Issue 8 | September - October 2018
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iHerp Australia

UPDATE: TURTLES IN TROUBLE?

Important Conservation Project in Jeopardy.

TOP END SURVIVAL GUIDE.

Welcome to Australia's 'Final Frontier'.

SNAKE OIL.

A booming trade in traditional medicine is threatening reptile conservation.

THE TROUBLE WITH SNAKE TRANSLOCATIONS:

Help or Hindrance?

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The 'Wrangler' Writes...

Happy New Year! Bear with me a moment... if the calendar year starts in January, and the financial year starts in July, then the 'herping year' surely must start at the beginning of a new breeding season, on the first day of spring, and in the southern hemisphere that's September 1! This is perhaps the most exciting time of year for many herp enthusiasts, as captive breeding projects are about to (hopefully) bear fruit, and no-one knows exactly what will result. We would love to hear from you if your animals produce something extraordinary.

Speaking of which, we believe we have an extraordinarily good mix of content in this issue, with something for just about everyone. But we're going to start by asking you to turn to the very back of the magazine. In Issue 2, we featured an article on the great work being undertaken on WA's Coral Coast by the Gnaraloo Turtle Conservation Program. Unfortunately, this unique and innovative initiative is in immediate jeopardy through a complete lack of funding. We urge our readers to have a look at the update at the end of this issue, and help in any way possible, perhaps by becoming a 'Turtle Friend' or purchasing merchandise.

In other features, Phil Mangion takes us on a tour of the NT's herping hot spots, Kit Prendergast examines the impact of Traditional Chinese Medicine on reptile conservation, and we examine some important new applications for traditional snake catching skills in the modern world. Plus Ben Dessen is right on cue to explain how to get started breeding beardies. And we are proud to welcome a couple of new authors. Janne Torkkola has contributed an intriguing piece on snake translocations, and Vickie Lillo takes us to a brand new eco-tourism venture created by local tribespeople in northern Guyana.

A couple more quick points before we let you get to the first article. First of all, one of our founding supporters, Kellyville Pets, has a special offer of $20 off online orders for iHerp readers – please support them if you can! Secondly, RepX is having its first Melbourne Reptile Expo at the Convention centre on Sunday November 25. This promises to be a huge event, as it is partnered with an aquarium expo (AQUARFEST) under the same roof.

Lastly, iHerp Australia is a free resource; you can support us by telling your friends.

Happy Herping!

John McGrath

iHerp Australia

Issue 8 | Sept - Oct 2018

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On the cover: Loggerback Turtle (*Caretta caretta*). Image by Andy Leach and courtesy of Karen Hattingh, Gnaraloo Turtle Conservation Program.

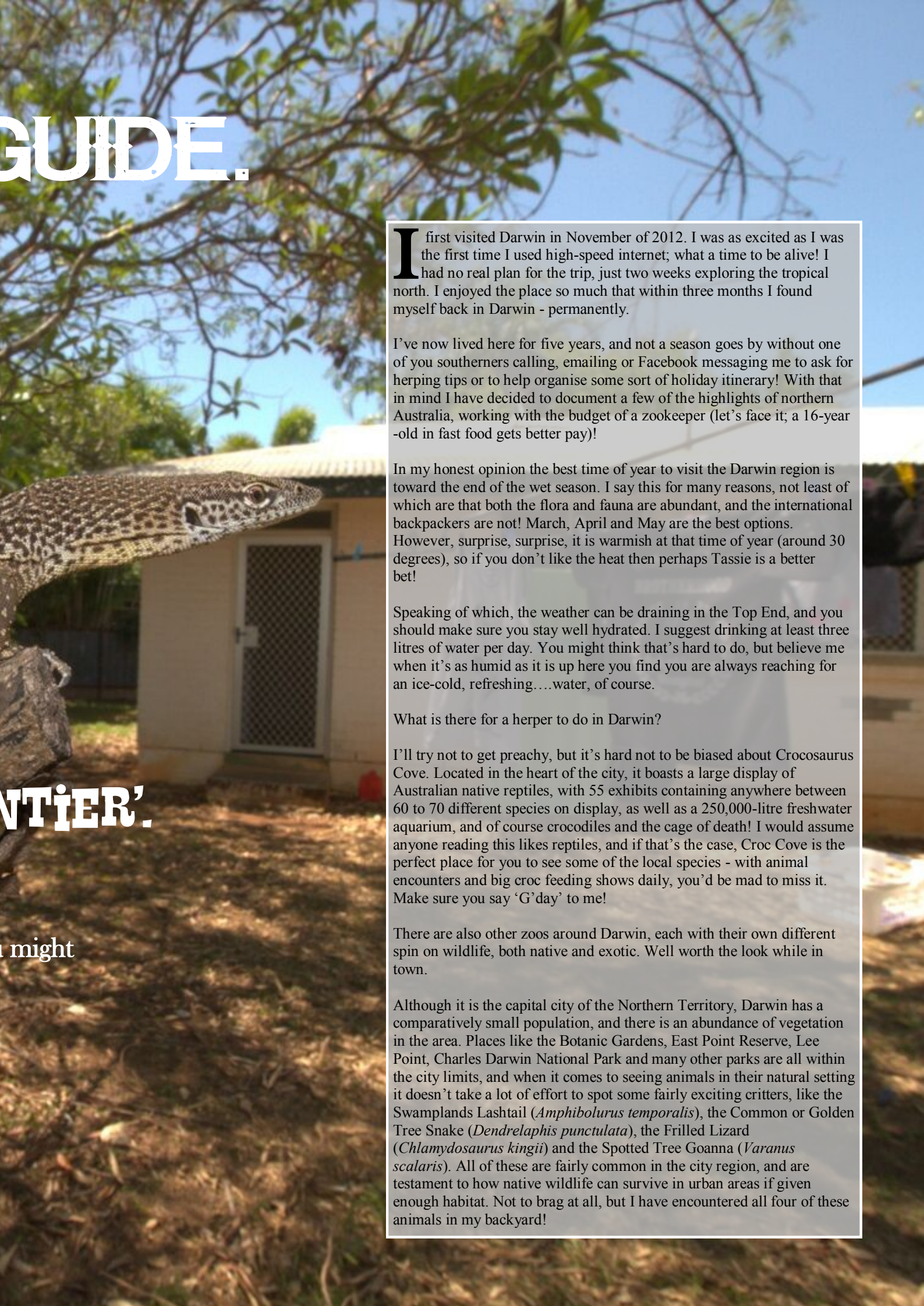
TOP END SURVIVAL C

WELCOME TO AUSTRALIA'S 'FINAL FRO

Phil Mangion looks after the reptiles on display at Crocosaurus Cove, but you be forgiven for thinking he is also employed part-time by Tourism NT....

Spotted Tree Goanna (Varanus scalaris). All images by Phil Mangion.

GUIDE.



I first visited Darwin in November of 2012. I was as excited as I was the first time I used high-speed internet; what a time to be alive! I had no real plan for the trip, just two weeks exploring the tropical north. I enjoyed the place so much that within three months I found myself back in Darwin - permanently.

I've now lived here for five years, and not a season goes by without one of you southerners calling, emailing or Facebook messaging me to ask for herping tips or to help organise some sort of holiday itinerary! With that in mind I have decided to document a few of the highlights of northern Australia, working with the budget of a zookeeper (let's face it; a 16-year -old in fast food gets better pay)!

In my honest opinion the best time of year to visit the Darwin region is toward the end of the wet season. I say this for many reasons, not least of which are that both the flora and fauna are abundant, and the international backpackers are not! March, April and May are the best options. However, surprise, surprise, it is warmish at that time of year (around 30 degrees), so if you don't like the heat then perhaps Tassie is a better bet!

Speaking of which, the weather can be draining in the Top End, and you should make sure you stay well hydrated. I suggest drinking at least three litres of water per day. You might think that's hard to do, but believe me when it's as humid as it is up here you find you are always reaching for an ice-cold, refreshing….water, of course.

What is there for a herper to do in Darwin?

I'll try not to get preachy, but it's hard not to be biased about Crocosaurus Cove. Located in the heart of the city, it boasts a large display of Australian native reptiles, with 55 exhibits containing anywhere between 60 to 70 different species on display, as well as a 250,000-litre freshwater aquarium, and of course crocodiles and the cage of death! I would assume anyone reading this likes reptiles, and if that's the case, Croc Cove is the perfect place for you to see some of the local species - with animal encounters and big croc feeding shows daily, you'd be mad to miss it. Make sure you say 'G'day' to me!

There are also other zoos around Darwin, each with their own different spin on wildlife, both native and exotic. Well worth the look while in town.

Although it is the capital city of the Northern Territory, Darwin has a comparatively small population, and there is an abundance of vegetation in the area. Places like the Botanic Gardens, East Point Reserve, Lee Point, Charles Darwin National Park and many other parks are all within the city limits, and when it comes to seeing animals in their natural setting it doesn't take a lot of effort to spot some fairly exciting critters, like the Swamplands Lashtail (*Amphibolurus temporalis*), the Common or Golden Tree Snake (*Dendrelaphis punctulata*), the Frilled Lizard (*Chlamydosaurus kingii*) and the Spotted Tree Goanna (*Varanus scalaris*). All of these are fairly common in the city region, and are testament to how native wildlife can survive in urban areas if given enough habitat. Not to brag at all, but I have encountered all four of these animals in my backyard!

NTiER'.

might

The Natural History Museum is also worth a few hours of your time, but let's face it you don't come to Darwin to stay in the city. You want to get out to the World Heritage-listed Kakadu National Park and the stunning Litchfield National Park!

There are many tour companies that will do day and overnight tours to Kakadu and day tours to Litchfield. Personally, I would rather hire a car and drive myself: there's more privacy; you can take in more on your own; you can see what you want without feeling rushed; and you end up saving money without paying a tour guide. I'll take you out myself for a fee!

Kakadu is one of my favourite places to visit. It has so much cultural significance to the Bininj Aboriginal people who have lived in the area for thousands of years and have a deep spiritual connection with the land and the animals they share it with. It's this ancient culture and the wildlife of Kakadu that really draws me to the place.

The town within Kakadu is called Jabiru and it has all the advantages of the big city, including internet coverage so you can update your social media! I will usually stay in Jabiru while in Kakadu as it means you can get an air-conditioned bungalow and private toilet/ bathroom combo. The older I get the more essential this becomes.

Ubirr is a 30km drive from Jabiru along a tarred road which follows the sandstone escarpment for much of its length, but also passes through a variety of different habitats including savannah and floodplains. Keep an eye out for snakes and lizards crossing, as we wouldn't want any of them to get run over! Once you get to Ubirr you have access to one of the largest indigenous rock art sites

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1. & **2.** *Frilled Lizards (*Chlamydosaurus kingii*) and Spotted Tree Goannas (*Varanus scalaris*) are both fairly common in the city region.*

3. *You might get lucky and spy a Mertens' Water Monitor (*V. mertensi*).*

'FOGG DAM IS ALSO A GR
LARGE VARIETY OF FR

1. Crimson Finch (*Neochmia phaeton*).
2. Double-barred Finch (*Taeniopygia bichenovii*) .
3. Brolga (*Antigone rubicunda*).
4. Dahl's Aquatic frog (*Litoria dahlii*).

EAT PLACE TO SEE A
OGS AND BIRDLIFE.'

within Kakadu, as well as a nice walk up a monolith to a view overlooking the Arnhem Land floodplain. While you're up there, if you are patient and willing to sit and take in the sights and sounds, you might just spot a Black-palmed Rock Goanna (*V. glebopalma*) chasing a small skink or grasshopper, or see Agile Rock-wallabies darting through the rocks with ease.

without a boat tour on the Yellow Water Billabong. Located in the southern end of Kakadu, this billabong is home to so much wildlife it would take an entire article to list all the species. I would recommend doing the morning or afternoon tour that lasts for about an hour. A highlight animal for this trip is the Saltwater Crocodile (*Crocodylus porosus*) and if you are very lucky

enjoying the swimming hole with you. My favourite part of Litchfield is the Wangi Falls area.

No herp trip to Darwin would be complete without stopping off at Fogg Dam. This is actually a manmade structure which was once used to irrigate rice crops in the Humpty Doo area, however the rice farming failed for a variety of

'DON'T VENTURE NEAR THE WATER'S EDGE, AS YOU MAY END UP BECOMING LUNCH!'

Cahill's Crossing (the river crossing famous for its Saltwater Crocodiles that features regularly in the news) is located near Ubirr. Don't venture near the water's edge, as you may end up becoming lunch and finding fame on the next news coverage about a silly person who got too close to a crocodile.

When I travel to Kakadu I also make a visit to Nourlangie and Noarlunga Rock, as both of these popular tourist sites are home to some amazing indigenous rock art and wildlife as well.

A trip out to Kakadu is not complete

you might see Pig-nosed Turtles (*Carettochelys insculpta*), which are a major target species of mine.

Much closer to Darwin, if you want to see a pretty waterfall and 'realign your chakras', then your destination is irrefutably Litchfield National Park. It's only an hour away from town, and there's mobile coverage most of the way. If you can find a quiet spot away from the rowdy backpackers, you might get lucky and spy a Mertens' Water Monitor (*V. mertensi*), Yellow-faced Turtle (*Emydura tanybaraga*), or potentially even the occasional Freshwater Crocodile (*Crocodylus johnstoni*) all

reasons. The dam itself provides the basis for a perfect ecosystem for plants and animals including reptiles, amphibians, fish and birds.

With the highest abundance of Water Pythons (*Liasis mackloti*) on the planet it's certainly no secret that Fogg Dam is herp heaven. There may be copious numbers of Water Pythons in the area, but they aren't the only reptiles that call Fogg Dam home. You can also see Northern Death Adders (*Acanthophis praelongus*), Slaty-grey Snakes (*Stegonotus cucullatus*), Keelbacks (*Tropidonophis mairii*) and occasionally file snakes (*Acrochordus*

spp.). Don't forget that where there is water, there are probably crocs, so once again, don't get too close.

Fogg Dam is also a great place to see a large variety of frogs including Dahl's Aquatic frog (*Litoria dahlii*), Green Tree Frogs (*L. caerulea*) and Northern Dwarf Tree Frogs (*L. bicolor*). Unfortunately, the Cane Toad (*Rhinella marina*) is common within the Top End, and this introduced pest has been causing a lot of problems for our native wildlife due to its highly toxic poison. It has been responsible for a sharp decline in monitor lizard numbers in the past few years, and the Yellow-spotted Monitor (*V. panoptes*) population in particular has been decimated.

The reduction in monitors has led to an increase in some of the smaller animals that are common prey species. This includes the ground-nesting Crimson Finch - keep your eyes peeled for these beautiful, blood-red birds while spotting around Fogg Dam. Some of the other birds that frequent the area include Black-necked Storks, Double-barred Finches, Brolgas, egrets and kingfishers.

With so much to see and do within the Darwin region you could literally spend a lifetime up here and not run out of new things to find and experience! I'm convinced; life in the Top End can be spectacular - it's an amazing area and Australia's 'final frontier'. Why not come up and find out for yourself just how magical it can be?

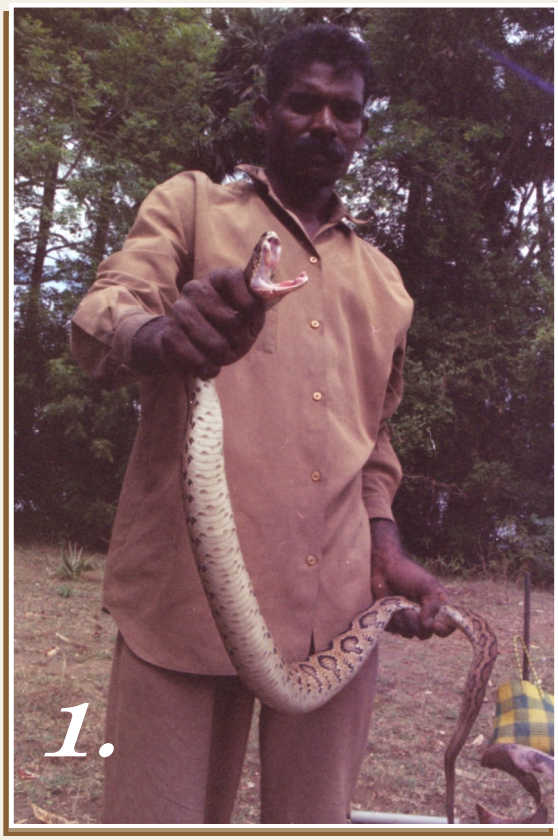
Cheers and happy herpin'.

1. *Cahill's Crossing is famous for its Saltwater Crocodiles (*Crocodylus porosus*).*

2. *Yellow-spotted Monitors (*V. panoptes*) have been decimated by the Cane Toad.*

3. *You may get lucky and see a Yellow-faced Turtle (*Emydura tanybaraga*) at Litchfield National Park.*

Snake Catching in the blood....



THE IRULAS OF TAMIL NADU.

John McGrath looks at a people whose lives are inextricably linked with snakes.

> "The best snake catchers in the world."
> Rom Whitaker; Madras Crocodile Bank Trust and Centre for Herpetology.

> "Better than any other snake catchers that I have known."
> Professor Frank Mazzotti; University of Florida.

The Irula people of southern India are an ethnic tribe indigenous to the state of Tamil Nadu, with a total population estimated to be around 50,000. In the Tamil language the name Irula translates as 'people of darkness'. This is thought to be because of their dark complexion, but could also be due to the fact that it is customary for many of their unique rituals and ceremonies to take place at night. Although basically Hindu, the Irula have retained traditional beliefs in the spirit world. Once predominantly a people of the forest, collecting natural wild resources, the Irula became renowned for their ability to catch snakes and rats, and this became their principal source of income. However, although rats continue to be a major headache for the grain farmers of Tamil Nadu; destroying up to a quarter of their crops, the Irulas' traditional fumigation technique and other methods used to tackle these pests are being lost as their children become better educated and pursue mainstream employment.

Similarly, snake removal and the sale of skins were once crucial to many Irulas' livelihood. Then in 1972, the Indian government introduced its Wildlife Protection Act, which made it illegal for anyone to keep or sell snakes. This legislation was aimed at a rampant and unsustainable trade in snake skins. In his introduction to Volume II of *Fauna of British India* Malcolm Smith observed that the skins of 5,250,000 reptiles were exported from India in 1932 and 1933. This insidious business continued unabated until by the late 1960s an estimated ten million skins were exported annually. Although the landmark legislation was completely effective in eliminating the trade in snake skins, there were potentially disastrous flow-on effects for many Irula people (and snake charmers – see the article in iHerp Australia Issue 4). Legendary Indian herper

1. *Irula tribesman with Russell's Viper.*

2. *Irulas with python skins prior to India's Wildlife Protection Act.*

3. *Rom Whitaker with Irula friends.*

4. *The Irula Co-op: snakes are kept in mud pots for three weeks and then released.*
Images by Rom Whitaker and Janaki Lenin.

Rom Whitaker had always felt a kinship with the Irulas. He recalled that early on he had turned to them naturally as the only people who shared his interest in snakes, and that he had learned so much from them. Rom had been actively involved in campaigning for the demise of the skin export industry, and felt responsible for the plight of the Irula snake catchers. As a result, he was instrumental in founding the Irula Snake Catchers' Industrial Co-operative Society, which is the only organisation legally empowered to make use of wild animals in India. The basic premise was that, using venom extraction techniques that Rom had learned whilst working with Bill Haast at the Miami Serpentarium, the Irulas could establish a viable business selling venom for the production of vital antivenom; thus saving countless lives and at the same time providing stable, ongoing employment for many poor families.

Co-operative Success.

Antivenom production is of the utmost importance in India, where snake bite kills an average of approximately 46,000 people per year – almost half the global total. Since the 1970s, Irula tribespeople have been catching venomous snakes, which are milked of their

venom once a week and then released after a month. The venture has been spectacularly successful, and is now essentially the sole source of venom required for antivenom production in India, supplying venom to seven different laboratories. In 2016, venom sales yielded 30 million rupees (nearly $600,000AUD). The Co-operative has a government licence to catch 8,300 snakes per year, but would like to see a threefold increase in this number. There are currently 370 members, 122 of which are women.

and Saw-scaled Vipers being milked for valuable venom. Collectively referred to as the 'big four', these species account for the vast majority of fatalities from snake bite in India. Rom himself is now immersed in what he calls the 'Indian Snakebite Mitigation Project' which aims to address the incredible number of snake bite deaths through interaction with government and the medical fraternity, research and public education.

'The Irula Co-operative is now essentially the sole source of venom for antivenom production in India.'

Today, visitors to the Madras Crocodile Bank Trust and Centre for Herpetology, which Rom and his former wife, Zai Whitaker, founded in 1976 about 40 kilometres south of Chennai, near the tourist precinct of Mahabalipuram, can conduct a short tour of the corner of the facility devoted to the Irula Co-operative, and watch Spectacled Cobras, Russell's Vipers, Common Kraits

Irulas in the Everglades.

Burmese Pythons were first sighted in the Florida Everglades in the 1980s, and were acknowledged to be a reproducing population in the early 2000s. *Python bivitattus* is native to southeast Asia, where it is found in a diverse range of habitats, although it is often associated with water (it is a strong swimmer and can remain submerged for extended periods).

One of the largest snakes in existence, the Burmese Python is capable of reaching a total length in excess of 5.5m (18ft). 'Baby', a celebrated captive Burmese Python held by a herpetological exhibit in Illinois, was first listed in the *Guinness Book of World Records* in 1999 as the world's heaviest living snake, with a reported weight of 183kg (403lb) and a total length of up to 8.2m (27ft). Immediately after her death in 2003, Baby's actual length was confirmed to be 5.74m (18ft 10ins) – obviously much smaller, but still arguably the maximum reliable recorded length for the species.

The Burmese Python has become popular in the pet trade due to its easy temperament and attractive colourations, however it also has a rapid growth rate, which can quickly present problems for owners. The population in the Everglades is likely to have originated from escapees or over-sized pets that were deliberately released; a number of specimens were liberated when a pet shop was destroyed in a hurricane in 1992. The vast, subtropical wetland was perfectly suited for their proliferation, and by 2007 wildlife management

1. *A Russell's Viper is milked at the Irula Co-op. Image by Arul. C. V.*

2. *The 4.8m female Burmese Python located by the two Irula snake hunters at the Key Largo missile base. Image by Janaki Lenin.*

3. *Vadivel Gopal, Rom Whitaker and Masi Sadaiyan with another large Burmese Python captured on Spoil Island. Image by Ed Metzger.*

authorities had caught close to 600 specimens. By 2017, that number had risen to more than 3,000.

The pythons consume rare birds, deer and alligators, and constitute a particular threat to small mammals such as Raccoons, opossums and Marsh Rabbits. Various control methods have been trialled, including traps, heat-sensing drones and 'Judas' snakes – large females released with tracking devices in the breeding season in order to attract males. In 2016, around 1,000 hunters were involved in a month-long hunt which resulted in the capture of 106 snakes. But the reality is that authorities have struggled to manage and contain the snakes, and their impact on the unique Everglades ecosystem.

As early as 2009, Rom Whitaker came up with the idea of using the Irulas to hunt down pythons in the Everglades. Why shouldn't their snake catching prowess be equally effective on the other side of the world? The Americans were not convinced, but finally in August 2016 the Florida Fish and Wildlife Conservation Commission consented to let the project go ahead. And so it was that in January 2017 two Irula snake hunters, Masi Sadaiyan and Vadivel Gopal, accompanied by Rom Whitaker and his partner, writer and film-maker Janaki Lenin, arrived in Florida.

The two Irula men waded into the largest subtropical wilderness in the world, armed with their machetes and crowbars. Within two days they had caught five pythons; in less than two weeks they had found 14; and in four weeks they located a total of 27. The largest of these was a 4.8m (15.65ft) female weighing 75kg (165lb) that was found holed up with two males in a bunker of an abandoned missile base in Key Largo. Although Burmese Pythons were known to be breeding on the island, this was the first known instance of anyone successfully setting out to look for them. For

Janaki's enthralling account of the capture (and more of the Irulas in the Everglades) go to:

https://www.firstpost.com/living/floridas-war-on-pythons-has-a-new-key-player-the-irula-of-tamil-nadu-3218324.html

Frank Mazzotti, from the University of Florida, leads a team of researchers concerned with the python problem in the Everglades. Commenting of the performance of the two tribesmen, he noted, "They excel at determining if pythons are present at a site. The rest of us are wondering where the snake is – the next thing we see they are holding it."

In July 2016, the same two Irula tribesmen had travelled to Thailand to assist researchers implant radio transmitters in King Cobras.

A Preternatural Talent.

I am fortunate to have had some personal experience of the Irulas' extraordinary snake catching talents. Late last year, whilst visiting Rom and Janaki near Mahabalipuram, I went on a short 'snake hunt' with a couple of Irula tribesmen (both of whom, incidentally, were 'Raj' or kings!). Along with Arul, a zoo educator who works at the Madras Crocodile Bank, and a couple of visiting Indian herpers, we headed across the road from the Croc Bank to a large area of wasteland that comprised a patchwork of swampy terrain, remnant vegetation and poorly-tended fields. Both of the Irulas carried their trademark machetes and short crowbars, which were used for digging in the sandy soil. Arul told me of their almost preternatural ability to find snakes, and was certain they would unearth something of interest. Almost immediately, we came across a large yellowish keelback in a shallow irrigation ditch, but somehow it managed to elude us.

'The Irulas excavated burrows first with crowbars and then with bare hands.'

Soon afterwards, we found a male Oriental Garden Lizard (or Eastern Garden Lizard, *Calotes versicolour*) vigorously pursuing a female. The male was resplendent in breeding garb of brilliant reds and yellows – I don't think I have seen a more beautiful lizard. Oriental Garden Lizards are common across much of Asia, and have been introduced elsewhere, including the United States. They are often found in bushes, and although they are related to iguanas, they are able to move each eye independently of each other, like chameleons. In Sri Lanka, they are misleading referred to as 'bloodsuckers', possibly because their throats turn bright red during the breeding season.

The Irulas had moved off, and whilst the rest of us were content to make the most of rough paths atop the

1. *Male Oriental Garden Lizard or Changeable Lizard exhibiting red throat during breeding season. Image by Bankim Desai.*

2. *Irula Kali digs out a cobra in Rajasthan. Not a strategy for the fainthearted! Image by Rom Whitaker.*

3. *Indian Rat Snakes or Dhamans have a reputation for being fast and excitable, but are harmless colubrids. Image by John McGrath.*

earthen levees that criss-crossed the landscape, they focussed their attention on the patches of remnant vegetation, often disappearing in the thick undergrowth. Rom had remarked that their technique is based upon heading straight for dense scrub. Sometimes they followed snake tracks to rat burrows, which they excavated; first with their crowbars and then with bare hands. I was sure they knew what they were doing, but I wasn't about to follow suit. Before long, one of them emerged from a thicket carrying a large Indian Rat Snake or Dhaman (*Ptyas mucosa*). These diurnal colubrids can be found just about anywhere they can prey upon small birds, mammals, reptiles and amphibians. They have a reputation for being fast and excitable, and this one was no exception; writhing uncontrollably in the Irula's arms. The snake quickly calmed down, however, and by the time I got to handle it, was on its best behaviour. Dhamans also have a habit of flattening their necks and growling when threatened, and this apparent mimicry of an elapid gets many of these harmless snakes killed.

A few minutes later a Common Bronzeback Tree Snake (*Dendrelaphis tristis*) was seen in a nearby copse by a couple of our

1. *Indian Rat Snake or Dhaman.*

2. *Common Bronze-back Tree Snake/*

3. *This Saw-scaled Viper cannot have been more than about 30cm in length.*
Images by Arul. C. V.

4. *Arul photographs the viper (circled) from a safe distance. Image by John McGrath*

5. *One of our Irula guides with trademark crowbar. Image by Arul. C. V.*

party, but it made good its escape by jumping to another tree – a common behaviour of this species. Soon afterwards, another was spotted about four metres up in the branches of a small tree. This time, the Irulas managed to capture the slender little snake, which true to its name had a bronze stripe running down its back. It also had beautiful pale blue flecks along the flanks, which were accentuated when it filled its lung with air – very reminiscent of some blue variants of our own Common Tree Snake (*D. punctulatus*) here in Australia.

By now it was close to mid-day; we had been walking in the stifling heat for a couple of hours, most of the water we were carrying had been consumed, and we were reminded of how far we had come from the Croc Bank by the heat haze in the distance. But just as we had begun to swing around in an arc that would take us back in the direction we had come from, one of the Irulas wandered up carrying a piece of bark, on which reposed a tiny Saw-scaled Viper (*Echis carinatus*)!

'The Irulas' unique skills have important new applications in the modern world.'

I have no idea how the Irula tribesman found the snake, as Saw-scaled Vipers are crepuscular/nocturnal and typically hide up during the day in burrows or other cover – perhaps he had found it under a rock, or even the piece of bark he used to transport it. However, this discovery was particularly notable, as the Saw-scaled Viper is the smallest of the 'big four' that are responsible for so many fatalities in India. This diminutive specimen cannot have been more than about 30cm in length, but nevertheless the keeled scales were obvious. It was an attractive red-brown in colour and was quite content to sit for photos.

The Saw-scaled Viper is found in Central Asia and the Middle East. *Echis carinatus* is a small snake but varies considerably in size; *E. c. carinatus*, the subspecies present in southern India, rarely exceeds more than 40cm in total length, whereas *E. c. sochureki*, from northern India, can grow much larger. This species appears to be highly adaptable, as it is found in a range of habitats and will brumate in northern parts of its range. Diet is also varied, and consists of small animals including scorpions and large insects. The southern subspecies is ovoviviparous; capable of producing more than 20 live young.

The large number of human envenomations from Saw-scaled Vipers can be attributed to a combination of factors including the abundance of this species in populated areas, its

small and inconspicuous nature, and the fact that it typically possesses an aggressive temperament. Honestly, if you were working in your garden, there is every chance you would have completely overlooked the little guy we were photographing. Although bites are often potentially fatal, antivenom treatment is very effective if administered within the first few hours. The venom can cause dangerous haemorrhaging, and it is therefore perhaps not surprising that it is used to manufacture an anticoagulant.


3.

We continued our broad sweep back to the Croc Bank, but although we passed several likely-looking patches of bush, the Irulas failed to detect any other wildlife of note (it wasn't for lack of trying). Arul had been confident that they would turn up some more snakes, and was perhaps a little disappointed. I figured four snake species plus a couple of lizards wasn't too bad for a morning's work! We completed our circuit in the very hottest part of the day; we had been at it for close to four hours and were in need of a cold drink or three.


4.

The younger generation of Irulas are (understandably) likely to eschew traditional practices in favour of higher education, or moving to the cities to chase a 'company job'. It would be a great pity if the Irulas' unique snake catching skills, honed over generations, were not passed on. Particularly since they have been demonstrated to have important new applications in the modern world.


5.

PARADOX

Revisited!

Our article on the Paradox mutation in iHerp Australia Issue 6 prompted Andrew Horlor to forward us a few pics of his T+ albino Children's Python. Andrew reports that he bred this animal from a female that was purchased from someone he had never met before, but who did make the tantalising comment that it had previously produced a Paradox offspring! Andrew hatched this Paradox snake from the first breeding with the female, but the same pairing last year did not produce anything unusual. Although he admits his Paradox animal may not be as dramatic as some others we featured in the article, it certainly offers some exciting prospects for future breeding.

Image by Andrew Horlor.

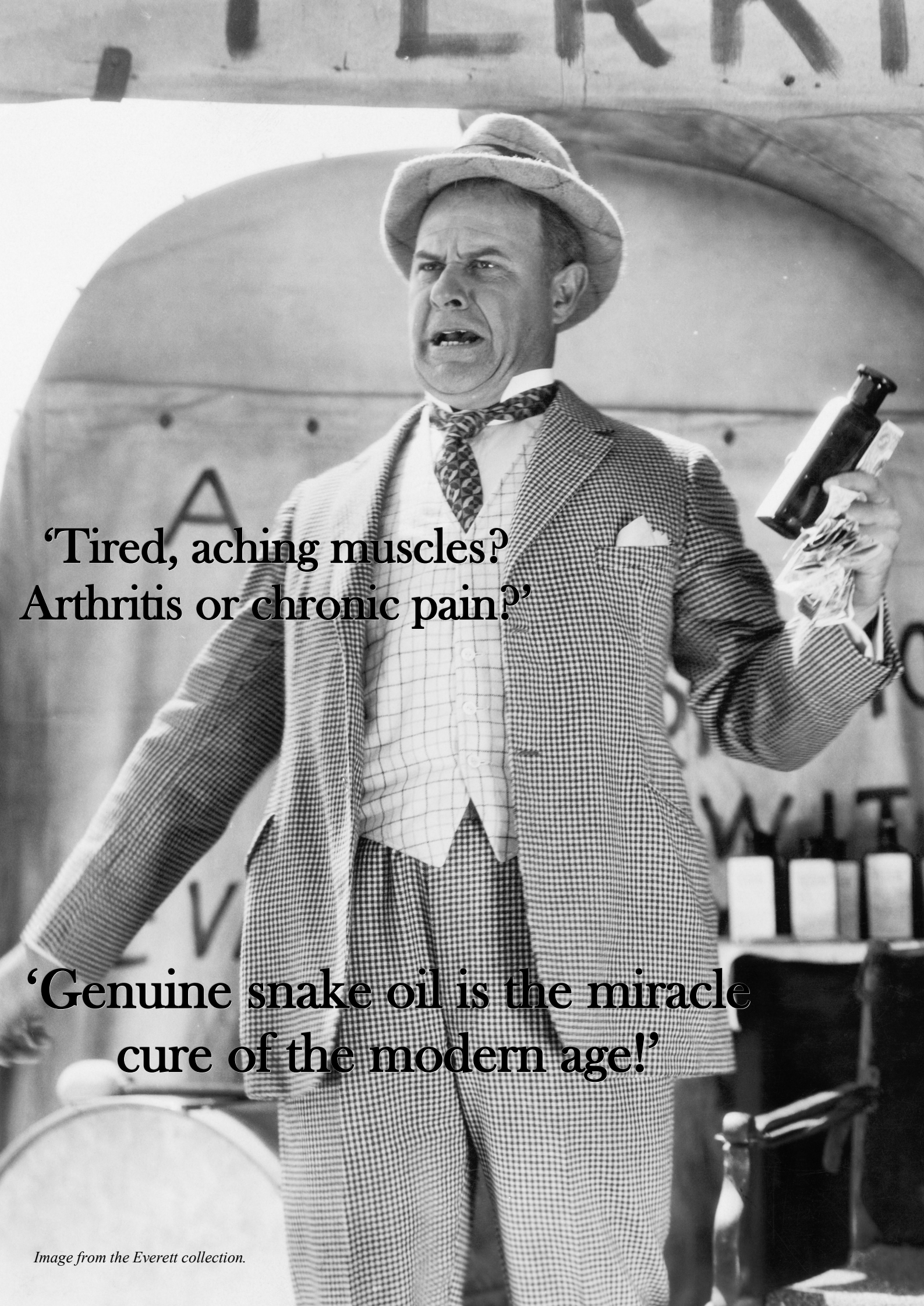


Image from the Everett collection.

Conservation biologist **Kit Prendergast** looks at the booming trade in reptile remedies, and the threat of traditional medicine and snake-oil 'cures' to reptile conservation.

"You know what they call alternative medicine that works? Medicine." ~ Tim Minchin.

We live in an age where entire diseases have been virtually eliminated by modern medicine, and a vast number of others can be effectively treated or prevented. Yet the use of animals in traditional folk medicine persists, and there is a lucrative trade in selling curatives derived from reptiles to a consumer base that turns to 'natural' or 'traditional' products and beliefs. This entails potential risk of harm to consumers, and grave consequences for the reptile species involved.

Some purveyors of preparations including reptile parts legitimately believe their concoctions work; for example, many people swear by the benefits of Tokay Gecko for curing all kinds of maladies ranging from erectile dysfunction to cancer. Schools of Traditional Chinese Medicine teach students to perpetuate these so-called remedies under the veneer of academic authority, while internationally-published TCM textbooks advocate the use of animal parts for 'medicinal' purposes (including various endangered species like tigers). Maciocia, in *The Practice of Chinese Medicine 2nd edition* (1994) uses various animal components, including parts of reptiles and the testicles and penis of dog, whereas Xie and Liao in *Traditional Chinese Internal Medicine* (1993) recommend herbal recipes that include tortoise-plastron glue. As with all TCM texts, they contain no evidence of the efficacy of the supposed remedies, or of the physiological basis upon which the animal parts can deliver a curative effect. Instead, they describe the benefits of the components in terms of TCM symptomatology (metaphysical parables about balancing Yin and Yang, Five Element Theory, etc.).

Then there are those that are fully aware that preparations from the skin of Tokay Gecko are about as effective in curing period pain, lack of libido or liver disease (insert whatever malady you have) as grinding up your own toenails and drinking them – snake oil salesmen. The name has now been incorporated into our lexicon to mean 'someone who knowingly sells fraudulent goods or who is himself or herself a fraud, quack, charlatan, and the like' (Wikipedia), and the Oxford English Dictionary defines snake oil as 'a quack remedy or panacea'. Although throughout history sly peddlers have made a profit from selling ineffective remedies with empty promises to cure all sorts of ills, the term snake oil salesman originates with Clark Stanley, the self-proclaimed 'Rattlesnake King'.

Snake oil has been used for centuries by the Chinese. It was introduced to the Western world in the 1860s when thousands of Chinese people arrived in the US as indentured labourers to work on the Transcontinental Railroad, which required over 3,000km of track to be laid, linking Iowa to San Francisco. The Chinese workers brought with them snake oil - specifically oil cruelly extracted from the Chinese Water Snake (*Enhydris chinensis*) - which they used as a salve to ease their muscles, aching from the back-breaking work. This exotic 'home remedy' was shared with some of the Western workers.

Charlatans saw a market, and began selling snake oil, often on the back pages of newspapers, as a tonic to cure not only muscular pain, but also arthritis, chronic pain, headaches, kidney problems and 'female complaints'. Instead of Chinese Water Snakes, the American peddlers of snake oil instead sought local species. Clark Stanley - a former cowboy - popularised snake oil using rattlesnakes, and claimed he had learned about the healing power of snake oil from Hopi medicine men. He showcased his new cure-all at the 1893 World's Exposition by taking a live snake and slicing it open in front of a crowd of onlookers. After plunging the eviscerated snake into boiling water, he skimmed the fat off the top, bottled it on the spot and sold it as 'Stanley's Snake Oil'. However, not only did Stanley's liniment fail to deliver the miracle cures touted; upon seizing a shipment, federal investigators found it to be

Right: *Tokay Geckos bottled with liquor in Vietnam.*
Image by Dekcos.

composed of beef fat, red pepper and turpentine, with not a single drop of snake oil (at least this duplicitousness was a good thing for the snakes: Stanley boasted he had killed 5,000 snakes to keep up with the demand for his sought-after product). Stanley was fined a mere USD20 for breaches of the Pure Food and Drug Act; the equivalent of about USD429 today.

Controlled, scientific, clinical trials have failed completely to demonstrate any of the potential health benefits conferred upon animal parts by traditional medicine. At best these ingredients and the resulting concoctions are benign, however complications frequently arise; for example, there have been at least 11 cases reported of serious extra-gastrointestinal infections from *Salmonella arizona* following the ingestion of rattlesnake folk 'remedies'.

Furthermore, it is simply not possible that a single species can act as a panacea to treat a litany of unrelated diseases and conditions. In India, products derived from the Bengal Monitor (*Varanus bengalensis*) are supposed to treat everything from haemorrhoids, to rheumatism, pain and burns, and spider and snake bites. Likewise in Mexico, pills made from rattlesnakes are used to treat all sorts of ailments including skin and face blotches, sores, rashes, pimples, welts, varicose veins, acne and blackheads, stress, heart disease, diabetes, cancer, rheumatism, haemorrhoids, and sexual impotence!

But although snake oil itself has largely gone out of favour, and despite advances in science and medicine, the trade in animal parts (specifically reptiles) by both snake oil salesmen and Traditional Chinese Medicine practitioners is thriving. In part this has been cultivated by fostering a distrust of modern medicine and 'big pharma', which is depicted as a series of greedy empires that profit from keeping people sick. Ironically, the market for unproven, debunked or traditional medicine was valued at 30 billion pounds in 2015. Although the main demand for folk remedies centres on their country of origin (notable Brazil and various countries in Afric and Asia), they are also growing in popularity in the Western world. Monique Roffey, award-winning British writer and journalist, writes in *The Independent* how, 'Chinese herbalists are all the rage, with about 600 Chinese herbalist clinics established in Britain.' It should be noted that really anything, be it plant or animal, used in Chinese medicine is referred to as a 'herb'; lizards are a common 'herb' used to treat asthma.

'The market for **unproven, debunked** or **traditional medicine** was valued at **30 BILLION POUNDS** in 2015.'

In some cases, the purported medicinal properties of reptiles are of less importance than their magical or religious significance. Reptile parts are widely used to ward off 'evil spirits' to appease or invoke spirits or gods; they are also fashioned into amulets which are routinely used in magical/religious diagnoses to protect the wearer from diseases or the 'evil-eye'. In Brazil alone, 13 reptile species are used for this purpose. Although occasionally available whole, they are typically

cut into pieces - be it the flesh, tail, eyes, head, teeth, fat, rattle, carapace or even cloaca - and sold at markets as trinkets. Sadly, many a boa or python has been beheaded in Africa and Brazil to protect against witches. In Brazil, just about everything - including the excrement - from *Boa constrictor* is used to promote success in love, and with money, gambling, travel, and business dealings.

Countless reptiles are similarly slaughtered to create 'love potions' or concoctions to enhance virility. In Brazil, solutions containing reptiles suspended in rose water or alcohol are sold as perfumes with the promise the user will achieve love and financial success. Across Asia, reptiles are preserved in wine or spirits, or consumed in special restaurants in a macabre pantomime which reinforces the 'manly' nature of the ritual.

As part of a ridiculous belief in homeopathy, some reptiles are used in products whereby it is believed the qualities of that reptile will be transferred to the human who inhales, ingests, or applies them. For example, preparations derived from slow-moving reptiles are meant to have a calming effect.

In fact, reptiles are one of the most frequently used groups of animals in traditional folk medicine. In a review published in *Biodiversity Conservation* (2008), at least 165 reptile species belonging to 104 genera and 30 families were found to be used in traditional medicine; 53% of these species were listed as endangered. Alarmingly, these figures must represent an underestimation, as the authors only obtained information from published data, and only included species that could be positively identified. Snakes comprised the greatest number of species (60), follows by lizards (51), turtles and tortoises (43) and crocodilians (11).

Because of a lack of effective regulation, the magnitude of the harvesting of reptiles for folk remedies is difficult to determine. Attempts to quantify this practice have produced disturbing results, which moreover are again certainly underestimates. He and Peng (1999) reported that $1.4x10^7$kg of snakes are consumed in the Guangdong Province of China per year, and Zheng and Zhang (2000) detailed that from 1990-1995, demand for wild snakes from 13 traditional Chinese medicine factories totalled 1,656.77kg of Black Striped

Opposite page: *Bengal Monitors (*Varanus bengalensis*) in Laos. This species is used to treat everything from rheumatism to snake bite.*
Image by Opas Mitsom.
Above: *Chinese Soft-shell Turtle (*Pelodiscus sinensis*). Chelonians are sought-after for traditional medicine, and are the most endangered group of vertebrates on the planet.*
Image by Pan Xunbin
Left: *bottled alcohol containing a cobra and a scorpion.*
Image by PicMy.

Snakes (*Ptyas dhumnades),* 234.75kg of Sharp-nosed Pit Vipers (*Deinagkistrodon acutus),* and 20,300 heads and 32.1 kg of Many-banded Kraits (*Bungarus multicinctus).*

Among conservation biologists there is a clear consensus that the harvest of reptiles for traditional folk remedies is taking a toll on exploited species, and has led to significant reductions in their populations. Field monitoring has shown declines in south-east Asia, particularly of snakes and turtles, along with Tokay Geckos.

Turtles and tortoises are the most endangered of all vertebrate groups on the planet – over half of all species are threatened with extinction, and their declines have been driven primarily by hunting for flesh and body parts, including for traditional medicine or religious/ magical purposes. Turtle meat, skin, heads, eggs, shells and even blood, urine and bile are used in traditional medicine (urine is often used as ear-drops, or consumed as a beverage). Concoctions containing turtle parts are believed to cure all sorts of maladies ranging from coughs to deafness, cancer, prolapse of the rectum, and more.

The most sought-after and common chelonians in traditional Asian medicine are the Yellow Pond Turtle (*Mauremys mutica*), the Golden Coin Turtle (*Cuora trifasciata*), the Chinese Yellow Marginated Box Turtle (*Cuora flavomarginata*), the Chinese Big-headed Turtle (*Platysternon megacephalum*), Reeves' Turtle (*Mauremys reevesii*), Chinese Soft-shell Turtle (*Pelodiscus sinensis*), and the Red-eared Slider (*Trachemys scripta elegans*). All of these except for the last are extinct or dangerously close to extinct in the wild. In Asian cultures, turtles are symbolic of longevity, wealth, strength and fertility, and because of these associations, there is a booming market for turtle products. One would think that after thousands of years, the lack of a causative link between turtle consumption and these purported health and financial benefits would have quenched the trade, but not so. Many Asians still firmly believe that turtle consumption maintains youthful beauty in women, and enhances sexual function in men. Appallingly, David S. Lee and Liao Shi Kun (2014) found that 'approximately 90% of China's modern day society believes that traditional Chinese medicines work, and are supportive of the

'Turtles are symbolic of **longevity, wealth, strength** and **fertility,** and there is a **BOOMING MARKET** for turtle products.'

Above: *snakes in alcohol sold at a liquor shop in Naha city, Japan. Snakes and lizards bottled in wine or spirits are common in countries across Asia, including Laos, China and Vietnam. Image by Yangxiong.*
Below: *dried soft-shelled turtles and centipedes for sale as herbal medicine in a Chinese market in Seoul. Image by JUNOH.*

exploitation of wildlife for their use'. And in just a single market in Dhaka, Bangladesh, almost 100,000 wild-caught turtles are butchered for consumption during a one-day religious holiday every year.

Likewise, there have been severe consequences for other targeted reptiles. The observed decline of some species of crocodiles has been driven by a high demand for their skin, meat and body parts for traditional medicine, and in Mexico, rattlesnake populations have been depleted under similar circumstances.

Traditional and folk medicine and religious traditions have no place in our modern, technically-advanced world. Certainly, there is no justification for using reptiles of conservation concern, and unless this topic is addressed head-on, we stand to lose many reptile species. The solution is not to tiptoe around the issue, but to confront these practices for the cruelty and inefficacy they embody. Unfounded beliefs need to be dismantled and subject to ridicule, evidence disseminated, and proven cures provided. Social influences can also be important (an example being the successful condemnation of shark fin consumption advocated by Jackie Chan). Better access to modern healthcare and education, together with government intervention can all contribute to helping prevent reptiles from continuing to suffer from this faith-based demand for folk remedies.

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'CHINESE HERBS HEALING: ART OF HERBAL REMEDIES REVEALED.'

(Extracts from a website with the above name concerning the unbelievable properties of Tokay Gecko or Ge Jie).

'One of valuable Chinese herbs....people believes that its urine is a deadly poison but the consumption of gecko works like a charm on helping deliver baby boy only and curing ED (erectile dysfunction) because their mating tends to last as long as a few days.'

'Gecko has proven itself with tons of health benefits....as a living and emotional herb it has an obvious efficacy on supplying vital essence and marrow. Because of that it is frequently used by modern TCM (traditional Chinese medicine) practitioners for kidney deficiency-induced impotence, premature ejaculation, frequent urination, nocturnal emission, marked emaciation, and so on.'

'The water-soluble portion 'is able to make the male mice's testes gain weight, which showed the male hormone-like effect. In addition, it can also make the vaginal opening hours ahead in animals, which thus is believed to act like two-way sex hormones.'

'Main functions include strengthening lung and benefiting kidney, relieving asthma and a cough, and supporting Yang to boost essence. Main tokay gecko uses and indications are asthma and cough due to lung-kidney deficiency, consumptive cough, blood vomiting, kidney deficiency induced impotence, spermatorrhea, frequent urination, diabetes, and so on. Recommended gecko dosage is from 3 to 6 grams in decoction, powder, and pills.'

The author does not cite a single study in support of these 'proven' benefits.

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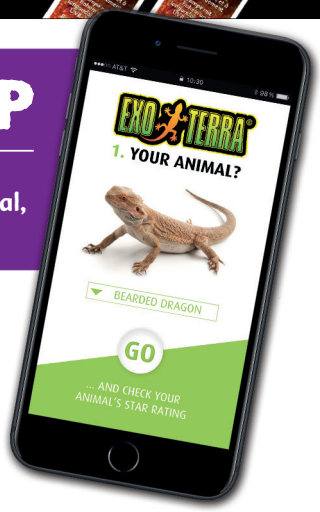

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*Conservationist and wildlife advocate **Ben Dessen** is Reptiles Department Manager at Kellyville Pets and is passionate about educating newcomers to the reptile hobby. With the breeding season upon us, he has a wealth of useful information for anyone considering breeding one of our most iconic reptile species....*

Breeding Beardies.

The *Pogona* genus, collectively known as bearded dragons, are amongst the most commonly-kept pet reptiles in captivity worldwide. Bearded dragons are the perfect entry-level reptile for any newcomer to the hobby, but are also a popular addition to many experienced reptile keepers' collections. Over the years, our knowledge and techniques for breeding these charismatic and engaging agamids have been refined and developed. So here is a brief A to Z of breeding beardies!

Responsible Breeding.

The decision to breed any animal in captivity must not be taken lightly and your motivations and intentions for breeding must be thoroughly considered. Bearded dragons can be quite prolific in captivity, with a single female capable of producing anywhere from 15-35 eggs in a clutch and up to three clutches in a season. That's potentially 100+ baby beardies that will need to be housed and fed, and then found suitable long-term homes.

Breeding bearded dragons should never be about simply making money, as it is an expensive and time-consuming process - and a huge responsibility. Sadly, some people do not carefully consider the wider implications of breeding, and every year many hatchling bearded dragons end up becoming unwanted, without good homes. If you do decide to breed bearded dragons, this should be motivated by curiosity and interest – it is certainly a fascinating and rewarding process to experience.

***Left:** there are some amazing variants now readily available, like these juvenile hypomelanistic beardies.,*
***Top Right:** dragon enclosures at Kellyville Pets; ideally adults should be housed individually.*
All images courtesy Ben Dessen.

Getting Started.

The first consideration is to ensure that you have a compatible pair of the right age and size that are ready to reproduce. Adult bearded dragons are easy to sex, with males having much broader heads, more obvious femoral pores on the underside of their hind legs, and hemipenal bulges at the base of their tails. Hold a dragon flat on your hand, facing away from your body, and then gently bend the animal's tail up to cause the skin around the base of the tail to tighten. If two obvious bulges are present just below the cloaca, it is likely the animal is a male; the absence of bulges is indicative of a female.

The male and female should be equal in size, at least 18 months old, and a minimum of 350 grams in body weight (for Central Bearded Dragons). Some females are capable of reproducing at an earlier age, however this is not good practice, and may lead to long-term health and reproductive complications. In the months leading up to winter, adult dragons should be fed a varied and nutritious diet consisting of foods with high levels of calcium and vitamins, such as Black Soldier Fly larvae and silkworms, along with plenty of fresh vegetables, commercial diets, and the appropriate supplements.

A female must be in perfect condition and of adequate body weight before she is considered for breeding.

With the variety of colour mutations and morphs now readily available in Australia - including hypomelanistic, leatherback and translucent bearded dragons, amongst others - it is also beneficial to have a basic understanding of the genetics behind the types of dragons you are breeding, so that you know what offspring a particular pairing is likely to produce. Some genetic combinations can produce truly stunning offspring, however, others may result in hatchlings that have health complications. If you are unsure about your potential pairing, seek expert advice before putting the animals together, in order to minimise the likelihood of any issues with the progeny.

Mating.

Bearded dragons are stimulated to breed after passing through a period of brumation during the cooler months of the year. Brumation is brought on by an overall decrease in temperatures inside the animal's enclosure, as well as a change in photoperiod (shorter day lengths). It is not always necessary to manually reduce the temperatures inside a

dragon's enclosure by adjusting thermostat settings, as the natural drop in ambient room temperatures in winter, combined with the shorter day lengths, are often enough to stimulate dragons to brumate. However, ambient temperatures and the number of hours with access to basking heat can also be manually reduced over a period of 4-6 weeks to induce brumation if necessary. Dragons that are allowed to brumate for a period of three to four months will have higher fertility and an increased chance of successfully reproducing at the end of winter.

A suitable set up will be required to house your adult dragons throughout the breeding process. Bearded dragons are solitary species (see my article in Issue 4 of iHerp Australia for more information), and it is strongly recommended that you house your adult male and female separately in two different enclosures throughout the year. Towards the end of winter, around late July or early August, the male bearded dragon can be introduced into the female's enclosure for periods of two to three days at a time. The animals should be observed closely during this time to ensure that the male does not cause injury to the female. Matings can appear quite brutal, with the male repetitively biting the flaps of skin on the back of the female's neck and pinning her down. Copulation is very brief, usually only lasting for around 30 seconds. Once a few successful matings have been observed, the male can be removed from the enclosure for a week and then reintroduced for another few days if deemed necessary. Leaving a male with a female year round can cause unnecessary stress and potentially even injury, as the male may repeatedly attempt to mate with the female, even after she becomes gravid.

Laying Time!

After successfully mating, the female will usually wait for between four to six weeks for the eggs to develop before she is ready to lay. In the later stages of development, the eggs will become very obvious in the female's abdomen, protruding beneath the skin. At this time, it is important to introduce a laying box into the female's enclosure. A large, rectangular plastic container, filled with a 60:40 mix of damp sand and coco peat makes an ideal laying box. The substrate mix should be

Above: *the female may dig a number of 'test holes' prior to laying.*
Left: *when she is ready, she will dig a deep hole in the damp substrate, in which to deposit her eggs.*

damp enough that it holds its form, but not dripping wet. Simply piling up damp sand/coco peat mix to a reasonable depth in one corner of the enclosure can also act as a suitable laying site.

When the female is almost ready to lay, she will become quite restless and begin pacing around the enclosure and digging frantically. The nest box should be positioned in a back corner of the enclosure so that the female feels that it is a private and secure spot in which to lay her eggs. If the female does not have an appropriate laying site, she may hold on to the eggs, which can be detrimental to her health. She may dig a number of 'test holes' in the days leading up to laying. Then, when she is ready, she will dig a deep hole in the damp substrate, deposit the eggs at the bottom, and cover them over with the mix.

'It is important to replace lost condition by offering the female plenty of nutritious foods that are high in calcium.'

After the female has laid, it is important to replace lost condition by offering her plenty of nutritious foods that are high in calcium, as well as treats such as mealworms and pinkie mice to assist in replenishing fat reserves.

Incubation.

Once the eggs are laid, they will need to be taken from the lay box and placed in a suitable incubation tub. The sand in the lay box can be gently excavated, taking care not to puncture any eggs with your fingers. Each egg can then be removed and any damp sand that is stuck to it can be brushed or blown off. You should be very gentle while handling the eggs, but it doesn't matter if they are rotated or their orientation is changed at this time.

A rectangular plastic container can be used to hold the eggs throughout the incubation period. Purpose-made reptile incubation tubs can also be purchased from most specialist reptile stores. The container should be filled to approximately 60% capacity with an incubation medium such as vermiculite or perlite. The medium is mixed with water until it is slightly damp to the touch, but not too wet, as this may result in overly high humidity and the growth of mould on the eggs. A ratio of 10ml of water to 100ml of vermiculite or perlite is a good starting point. It is safer to use a mix that is slightly on the drier side, as extra water can always be added

throughout the incubation period if needed.

Using your thumb, make small indentations in the incubation medium, in which to place the eggs. These should be half-covered by the medium, with the top halves being exposed to the air inside the incubation tub. Before resting the eggs in the medium, they must be candled to ensure they are facing the correct way up. Using a small torch (the light on your phone works a treat!), shine the light beneath each egg to reveal a red/pink patch or circle on one side. The red patch is where the embryo will develop from and it is important that this side faces upwards and is exposed to the air, while the white side of the egg faces downwards in the incubation medium.

Line the eggs up in neat rows, with small gaps in between to ensure that viable eggs are not damaged if a neighbouring one becomes mouldy. Once all the eggs have been candled and positioned, the incubation tub must be sealed with a plastic lid equipped with small ventilation holes. Alternatively, plastic cling wrap can be placed over the tub and sealed tightly with an elastic band around the sides.

The egg tub must then be placed inside an incubator controlled by an accurate thermostat. Small incubators with temperature control and humidity readings can be purchased from specialist reptile stores at reasonable prices. Bearded dragon eggs should be incubated at approximately 31 degrees Celsius, with 70-80% humidity. Dragon eggs are fairly forgiving and will develop at a temperature range of 28-33 degrees. However, at 31 degrees a relatively even mix of males and females will be produced, whereas temperatures of 32 degrees or higher are likely to result in mostly females.

Eggs must be monitored closely during incubation to ensure they are developing well. If humidity is too low the eggs may shrivel, but any condensation or excessive moisture build up on the eggs must be promptly removed using a tissue. The incubation tub can be opened to allow fresh air in one to two times a week. Bearded dragon eggs take between 50-70 days to hatch, with higher temperatures resulting in faster development of the embryos.

Hatchlings.

Newly emerged hatchlings can be left in the incubator for a few hours to rest and gain some strength. They can then be transferred to a suitable enclosure, set up in the same way their parents are housed. This means that they should be provided with a hot basking spot of 35-40 degrees

Left: *the moment you've been waiting for! New hatchlings can be left in the incubator for a few hours to gain strength.* ***Top right:*** *after 6-8 weeks, they are ready to go to their new homes.*

Celsius, ambient temperatures of 28-30 degrees and a cool end of approximately 24-26 degrees. They will require 10-12 hours of heat and intense (10.0) UVB light in order to grow and thrive. Bearded dragon hatchlings also need frequent feeds of appropriately-sized, calcium-and-vitamin-coated live insects 2-3 times per day and in addition can be offered finely cut greens. Take care to monitor the hatchlings for signs of dominance or aggression and ensure your enclosures are not overcrowded with too many lizards, as this will result in tail and toe nips.

After approximately 6-8 weeks of growth, the hatchlings will be ready to go to their new homes. It is the responsibility of the breeder to ensure each baby goes to an appropriate home with people that are sufficiently educated and equipped to care for the animal over its lifetime.

Over time you will refine your breeding techniques and learn more about these amazing Australian reptiles. Don't forget there are many experienced keepers who can assist you if you are unsure at any stage. The team at Kellyville Pets are all professional and experienced reptile keepers and breeders and are always more than happy to provide advice and information both in-store and over the phone.

What's NEW:

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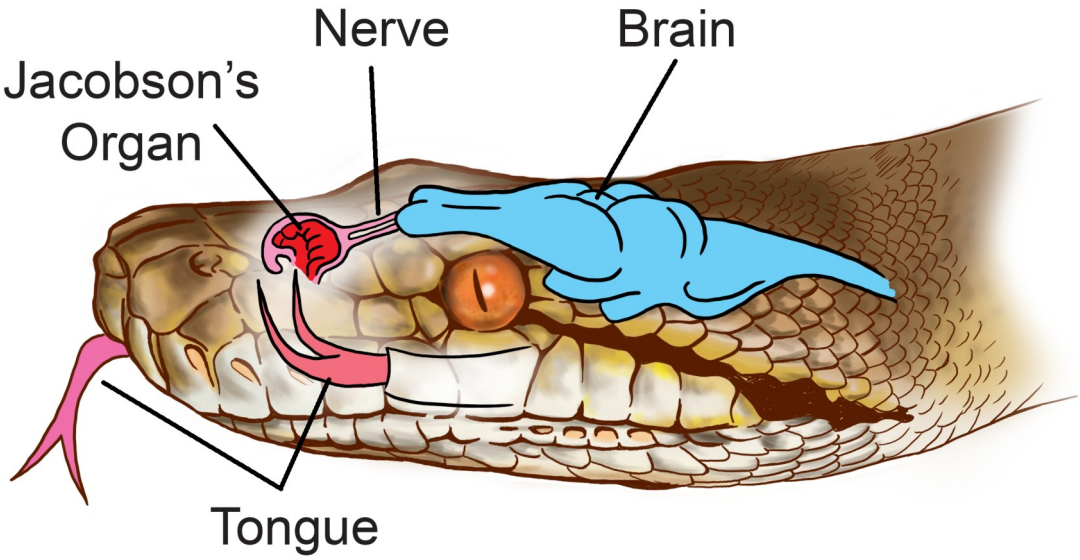
Why do snakes and lizards always POKE THEIR TONGUES out?

The answer lies in an intriguing 'sixth sense'. An auxilliary olfactory organ that specifically detects heavy, non-volatile particles and is of widespread importance in the interception of pheromones. This will not come as a complete surprise to many with an interest in reptiles, but what about if we told you that lions and giraffes use a very similar structure?

Jacobson's organ, or the vomeronasal organ (VNO) was discovered by Frederik Ruysch in the first half of the 18th century and described in the early 19th century by Danish anatomist Ludwig Jacobson, after which it is named. The VNO consists of a pair of crescent-shaped tubes filled with fluid that develop as folds in the floor of the nasal sacs. Inside these structures is a sensory epithelium containing specialised receptor cells that are extremely sensitive. The VNO is surrounded by blood vessels that act as a pumping mechanism, conveying chemical stumuli to the receptors inside. In many cases, the VNO opens via ducts to the nasal cavity, however, in some animals there are also connections to the oral cavity. In squamates (snakes and lizards), the VNO has no opening to the nasal cavity at all, and terminates in two small pits in the roof of the mouth. Neurones from the VNO connect to the hypothalamus, which is instrumental in regulating reproductive, defensive and feeding behaviours.

Although present in the embryonic stages of all tetrapods, the VNO is lacking or poorly developed in adult crocodiles, turtles, birds and most advanced



primates. A functional VNO is present in many other mammals, along with amphibians and all snakes and lizards. Despite claims to the contrary, it is widely accepted that adult humans do not possess a functioning VNO, and in fact there is evidence to suggest that our olfactory capabilities are on the wane.

In order to enhance the access of inhaled scent particles to the VNO some mammals, including species of cats, horses, sheep, cows, goats, deer and pigs, will raise their heads, curl their lips and wrinkle their noses (thereby closing the nostrils) in a behaviour known as the Flehmen response. Similarly, salamanders apparently rely on a bizarre form of 'nose tapping' to stimulate their VNO, while snakes and lizards employ the familiar 'tongue-flicking'.

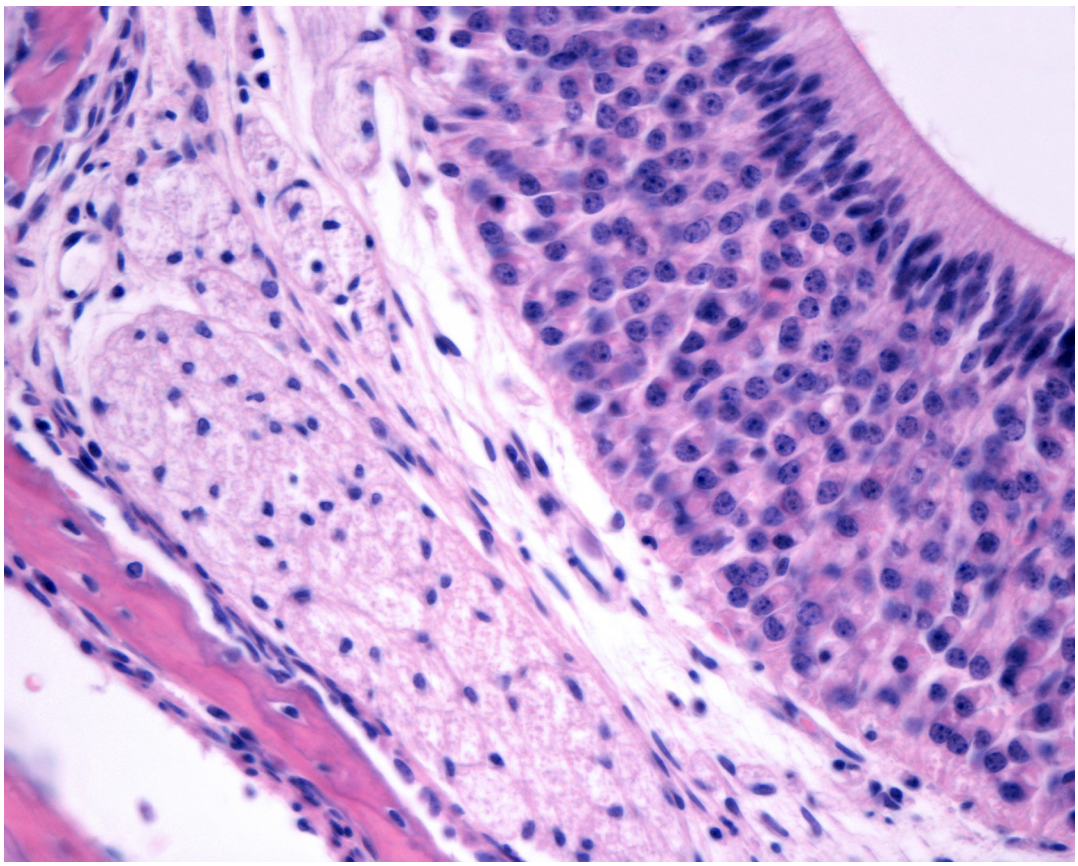
Studies have connected the VNO to pheromone recognition in relation to reproductive behaviour amongst rats, mice, hamsters, Guinea Pigs and pigs, and also territorial aggression. The link is strong enough for vomeronasal receptors to be sometimes referred to as 'pheromone receptors'. Often urine or vaginal discharges will trigger a response from the VNO.

To return to the world of reptiles, garter snakes have also been demonstrated to use their VNO to detect pheromones, as well as locate prey items. Although snakes and lizards have a functional

Left: *horses are amongst many mammals to exhibit the Flehmen response. Image by Sari O'Neal.*
Below left: *Salamanders rely on a bizarre form of 'nose tapping' to stimulate their VNO. Image by Federico Crovetto.*
Above: *The VNO (Jacobson's organ) of squamates does not open to the nasal cavity. The tongue is therefore responsible for collecting scent molecules from the external environment, which are then transferred to the VNO via two small openings in the palate. Diagram by Rachael Hammond.*

Smelly Facts!

- Some turtles use their VNO to smell underwater.
- Elephants transfer scent particles to their VNO via the prehensile 'finger' at the end of their trunks.
- The area of conventional receptor cells in the nasal cavity is indicative of an animal's sense of smell. Dogs may have around 170cm^2 of olfactory epithelium, compared to a human's mere 5-10cm^2.
- In the same way that other mammals may utilise the Flehmen response to heighten the effectiveness of the VNO, dogs will sniff rapidly or run into the wind with their heads high while on the trail of a scent. Both strategies are designed to optimise olfactory performance by increasing airflow over the epithelium.



Right: *high magnification micrograph of the sensory epithelium of a VNO. The lumen of the organ is at top right; sensory neurons have an ovoid-shaped body; dark nuclei near the lumen are supporting cells; bundles of nerve fibres appear below the epithelium. Image by Jose Luis Clavo.*
Below: *snakes may tongue-flick more than once per second when tracking prey. Image by Eric Isselee.*

conventional olfactory system, the VNO takes over when it's time for dinner! Because their VNO is not accessible via the nasal cavity, the only way that it is able to process stimuli is through the mouth. In pursuit of prey, snakes will tongue-flick once a second, if not more, in order to track their quarry. When the tongue is retracted, the scent molecules can be transferred to the VNO via the two small openings in the palate.

About a hundred years ago, scientists developed a very plausible theory that this accounted for the fact that snakes (and monitors) have forked tongues – each of the 'tynes' entering one of the pits to stimulate the VNO. It was easy to extrapolate this idea to the extent that snakes and lizards with more pronounced forks in their tongues could be expected to have heightened olfactory senses. The current consensus is that this is not the case, however, it has been speculated that the separation of the forks may allow the reptile to determine direction to some degree – i.e. whether the scent is stronger on the left or right.

Best Blogs.

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

Overindulgence!

Ever had that nasty feeling that you've simply eaten too much? Maybe you have suffered from embarrassing indigestion, or perhaps you have even been so full that you feel you just can't move!

Snakes – in particular pythons and boas – are renowned for swallowing large prey items. Their lower jaws are not rigidly attached to the skull and, unlike mammals, are not comprised entirely of bone, being interrupted by an elastic ligament in front. This arrangement introduces great flexibility and range of movement. Nevertheless, snakes are quite capable of 'biting off more than they can chew' (figuratively speaking)....

In May 2017, a Chinese farmer in Ximeixiang, Fujian Province, was searching for a missing goat when he came upon a large python entangled in a mesh fence. It had become trapped whilst attempting to consume the goat, which was lying dead under the huge snake. Incredibly, pythons have the same level of protection in China as Giant Pandas. The farmer contacted forestry police, who were quickly on the scene to extricate the snake from the fence. It was found to measure 3.4 metres in length, with a diameter of 36 centimetres and a weight of 21.5 kilograms. The python was estimated to have been trapped in the fence for more than ten hours. After receiving treatment for its wounds, it was later released.

Naturalised Burmese Pythons have long been a concern in Florida's Everglades, and in 2015 researchers from the Conservancy of Southwest Florida were presented with a graphic example of the destructive capacity of these animals to take down large prey.

A 3.3-metre female python was initially discovered and captured in a bloated and obviously stressed condition. Her eyes were obviously too big for her stomach, because later, to the amazement of astonished onlookers, she proceeded to regurgitate a young White-tailed Deer. In what has been touted as the most extreme python-to-prey ratio ever documented, the fawn weighed in at 15.88kg versus the python's 14.29kg, meaning that prey constituted 111.1% of the weight of predator!

Incidentally, the Conservancy of Southwest Florida was created in 1964 when a group of concerned citizens mobilized to thwart plans for a new road through Rookery Bay. Now active across five counties, the Conservancy works to protect Florida's natural environment by utilising the combined forces of environmental policy, advocacy, research, education and wildlife rehabilitation. For more information visit: https://www.conservancy.org/

The dangers of gluttony led to its inclusion amongst the 'seven deadly sins'; it would seem to be equally hazardous for snakes as well.

For more, including photos and videos, visit:
www.dailymail.co.uk/news/article-4507068/Python-trying-swallow-goat-stuck-metal-grille.html
https://au.news.yahoo.com/a/39390363/massive-snake-regurgitates-deer-in-florida/

Below: *incredibly, this female Burmese Python weighed less than the young White-tailed Deer that she consumed. Image: the Conservancy of Southwest Florida.*

The Trouble with Snake Translocations: Help or Hindrance?

Just what happens when snakes are relocated? ***Janne Torkkola*** *- a zoology/ genetics graduate who runs a snake removal service and a wildlife science podcast in Brisbane – is concerned that often there is no happy ending.*

Rudyard Kipling (see opposite page) evidently disliked snakes, like many of his era and before. Snakes were seen not only as dangerous, venomous, marauding villains, but also as a portent of evil; the Devil's own infiltrator lurking in the Garden - one who knows our weaknesses and tempts us into our sinful demise. While religions like Hinduism and Buddhism included powerful, even benevolent serpent gods (such as the Nagas, now the namesake of the *Naja* genus of cobras), the perception of snakes in Western culture is almost universally negative. Here in Australia, where some of the world's most venomous snakes are regular backyard visitors, prevailing attitudes are often no different. It's still common to hear the old adage that, "A good snake is a dead snake!", and urban legends persist – such as the possibility of pythons and brown snakes interbreeding to form dangerous hybrids, despite these taxa being in separate families (Pythonidae and Elapidae), and therefore, in some senses, as likely as a cross between a cat and a dog to produce viable offspring.

Snakes are a hugely persecuted but equally ecologically important clade; they have adapted with varying degrees of success to human-modified environments. Some snake fanatics, like myself, wind up in a career involving snake relocation; the safe capture and removal of snakes posing a risk to people, pets, or in the case of rescues, themselves. Following a quick health assessment, we then aim to find suitable habitat for release within their own ecosystem, all working under local and federal wildlife and safety legislation.

After nearly five years of managing a snake removal service, I still believe fauna translocation can be useful for both people and ecosystems. But a number of literature reviews on the subject and a plethora of published studies have cast doubt on the suitability of translocation as a management tool.

In the case of snakes, translocations are frequently employed to mitigate threats involved in wildlife interactions, often in urban areas. In my own area of Brisbane, by far the majority of calls are for non-venomous Carpet Pythons. Looking at some of my own data, from 1 July 2017 to 18 April 2018, there were a total of 181 Carpet Python (*Morelia spilota*) captures, followed by 22 Common Tree Snakes (*Dendrelaphis punctulata*) and 21 Eastern Brown Snakes (*Pseudonaja textilis*). After these comes an assortment of minor players; four Yellow-faced Whip Snakes (*Demansia psammophis*), three Red-bellied Black Snakes (*Pseudechis poriphyriacus*), three Brown Tree Snakes (*Boiga irregularis*), and a few others, for a total of 38 venomous and 206 non-venomous snakes. The non-venomous species are only moved if there's a genuine threat; if there are pets at risk on the property, if they're indoors, or if they're stuck somewhere people need access to (like cars, offices, or work sites). Handling is, ideally, done with an aim to minimise stress where possible and avoid unnecessary agitation.

Moving wildlife is always a troublesome prospect, as most species are locally adapted to their environments, and so are populations and individuals. For translocated animals, environmental conditions are hardly likely to be exactly the same at the release site, thus local adaptations may no longer be appropriate, or could even become detrimental. The extent to which we're interfering with locally-adapted snakes is difficult

Left: *the author wrangles an Eastern Brown Snake (*Pseudonaja textilis*).*
Right: *Eastern Brown Snakes comprise the majority of venomous snakes encountered during call-outs in the Brisbane area.*
All images courtesy of Janne Torkkola.

“I hate and fear snakes, because if you look into the eyes of any snake you will see that it knows all and more of the mystery of man’s fall, and that it feels all the contempt that the Devil felt when Adam was evicted from Eden.”

Rudyard Kipling; The Return Of Imray.

to determine, however there are multiple studies that attempt to assess this impact, often by radio-tracking translocated individuals. In the USA, relocated Timber Rattlesnakes (*Crolatus horridus*) were shown to have a mortality rate of 55% and more erratic daily movements, averaging 123.8 metres per day, compared to 11% and 36.9 metres in resident snakes. Following translocation, Heiken et al. (2016) also found elevated corticosterone and testosterone levels in Pacific Rattlesnakes (*C. oreganus*), suggesting the procedure can be rather stressful. Relocated Western Diamond-backed Rattlesnakes (*C. atrox*) showed three times higher mortality rates then resident rattlesnakes, and resident Eastern Hognose Snakes (*Heterodon platirhinos*) also survived three times longer than transplants.

Such findings aren't restricted to reptiles in the United States. In India, King Cobra (*Ophiophagus hannah*) studies show significant increases in home range size and average daily movement following relocation. The White-lipped Pit Viper (*Trimeresurus albolabris*) is commonly found in homes and urban areas in south China, where they're relocated to national parks, with some surprising negative consequences. After a three-kilometre translocation, individuals exhibited increased movement, exposing them to additional risks. Furthermore, translocation resulted in a failed, delayed or extended onset of winter hibernation. Translocated female snakes did not reproduce the following season and suffered 80% mortalities, while all males died before the first summer.

Here in Australia, several species also show negative responses following translocation. Tiger Snakes (*Notechis scutatus*) in Victoria were shown to have home ranges six times the size of residents, and also to move further on a daily basis (140 metres versus 64 metres). A recent project by reptile ecologist Ashleigh Wolfe on Dugites (*Pseudonaja affinis*) - a member of the brown snake genus common around the city of Perth - found that four specimens all perished following relocations over three kilometres, while snakes moved less than 200 metres also experienced 50% mortality. Translocated Dugites also had greater ranges and travel distances prior to death.

A range of unrelated taxa appear to show similar responses. Translocated Brushtail Possums (*Trichosurus vulpecula*) in Melbourne, Australia, and White-tailed Deer (*Odocoileus virginianus*) in Illinois, USA, both also show high mortality rates. Additionally, translocation has frequently failed to limit human-wildlife conflicts in species such as Saltwater Crocodiles

1. *A Carpet Python (*Morelia spilota*) consuming an urban prey item - in this case a wandering neighbourhood cat.*

2. *Snakes have a habit of exploring caves and crevices; these Carpet Pythons were found in a roof space.*

3. *'Just dropped in for a bite!' This Eastern Brown Snake was found in an office lunchroom, on the kitchen bench between the toaster and the kettle.*

(*Crocodylus porosus*), Grey Wolves (*Canis lupus*), and Brown Bears (*Ursus arctos*) to name just a few.

Translocation, it seems, is at best a temporary solution to an animal's presence, not so much a measure against further interactions; nor is it ideal for the animal itself. What does all this mean for snake translocations here in Australia? There does, at the very least, appear to be ways to minimise the impact. Studies on various species, including Eastern Massasaugas (*Sistrurus catenatus*) in Canada, Pacific and Timber Rattlesnakes in the USA, and Dugites in Western Australia, suggest a positive relationship between translocation distance and mortality rate. This makes intuitive sense, with translocations over a shorter distance less likely to move an animal out of suitable local habitat (and perhaps even allowing an individual to remain within its own home range).

Returning to the issue of human-wildlife conflict, studies have shown that even short distance translocation is hardly an ideal mitigation measure, as many animals, including Tiger Snakes, may return to their homes in or near urban areas shortly after release. Here we come to an interesting point. I'd like to suggest that not all nuisance or threatening animals are equal. Compare the Tiger Snake to a mammalian predator, for example, a Coyote (*Canis latrans*). No matter how hungry it is, the former does not see you as a prey item, but the same cannot be said of a starving Coyote wandering through the suburbs. Australian elapids generally make every possible effort to flee and avoid humans. Also, snakes are often small and have a habit of exploring crevices and caves, leading them to occasionally enter homes via open doors and windows. Moving them back outdoors or off the property, away from pets and people, is often all that's needed as they'll generally disappear into cover immediately after release. Moving large, highly intelligent and spatially-sensitive predators that return home and see livestock or humans as potential prey (including bears, wolves or,

'Even short distance translocation is hardly ideal, as many animals, including **Tiger Snakes**, may return to their homes in urban areas shortly after release.'

Below: *Red-bellied Black Snakes (*Pseudechis poriphyriacus*) have a hugely variable home range - anything from 0.02ha to 40ha or more.*

closer to home, the Saltwater Crocodile) is much more challenging.

Another consideration is the specific ecology of the snake in question. For instance, the mortality rates following translocation were much lower for Tiger Snakes than for Dugites. Perhaps it is easier for the Tiger Snake, a much more generalist predator, to find suitable prey items in unfamiliar territory, while the Dugite struggles to find new grounds to hunt rodents and lizards. Or it may be that, since these studies haven't been replicated in different areas, the suburbs surrounding Perth where the Dugite study took place are more hostile to snakes in general than the wetland park where the Tiger Snake study occurred. Previous work by Wolfe et al. (2017, 2018) found that, compared to those found elsewhere, urban Dugites were in worse condition, generally smaller and less likely to have prey in their stomachs. It might be interesting to examine how several sympatric snake species, like Eastern Brown Snakes and Red-Bellied Black Snakes, fare around large, urban centres such as Brisbane, Sydney, and Melbourne.

Until more is known, like a snake catcher under a house, we must continue to grope around in darkness! However, as a snake catcher, I believe we can try to live by a couple of basic rules, based on what we do know:

1. Try not to move snakes. It's counter-intuitive, but the best job is one where you've educated a frightened caller and not moved anything. You don't get paid, but that's life.
2. If you must move an animal, minimize the distance and choose appropriate habitat, taking into account the species' ecology, in particular, movement patterns and home ranges, if these are known.

Thus, what is appropriate must be decided on a species by species basis. This, again, gets complicated. For example, Eastern Brown Snakes have been shown to have a larger home range than Tiger Snakes, suggesting that the former species may handle more distant translocations, although this is contradicted by mortality rates in Dugites. Further, the size of home ranges can vary hugely, even within a single species. Carpet Pythons' home ranges have been shown to vary from 17.6 hectares up to 52 hectares; similarly those of Red-bellied Black Snakes may be anything between 0.02-40 hectares, or even more for males during breeding season. Home ranges are thus probably better used as guides, and only relied upon if the spatial ecology of the species is well studied.

Unfortunately, rarely do we have a good understanding of a snake species' movement ecology, though there are exceptions, and generalizations are certainly possible. Invasive Burmese Pythons (*Python bivittatus*) clearly move further than Carpet Pythons, which move further than Brown Snakes, which move further than Tiger Snakes. What movement ecology means for survivorship following translocation, I would suppose, depends on the distance to, extent of, and quality of the new habitat, as well as the condition of the animal before and after handling. Ideally, controlling for these factors, translocation can be improved upon, as appears to have been the case with increasing success rates over the last few decades, likely due to improved methodology. While hardly ideal, an appraisal of each species' home range and ecology, and the local ecosystems at capture and release seems to me the best way forward for now. Nonetheless, while it's not a huge sample size, four out of four dead Dugites speaks for the need for more research, and the potential for our well-meaning actions to cause more harm than good.

A final thought. What might be the outcome if we abandon snake translocation entirely? Would snake populations (and the humans that interact with them) be any worse off if we left an educated general public to deal with snakes on their own, without using professional snake handlers? And what viable options other than translocation are available to us? I don't know the answer to these questions, but it seems that for now, we will continue to use the less-than-perfect tool of translocation for snake management in urban areas. More research into its impacts on various species and local ecosystems certainly would not go awry. Let's stay on our toes.

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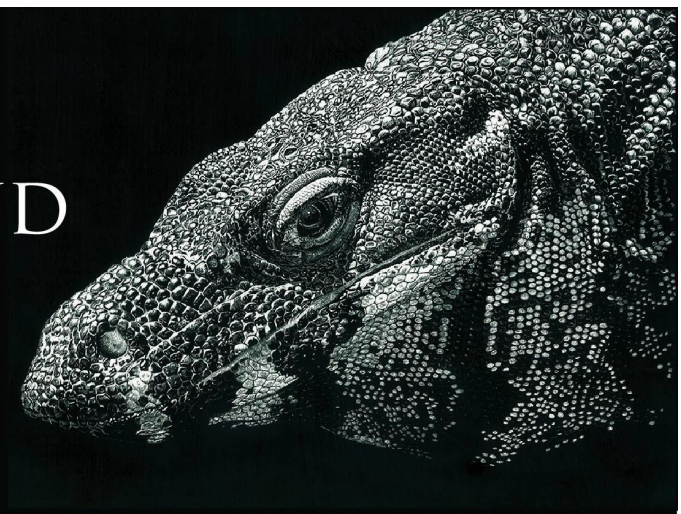
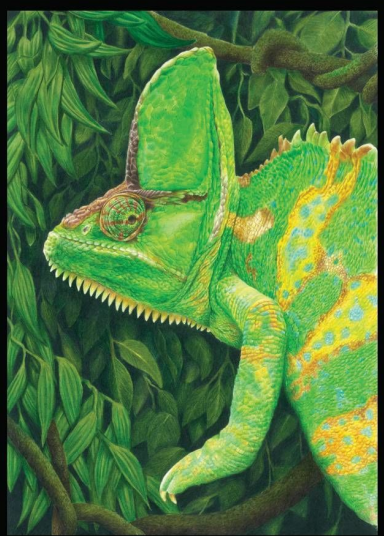
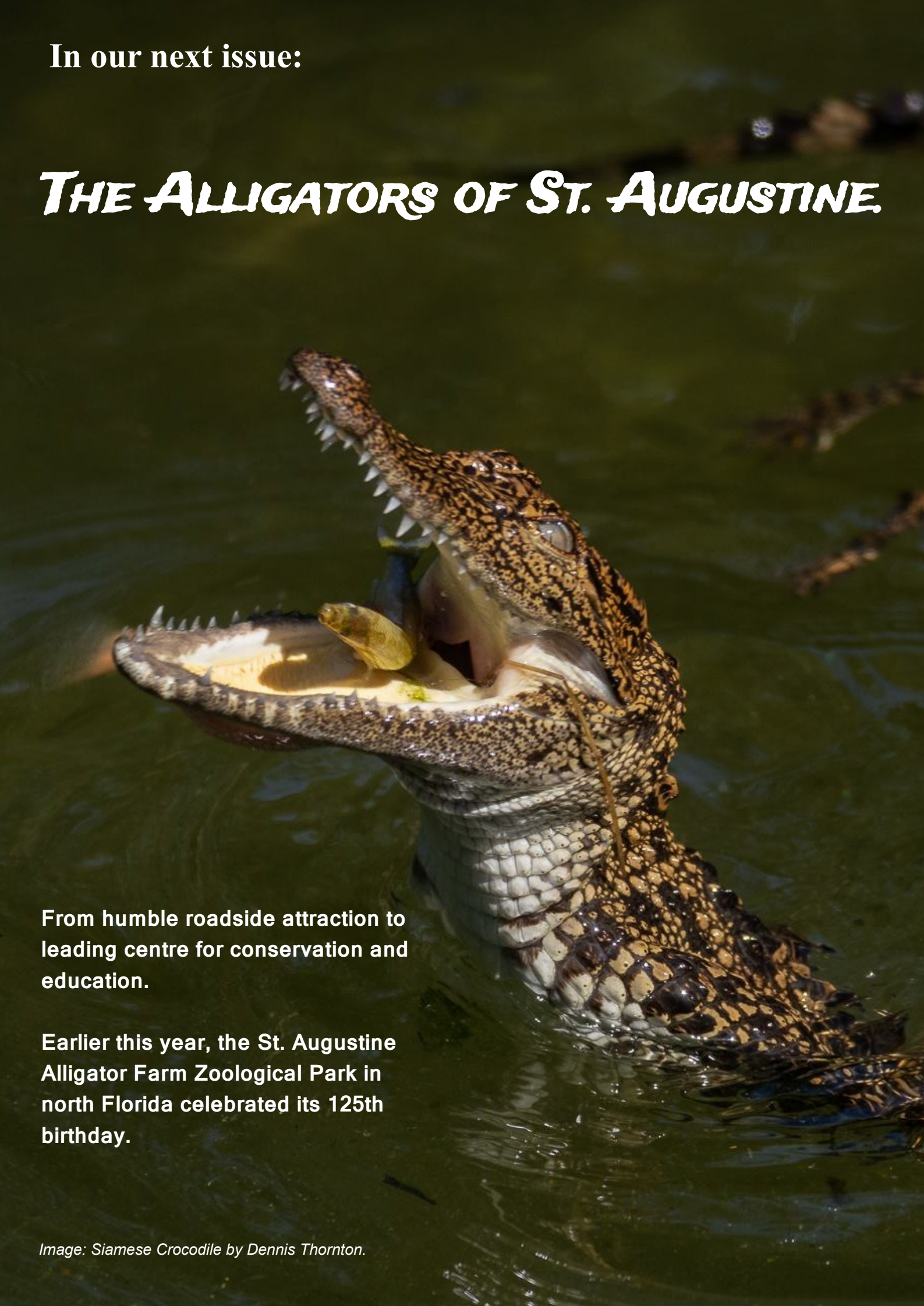




In our next issue:

The Alligators of St. Augustine



From humble roadside attraction to leading centre for conservation and education.

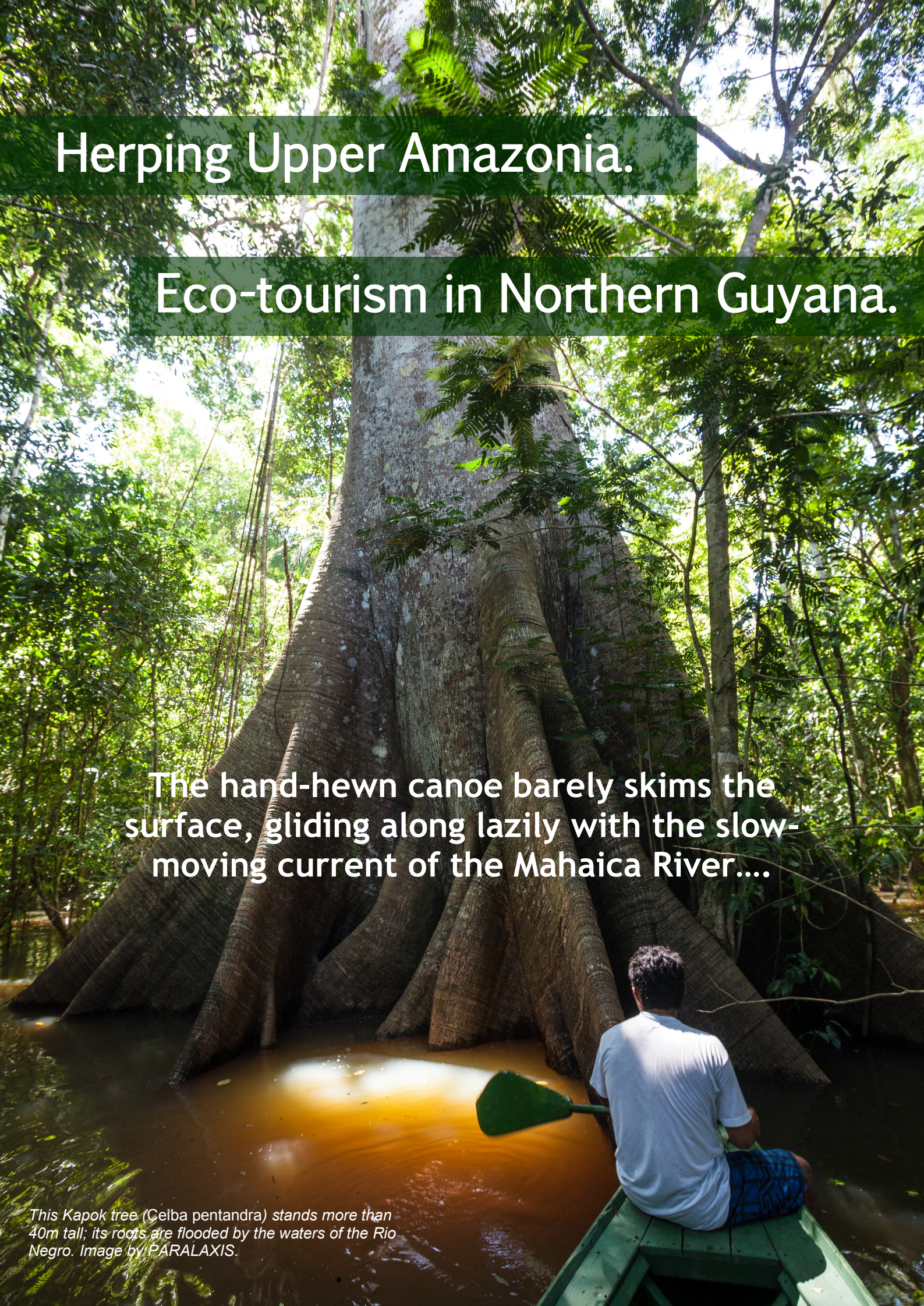
Earlier this year, the St. Augustine Alligator Farm Zoological Park in north Florida celebrated its 125th birthday.

Image: Siamese Crocodile by Dennis Thornton.

Herping Upper Amazonia.

Eco-tourism in Northern Guyana.

The hand-hewn canoe barely skims the surface, gliding along lazily with the slow-moving current of the Mahaica River….



*This Kapok tree (*Ceiba pentandra*) stands more than 40m tall; its roots are flooded by the waters of the Rio Negro. Image by PARALAXIS.*

Vickie Lillo is a freelance US writer with a special interest in travel and herpetology.

Indigenous tribesmen Ducky and Buddy Simon - brothers - are paddling upstream, packing a pair of cane poles, along with crickets and a tin of pungent flour and cheese paste for bait. They are headed towards prime fishing territory for giant catfish and peacock bass. The ebony water, tainted black from decomposing vegetation, laps at the side of their dugout.

"Look," Ducky whispers, pointing at a napping Smooth Machete Savane (*Chironius scurrulus*) in the bushes along the shore. *Thwack!* His wooden oar smacks the surface, sending a splash of river water onto the 'fire snake'. Awake and frightened, the mildly-venomous colubrid slithers into the undergrowth.

Hours later, content with their catch of fish, the two siblings are rounding the same bend in the river when suddenly, from out of the tangle of interlaced roots, springs that very same copper-red snake, rear fangs bared! The serpent propels its slender body through the air and into the cramped canoe, betwixt the two Amerindian guides - apparently still agitated that they roused it from a peaceful slumber. Without a second thought, both Buddy and Ducky dive fully-clothed into the Mahaica. Meantime, the Smooth Machete Savane simply glowers at the two men still treading water; smug and complacent from his position of power in the bottom of their boat….

"I love telling that story about my brothers-in-law," Damon Corrie confides to my husband Gustavo, teenage son Nicolas and I, with a chuckle. As heir to the hereditary chieftaincy of the Eagle Clan of the Lokono-Arawak nation, this self-taught herpetologist and conservation crusader is fiercely proud of his Amerindian heritage and protective of the 240 square miles of crime-free, disease-free (no yellow fever; no malaria) tribal lands. My family and I are the first week-long guests at the newly-opened Ayonto Hororo Eco-lodge and Wildlife Sanctuary, here in northern Guyana; an entrepreneurial venture to help fill the communal coffers and appease the widespread (up to 70%) unemployment rate on the reservation. This is Damon's vision: a way for the

Above right: *Ayonto Hororo Eco-lodge & Wildlife Sanctuary.*
Rjght: *Ceremonial Roundhouse on the banks of the Mahaica River in the grounds of the Eco-lodge. Images by Vickie Lillo.*

Lokonos to successfully transition into the new millennium and still maintain their centuries-old traditions.

Few places in the world offer a better opportunity for field herping than the jungles and moist forests of upper Amazonia. Better still, Damon's homeland of Guyana is the only English-speaking nation in all of South America, and he'd be delighted to create a custom itinerary just for you and your entourage. Here you may encounter constrictors, rattlers, Fer-de-lance vipers, rat snakes, tortoises and turtles, geckos, ameivas ('jungle runners'), tegus, and frogs and toads. A quest for gargantuan anacondas (water *camoudis*) would require venturing farther inland. Though these huge snakes are often found sunning on the banks of the rivers, Damon notes that, "Ours don't expose themselves near the village. We really must go in search for them a good distance away and hope for luck."

In a striking example of convergent evolution, the Emerald Tree Boa even perches in the same fashion as the Green Tree Python.

Early one morning, before the daily rains, we explore an area of forest near the eco-lodge; a low-land thicket of mahogany and nutmeg trees. There are also Greenheart laurels, valuable for their timber, while in the understorey knotted lianas creep up bitter-wood stalks; mosses and lichens germinate along buttress roots, and a maze of mud tubes lead down to termite nests poking out of the soil. An Amazon Lava Lizard (*Tropidurus torquatus*) scatters at our approach, running momentarily on only its two hind legs, bipedal fashion.

The upper canopy is dominated by Silk-cotton trees, or Kapoks (*Ceiba pentandra*). With thorn-studded trunks and sweeping branches, these giants fan out like frilly Victorian umbrellas, with hundreds of flocculent balls of 'fluff' protecting their precious seeds. At night, their pink and white flowers emit a foul-smelling stench that acts as an aphrodisiac to the rainforest bats. They flock to the sugary nectar like bears to honey, feasting happily and in the process also pollinating the flowers. They may also end up as unsuspecting prey for the beautiful nocturnal Emerald Tree Boa (*Corallus caninus*). In a striking example of convergent evolution, this species is remarkably similar in appearance to the Green Tree Python (*Morelia viridis*), and also 'perches' in the same fashion. It even undergoes a corresponding ontogentic colour change – morphing from a red-brown or orange juvenile to a bright green adult at round 9-12 months of age. Described

Left: *Amazon Lava lizard (*Tropidurus torquatus*). Image by Fotos593.*
Above: *Juvenile Emerald Tree Boa. Image by Audrey Snider-Bell.*
Below: *Adult Emerald Tree boa after ontogenetic colour change. Image by Babu Paul.*

by Linnaeus in 1758, the species name, *caninus*, apparently derived from the 'dog-like' shape of the head and snout. The Emerald Tree Boa also possesses elongated front teeth that are proportionately the largest of any non-venomous snake.

Eventually, we can venture no further on the swampy trail, and Buddy ushers us back to Ayonto Hororo Eco-lodge just as it begins to drizzle. With constant precipitation during the rainy months, whether it is a fine mist or a monsoon, this is not the ideal season for encountering much herpetofauna.

Most of the frogs and lizards are hunkered down under palm fronds, while many of the snakes are camouflaged up in the treetops, waiting out the early morning and afternoon downpours.

After the rains subside, the blistering heat of midday sets in.

"You want to see the snake now?" Damon has a beautifully-patterned Red-tailed Boa (*Boa constrictor*) wrapped around his arm; tongue flicking, eyelids half-closed. "Buddy caught him out on the savanna a couple of days before you arrived."

Gustavo and I take the opportunity to admire the snake, which Damon then curls around the branches of a small tree. The boa immediately goes to ground, heading towards the tawny grasses which splay out from the eco-lodge, and then towards the hostel's resident rooster. Apparently, the snake is not hungry, as it abruptly changes direction, away from the hapless bird.

Behind the hostel, in a fenced area of low-growing Papaya bushes, a dozen or so Red- and Yellow-footed Tortoises (*Chelonoidis carbonarius* and *C. denticulatus* respectively) lead their typically slow-paced life. I am curious and ask Damon, "What made you develop an interest in reptiles?"

"I became an autodidact herpetoculturalist from my first pet - a tortoise called Josephine - that I owned from the age of nine. Over the years, I became the owner of dozens of other species of reptiles and amphibians. I stopped counting at 50 species." Our host hands me one of the Red-footed Tortoises - I can fully understand his

Above left: *Red-tailed Boa (*Boa constrictor*).*
Below left: *Red-footed Tortoise (*Chelonoidis carbonarius*).*
Right: *breeding pen for Red- and Yellow-footed Tortoises located behind the Eco-lodge.*
Images by Vickie Lillo.

fascination with these animals. The glossy flecks of crimson stippling its front and rear legs remind me of gaudy nail polish, as do the garish golden specks atop its head. Damon balances the concave plastron of the tortoise in the palm of his hand, and affectionately strokes its bony carapace before continuing. "We are trying to breed these two species of South American tortoises here at the lodge because many tribesmen still eat them, not understanding that they grow slowly and reproduce poorly. This habit will lead to ever-smaller numbers of these species on our territory. As it is, I suspect what they are finding now are specimens that have wandered in from off the tribal lands."

Since our visit, Ayonto Hororo Eco-lodge has rescued and tamed an orphaned baby Ocelot (*Leopardus pardalis*); perhaps she might pad softly into your room in the middle of the night! Additionally, the Lokono Amerindians are in the process of building a series of terrariums at the hostel, to house and showcase the dozens of naturally-occurring species of reptiles on the reservation.

'Living Gold' at Kaieteur Falls.
The 13-seater Cessna Caravan carries us over an unbroken blanket of green – endless acres of Amazonian trees – with just a sliver of road momentarily discernible during the flight. Our destination is a remote corner of the Guiana Shield (the geological formation encompassing Guyana, Suriname, French Guiana and parts of Venezuela, Colombia and Brazil). Without warning, the forest parts to allow us a glimpse of Kaieteur Falls, where the Potaro River cascades like thunder into a chasm 741 feet (226 metres) below.

Around us, gigantic tank bromeliads proliferate; their close-knit leaves efficiently trapping water and nutrients and relieving them of the need for a conventional root system. Bromeliads may have originated in the highlands of the Guyana Shield, which is home to the most primitive genus of these plants.

"Look down inside there," our tour guide, Amerindian park ranger Thomas Williams instructs.

> "It's supposed to be a type of poison dart frog. But a scientist licked one and said it wasn't toxic."

We peel back the overlapping leaves of the bromeliad he indicates to observe the reservoir of water at its base; a single Golden Rocket Frog *(Anomaloglossus beebei)* seeks refuge amongst the stalks. Endemic to the Kaieteur Plateau, and with a life cycle that is entirely dependent on the giant bromeliad *Brocchinia micrantha*, the tiny amphibian with the gilded skin, full grown, only measures half an inch long (1.25cm). Thomas explains, "It's supposed to be a type of poison dart frog. But right now, there's a debate going on about whether or not it's poisonous to the touch. Apparently, in some new study, a scientist actually licked one, and said it wasn't toxic."

I think I'll just have to take that on faith. Bromeliads and the natural reservoirs they contain provide habitat for many different species of frogs, together with salamanders, crustaceans and an array of invertebrates.

Gustavo gets one last panoramic image of the brume rising from the canyon floor, and the unhampered lichens nosing out of the sandstone cracks. He focuses his camera lens toward the river bank, only slightly upriver from the falls. A Schneider's Dwarf Caiman *(Paleosuchus trigonatus)* is trolling amongst the tiny green islands of algae. Adults grow to only about 1.5 metres in length and weigh around 15 kilograms.

Ranger Williams regains my husband's attention. "You don't need any bug repellant here in the park. There are no mosquitoes. That's because we have four different kinds of insect-eating plants here at Kaieteur." A yellow bladderwort peeps out from under a rock. "There's one," he points, "And that reddish one too, with the flower pattern." He directs his walking cane toward a sticky sundew plant bristling with tiny hairs.

Our party bids adieu to one of the most incredible cascades in the world; a hidden gem in a pristine environment. All of Guyana is like that - its biodiversity never ceases to amaze. Whether you're a diehard field herper, a conservationist or simply a lover of nature, the Lokono-Arawak Amerindian Reservation offers the adventure of a lifetime. And you'll help stay the chronic unemployment that threatens not only the indigenous peoples' livelihood, but also their time-honored, traditional ways of life. All in all, it's been a fabulous six days.

Ayonto Hororo combined homestay, Eco-Lodge and Wildlife Sanctuary is located in Guyana's Upper Mahaica River and can be contacted via e-mail at: damoncorrie@yahoo.com

Above: *Kaieteur Falls. Image supplied by Vickie Lillo.*
Left: *the tiny Golden Rocket Frog (*Anomaloglossus beebei*) is endemic to the Kaieteur Plateau, and entirely dependent on the giant bromeliad* Brocchinia *micrantha. Image by Erik Zandboer.*

Lokono Philosophies and Tribal Wisdom.

“Some tribes consider snakes and crocodilians to be representative of negative spirits when seen in visions.”

We had taken a detour to the zoo in Georgetown, Guyana’s capital, and were standing in front of a monstrous caged exhibit which housed a dozen or so intertwined Green Anacondas (*Eunectes murinus*). The giant snakes twitched continuously; a braided knot of serpentine flesh. Damon Corrie continued, “In dreams, the anaconda is the animal representation of the supreme negative entity for the Lokono-Arawaks. But I know the dream imagery and the living thing are two separate issues, not to be confused with the other.

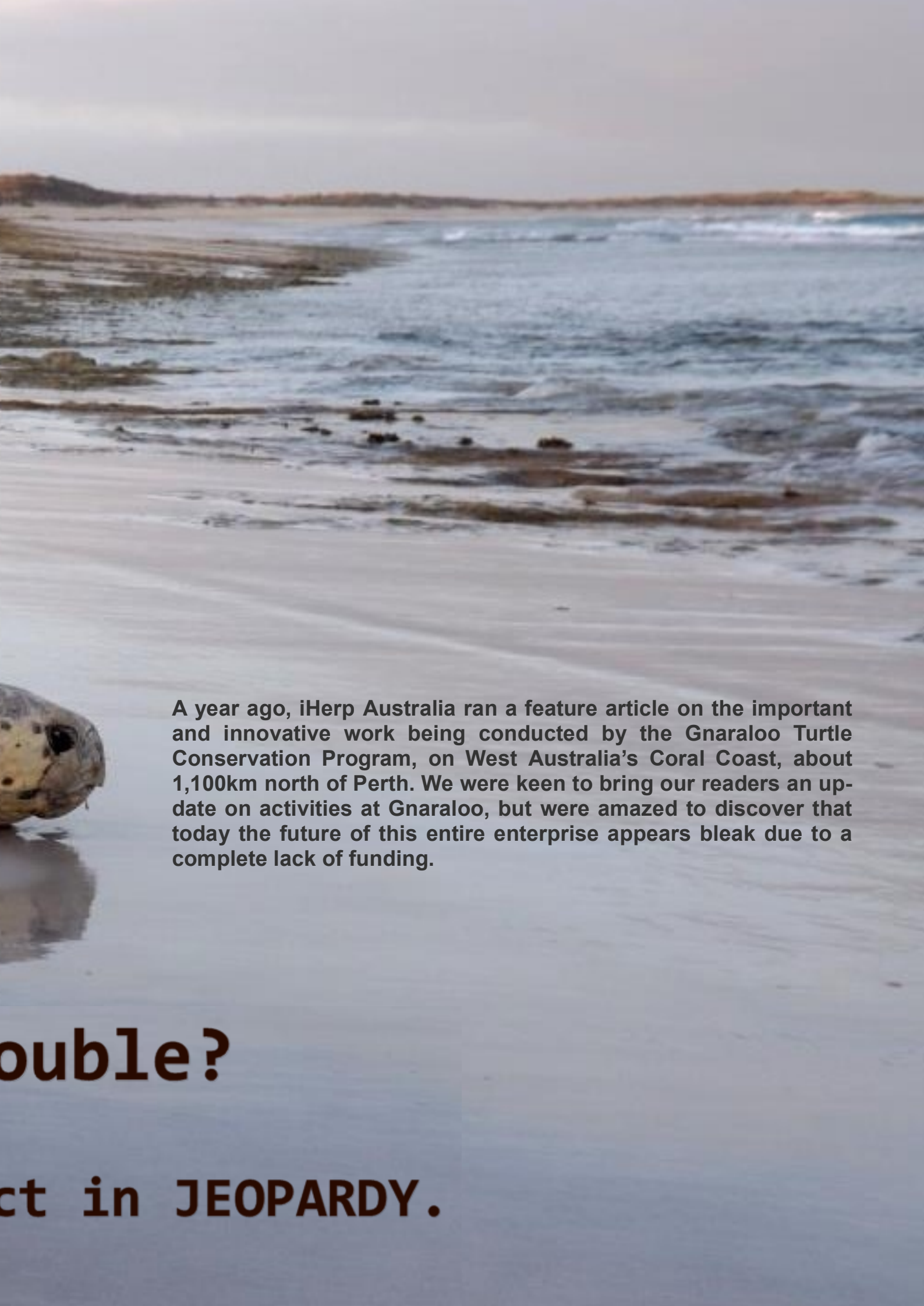
“I would never kill a real anaconda because all life is serving a useful purpose as ordained by the Creator. But a snake – all snakes – must shed their old skin to survive, and shamans associate this ability to shed their skin with astral travel. For any real shaman must be able to make his conscious spirit leave his body - shedding his physical skin, in a way - in order to get answers from the good spirits so he can give good advice to the physically living when he returns,” Damon smiled. “Such as, which plant the Creator has made to use to cure which disease, etc. Western scientists think we used trial and error over centuries **to** find out what medicinal plants to use, but we didn’t….too few people in our tribes to risk losing any to death from using the wrong plants until we find the right one. After all, we are never told lies by the good spirits.

“Living animals of all kinds, we have respect for. All animals have a practical educational life lesson to teach….every insect, reptile, amphibian, bird, fish, mammal, right down to the lowliest arthropod. Peaceful animals like the tortoise, who harm no one, are to be emulated and are viewed as representations of positive entities with positive qualities….like taking time to enjoy life and living in peace and longevity.”

Image by Gustavo Frazao.

Update: Turtles in Tr

Important Conservation Proje



A year ago, iHerp Australia ran a feature article on the important and innovative work being conducted by the Gnaraloo Turtle Conservation Program, on West Australia's Coral Coast, about 1,100km north of Perth. We were keen to bring our readers an update on activities at Gnaraloo, but were amazed to discover that today the future of this entire enterprise appears bleak due to a complete lack of funding.

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ct in JEOPARDY.

Since 2008, the Gnaraloo Turtle Conservation Project (GTCP) has conducted daily beach track surveys, along with a variety of complementary research and monitoring activities, in the Gnaraloo Bay Rookery between 1 November and 28 February each year. This high-density rookery has been identified as being critical to the survival of Loggerhead Turtles in the southeast Indian Ocean. In 2011-12 additional surveys commenced in the Gnaraloo Cape Farquhar Rookery. A total of 697 nesting activities and 355 nests were recorded during the 2017-18 season.

Prior to 2008-9, foxes and feral cats and dogs were responsible for widespread predation on turtle nests within the survey area, and therefore control measures formed an integral part of the overall conservation strategy. These have proved so successful that there has been no evidence of predation by feral animals since 2010.

The Gnaraloo Bay Rookery is critical to the survival of Loggerhead turtles in the southeast Indian Ocean.

Flipper tagging was added to the program during the 2017-18 season. This enables identification and tracking of females, and can reveal some interesting information; for example, 11 females were observed to lay multiple nests, with an average internesting period of 16.1 days. Long-term flipper tagging is of considerable value in determining population dynamics, remigration intervals and recruitment rates, and it is therefore essential that this work is continued.

In another exciting development in season 2017-18, two Loggerhead Turtles nesting at Gnaraloo were fitted with satellite tracking devices. Both went on to lay three more nests in the Gnaraloo Bay Rookery and then began their long migration to foraging habitat in the Gulf of Carpentaria, Queensland. The first female, christened Gnargoo, took around three months to complete her journey, travelling approximately 4,100 kilometres. The second, named Baiyungu, joined her about six weeks later, having swum close to 4,700 kilometres. Previous satellite tracking has also revealed foraging grounds ranging from Shark Bay (around 250 kilometres south of Gnaraloo), all along the western coast of Australia, north to Darwin. This demonstrates the need for comprehensive and collaborative approaches to turtle conservation, as it is vital that foraging grounds are protected, in addition to nesting beaches.

The Gnaraloo project is not confined to hands-on conservation and research, as community engagement has been a central focus since 2010-11. During the 2017-8 season the GTCP directly

engaged with a total of 4,665 people via both onsite activities and offsite presentations. Skype in the Classroom lectures were provided to students from a wide variety of countries, including Sweden, Egypt and Brazil, and the free 'Turtle Tracker App' developed by the Gnaraloo Wilderness Foundation enabled members of the public to share the travels of the two turtles fitted with satellite trackers. Until 2016-17, all of the GTCP's outreach activities were provided free of charge to participants. Due to decreased funding, onsite visitors were asked for small financial contributions in season 2017-18.

So what now? Well, quite simply (and inexplicably), there is no funding from private or public sources for the continuation of this work. This means that the 30 -year consecutive baseline data set of Loggerhead Turtle nesting in the Gnaraloo Bay Rookery survey area will be broken and lost. Field teams will no longer be able to rescue stranded turtles during the nesting period, and monitoring of feral predators will cease, which means any increase in predation will be impossible to assess and may go unnoticed. Plus thousands of school children and members of the public will be unenlightened about the plight of sea turtles and the comprehensive and co-ordinated efforts necessary for effective conservation.

And just how valuable is this work? The Loggerhead Turtle is shackled by a prolonged generation time (females may be at least 30 years old before they first reproduce), low natural recruitment and total reliance upon scattered nesting beaches. Their fragile ecology renders the species especially vulnerable to a suite of threats including human consumption, commercial fishing, development, pollution, climate change and exotic or displaced

Left: *two turtles fitted with satellite trackers in December 2017 travelled more that 4,000 kilometres to their foraging grounds.*
Above and insert: *at Gnaraloo the number of turtle nests has remained consistent despite general declines noted elsewhere.*
Images courtesy of Karen Hattingh, Gnaraloo Turtle Conservation Program.

predators. Available data from nesting sites continues to indicate persistent and marked declines, and the IUCN believes that the Loggerhead's survival is now largely dependent on conservation efforts.

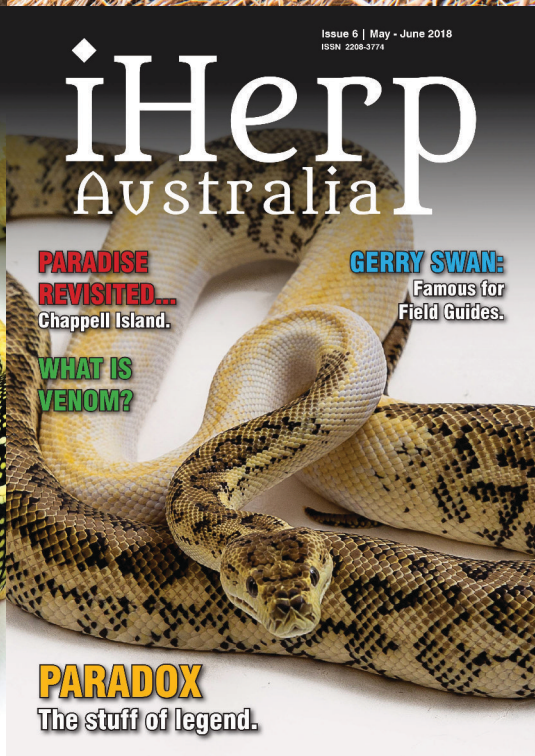
At Gnaraloo, the number of nests has remained relatively consistent since 2008; although numbers were down 2017-18, they were up in 2016-17, and there is no overall decline apparent. Moreover, given the high levels of nest predation prior to the inception of the program in 2008, it would be reasonable to predict a general decline of nest numbers, or at least a stabilisation at low levels, for perhaps 20 years. In this light, the lack of a decline can be considered to be a significant victory, and one can only imagine what the situation would be like had the GTCP not commenced operations in 2008.

At iHerp Australia, we were so impressed by the initiatives at Gnaraloo, and by the obvious passion demonstrated by chief scientist Karen Hattingh and her team, that we decided to produce some limited edition turtle posters, with all proceeds going to the GTCP. Unfortunately, despite this worthy cause, very few of these magnificent posters were sold, and so recently we shipped the remainder to Karen in WA, in the hope that she may sell some, or use them to encourage potential benefactors.

Apathy is a terrible thing, and if we all do nothing, this outstanding project will cease to exist. The team at Gnaraloo has not given up, and we urge anyone who is able to help; please contact the GTCP. Make a donation, take out a 'Turtle Friend' membership, sponsor a satellit tag, or perhaps make them an offer that they can't refuse for one of the posters!

Go to:
www.gnaraloo.org
gnaraloo.org/be-a-turtle-friend/
Facebook: Gnaraloo Wilderness Foundation and Gnaraloo Turtle Conservation Program.

Help save the turtles. Donate NOW to become a 'TURTLE FRIEND', sponsor a SATELLITE TAG, or make an offer on one of these special LIMITED EDITION POSTERS!



The next issue will be published on Friday 2nd November 2018

Photograph courtesy of Jason Sulda