



TRAVELOGUE

The Top End of Down Under, Part 2: More Amphibians and Reptiles of Northern Territory, Australia

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Photographs by the author unless otherwise indicated.

Stranger in a Strange Land

The plane descended as a sliver of pink morning grew wider to the east and finally the coast appeared below us. The flight from Atlanta, Georgia, to Australia is unbelievably brutal, including a stopover at LAX — quite brutal all

by itself — followed by 20 hours of incarceration in a jumbo jet. To make things worse, I was in the middle seat between two women, and I was the one who had to get up during the flight to use the restroom something like fifteen times. The women never did, but I woke them up every time I had to get



Sunset over the marsh at Fogg Dam. The region around Humpty Doo, Northern Territory, is similar in many ways to the Everglades of southern Florida — however, the similarity is only superficial. Fogg Dam has been the research site for hundreds of studies on amphibians and reptiles from the Shine lab at the University of Sydney. Photograph by Crystal Kelehear.

up. Fortunately the Qantas flight took good care of us. We had nice meals, drinks, and the godsend: An endless supply of free movies on a screen the size of a post card. I stayed up for the whole flight watching movies, and by touchdown I had that buzzing delirium that accompanies a missed night of sleep. The other American passengers craned to get their first glimpse of the southern continent, peering and getting up from their seats, perhaps expecting to see their first Kangaroo or Taipan from 24,000 feet.

“Oooooooooo!”

“It’s so beautiful!”

I too could not help myself from looking past the woman in the window seat to get my first look. The ground looked flat and gray-green, and the water and land just north of Brisbane did appear quite nice, but a little strange at the same time. Then, just to the west of the coast a huge gash in the earth appeared — a massive, hideous strip mine. I smiled to myself and hunched back in my seat. This would be a running theme to all my visits to spectacular Australia: It’s strange and beautiful — but in many ways quite familiar.

For the two of you who read my first travelogue about Australian amphibians and reptiles (Graham 2012), please note that very little of that first adventure actually took place in the Top End as it is understood in Australia. Instead, it focused on what they call the Outback or more specifically the Red Centre. I must now confess that I was rather attached to the snappy title, and this was the sole reason for the geographic misrepresentation. However, a majority of

my two-month research collaboration with Rick Shine’s lab (University of Sydney) took place at a tropical field station in the Top End proper, near the improbably named city of Humpty Doo, right next to the Fogg Dam Conservation Reserve, which Shine has made famous by means of numerous studies on snakes and, more recently, Cane Toads. This account describes my adventures exploring this subtropical herpetological paradise.

After a final quick flight from Brisbane to Darwin, I was picked up by Crystal Kelehear, my collaborator for the next two months, who drove me back to her apartment. The highways ran long and very straight, since this region is a vast coastal plain. We crossed occasional marshes and swamps, and the weather and general feel of the terrain was reminiscent of southern Florida — but instead of pines, cypresses, and bays, everything was either a Eucalyptus or Paperbark, with off-green, waxy leaves, and a few palms. The forest understory was a carpet of foot-tall grasses, with occasional cycads and palm-like Pandanus. It was strange, yet familiar. It was like a forest on an alien planet, or the kind of forest an alien might come up with to make humans happy if they placed us in an intergalactic zoo.

Crystal fed me a delicious Barramundi — a humungous perciform game fish that gets everyone down here quite excited, and for good reason — and then we went for a quick ride across Fogg Dam. The dam is an earthen embankment once used in a drainage scheme for rice farming, which was perhaps abandoned due to the swarms of crocodiles that



The Yellow-spotted Goanna (*Varanus panoptes*) once was common in the Top End, but this species experienced population crashes when Cane Toads (*Rhinella marina*) arrived. Fortunately, the species appears capable of eventually recovering, and I was lucky enough to see one on my first afternoon in the Northern Territory. Photograph by Crystal Kelehear.

showed up. It is now a popular area for tourists to view wild-life, and members of the Shine lab have been coming here for decades every night to count snakes. On either side of the dike is a great marsh, extending far away into the horizon. Strange yet familiar Magpie Geese, part duck, part crane, swooped down into the marsh. Despite my brain's liquid state, I tried to enjoy the abundant waterfowl wading along the spillway, and caught my first reptile — a skink, of course — near the wildlife viewing platform. As we headed back to the apartment, I noticed a dog slithering along the side of the road.

“Oh, sweet, a goanna,” Crystal said.

“Huh?”

I looked at the dog again, my brain reeling, and realized it was a huge lizard. We slowly approached, and as we got closer, it began trotting. It appeared yellow-green in the dappled sunlight of the monsoon jungle. Crystal described how we were a little lucky to see one, since they'd been scarce around here since Cane Toads showed up (see Doody et al. 2009). Goannas will rapaciously devour frogs of any kind, but if they eat a toad they're dead meat (Ujvari and Madsen 2009).

“Can I try to catch it?”

“Go your hardest — but wait, I'll try and get a picture.”

We got a little closer, close enough for Crystal to identify it as a Yellow-spotted Goanna (*Varanus panoptes*). She was able to click off one shot before I cracked my door and got out. “I'm going to have to flank it,” I said, narrating as if I was some kind of nature show host, and then I looked up and it was gone. As soon as my feet hit the ground it was history. It was by far the fastest lizard I'd ever been up against. OK, I thought to myself, I guess you don't catch goannas.

I passed out. I slept in fits, waking up in the middle of the night because after all, it was yesterday morning back home, and didn't that make perfect sense? When it became the next

morning in Australia, I painfully opened my eyes, my brain still revving and lurching to make sense of things, and out the window I saw a brown bird scratching in the leaf litter under the palms. It had orange legs and a cool crest on its head, and was somewhere between the size and shape of a Ruffed Grouse and a Turkey. I found that this was an Orange-footed Scrubfowl, one of the mound-nesting megapodes. These, you may have heard, build earthen mounds the size of garages to incubate their eggs, compulsively monitor the temperature inside them, and when the eggs hatch, their young need no further parenting. Pretty neat — and it kept getting better from there.

Variations on a Theme

I will now also apologize that most of the biological and cultural comparisons I will draw (as in my first travelogue) are between Australia and the United States, which will be fairly uninteresting for readers from elsewhere. As far as culture is concerned, the U.S. and Australia are very similar: Both think they have the best country in the world, both are made up of a large majority of city folks and a small but influential cadre of country folks, and both hold a penchant for junk food. Some differences do exist — people around the world still love Australians. Everything is twice as expensive in Australia. In Australia, rednecks are found mostly in the northern part of the country, and they refer to over-educated tourists from Sydney as “bloody Southerners.” When you ask an Australian when they gained independence from England in a righteous armed struggle, you get blank looks. In Australia, only about 20 million people share a continent with a landmass just shy of that of the continental U.S. The U.S. probably has as many illegal aliens as Australia has citizens. This massive difference in population is, in my opinion, the wellspring of all other minor differences between Australia and the U.S.



This hill in the flatlands near Fogg Dam is actually a nest. The Orange-footed Scrubfowl (*Megapodius reinwardi*) is common in these monsoon forests and much of the limited topography of the area is built by them for the long and complicated incubation of their eggs.



Can you pick out the redneck? Only one of these gentlemen is from the southeastern United States. Northern Australia has definite cultural leanings toward the bumpkin. Far left, an Aussie, second from left, the author, third from left, Matt Greenlees, second from right, some Aussie, far right, Tom Lindström. Photograph by Crystal Kelehear.



The Rocket Frog (*Litoria nasuta*).



Dahl's Aquatic Frog (*Litoria dablii*).



Wotjulum's Frog (*Litoria wotjulumensis*). Photograph by Crystal Kelehear.



Roth's Treefrog (*Litoria rothii*). Photograph by Crystal Kelehear.

Now for biological comparisons... On the first night we went road cruising, we found wonderful frogs and snakes that appeared very similar morphologically and behaviorally to the critters back home. The first I'll mention are the hylid frogs of the Top End, which as a family have filled nearly every kind of frog niche one can imagine. This is even more



The Northern Dwarf Treefrog (*Litoria bicolor*). Photograph by Crystal Kelehear.



The Giant Frog (*Cyclorana australis*). Photograph by Crystal Kelehear.

Incredibly, all of these frogs, ranging in morphology from slim long jumpers to squat burrowers, belong to the same recent adaptive radiation of Australian hylids.

extraordinary considering that only two genera occur in the area, *Litoria* and *Cyclorana*. The situation becomes fully mind blowing if you consider that *Cyclorana* is not even real in an evolutionary sense: This group of fat, burrowing frogs is really just a glorified branch growing from within the *Litoria* family tree (Pyron and Wiens 2011). This suggests an explosion of morphological and ecological diversity, indicating that when hylids — relative newcomers in Australia — invaded the continent from Asia, their evolutionary flexibility allowed them to quickly diverge into new forms and occupy niches not already occupied by endemic frog families.

Some of the hylids looked like I thought they should: Green Treefrogs (*Litoria caerulea*), Roth's Treefrogs (*L. rothii*), and Red Treefrogs (*L. rubella*) are long-legged, slim-waisted, sticky-toed arboreal frogs like any self-respecting hylid should be. However, some hylids look like true frogs: Rocket Frogs (*Litoria nasuta*) are long-legged, pointy-faced long jumpers (perhaps the *longest* jumpers of them all — James and Wilson 2008) that look like Southern Leopard Frogs (*Lithobates sphenoccephalus*) designed by an Italian car manufacturer. The Dahl's Aquatic Frog (*Litoria dablii*) is a

fully webbed, double-striped hylid that looks uncannily like a Carpenter frog (*Lithobates virgatipes*) or a Pig Frog (*L. grylio*). Some hylids are squatter and look a little like *Eleutherodactylus* from Central America, and like many eleuths, they have robber masks. Finally, the big-mouthed *Cyclorana*, whose closest relatives are treefrogs, are burrowers and look like the “Pacman frogs” (*Ceratophrys* spp.) of the Amazon. All of these crazy morphologies were produced within a single radiation of hylid frogs.

Interestingly, along with this startling morphological convergence with other frogs, the calls of these frogs also seem to converge on those of familiar American species. However, they're all mismatched. The Rocket Frog looks like a Leopard Frog but talks like the Green Treefrog (*Hyla cinerea*) back home. The Australian Green Treefrog (*Litoria caerulea*) sounds like a Bullfrog (*Lithobates catesbeianus*). The Roth's Treefrog looks like a Gray Treefrog (*Hyla versicolor*) but talks like a Leopard Frog. We once searched a Paperbark swamp for elusive *Crinia* — a group of endemic Australian frogs — with males that sound like Chorus Frogs (*Pseudacris* spp.), but which instead look just like Cricket Frogs (*Acris* spp.). Next



The Bilingual Froglet (*Crinia bilingua*).



The Marbled Frog (*Limnodynastes convexiusculus*). Photograph by Crystal Kelehear.



Ornate Burrowing Frog (*Platyplectrum ornatus*). Photograph by Crystal Kelehear.



The Floodplain Toadlet (*Uperolia inundata*). Photograph by Crystal Kelehear.

These four frogs belong to endemic Australian frog families (*Limnodynastes* and *Platyplectrum* in the family Lymnodynastidae; *Uperolia* and *Crinia* in the family Myobatrachidae). All have strange habits and often bizarre calls.

to them, Floodplain Toadlets (*Uperolia inundata*) clucked only occasionally from little flooded calling amphitheatres, not sounding like anything familiar, and with their brown, Vienna sausage-shaped bodies, they didn't look familiar either. The two endemic frog families in Australia are for the most part squat, terrestrial, bizarre, and toadlike, with strange and intermittent calls, perhaps reflecting their evolutionary conservatism, contrasting sharply with the recent creativity of the hylids.

We continued out Anzac Parade, and then drove several dozen kilometers east on the Arnhem Highway across endless marshes, swamps, and monsoon forests. This region is famous for its frequent displays of lightning, which lit up large thunderheads in the distance in bright yellow-blue pastels that never seemed to touch the ground. The place is very remote, and few hamlets or pubs are seen for miles. Dozens of Water Pythons (*Liasis mackloti*), attractive pythons with a pretty, iridescent sheen, fittingly mimicked the color of a bursting thunderhead. The reason I mention how attractive they are is to give them their due; snakers in Australia don't get excited by them because they are so common. They have



Spectacularly large and beautiful Water Pythons (*Liasis mackloti*) are very common and therefore somehow quickly become boring. I never got a photograph of one, but fortunately Crystal did. Photograph by Crystal Kelehear.

the status of other dirt common species, such as Gartersnakes (*Thamnophis* spp.), Cardinals, or Blue Jays, whose beauty is taken for granted due to their familiarity. I too quickly became bored with them, and as with most common species, I never got a decent photo of one.

On that first road cruise, I became thoroughly impressed by Crystal's road-cruising skills. Her eyes are beautiful — bright, intelligent, and brown — but I was now realizing how sharp they were. I am pretty good at spotting things on the road, having trained myself to see things as small as Dwarf Salamanders (*Eurycea chamberlaini*) from a speeding vehicle, and people in the car with me often are perplexed by how I do it. Now I found myself in the same situation. She was spotting things on the shoulder, things that hadn't even considered crossing the road yet. I took awhile to realize that this could work; you'd see a big Water Python face arched up a foot off the ground scanning the road from the grass, as if it was looking before it crossed. So naturally, she was the one who spotted the first dangerously venomous Australian elapid of the trip.

It had been barely poking from the grass near the Windows on the Wetlands visitor center, a very nice facility atop a large rock outcrop (Beatrice Hill) jutting out of the Adelaide River floodplain. She stopped the car and warned me to be quick, since locals often complain to park rangers about people getting out of their cars to harass snakes. They do this out of concern for the snakes. Okay, some things in Australia are unique. I got out to have a look, expecting this to be another Slaty-grey Snake (*Stegonotus cucullatus*) or some other colubrid. The Top End has the highest proportion of non-venomous snake species of any area of Australia (Shine 1997). Similar to the situation with hylid frogs, the subtropical and tropical north is the home of recent colubrid arrivals from Asia, along with lots of pythons. Although at first consideration you might think that this would make herpetology a safer proposition in the Top End, you would be completely wrong. Down south, where one encounters few non-venomous species, you get in the habit of treating all snakes with great respect. Up here you have to sort through lots of snakes and really know them well to avoid hassling the wrong kind. This snake needed no discerning. This was very obviously a Death Adder (*Acanthophis praelongus*).

Death Adders are shaped exactly like a pitviper, and thus another terrific example of convergent evolution. To me, it's the finest example of convergent evolution in nature. Australia has no vipers. It has been drifting along by itself in the southern ocean for so long that no viper ever got there. Even during periods of low sea levels, when hominids, colubrids, hylids, and microhylids rafted, slithered, or hopped from Asia, no viper ever reached Australia. Without any vipers, Australia came up with her own. Among the abundant elapids that have dominated the continent for some time arose an ambush hunter, and it set forth along a selec-

tive pathway identical to that of the first ambush-hunting vipers. These similar selective pressures produced a similar snake. Ecologically and morphologically, it can hardly be distinguished from a viper (Shine 1980), and early naturalists classified them as such (e.g., McCoy 1885). Adders even have a yellow-tipped tail they wriggle to lure lizards into zapping distance, just like many young vipers (Shine 1980). When I returned from this trip, I used Death Adders as an example of evolution for a class at a Christian school at which an old friend of mine teaches. He wanted his students to be familiar with evolutionary arguments, despite the fact that he'd been teaching them variations of creationism or intelligent design all year. I asked the students, "Why would God reinvent the viper? If He wanted vipers in Australia, why not just put one there?" Fans of intelligent design claim that DNA is the blueprint of the designer. Well, here is a snake whose blueprint clearly shows it is an elapid; its DNA is most similar to the cobras it doesn't resemble at all (Keogh 1998), rather than to the vipers it resembles closely. I was surprised to see a few light bulbs among the students. At least I think I did.

Like most vipers, this species is extremely well behaved. This fellow sat there harmlessly as we photographed it. On the way back, I saved face by spotting my own Death Adder on the road, and mine was much prettier than Crystal's.

Toad Busters

Cane Toads (now known by the new and improved name: *Rhinella marina*) were everywhere. My field notes for most of our road cruises read "Cane Toads ubiquitous." We could easily have collected about 40 in five minutes if we had been so inclined, and we could hardly keep from hitting dozens of them with the car. My goal was to collect one from a moving car like Nicolas Cage in the movie *Raising Arizona*. I succeeded.

Cane Toads arrived in Queensland in 1935 as part of a poorly conceived program to rid sugar cane fields of a pesky beetle, and, as the familiar story goes, the toads ignored nearly every beetle and instead stuffed their faces on anything else that could fit in their mouths, and then bred like, well, rabbits (Shine 2010). Of course, Cane Toads were introduced elsewhere, including Hawaii and southern Florida, but they really seem to adore Australia. It took them only 70 years to



A Northern Death Adder (*Acanthophis praelongus*) demonstrating just how cool convergent evolution can be. Death Adders also suffer whenever Cane Toads are introduced, and thus are another example of a species I was fortunate to see.

spread from the coast of Queensland to the Darwin area, and they're still hopping west, faster and faster with each generation, and recently crossed into Western Australia for the first time. They will surely reach the west coast in well under 100 years since their introduction.

The Shine lab has documented all kinds of interesting things about this invasion, such as the fact that certain morphological features (longer legs) are associated with the toads at the invasion front, which means that in only a few hundred generations the toads have evolved to be faster and longer-

Table 1. Species encountered during the trip to Top End, Northern Territory, Australia on 1 February–29 March 2011.

Environs of Humpty Doo and Fogg Dam

<i>Litoria caerulea</i> (Green Tree Frog)
<i>L. inermis</i> (Peter's Frog)
<i>L. nasuta</i> (Rocket Frog)
<i>L. rubella</i> (Red Tree Frog)
<i>L. rothii</i> (Roth's Tree Frog)
<i>L. tornieri</i> (Tornier's Frog)
<i>L. pallida</i> (Pale Frog)
<i>L. bicolor</i> (Northern Dwarf Treefrog)
<i>L. dablii</i> (Dahl's Aquatic Frog)
<i>Cyclorana australis</i> (Giant Frog)
<i>Limnodynastes convexiusculus</i> (Marbled Frog)
<i>Crinia bilingua</i> (Bilingual Froglet)
<i>Uperolia inundata</i> (Floodplain Toadlet)
<i>Rhinella marina</i> (Cane Toad)
<i>Carlia gracilis</i> (Rainbow Skink)
<i>C. rufilatus</i> (another Rainbow Skink)
<i>Ctenotus robustus</i> (Eastern Striped Skink)
<i>Cryptoblepharus metallicus</i> (Metallic Snake-eyed Skink)
<i>Glaphyromorphus darwiniensis</i> (Darwin Mulch-skink)
<i>Gehyra australis</i> (Top End Dtella)
<i>Amphibolurus temporalis</i> (Northern Water Dragon)
<i>Chlamydosaurus kingii</i> (Frisled Dragon)
<i>Varanus panoptes</i> (Yellow-spotted Goanna)
<i>Dendrelaphis punctulata</i> (Golden Tree Snake)
<i>Boiga irregularis</i> (Brown Tree Snake)
<i>Tropidonophis mairii</i> (Keelback)
<i>Stegonotus cucullatus</i> (Slaty-grey Snake)
<i>Demansia papuensis</i> (Papuan Whipsnake)
<i>Morelia spilota</i> (Carpet Python)
<i>Antaresia childreni</i> (Children's Python)
<i>Liasis mackloti</i> (Water Python)
<i>Acanthophis praelongus</i> (Northern Death Adder)
<i>Pseudonaja nuchalis</i> (Western Brown Snake)
<i>Crocodylus porosus</i> (Estuarine Crocodile)
<i>C. johnstoni</i> (Freshwater Crocodile)
<i>Chelodina rugosa</i> (Snakeneck Turtle)

Darwin Area

<i>Rhinella marina</i> (Cane Toad)
<i>Litoria caerulea</i> (Green Treefrog)
<i>L. dablii</i> (Dahl's Aquatic Frog)
<i>L. nasuta</i> (Rocket Frog)
<i>L. wotjulumensis</i> (Wotjulum Frog)
<i>Limnodynastes convexiusculus</i> (Marbled Frog)
<i>Heteronotia binoei</i> (Binoe's Gecko)
<i>Amphibolurus temporalis</i> (Northern Water Dragon)
<i>Furina ornata</i> (Ornate Moonsnake)
<i>Fordonia leucobalia</i> (White-bellied Mangrove Snake)
<i>Cerberus australis</i> (Dog-faced Watersnake)
Kakadu National Park
<i>Litoria rubella</i> (Red Tree Frog)
<i>L. caerulea</i> (Green Tree Frog)
<i>L. meiriana</i> (Rockhole Frog)
<i>L. coplandi</i> (Copland's Rock Frog)
<i>L. personata</i> (Masked Rock Frog)
<i>L. wotjulumensis</i> (Wotjulum Frog)
<i>L. nasuta</i> (Rocket Frog)
<i>L. dablii</i> (Dahl's Aquatic Frog)
<i>Cyclorana australis</i> (Giant Frog)
<i>Limnodynastes lignarius</i> (Carpenter Frog)
<i>L. convexiusculus</i> (Marbled Frog)
<i>Platyplectrum ornatum</i> (Ornate Burrowing Frog)
<i>Austrochaperina adelphe</i> (Northern Territory Frog)
<i>Oedura gemmata</i> (Marbled Velvet Gecko)
<i>Gehyra pamela</i> (Arnhemland Watercourse Dtella)
<i>G. nana</i> (Northern Spotted Rock Dtella)
<i>G. australis</i> (Top End Dtella)
<i>Pseudothecadactylus lindneri</i> (Giant Cave Gecko)
<i>Varanus mertensi</i> (Mertens' Water Goanna)
<i>Tropidonophis mairii</i> (Keelback)
<i>Furina ornata</i> (Ornate Moonsnake)
<i>Antaresia childreni</i> (Children's Python)
<i>Liasis mackloti</i> (Water Python)
<i>Chelodina rugosa</i> (Snakeneck Turtle)



Cane Toads (*Rhinella marina*) are the indestructible, globe-trotting anuran scourge of Australia. Photograph by Crystal Kelehear.

legged (Phillips et al. 2006). The lab also gets pulled into the controversial topic of toad control, often at odds with infuriated locals who “bust” toads with various inhumane contraptions, such as modified, reverse-intake leaf blowers. Since the lab has a long-term dataset on reptile populations from the area, they were among the few researchers who were able to document any substantial effect of the toads on the native fauna. Apparently, they aren’t really that much of a scourge, a fact that toad haters do not appreciate. A few species seem to decline when toads arrive, but most of these species are those that locals hate anyway (Doody et al. 2009). Rick joked that if he’d told rural Australians that he knew how to reduce the numbers of Quolls (a native marsupial carnivore) and King Brown Snakes (*Pseudechis australis*), without having to use traps or chemicals, they’d have jumped at the opportunity. Now these same folks are out with golf clubs busting the warty solution to their more substantial woes. Still, the toad invasion is not welcome by either misguided or informed standards, but the country and its citizens are becoming resigned to the fact that toads are here to stay and that they can’t do much about it. Perhaps given enough time, they too will find their place. They are certainly evolving their way into the native fauna. After all, it wasn’t too long ago when hylid frogs invaded, diverging into unprecedented forms unknown to the original inhabitants of Australia.

Skink of the Day

Although not well publicized, the animal for which Australia should be most well known is the skink. Forget about



Cane Toads (*Rhinella marina*) doing one of the things they do best. Photograph by Crystal Kelehear.



The Darwin Mulch-skink (*Glaphyromorphus darwiniensis*), along with dozens of species in the genera *Carlia* and *Morethia*, are just a few of the bewildering variety of Australian skinks.



This Metallic Snake-eyed Skink (*Cryptoblepharus metallicus*) was photographed in its natural habitat — the cinderblock walls of our field station. Snake-eyed Skinks have no eyelids, thus the name.



Burton's Snake Lizard (*Lialis burtonis*) eating a Rainbow Skink (*Carlia* sp.). The outrageous diversity of skinks in Australia is tracked by an assortment of skink eaters, such as this pygopodid. Photograph by Ruchira Somaweera.

Platypuses, Kangaroos, Dingoes, Cockatoos, Russell Crowes, and other well-known Australian fauna. Australia is the skink continent. One in every two reptiles you are likely to find is a skink. The field guide to Australian reptiles is three-fourths skinks (Wilson and Swan 2008). I know my math is fuzzy, but I need to make this point. Australia has a lot of skinks. Not only are there a lot of species of skinks (probably over 400), but each species can be found in bewildering numbers. Even for people who think skinks are unbearably boring (I include myself in that group), some skinks are worth noticing. Some are really big, like the Blue-tongued Skinks (*Tiliqua* spp.) and the Sleepy Lizards (*Tiliqua rugosa*). Also, skinks run the gamut along the spectrum of limblessness, from fully limbed to ridiculous numerical combinations of missing toes and limbs, on through to fully snakelike.

The best thing, however, about the skinks is that if you are sitting around bored, with nothing else to do, you can always go outside and catch yourself a new species of skink. If you feel the compulsive need to find new additions to a life list, you always have a new skink of the day. I took to doing this on days spent in the lab processing samples. I would go out and quickly search the walls of the lab or the apartment or flip a palm frond or rake back a bit of leaf litter, and within a minute, I'd have a new squirming brown skink. Then I'd settle down in a Zen trance, with an unpublished key to the lizards of Darwin graciously provided to me by Ruchira Somaweera, a brilliant herpetologist in Shine's lab. Ruchira was just finishing his dissertation on crocodiles when I met him, and he had already completed a book on the snakes of his native Sri Lanka. However, he's also a field herpetologist through and through. With the help of a dissecting scope (needed to count scales or discern the texture of scales on the tiniest of skinks), soon I'd have the skink identified. This was always a little bit challenging, yet enjoyable and rewarding, sort of like playing a board game. The thing of it is, practically every skink I found was a different species. The skinks seem to fill the combined niches of all the lizards and salamanders in the eastern U.S., and I'd bet they represent the same substantial chunk of vertebrate biomass in these subtropical woodlands as salamanders do in eastern deciduous forests (Burton and Likens 1975). The number of snakes and lizards that specialize on eating skinks in Australia provides further testimony to their diversity and abundance (Greer 1997).

Fleet, terrestrial skinks that look like racerunners (*Aspidoscelis*) are in the genus *Ctenotus*. Ninety-seven species of Australian *Ctenotus* have been described (Wilson and Swan 2008), and at Fogg Dam, they only appeared on the hottest cloudless days, which, as it turned out, were few. In addition, I found handfuls of small litter skinks, some shiny and iridescent (*Carlia* spp.), some striped and red-tailed (*Morethia* spp.), some long and undulate (*Glaphyromorphus darwiniensis*), and some plain and boring brown jobs that kept vanish-

ing into the grass. Then there were the concrete-colored wall skinks that were curiously camouflaged in the suburban environment in which they thrived. One is named the Metallic Snake-eyed Skink (*Cryptoblepharus metallicus*), a name any metal head can appreciate.

If you like skinks, and I know you don't, you'd love Australia.

Trip Highlight

We raced along Anzac Parade, enjoying the sunshine. It had rained all day and night for two weeks straight, and the phenomenon of monsoon rains had become very real to me. I had been in Australia for a month, but due to cloud cover had not yet seen the Southern Cross. A cyclone had even come and gone, and had fortunately spared the region the kind of devastating flooding that had drowned much of Queensland in 2011. Still, Estuarine Crocodiles (*Crocodylus porosus*) were turning up in people's swimming pools in Darwin, and the Arnhem Highway was impassable east of the Adelaide River. A University of Sydney tropical ecology class field trip was cut short, the students evacuated by helicopter. The rain started flooding the area on Valentine's Day, and Crystal and I could easily have become unlucky victims of Cyclone Carlos had she not had such good reflexes; on the way back from our date she slammed on the brakes just in time to avoid hitting a newly flooded section of highway at 120 kph. If I'd been driving we'd likely have been killed. The weather was grim, but it kept us stranded in the apartment with nothing else to do but fall deeply in love.

We had our sunglasses on for the first time in weeks, and near the intersection of Anzac Parade and the Arnhem

Highway I spotted a huge snake. It was broad daylight and smack in the middle of the road, so Crystal didn't see it.

"Snake! I don't think it's a Water Python," I said, alerting Crystal. Despite the fact that the snake was big, and long, and easily the size of a python, it wasn't a python, which left only a simultaneously dangerous and enthralling possibility. I became very excited. She tore the car around in U-turn, while I rapidly stuttered the word "snake" over and over again. It was still there, alert, with its head up. She urged me to be careful, but I was totally ready — a snake hook in one hand, a camera in the other, wearing shorts, a Hawaiian shirt, and flip flops. Some Aussies believe that some of their venomous snakes are in the habit of attacking people unprovoked, similar to our own misconceptions about Cottonmouths (*Agkistrodon piscivorus*), and Crystal had warned me about this. Undaunted, I got out and approached the snake.

"If you mess with it you'll be dead in twenty minutes," Crystal warned.

It stayed there, nearly six feet of olive snake, still alert on the road. I had no idea which brown snake it was because so many different kinds have been described and they are desperately in need of serious taxonomic attention. Imagine the situation if, say, the Rattlesnakes (*Crotalus* spp.) in North America were impossible to distinguish without seeing the color of the lining inside their mouths. That is the situation with the Brown Snakes (*Pseudonaja* spp.), and I'm not joking. The best way to tell the difference between the Eastern (*Pseudonaja textilis*) and Western Brown Snakes (*P. nuchalis*) is by noting the color of their gums (Wilson and Swan 2008), presumably while they savagely gnaw on your hand. Add to this variability and uncertainty, two more similar, variable,



Western Brownsnakes (*Pseudonaja nuchalis*) are alert, agile, very fast, and formidable — for the record, this one did not attack me.

and fantastically deadly species — the King Brown Snake (*Pseudechis australis*), which is actually a kind of black snake, and the Taipan (*Oxyuranus scutellatus*) — and you soon come to the unbelievably dangerous realization that the venomous elapids of Australia are about as easily sorted out as the Dusky Salamanders (*Desmognathus* spp.) in eastern America. Show a picture of one of these snakes to expert Australian snakers, and you'll get three different names, each preceded by a "probably." The most deadly terrestrial snakes on earth are hopeless brown jobs sorted out based on body proportions and general gestalt. Holy shit!

This snake, which we eventually figured was an unusually large and thick Western Brown Snake, was perhaps flushed from the lowlands by the flooding and was probably enjoying the sunshine as much as we were. It was as large as an Indigo Snake (*Drymarchon corais*) and shaped much the same. It allowed fairly close inspection, but I never had any intention of catching it. I photographed it, my heart racing as I admired its intelligent eyes, and then it hurled itself into a U-turn of its own, and quickly raced into the brush. It was very fast.

I got back in the car, shaking with enthusiasm and excitement. Unwisely, I said: "Wow! That was the highlight of the trip so far."

Crystal's eyes are bright, keen, and beautiful, but they become instruments of sheer terror when reflecting scorn.

Night in the Mangroves

We explored a mangrove swamp west of Darwin. It was associated with a tidal creek with steep banks of the dark organic mud typical of brackish waters. This site is teeming with mangrove snakes and seasnakes, and researchers from the Northern Territory Museum have begun marking and recapturing the specialized suite of snakes that occurs there. One night we tried our luck accompanied by Ruchira and Matt Greenlees, a recent graduate from Shine's lab. Matt bears a passing resemblance to an enormous Cro-Magnon version of Eddie Vedder, on whom Matt readily admits to having a man-crush. He's an immediately likeable guy, and not just because he likes Pearl Jam. Small, steep rivulets wandered aimlessly through the stout buttresses of the mangroves, the mud interrupted by thousands of pneumatophores, the little snorkels sent up by mangrove roots. The tidal creek could easily have concealed an ambushing crocodile, and I alarmed the Aussies by plunging around in the water, leaping across muddy creeks as though I was back in my Cottonmouth swamps back home. I heard them call out for me many times, checking to see if the splashing indicated my doom.

The mangroves supported a diverse assortment of invertebrates, such as crabs and giant flatworms, as well as numerous Mudskippers (Perciformes: Gobiidae: Oxudercinae), completely amphibious fish that can use their pectoral fins to walk on land. They were delightful, and one species was much larger than I had expected, at least as long as a banana. I



White-bellied Mangrove Snakes (*Fordonia leucobalia*) are assigned to the subfamily Homalopsinae. Homalopsines were formerly placed within the colubridae but are now considered a family of their own. Most species are rear-fanged mangrove snakes found from southeastern Asia through northern Australia. Photograph by Crystal Kelehear.

was able to catch one with my bare hands, and it required the same kind of strategy and dexterity needed to bring in a salamander. Sometimes I feel sorry for Aussie herpetologists, since Australia has not one salamander — but with fish like these, who needs salamanders? Crystal soon found a White-bellied Mangrove Snake (*Fordonia leucobalia*), one of three species of mangrove snakes along the northern coast of Australia. It was negotiating the pneumatophores, and was kinked like it would be if it had entered a rat maze. Several years ago I was at the national herpetology conference and some Aussie researchers presented one of the most memorable posters I've ever seen. It included a video of this species dismembering and chewing a crab. The poster had a large audience, and I overheard Whit Gibbons — executing an uncannily accurate impression of the actor Strother Martin — whisper to a colleague: "I guess we're gonna have to stop teaching that all snakes swallow their food whole."

Along one tributary I spotted a foraging Dog-faced Water Snake (*Cerberus australis*). It had the tip of its tail curled around a mangrove stilt, its periscoping eyes bobbing well above the



The Dog-faced Mangrove Snake (*Cerberus australis*) has a bizarre pop-eyed look derived from its periscoping eyes. They are agile, and this individual managed to put a fang in my hand when I captured it. Clearly the venom is not dangerous, for I lived to write this travelogue. Photograph by Crystal Kelehear.

water, its head and body dangling in the outgoing tidal current. I watched it for a while and then it let go of its anchor and quickly disappeared into the murky water. Another was just under the surface of the water of the larger tidal creek, and as soon as my headlight beam illuminated it, it dove. I charged it, splashing several feet into the dark, foreboding water, plunging my hand in deep, guessing where it should have gone. Instead I grabbed a leathery object that could only have been a crocodile's sneering face. My head suddenly snapped off into the murderous jaws of a 10-meter Estuarine Crocodile, and I was killed instantly. Actually, I was able to grab the snake by the tail, and before I could get my fingers around its jaws to secure it from biting me, it had already gotten hold of my hand with its sizable face. I felt a back fang slide into me. Then my neck became instantly swollen, my eyes popped out of my head, and I died of anaphylactic shock. Really, it didn't hurt much at all, and my hand didn't even swell, but I did panic a little. The Australian homalopsines are all venomous, but none dangerously so. The Dog-faced Water Snake is considered potentially dangerous, and I asked Ruchira, who has been bitten by nearly every snake known to science (and probably some unknown to science) what kind of maladies I should expect. He smiled, reassuring me that he'd been bitten by the species multiple times and had never experienced anything worse than cerebral ischemia, phlebitis, ptosis, hemoglobinuria, myasthenic facies, colicky, dysarthria, hypofibrinogenemia, or bloody diarrhea. Satisfied, I continued looking for more snakes. Still, I soon found myself compulsively monitoring the size of my hand, wondering if I was short of breath, whether I was getting tired or light headed,



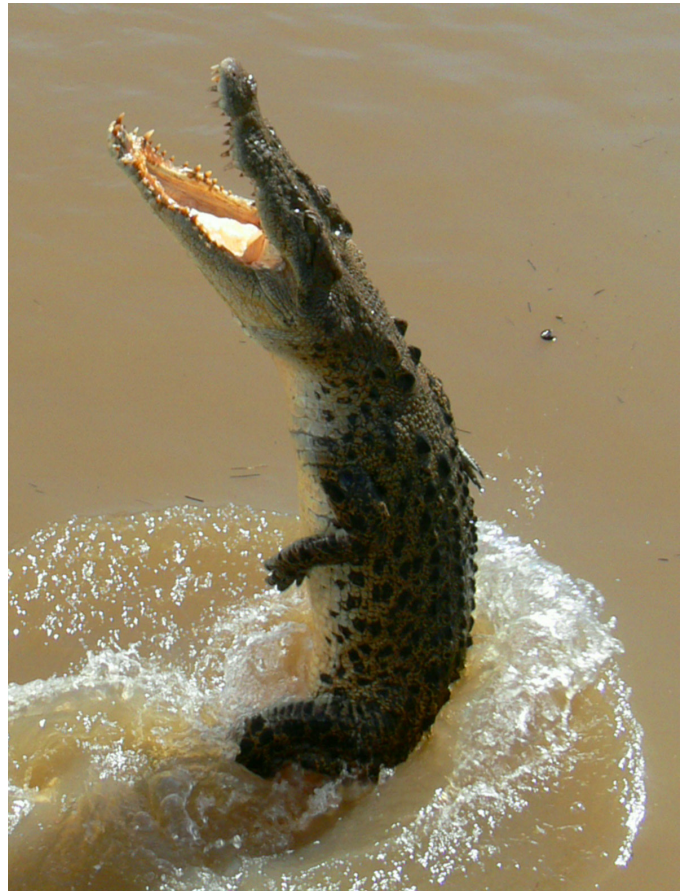
Mudskippers (Perciformes: Gobiidae: Oxudercinae) are completely amphibious fish that are Australia's answer for salamanders. Photograph by Crystal Kelehear.

and whether the feeling of impending doom I was experiencing was snake- or self-inflicted. Then I died.

Jumpin' Croc Cruise

Before I left for Australia, I went nuts studying field guides, reading about marsupials, and examining aerial images and maps of the region. I saw that Fogg Dam was long and straight, and nearly a mile across. It would make a perfect jogging route from the apartment and back, and I was sure I'd see all kinds of wildlife during my daily run. I never got to run across the dam. The reason was the crocodile.

The first night we drove across the dam we saw the beady eyeshine of a half dozen crocs, all of them small. We got good looks at a few, enough to identify both species found in the area — the Estuarine Crocodile (*Crocodylus porosus*), or “saltie,” and the thin-snouted Freshwater Crocodile (*C. johnstoni*), or “freshie.” Almost everyone knows that the saltie is the largest crocodylian on earth, and is therefore the largest “reptile” in the world. It also is an unrepentant man-eater, and unprovoked attacks by salties occur nearly every year. Many of these attacks take place in freshwater swimming areas where inexperienced tourists aren't aware of or ignore the danger. The freshie is much smaller and is not as prone to attack (however, before you get too comfortable, see Hines and Skroblin 2010 and Somaweera 2011). Neither species is particularly well informed as to which type of water they are supposed to prefer, and the saltie is certainly found well inland in freshwaters, which is why we found both species in the abandoned freshwater paddies along Fogg Dam. The dam had been closed to foot traffic due to the recent arrival of a 6-meter bull saltie,



An Estuarine Crocodile (*Crocodylus porosus*) demonstrates its athleticism on the Jumpin' Croc Cruise at the Adelaide River. Besides jumping abilities, these crocs really seem to exhibit surprising intelligence and do not appear to behave aggressively, unlike human-habituated alligators in the southeastern United States. Photograph by Crystal Kelehear.



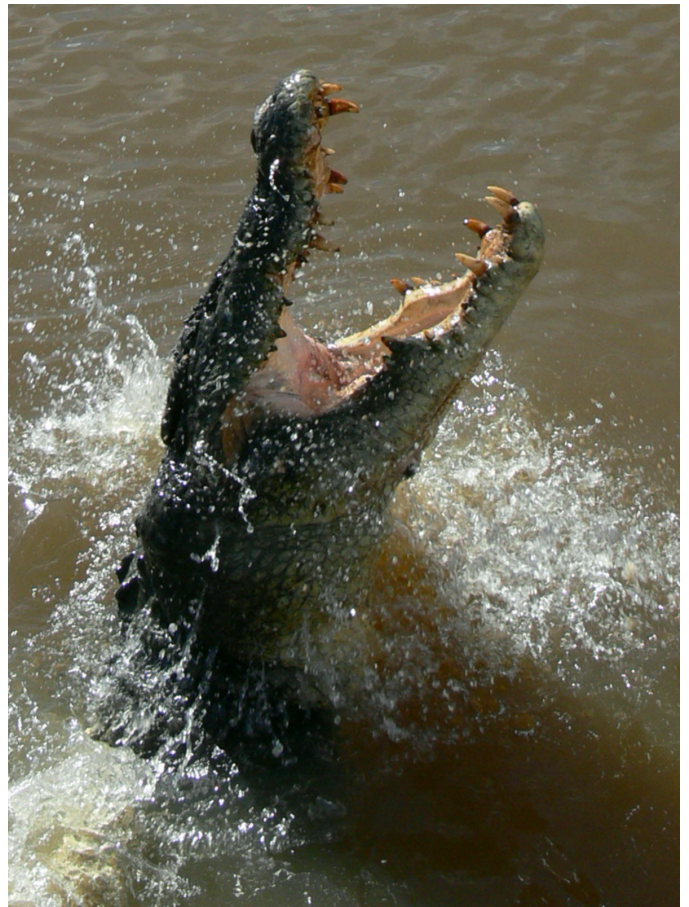
Freshwater Crocodiles (*Crocodylus johnstoni*) were common along Fogg Dam and are relatively harmless when compared to their larger cousins. Photograph by Crystal Kelehear.



A Jabiru Stork (*Ephippiorhynchus asiaticus*) and an Estuarine or “Saltwater” Crocodile (*Crocodylus porosus*) — make no mistake, this croc frequents fresh-water. Photograph by Crystal Kelehear.

who was occasionally sighted during my visit. I desperately wanted to make his acquaintance — but only from the relative safety of the car.

After the Adelaide River returned to its banks, we had some close encounters with salties by taking the Jumpin’ Croc Cruise, a cheesy, overpriced, but quite entertaining tourist operation. It was also pretty interesting. In brief, you go out in a big aluminum pontoon, a dude attaches pork chunks to the end of a tether, and lures crocs out to the middle of the river. Then they leap — surprisingly far and quite impressively — and snap the meat off the line. Their jaws make fearsome and scary slaps, like a major-league slugger hitting a baseball. It was very disconcerting to observe, or rather not to observe, how you couldn’t see the 3-meter crocs until they burst out and snatched the meat. Now, I’m going mostly by what the dude running the cruise said, but it really didn’t seem to be particularly exploitative or unsafe, and I saw a lot of interesting croc behavior that supported his story. I asked him if feeding the crocs was dangerous to other boaters on the river, figuring he’d laugh it off, slap my back, and explain, “Mate, there’s no way any bloke would be crazy enough to fish for barra’ in this bloody river, what with us feeding the bloody crocs!” Instead, he explained that the crocs recognized the sound of the Jumpin’ Croc Cruise pontoons, and never harassed small fishing vessels. He also knew every single croc by name — names like Charlie, Mad Max, Daisy, Bart, Shelly, and Tiny, of course — and I believe that the crocs he recognized were the same individuals he saw every day. I was especially surprised to see how the crocs really seemed to



The Estuarine Crocodile (*Crocodylus porosus*) is the largest ectothermic tetrapod on earth, and the 5–6 m individual we saw near Fogg Dam is the largest reptile I’ve ever seen. Photograph by Crystal Kelehear.

get into the program. They took one or two pork faces, and then turned around and headed back to the flooded forest. The cruise captain tried to lure out a big male for us (“Agro” of course), and apologized that the flooding likely had them prowling in the flooded forest for unsuspecting game.

One night we saw a large croc at the dam. He was positioned at the bottom of the spillway that runs over the dike about halfway across its length. His eyeshine was quite bright among the tinier glowing eyes of night herons and catfish. His eyes looked to be separated by a foot, which would make him a huge animal. Still, the way he was laying in the water concealed a lot of his tail, and the water seemed to wash over the tip of his snout, making him look like an Alligator. Was it the big boy? We couldn’t really see if he was impressively big or not, since he was pretty far away and our headlamps and spotlight couldn’t quite make him out. Perhaps it was another, more modestly sized croc. Still, I kept seeing those fiery eyes, a foot apart. We strained our eyes, hoping he would move so we could get a better look, trying to gauge his size. He lay there, unmoving, eyes blazing. Impatient, I got out of the car and picked up a few rocks. I pondered whether to toss a rock toward him, but thought better of it because that would be harassing a giant crocodile. The rocks plopped onto the ground harmlessly at my feet when the big finned tail suddenly appeared, itself about as large as the biggest Alligator I’d ever seen, and made a terrible swooshing sound as he lunged in the opposite direction, kicking up a splash like a jet ski at full speed. The nearly meter-long snout of the beast was momentarily visible as he quickly darted away, all 6 meters of him.

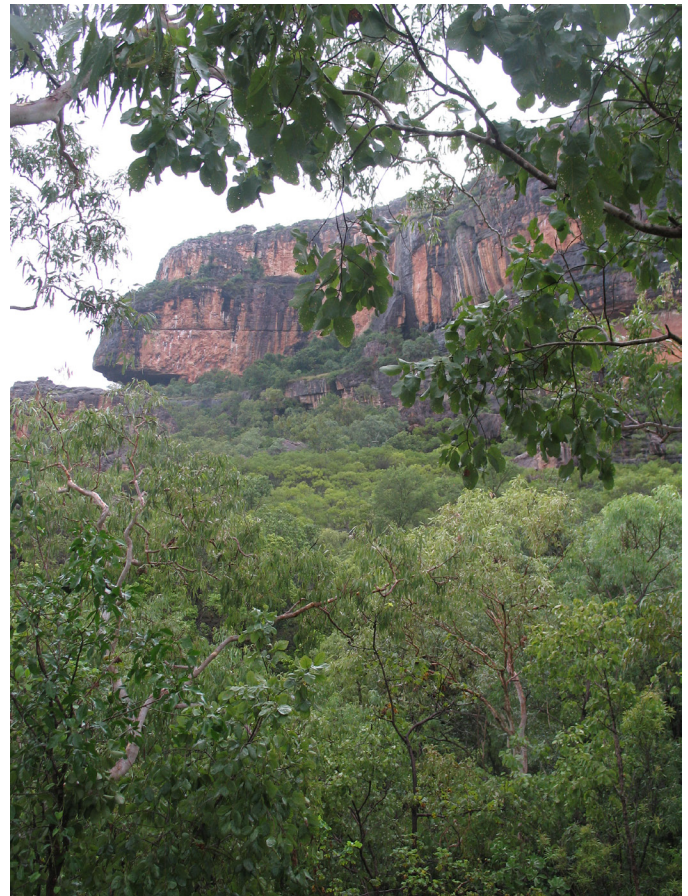
Kakadu

Since I already relayed my encounter with a Frilled Dragon (*Chlamydosaurus kingii*) as the finale of my previous travelogue, I have no other recourse now but to convey our highly successful bounty from a side trip to the spectacular Kakadu National Park as the finale to this one. This trip included a search for a species that was entirely unknown to me before coming to Australia, but which is one of the most highly coveted species sought by Australian herpetologists — the Oenpelli Python (*Morelia oenpelliensis*). For my part, I was quite satisfied to see the numerous common species of pythons that Australians don’t care about, and I had to put myself in the mindset of my Australian companions to appreciate how rare and wonderful this species is. That is, until I saw just how damn big they are.

Kakadu National Park is a couple of hundred kilometers east of Humpty Doo, at the end of the Arnhem Highway, and is the western leading edge of the Arnhem Escarpment, a massive uplifted sandstone plateau that makes up a substantial section of the Top End. Best of all, it allows tourists access to Arnhem Land, most of which is entirely off limits to anyone without authorization from its native inhabitants.

Matt Greenlees explained that up there in Arnhem Land, Aborigines were still practicing their traditional culture, a wonderful prospect. Many Aborigines I’d seen in Northern Territory were destitute. They did not appear to be participating in any culture, traditional or otherwise. One Aboriginal dude in Darwin was wearing a Slayer heavy metal T-shirt. Now, I never expected to see Aborigines out in the woodlands whacking goannas with boomerangs, any more than I expect to find Native Americans out on the plains wearing head-dresses and chasing Bison. But I was not braced for, nor had I ever known, that the situation is so bleak for these people.

Matt, Crystal, Tom Langström, and I headed to Kakadu. Tom is a new post doc in Rick’s lab, and he’s a modeler, for which Matt immediately began chastising him. He’s a very nice guy and a gifted musician, as talented at playing blues riffs as he is playing sinister, progressive Nordic metal. He’s from Sweden, as evidenced by the umlaut in his name. As we approached Kakadu, large sandstone mesas appeared, which was the first sign of any real sort of topography I’d seen in the whole country, since up until then we’d spent a majority of our time in the low coastal plain near Darwin. The red walls of the sandstone cliffs reminded me a lot of the scenery in



Given the astounding scenery, biodiversity, endemism, and cultural history, Kakadu National Park would have to be included in any discussion about the world’s greatest preserve.



These sandstone cliffs are the leading edge of Arnhem Land, a giant preserve for biodiversity and Aboriginal culture. Kakadu National Park allows tourists access to this landscape, which is otherwise forbidden. In the foreground is the bird-pollinated shrub *Grevillea*.

Arizona; however, here the floor and tops of the canyons and mesas were cloaked in luxurious subtropical forests. I thought to myself that when the American Southwest was a wetter place it might have looked something like this. The combination was as if you took Everglades National Park and dropped it on Monument Valley. Spectacular.

Just outside the park entrance we saw a small goanna in the middle of the road, and Crystal quickly turned the car around so we could identify it.

“Mertens,” Greenlees said, indicating this small green goanna was Mertens’ Water Goanna (*Varanus mertensi*). It was still on the warm highway, monitoring.

“Do you guys catch these things?” I asked, remembering my previous experience with the fleet *V. panoptes*.

“Sure,” he said, opening his car door. Excited to see how it was done, I got out too.

“I’ll be sure to flank it,” I said, again narrating for a nonexistent camera. He rounded the car and as soon as the goanna saw him (he’s quite a large fella), it bolted toward the marsh. Something came over me, and like a cougar watching a jogger run down a trail, my pupils dilated, my ears swept

back, my tail twitched, and I found myself sprinting after it. I would have paid big money to see a video of what happened next, or at least to have been able to see it from a bystander’s point of view. I was running at top speed, literally sprinting as fast as I could, really just to see how close I could get. I descended into the muddy ditch alongside the highway, right on its scaly little heels. I kicked up eruptions of mud with every stride — then it miscalculated. Had it darted into the marsh at an angle perpendicular to the road, I’d never have seen it again. Instead, it dove into the shallow water of the ditch, attempting to swim to safety. It was furiously undulating like a snake, but, smart as goannas are, this one didn’t realize the ditch was never going to be more than a foot deep. Still, I was pumping my arms and huffing furiously to keep up. I soon found myself closing in on it surprisingly quickly, and realized I had no way of stopping if I overtook the beast. So I laid out for it.

The Aussies and the Swiss dude doubled over laughing as they saw me trip and fall flat on my face. A thick slurry of black murk splashed into the air in slow motion as I belly-flopped into the ditch. The world became a giant gurgling brown wave, like those slow motion videos of a surfer’s point



Me and a Mertens’ Water Monitor (*Varanus mertensi*). Trying to catch a goanna is like trying to catch a River Otter bare-handed. Photograph by Crystal Kelehear.

of view in a totally tubular break, only brown. I laid in the mud momentarily, my grinning teeth dripping wet gritty marl, laughing at myself, understanding and coveting the extreme absurdity of how this must have looked to them. I stood, giggling uncontrollably, covered chest to toe in peaty sludge, my face spattered with muddy spunk. Then I victoriously lifted the goanna in the air for all to see.

Rain was falling furiously when we entered the park and drove across the South Alligator River marsh. We passed a lot of the rainy day in the Jabiru visitor's center museum, looking at nice displays about the wildlife and culture of Kakadu. One display featured a stuffed Oenpelli Python, and that's when I started to get excited about the prospect of seeing one. That specimen would easily have been the largest snake I'd ever seen. They are among the largest snakes in Australia, possibly outmatched in size only by the Scrub Python (*Morelia amethystina*), which is found farther east in tropical Queensland.

However, this big python is endemic to the Arnhem Plateau, and is thus much rarer. In fact, this species has been known to science only for exactly the same number of years that I have been alive (Gow 1977). They are an attractive gray dappled with brown saddles and have a large, handsome *Morelia* face. I was starting to understand my companions' fascination with this species, and inquired about our likelihood of seeing one. Greenlees replied that he'd been looking at Kakadu about nine times, and had yet to see one. However, with me along, as well as a Norwegian dude who wasn't even a herper, we had a whole lot of beginner's luck on our side.

We explored the rock walls of the Nourlangie Rock Anbangbang shelter during the day, something that was mystically important to me, something I think every human being on the planet should do. To me, this was like being able to see Neil Armstrong's footprints on the Moon. This is because this rock shelter contains art from the oldest and longest con-



Rock art at the Anbangbang Rock Shelter: The large portly figure on top is Namondjok, who later became the Estuarine Crocodile. Namarrgon, the Lightning Man, is the figure on top right, and his wife, Barrginj, is depicted down and to the left of Namondjok. This rock shelter illustrates beings important to the local Aborigine culture, and preserves a range of both ancient and more recent rock art; some of these paintings were touched up as recently as the late 1960s, when the meaning of the art was made known to anthropologists.

tinual cultural occupation of any place on the planet (Breedon and Wright 1989). A nearby rock shelter boasts artifacts dating back 30,000 years, overlain with evidence of occupation all the way through the the 1970s. Art at Anbangbang has similar antiquity, and ancient art was painted over with fresh expressions as recently as 1964 (Morwood 2002).

With this singular fact in mind, the spectacular rock art takes on as near a holy aspect as I am capable of appreciating. The art tracks endless spans of time, featuring animals that no longer exist or which now exist only far to the north along the coast. In effect, the art records the comings and goings of ancient sea levels. It records a time when humans coexisted with the now extinct Thylacine, the Tasmanian Tiger, and culminates with paintings depicting the arrival of Europeans — a decidedly creepy image of a faceless Whitefella with hands in his pockets. Some paintings even depict the Oenpelli Python, known as Nawaran by the local Aborigines (Breedon and Wright 1989), indicating that the locals had in fact described this species well before science did. The purpose and meaning of these paintings is elusive for modern folks. They relate stories of the Dreaming — a connection among all living things — and represent powerful totems, but this is a fantastically crude explanation. Despite the fact that anthropologists were able to consult with the



The figure in the center is wearing a hat and has his hands in his pockets. This painting from the European contact period is an eerie depiction of a Whitefella. Photograph by Crystal Kelehear.



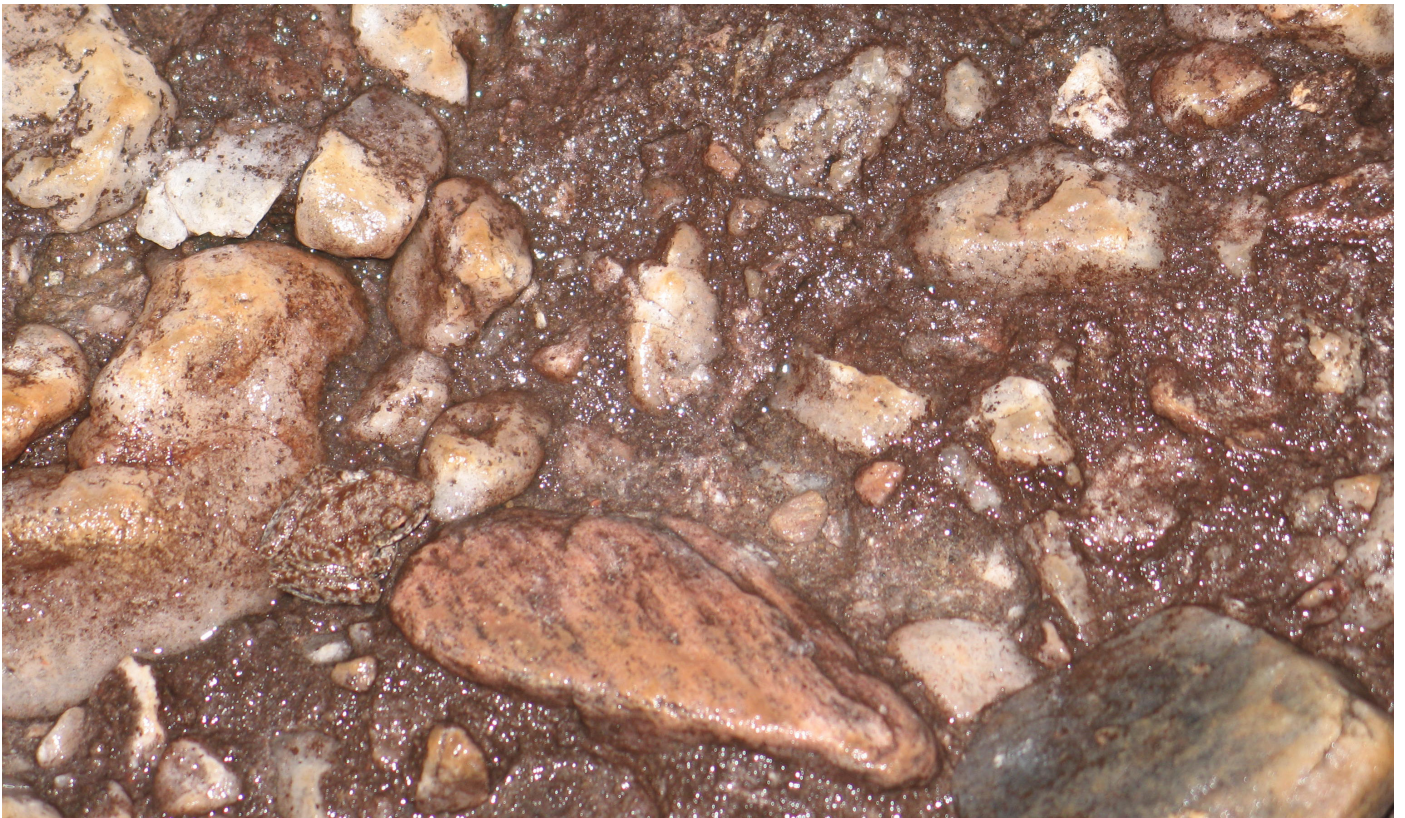
Nourlangie Rock art: A familiar Australian subject.

actual artists about the significance of some paintings (something not remotely possible for cave art in other parts of the world), they are still admirably inscrutable. I quickly become totally confused when trying to grasp their meaning or the Dreaming. Aborigines readily admit that Whitefellas cannot easily comprehend the Dreaming (Danalis 2010).

The rock walls echo with the past lives they once sheltered, and the paintings are gloriously mysterious and expressive. A kangaroo, rendered as large as life, as if by chalk yesterday but perhaps with pale clay some thousand years ago. Namarrgon, the Lightning Man, dances across the red walls, with other portly figures splayed wide and painted with weird spotted geometry, and those *hands*. Those stenciled hands! Why were hunter-gatherers obsessed with outlining their own hands? Such images appear in caves all over the world, and at varying times in prehistory. A recent *National Geographic* (Jenkins 2012) featured a poignant article about a surviving band of cave people — perhaps the last — in New Guinea, and there, on the walls of their cave, were the hands!



The Northern Spotted Rock Dtella (*Gehyra nana*) belongs to a radiation of climbing Australian geckos of relatively recent Asian origin.



This Rockhole Frog (*Litoria meiriana*) exhibits superb camouflage among the conglomerate sandstone of Nourlandje Rock. The tadpoles of this species are specialized for living in rock pools.



Copland's Rock Frog (*Litoria coplandi*) is another example of a rock-outcrop specialist. Photograph by Crystal Kelehear.



The Carpenter Frog (*Limnodynastes lignarius*). Photograph by Crystal Kelehear.

We continued exploring these rock shelters until well after dark, when numerous *Dtellas* (geckos in the genus *Gehyra*) emerged and skittered along the walls and boardwalk. We then drove to Nawurlandja, a large rock escarpment near Anbangbang Rock Shelter. We began to find frogs we'd not encountered near Darwin. We found the Northern Territory Frog (*Austrochaperina adelphe*), the only microhylid frog in Australia that can be found outside of the Cape York Peninsula. Thankfully, this little guy actually looked like what I expected — it resembled a cute, tan little Narrowmouth Toad (*Gastrophryne* spp.). Many more frogs awaited us, and many showed adaptations for living among the rocks. Copland's Rock Frog (*Litoria coplandi*) was perfectly camouflaged against the pebbly conglomerate sandstone. The tadpoles of *Litoria meiriana* had a rock-sucking oral morphology. We found a very large and very pretty diplodactylid gecko, *Oedura gemmata*, which was about the size of a Collared Lizard (*Crotaphytus collaris*), and was an excellent subject for



This little Top End Frog (*Austrochaperina adelphe*) was the only species I encountered that behaved itself, morphologically speaking; it is a microhylid and it looks like a microhylid. The other Australian members of the family Microhylidae are found in northern Queensland. Photograph by Crystal Kelehear.



Large, terrestrial Marbled Velvet Geckos (*Oedura gemmata*) are members of the endemic Australian diplodactylid gecko radiation. Photograph by Crystal Kelehear.

portraits. However, the anticipation was killing us, and we searched intensely for the Oenpelli Python, which is probably found more often on this particular rock outcrop than in any other place in Australia. Still, I had seen over 100 species of amphibians and reptiles over the past month, including nearly every species that made up my trip wish list, and some species I hadn't even known existed, and seeing an Oenpelli Python wouldn't *necessarily* clinch the perfect herpetological adventure, would it? Well, it was getting late so we left.

Due to our inability to fathom such an important creature, we never found Nawaran.

Different Seasons

The Aboriginal inhabitants of Arnhem Land named six seasons for the passage of time in northern Australia, which correspond quite well to the regional weather patterns and plant and animal phenology, making them a far more appropri-



Adult Children's Pythons (*Antaresia childreni*) often are mistaken for young Oenpelli Pythons (*Morelia oenpelliensis*) by overeager herpetologists. Despite the name, this species is named for some guy named Children and is not known to consume young humans. Photograph by Crystal Kelehear.



A Carpet Python (*Morelia spilota*); pythons in the genus *Morelia* are Australia's largest, and include the Scrub Python (*M. amethystina*) of Queensland and the highly coveted Oenpelli Python (*M. oenpelliensis*) of Arnhem Land.

ate scheme than the four seasons and twelve months of the temperate Northern Hemisphere. These are the Gudjewe, Banggerreng, Yegge, Wurrngeng, Gurrung, and Gunumeleng (Morris 1996). I left the United States on 31 January — the South still locked in winter — and arrived in the Top End during Gudjewe, the monsoon season, which felt much like a wet July summer in Georgia. The Spear Grass was still short and green and it rained nearly constantly. When I left the Top End, the first “knock-em-down” storms had begun, the floodwaters began to subside, and the Southern Cross appeared at last. The head-tall Spear Grass was seeding, and was pushed flat in some places by storms, indicating that Banggerreng, or harvest time, had begun. I flew from Darwin to fly home out of Sydney, and Crystal came along to meet with Rick about her dissertation and to see me off. In Sydney, which is at about the same latitude in the Southern Hemisphere as Atlanta, Georgia, is in the northern one, we spent one more day together exploring the harbor. I saw the famous harbor bridge, opera house, royal botanical gardens, and a Wollemi Pine, a critically endangered Australian endemic. It was overcast and cool, a misty autumn day. I flew home on 28 March to the beginning of spring in America, having experienced six seasons in two months.

During my visit in Australia I had seen over 100 species of amphibians and reptiles, learned that Crystal is an excellent cook, that she was serious when she said she liked hip-hop music, that she grew up hearing her father read stories about a rambunctious Koala named Blinkie Bill, that one of her photographs was published in an Australian wildlife photography book, and that I had at long last found the woman I would marry. Before I got on the plane, I kissed Crystal goodbye, promising her I'd be back. I didn't know when — I had my own dissertation to complete — but I'd be back. It was emotional, and the pesky mold spores in the airport terminal made my allergies act up, so I sniffed and some tears might accidentally have welled up in my eyes.

She said: “I'll wait for you.”

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Knock-em-down storms are brief thunderstorms that knock flat the 3-m high Spear Grass and are signs that Bangerreng, the harvest time, has begun. Photograph by Crystal Kelehear.



The Sydney Opera House and Harbor Bridge viewed from the Royal Botanical Gardens.

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Fogg Dam at dusk. Photograph by Crystal Kelehear.