guts but it's not like that at all. With traditional taxidermy, the skin is removed from the body. We don't cut into the veins or organs; it's more a matter of separating the skin from the muscles. However, my preferred method for reptiles (and pets in general) is freeze-drying. The reason for this is that the end result is

still your pet, not just its skin over a man-made form. Freeze-drying is a way of preserving an animal in its natural state without altering its appearance. It's not as invasive as traditional taxidermy; specimens are carefully preserved with minimal intrusion and with this method it is possible to ensure that they continue to look just as they did in life.

A lot of people ask me if others will think they're weird for having their bird/reptile/cat/dog preserved. In my experience most people who think it's unusual to start with are impressed and fascinated by the end product – it's a huge talking piece.

If you have invested in an unusual pet why not have it preserved? Just wrap the critter tightly in a plastic bag or container and put it in the freezer as soon as possible after it has passed away. Then get in touch with me. If you have an animal die and your plan is to simply dispose of it, consider preservation as an alternative, even if you don't want to keep it yourself. I take donations and will even pay a fair price to purchase certain specimens.

It makes me truly happy to bring nature's beautiful creatures back to life. Don't be shy to reach out if you have any questions about the work that I do. My goal is to dispel any myths and bring taxidermy and preservation into the mainstream.

And those feeder animals (mice, rats and rabbits); if you ever want to do something a little different with them other than feed them to your snake, why not come and do a class with me and walk away at the end of the day with your very own taxidermied critter? You won't regret it.

***Left and above:*** *'I find it most rewarding when pet owners see their snake wrapped around its favourite branch again, or bird back up on its perch.'*



# The systematist: John Edward Gray.

Another in our continuing series of articles about Australian pioneers.

John Edward Gray was born in Walsall, England, on 12 February 1800. At the age of 16, he began to study medicine, however this pursuit was later abandoned, due in part to a revulsion to surgery. However, he had previously assisted his father to compile *The Natural Arrangement of British Plants*, and had also collected insects for the British Museum as on a voluntary basis. In 1824 he was officially engaged by J. G. Children, the Keeper of the Zoological Collection, to help catalogue reptiles. Children himself appears to have been the beneficiary of a politically-motivated appointment, and would heavily upon his younger assistant. Gray succeeded Children upon his retirement in 1840.

Gray was confronted by zoological collections that were unorganised and uninspiring, but he worked tirelessly to ensure that eventually the museum's collections became recognised as the best in the world. He was a copious writer and was calculated to produce 1,162 books, papers and articles during his career, including descriptions of a huge number of new species. During Gray's fifty-year tenure the museum was literally flooded with an almost unlimited supply of new specimens from around the globe. Many of his descriptions were (perhaps necessarily) somewhat superficial, and numerous amendments to scientific names were to cause considerable confusion.



However, the meticulous cataloguing system he devised ensured that, to this day, the vast majority of his type specimens remain preserved in the museum's archives.

**'Gray produced an incredible 1,162 BOOKS, PAPERS AND ARTICLES during his career.'**

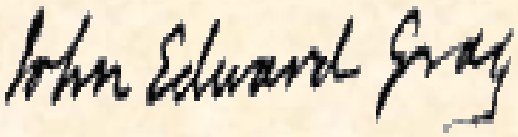
This was also the Golden Age of Australian exploration, and Gray was personally responsible for describing and naming many familiar Australian species, particularly reptiles and mammals. He described the Thorny Devil, the Frilled Lizard, the Perentie, the Olive Python and the Children's Python (after his mentor) to name but a few archetypal species, and is credited with establishing the genera *Morelia, Liasis, Moloch,*

*Lophognathus, Diplodactylus, Oedura, Gehyra, Aprasia, Delma, Carlia, Egernia, Morethia and Teliqua* amongst others!

John Gray can also lay claim to the earliest book devoted entirely to Australian reptiles. *The Lizards of Australia and New Zealand in the Collection of the British Museum*, published in 1867, is often referred to simply as 'Gray's lizards' and consisted of the examination of part of a collection derived from an expedition under the command of Sir James Clark Ross.

Gray's wife, Maria, was a celebrated conchologist, and rendered him considerable assistance, especially in the form of drawings. He was also ably supported by his colleague and younger brother, George. John Gray was a prominent member of many scientific societies, and quite possible the first known stamp collector, since he is believed to have preserved a number of Penny Blacks purchased on their first day of issue in 1840. He died in 1875.

3.




4.

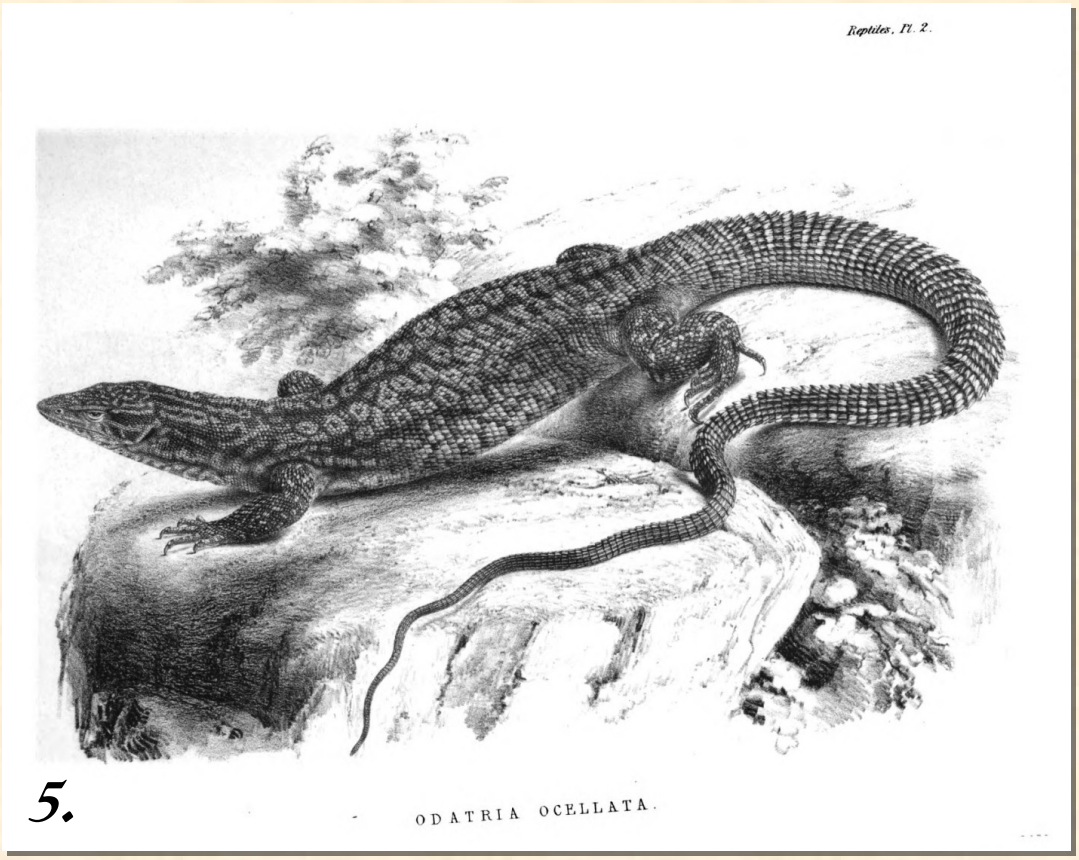
***1.*** *John Gray; a portrait taken in 1851.*

***2.*** *A later photograph; date unknown.*

***3.*** *Gray with his wife Maria in 1863.*

***4.*** *Gray's signature.*

***5.*** *A beautiful plate from 'Gray's lizards'.* Odatria ocellata *(Gray 1845) is immediately recognisable today as* Varanus acanthurus.

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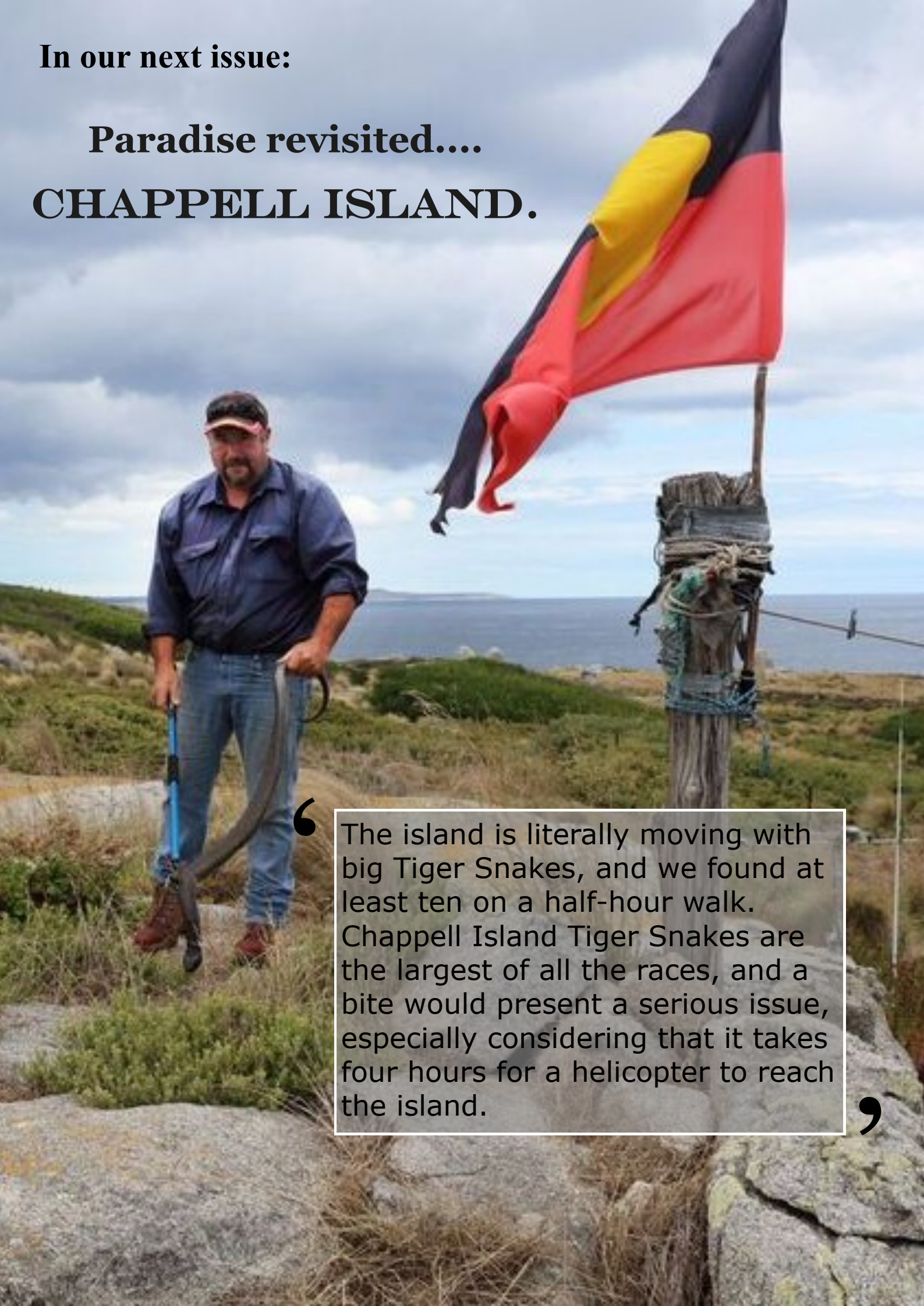
**In our next issue:**

## Paradise revisited....

# CHAPPELL ISLAND.



‘The island is literally moving with big Tiger Snakes, and we found at least ten on a half-hour walk. Chappell Island Tiger Snakes are the largest of all the races, and a bite would present a serious issue, especially considering that it takes four hours for a helicopter to reach the island.’

# MONACO
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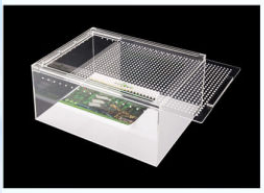
5 Canley Vale Road
Canley Vale NSW 2166
Tel/Fax : 02 9754 1494
www.monacoaquariums.com.au

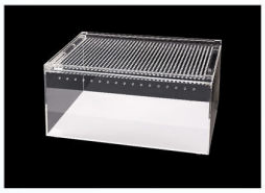
## Mini Glass Reptile Habitat

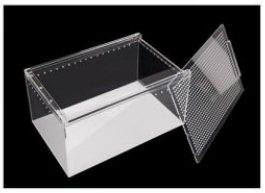
AK01B - 21 X 21 X 15cm
AK02B - 21 X 21 X 20cm
AK03B - 21 X 21 X 30cm
AK04B - 31 X 31 X 20cm
AK08B - 50 X 30 X 25cm
AK09B - 31 X 21 X 15cm
AK10B - 31 X 31 X 30cm
AK12 - 31 X 21 X 20cm

## Acrylic Breeding Enclosure

ACR01 - 20 X 30 X 15cm (3mm) : Transparent
ACR02 - 40 X 30 X 15cm (4mm) : Transparent
ACR03 - 15 X 20 X 15cm (2mm) : Transparent
ACR01B - 20 X 30 X 15cm (3mm) : Black
ACR02B - 40 X 30 X 15cm (4mm) : Black
ACR03B - 15 X 20 X 15cm (2mm) : Black







## Superior Heat Mats

SHM05 - 14 X 15cm - 5W
SHM07 - 28 X 15cm - 7W
SHM14 - 28 X 28cm - 14W
SHM20 - 42 X 28cm - 20W
SHM28 - 53 X 28cm - 28W
SHM35 - 65 X 28cm - 35W
SHM45 - 80 X 28cm - 45W

## Plastic Tanks

RT2001Black - 20 X 20 X 17cm
RT2001White - 20 X 20 X 17cm
RT2002Black - 26 X 26 X 20cm
RT2002White - 26 X 26 X 20cm

## Natural Cork Tile Background

NCT01 - 30 X 32cm
NCT02 - 30 X 45cm
NCT03 - 45 X 45cm
NCT04 - 60 X 45cm
NCT05 - 45 X 60cm
NCT06 - 60 X 60cm
NCT08 - 50 X 25cm
NCT10 - 30 X 30cm
NCT11 - 20 X 15cm
NCT12 - 20 X 20cm
NCT13 - 20 X 30cm

## Deluxe Heat Mats

DHM10 - 15 X 25cm - 10W
DHM20 - 20 X 35cm - 20W
DHM30 - 30 X 50cm - 30W
DHM40 - 40 X 60cm - 40W

## Ceramic Sockets


REPTI ZOO
living in nature

# The Best Selling Brand For Reptile Products

The next issue will be published on Friday 4th May 2018

Photograph courtesy of Jason Sulda