



## TRAVELOGUE

# Reptiles, Rarely Seen Amphibians, and Rainfall: The Trifecta of Optimal Herping in the Outback

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Photographs by Maria Eifler and Drew Dittmer.

Welcome to the Australian Outback, a herpetologist's haven. Located in the southwestern region of the Northern Territory is Uluru-Kata Tjuṯa National Park (UKTNP), home to the richest reptile biodiversity in all of Australia's arid lands (Reid et al. 1993). The park landscape consists of semi-arid grassland with a red sand substrate nestled between two large, prominent rock outcrops (Uluru and Kata Tjuṯa), each with great cultural significance to

the Aborigines who call the park their home. The area has been described as vast, desolate, and inhospitable, but to the trained eye and the savvy visitor, living amidst the aptly named Porcupine Grass or Spinifex (Poacea: *Triodia basedowii* and *Plectrachne schinzii*) is an amazing variety of herps waiting to be revealed.

The indigenous Australian owners of UKTNP refer to themselves as Anangu, which means "the people" in



**Fig. 1.** The two rock outcrops of Uluru-Kata Tjuṯa National Park (UKTNP), Northwest Territories, Australia: (A) Uluru and (B) Kata Tjuṯa.



**Fig. 2.** Spinifex is a spiny grass that grows in large clumps throughout the Outback. As the plant grows, more vegetation is added to the outside and the center begins to die, providing both a characteristic shape and fuel for ecologically important fires.

Pitjantjatjara and Yankunytjatjara, the two major native languages of the region. Many species of reptiles are held in high regard by Anangu, both as subjects of their own creation stories and as *kuka wiru*, the Pitjantjatjara phrase for good meat. Sand Goannas (*Varanus gouldii*) are known as *tinka* in Pitjantjatjara and are a prized food (Reid et al. 1993). Mutitjulu Community Rangers (MCR, the local community ranger program at UKTNP), often assist with checking pitfall traps. Whenever Sand Goannas are captured, the MCR are quick to point out the size of the hind legs and the base of the tail on these lizards, while commenting on those areas as the source of the best meat.

During the sampling seasons of 2013–2015 (October–April), Black-headed Goannas (*Varanus tristis*), known as

Mulymaru in Pitjantjatjara, were the most common goanna captured in pitfall traps around Uluru. Mulymaru are a bit smaller than Sand Goannas, although they still appear to be suitably sized for eating. However, MCR are generally fearful of Mulymaru. When asked why Mulymaru aren't considered *kuka wiru* the general answer is that they cause bad dreams. Notably, Anangu culture is strongly guided by Tjukurpa, which refers to aboriginal law and important oral histories. Tjukurpa is very personal and important to Anangu; most of the laws and lore are not shared outside of communities and traditional elders. With that in mind, the Tjukurpa surrounding the story of Mulymaru is likely a very important story that is meant to be told only by senior community members at the appropriate place during the correct time.

The goannas are certainly common subjects in Anangu cultural histories, but the Kuniya or Woma Python (*Aspidites ramsayi*) is credited for the creation and existence of many of the physical features at the base of Uluru, including some of the waterholes. Woma Pythons are arguably one of the most attractive snakes occurring in UKTNP, and like the Sand Goannas are considered *kuka wiru* by Anangu.

Woma Pythons also are known to predate upon another edible reptile, the Great Desert Skink, (*Liopholis kintorei*), known by the Anangu name Tjakuṛa. Great Desert Skinks are large lizards that live in communal burrows in the spinifex sand plain habitats of UKTNP and west central Australia. Saying that Tjakuṛa live in “communal burrows” is actually a vague description of this lizard's social behavior; Tjakuṛa are one of the few lizards currently known to construct burrows where entire families of related lizards live together in a burrow complex (McAlpin et al. 2011). Generally speaking, Anangu hold in reverence two overlapping qualities of wild-



**Fig. 3.** The Sand Goanna (*Varanus gouldii*) is a large local lizard that is coveted by indigenous people for meat, and is the most widespread and abundant goanna in Australia. Its distinctive deep, sloping burrows are commonly encountered throughout open sandy areas, where the species thrives.



**Fig. 4.** The smaller, less commonly seen Black-headed Goanna (*Varanus tristis*) is not typically eaten by Anangu as it is believed to cause bad dreams. This lizard is widely distributed in arid Australia, where it is most abundant in woodlands and rock outcrops.



**Fig. 5.** The Woma (*Aspidites ramsayi*) is a python central to much of Anangu cultural lore, serving as the focus of their creation story and in their interpretation of the origin and physical features of Uluru. The snake is abundant in woodlands and shrublands, often sheltering in Spinifex.



**Fig. 6.** Tjakura (*Liopholis kintorei*) are important Anangu cultural icons and stand out because they occupy communal burrows throughout arid sand-flats dotted with Spinifex. Their burrow systems can house multiple generations of family members. They are secretive, historically hunted for food, and are critically endangered, with very little known about their biology.



**Fig. 7.** The Australian desert is littered with holes of all shapes and sizes. Tjakura holes are readily distinguished by their shape; burrow systems are considered active when Tjakura tracks are present, other Tjakura holes are found nearby, and an active latrine is present.



**Fig. 8.** Male Military Dragons (*Ctenophorus isolepis*) are boldly striped and colorful (A), whereas females are drabber in appearance (B). They live and forage on the ground in arid sand-flats.

life species; the animal is good to eat (kuka wiru) and displays familial behaviors. Published accounts of Tjakura mention the novelty of their social behavior (McAlpin et al. 2011), but Anangu have been familiar with this lizard's behavior for countless generations.

### Pinball Lizards of Oz

During the austral summer (December through March) daytime temperatures soar well above 40 °C (100 °F), and nights often remain warm (-21–23 °C or 70–73 °F). Few lizards tolerate the high heat and intense sun of the Australian Outback, although Military Dragons (*Ctenophorus isolepis*) are among the last to seek refuge from the daytime heat. Males bear a bold, dark lateral stripe (they are said to resemble “Redcoats”; hence the common name), whereas females are much more cryptically colored. They move notoriously fast, racing from one Spinifex clump to another when approached, giving the appearance of a dark ball “bouncing” through the habitat like a pinball! Sometimes, Military Dragons will flush out other denizens of the Spinifex, like the Spinifex Slender Blue-tongues (*Cyclodomorphus melanops*), the fast-moving, rarely seen Barred Wedgesnout (*Ctenotus schomburkii*) or Tjimpilka (“dragon lizards”) that include the secretive Canegrass Dragons (*Diporiphora winneckeii*).



**Fig. 9.** Canegrass Dragons (*Diporiphora winneckeii*) can be spooked from Spinifex clumps on hot days, or can be found by road cruising after rains during termite emergences.



**Fig. 10.** The rarely seen but abundant Slender Blue-tongued Skink (*Cyclodomorphus melanops*) spends its days sheltering in Spinifex clumps.



**Fig. 11.** Barred Wedgesnouts (*Ctenotus schomburkii*) can move very fast and frequently seek shelter in Spinifex clumps.



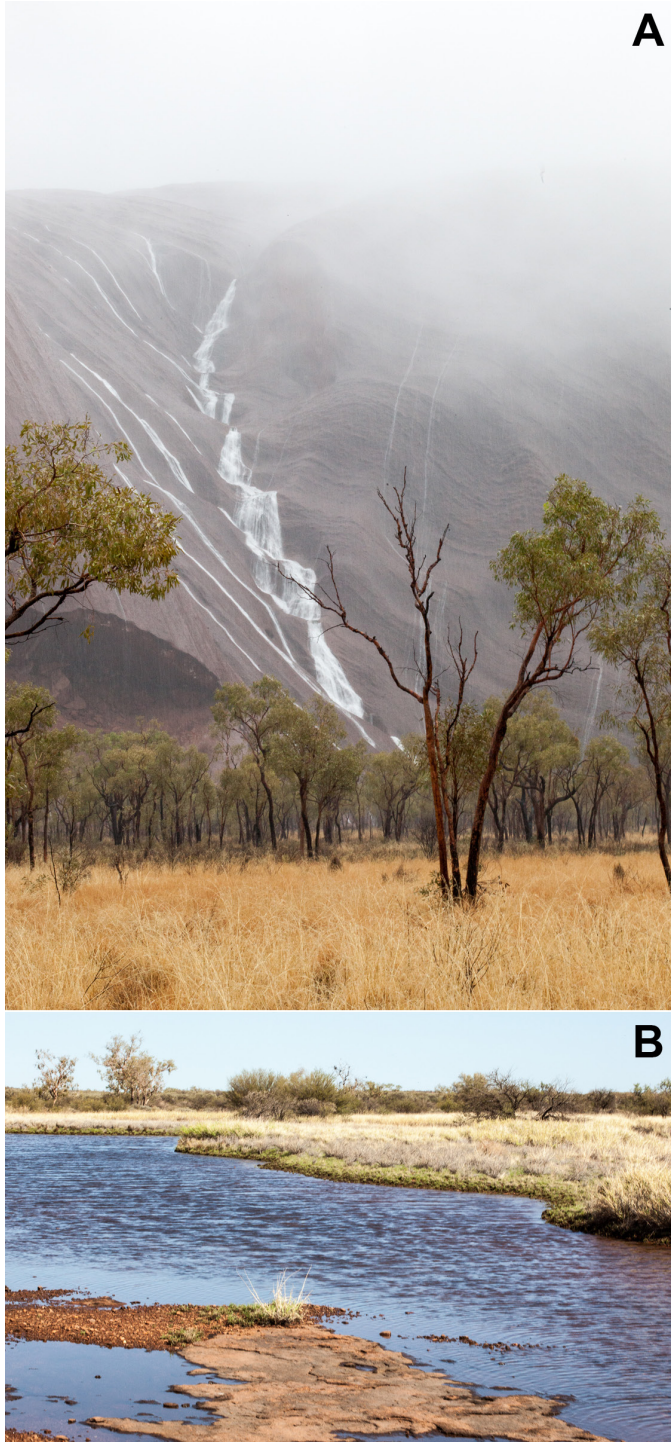
**Fig. 12.** Centralian Earless Dragons (*Tymanocryptis centralis*) are sit-and-wait predators, often seen sunning themselves or waiting for prey to come by on hot, sunny days along tourist trails around Kata Tjuta.



**Fig. 13.** While the landscape of the Red Centre always has an intimidating appearance, the conditions look especially bleak after a bushfire.

trails through Kata Tjuta is the basically unstudied Centralian Earless Dragon (*Tympanocryptis centralis*). Unlike most agamids, Centralian Earless Dragons freeze when seen, relying more on rock mimicry than speed to escape threats; however, they move very fast when stillness fails to deter a pursuer.

Fortunately, summer in the Outback coincides with the rainy season, providing a hiatus from the scorching heat and



**Fig. 14.** During seasonal rains, water pours down the crevices in Uluru, frequently cascading into temporary waterfalls (A) and forming vernal ponds (B).



**Fig. 15.** Shield Shrimp (Brachipoda: *Triops australiensis*) thrive in the ephemeral pools that form during the rainy season.



**Fig. 16.** Termites (Isoptera) swarm following heavy rains, as do ants (Hymenoptera; pictured). Winged ants and termites (*alates*) are either females capable of become queens, or males that fertilize their eggs during nuptial flights.

intense sun. When the rains come, the desert comes to life, invertebrate populations peak, and many normally unseen herps, including frogs, are out to capitalize on the abundance.

### Sinful Frogs

Frogs of the Australian Arid Zone lead a slovenly, sinful, indulgent existence. After spending months resting below ground, they emerge briefly to eat and have sex before going back underground. The Australian Outback is unforgiving to any creature that lingers long enough to experience the oppressive heat, but the Outback is specifically unforgiving to an amphibian that relies on moist conditions to breathe and reproduce. When rains arrive, shallow pools fill with clear, cool waters and termites, as well as other insects, are stimulated to swarm. Swarming ants and termites and shallow pools of water are the bread and butter of amphibian sin; gluttony and lustful orgy abound as the frogs fully embrace the rain's offerings. Male frogs will call (although not very melodiously) to all of the large, rotund females, and the females often will



**Fig. 17.** The Desert Spadefoot Toad (*Notaden nicholtsi*; A) is the most “toad-like” of the amphibians occurring in UKTNP. Rarely observed at the base of Uluru, the species prefers the swales between sand dunes found in central and eastern portions of the park. The Common Spadefoot Toad (*Neobatrachus sudelli*; B) makes a very brief appearance during and after heavy rainfall. It breeds in ephemeral water holes at the base of Uluru and also is commonly observed at night on the sealed roads of UKTNP feasting on swarming termites. The Shoemaker Frog (*N. sutor*; C) was abundant at the base of Uluru during the pitfall sampling of 2013–2014. This frog has a particularly notable call, producing a steady tapping noise resembling the tapping of a wooden block in an echoing chamber. Main’s Frog (*Cyclorana maini*; D) is the most abundant frog at the base of Uluru. Often for weeks after a heavy rainfall these frogs can be observed floating on the surface and swimming through the two water holes accessible by tourists. In the early morning after heavy rainfall they can sometimes be heard wailing loudly, producing a sound similar to the bleat of a sheep.

find themselves beneath a pile of male frogs wrestling for the best position for successful reproduction.

Of course reproduction will take place, eggs will be fertilized and tadpoles will be born — but arid-zone amphibians are inattentive parents; many tadpoles will be born into environments unsuitable for their development. Actually, that is an understatement; many tadpoles will be born into lethal environments. Entire cohorts of tadpoles end up as desiccated carcasses on the cracked mud of their sundrenched birth pools.

This is, of course, only one way to view desert frogs. Amphibians could also be seen as amazing survivors in the harsh arid conditions of the Outback. They patiently bide their time beneath the surface of hot desert sands. Somehow they know to surface during rainfall to feast and breed, and they know to retreat below ground as humidity drops and temperatures rise. Furthermore, Outback rainfall usually causes night-time temperatures to drop, which excludes many Outback predators from a frog meal.



**Fig. 18.** Within 24 hours after rainfall tadpoles can be found in Uluru's water holes, which are off limits for swimming or wading. Sampling for amphibians was conducted under permit and with explicit permission from the local Aboriginal community.

Although all Outback frogs must wait to surface during rainy conditions if they hope to breed and eat, the four species at Uluru have a nuanced approach to the how, when, and where of their brief time on the surface. The Desert Spadefoot Toad (*Notaden nichollsi*) is the only species of frog occurring in UKTNP that is rarely found at the base of Uluru and is not known to use the ephemeral pools to breed. Overall, very little is known about *N. nichollsi* other than the fact that during rare Outback rainfall events the species will emerge from beneath *Spinifex* on the dunes, sand plains, and swales in an impressive show of abundance (Morton and Hobbs 1993). The two Outback species in the genus *Neobatrachus* commonly breed in the ephemeral pools at the base of Uluru, where both the Common Spadefoot Toad (*N. sudelli*) and the Shoemaker Frog (*N. sutor*) are very abundant. The surface activity of these two species is exceedingly brief; they emerge right before or during rainfall and breed for a couple of nights, and then usually are not seen or heard again until sufficient rain falls once again. The fourth species of frog that occurs in UKTNP and breeds at the base of Uluru is Main's Frog (*Cyclorana maini*). This species is by far the most abundant; adults can and often do remain surface-active near ephemeral water holes for many weeks, and commonly aggregate around puddles on dirt track roads.

Even tadpoles of arid-zone frogs are sinful, though certainly not lustful — their reproductive bits aren't really a "thing" yet — gluttony and cannibalism characterize their sins. To be fair, arid-zone tadpoles are often born into resource-poor situations; feel free to blame their negligent parents. They have rasping mouthparts that are adept at scraping algae and other plant materials off the surface of stones and rocks. However, several thousand tadpoles don't need much time to consume most of the available plant material in their lentic and rapidly evaporating pools. Some tadpoles

succumb to starvation, and healthier tadpoles do not hesitate to descend upon their struggling siblings, mercilessly rasping away at their carcasses. Even the shins and feet of ambitious field biologists will be eagerly scraped by these portly polliwogs.

While the correlation between rainfall and arid zone amphibian emergence has been well documented (Navas and Carvalho 2010), falling rain is likely a secondary environmental cue for emergence (Carvalho et al. 2010). The ovaries of female frogs in arid environments in Brazil and North America develop well in advance of any cues that would forecast rainfall in their local environments, and many adult amphibians have been captured with food in their stomachs just prior to the onset of rainfall, suggesting that they were active and foraging well before any rain showers (Carvalho et al. 2010). While the physical nature of raindrops penetrating soil is unlikely to be "the" cue that causes arid-land amphibians to be active, many frog species undeniably concentrate their activity to periods coinciding with rain.

### Swarming

From 6–9 January 2015, UKTNP received more than 50 mm of rainfall, which represents the sixth time in three years that that much rain had fallen. Without fail, heavy rainfall results in a notable inundation of insects. The invertebrates follow a somewhat orderly pattern after heavy rainfalls, starting with ground burrowers whose homes are threatened with floods:



**Fig. 19.** During later stages of their development, Main's Frog (*Cyclorana maini*) tadpoles at Uluru become rather bold with regard to their foraging, rasping the exposed feet of any field biologist willing to endure the intense tickling.





**Fig. 20.** Termite mounds can become quite large over time, and some resemble castles.



**Fig. 21.** Following rains, dozens of chimneys appear throughout the sands of the Outback. Reproductive termites (*alates*) emerge from these straw-like tubes to start new colonies.



**Fig. 22.** Beaked Geckos (*Rhynchoedura ornata*) are termite specialists that are small enough to live in spider burrows.



**Fig. 23.** Fat-tailed Geckos (*Diplodactylus conspicillatus*) are known to confuse predators with their tails that resemble a head. The tail can be easily released in the event that a predator inadvertently grabs the “wrong” end (or would that make it the “right” end?).

ground spiders (Mygalomorphae), scorpions, and centipedes are followed by crickets, and then carab beetles, along with winged ants and termites (Read 2003). If royalty exists in the world of insects, then termites are the best example. Unlike eusocial hymenopterans (ants, bees, and wasps), the colonies of which are almost entirely comprised of related sisters, termites have both males and females filling most of their social castes. Furthermore, “king” as well as “queen” termites are represented. In the world of termites, the process of becoming a queen or king is practically as complex as the royal hierarchies and successions in our own (human) manifestation of royalty.

Similar to the way in which human royalty provided the impetus for the construction of pyramids and cathedrals, termites often construct their own ascending structures. Termite mounds serve the very practical purpose of housing the work force and providing protection for offspring. After heavy rainfall, many species of termites at UKTNP construct ephemeral tubes that are essentially launch pads for the next generation of reproductive adults to disperse and build new colonies. The tubes are slightly larger than drinking straws in width and length and are constructed by the thousands after just a few

hours of heavy rainfall. From these tubes, millions of winged termites emerge and fill the air. Termites are rather poor fliers relative to other insects, but in the flat light of dawn and dusk millions of clumsy wings can be seen beating across the landscape. Upon landing, most termites will immediately shed their wings. The millions of shed wings accumulate in the corners of open buildings, cover the surface of roadside puddles, and generally scatter across the landscape like the autumn leaves in deciduous forests.

The many lizard species of UKTNP are quick to capitalize on termite emergences, and some are termite specialists that are found only in areas of high termite activity. The Beaked Gecko (*Rhynchoedura ornata*) has the additional distinction of sheltering in spider burrows. Another lizard that specializes on termites and occupies spider holes is the Fat-tailed Gecko (*Diplodactylus conspicillatus*), the tail of which looks like a second head and which the gecko uses to block the vertical entrance of its burrow. While some lizards are active all year, swarming termites cause lizards to exhibit activity all day and all night. Light rainfall at the base of Uluru in 2013 caused a small termite swarm when the ambient temperatures were roughly 21 °C (69.8 °F); simultaneously dozens of Helen's Skinks (*Ctenotus inornatus helenae*) began swimming through rather cold puddles to retrieve crashed, drowning termites from the water's surface (Dittmer, unpubl. data).

### Road Cruising

If you're fortunate enough to be driving in the late afternoon through the remote Australian Outback during a termite swarm, keep your eyes peeled and you will see a plethora of lizards representing dozens of species. Many of the lizards will be in mid-chomp on freshly seized termites. After sunset, these lizards will be joined by thousands of frogs; while frogs in the arid Outback lands are not notably diverse, they are notably abundant, likely comprising the most plentiful vertebrate in Australia's arid lands (Morton and Hobbs 1993).

Some of the first lizards seen sitting on or crossing the road in the early to mid-afternoon are those in the family

Agamidae. Most of the agamids that occur in UKTNP have relatively high preferred body temperatures, particularly the Central Netted Dragon (*Ctenophorus nuchalis*), Spotted Military Dragon (*C. maculatus*), and Canegrass Dragon (*Diporiphora winneckeii*). All three strike an alert pose when sitting in the road. If the car pulls over, many of these agamids can be approached surprisingly closely before they dash to cover on the shoulder of the road.

Another pair of lizards commonly seen crossing the road in UKTNP are the Centralian Blue-tongued Skink (*Tiliqua multifasciata*), often observed on the roads that cut through Spinifex habitats well after sunset, and the Western Blue-



**Fig. 25.** This Central Netted Dragon (*Ctenophorus nuchalis*) demonstrates the posture that these and other dragons often assume when basking on sealed roads in the afternoon.



**Fig. 24.** The most speciose genus of skinks (Scincidae) in Australia is *Ctenotus*, with well over 100 species. Helen's Skink (*Ctenotus inornatus helenae*) is one of the more commonly seen representatives of the genus in UKTNP.



**Fig. 26.** The two Blue-tongued Skinks that are abundant in the Outback are distinguished by the breadth of their stripes. The Centralian Blue-tongue (*Tiliqua multifasciata*; A) has narrow stripes, whereas the Western Blue-tongue (*T. occipitalis*; B) has much wider stripes.

tongued Skink (*T. occipitalis*), more commonly observed crossing the road in the early morning or mid-to late afternoon.

On the roads at Uluru, the period leading up to dusk is also a prime time to see the Thorny Devil (*Moloch horridus*), which is among the most famous and iconic of the Australian lizards. Thorny Devils have a unique strut that they maintain even when approached while crossing the road. Unfortunately, due to their rather slow nature and their fondness for road basking, these lizards are one of the most common roadkills in UKTNP.

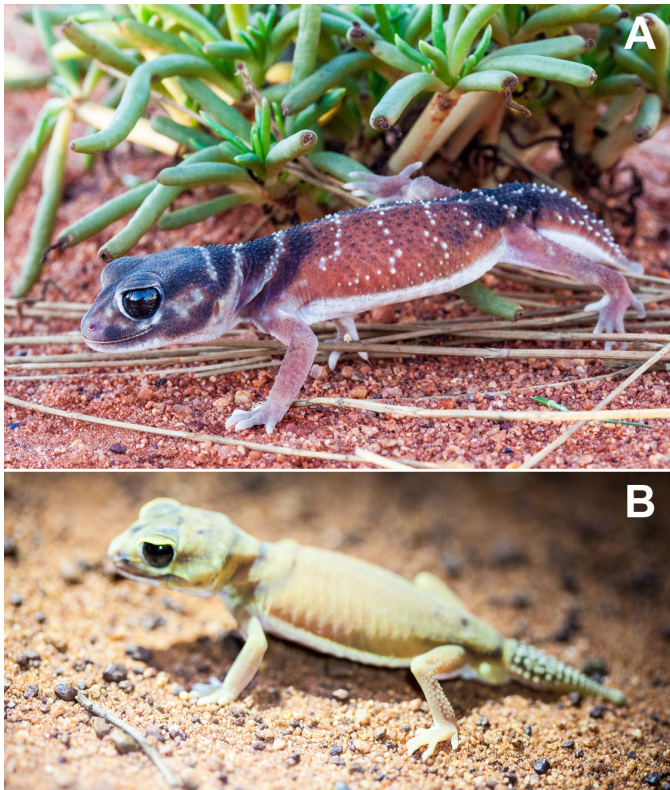
As darkness begins to fall, Muḡinka (skinks) in the genus *Ctenotus* begin to arrive. One of the most common species at UKTNP is the Leopard Skink (*C. pantherinus*), a lizard that is nocturnal when the rains come and termites swarm on warm nights, but otherwise is diurnally active (Gordon et al. 2010). Also commonly seen is Leonardi's Skink (*C. leonhardii*), which occurs in Spinifex habitats where they occupy burrows with two entrances. About one to two hours after sunset the geckos start to emerge and can be reliably found on the roads.



**Fig. 27.** The iconic Thorny Devil (*Moloch horridus*) is convergent with the North American Horned Lizards in the genus *Phrynosoma*; both are ant-eating desert dwellers with skin characterized by numerous sharp protuberances that may protect them from ant bites and deter predators.



**Fig. 28.** The Panther Skink (*Ctenotus pantherinus*) shifts its activity from diurnal to nocturnal with the advent of the rains and termite swarms.



**Fig. 29.** The two abundant Knob-tailed Geckos of UKTNP differ in tail shape and habitat preferences. The Smooth Knob-tailed Gecko (*Nephruurus levis*; A) has a fat tail and lives in Spinifex clumps, whereas the Pale Knob-tailed Gecko (*N. laevis*; B) has a much thinner tail and occupies the crests of sand dunes.

The Knob-tailed Geckos in the genus *Nephruurus* have to be some of the most endearing of all geckos. They have quite large eyes and heads, and short stubby tails that end in a small round knob (hence the name) that is thought to serve a sensory function (Russell and Bauer 1987). The tail of the Smooth Knob-tailed Gecko (*N. levis*) can have a very fat, heart-shaped mid-section, before ending in the caudal knob, whereas the Pale Knob-tailed Gecko (*N. laevis*) has a much thinner, more cylindrical tail. Both species spend their days hidden in burrows, with *N. levis* preferring to burrow in Spinifex sand plains and Mulga Tree habitats, whereas *N. laevis* prefers sand dunes, often constructing day-time refuges at the very crest of a dune.

In close competition for the title of “most appealing lizard” is the Spiny-tailed Gecko (*Strophurus ciliaris*) that is fairly common, semi-arboreal, and widely distributed throughout Australia. In addition to the spiny scales along the dorsal surface of the tail, from which the species derives its common name, is a row of spiny scales above the eyes, which accounts for the local name of Eyelash Gecko and provides the basis for their appeal.

Australia’s Outback is home to several species of legless lizard, including the nocturnal Western Hooded Scaly-foot (*Pygopus nigriceps*), which lacks forelimbs and has vestigial hindlimb flaps. Scaly-foots can be found on the roads at night after rains when animal activity is at its peak. The nocturnal, fossorial, mildly venomous Desert-banded Snake (*Simoselaps*



**Fig. 30.** The Spiny-tailed Gecko (*Strophurus ciliaris*; note the spines along the tail) is locally known as the Eyelash Gecko, due to the elongate scales along the eyes that give the impression of eyelashes.



**Fig. 31.** One of the more frequently seen legless lizards is the Western Hooded Scaly-foot (*Pygopus nigriceps*), which emerges once the night is very dark. These lizards have vestigial hindlimbs.



**Fig. 32.** The small, mildly venomous burrowing Desert-banded Snake (*Simoselaps anomalus*) specializes on legless lizards as prey. They are expert “sand-swimmers” and are virtually harmless given their disinclination to bite, even when handled.

*anomalus*), which specializes on legless Sliders (skinks in the genus *Lerista*) as prey, becomes active during and following summer rains as well.

In many ways, the Australian Outback is a very difficult place to observe wildlife, especially during the oppressively hot summer months. However, if you’re fortunate enough to go, with a little luck you can witness a warm summer rain during which the high diversity is easiest to see and the lizards, frogs, and insects can be found in amazing abundance. The landscape is characterized by wide-open spaces and stunning sunsets and sunrises; don’t forget to take in the landscape as well. You won’t regret it!

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**Fig. 33.** Cloudy evenings during the rainy season make for stunning sunrises and sunsets. Kata Tjuta can be seen at dusk from very far away thanks to the vast and open landscape.

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