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ACTHA INC. NEWS **OCT - NOV 2013**

*Newsletter of the
ACT Herpetological
Association Inc.*



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** Denotes Life Members*

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Ed: This Newsletter will be included with past Issues on ACTHA's website. The photos and graphs are much clearer in full colour, so go ahead and have a look!

DIARY DATE

The *bi-monthly* meetings of the Association are held on the **third Tuesday of the month at 7.30pm**. Our usual venue is:

Belconnen Soccer Club, Hawker
(cnr Belconnen Way & Springvale Drive)

UPCOMING MEETING

TUESDAY, 15 OCTOBER 2013

It's our **AGM!** Please come along to the meeting and support your Association whole-heartedly!

Following our AGM we will hear from Peter Child, Reptiles Inc, who will discuss the differences in reptile keeping regulations between NSW and the ACT. Peter will also explain why he is opening a new shop in Queanbeyan. How does he do it!!

ACT HERPETOLOGICAL ASSOC. INC.
PRESENTS
THE ANNUAL GENERAL MEETING
NEXT TUESDAY, 15 OCTOBER '13
WHAT'S NEW? WHAT'S HAPPENING?
BE THERE AT 7.30PM SHARP & FIND OUT.
YOU'LL BE IMPRESSED!!

ADVENTURES IN THE WILDS OF LOWLAND PAPUA NEW GUINEA

Summary of a talk given by *Distinguished Professor Arthur Georges, Institute for Applied Ecology, University of Canberra*, during 'Big Issues, Big Talk: Celebrating Canberra's Centenary' on 20 August 2013
By Mandy Conway.



Arthur has been described as the Indiana Jones of the University of Canberra's IAE: a field biologist who is happiest when in the field, no matter on which continent. In this talk Arthur described his experiences in the lowlands of Papua New Guinea, specifically between the Indonesian border and Port Moresby, in the extensive

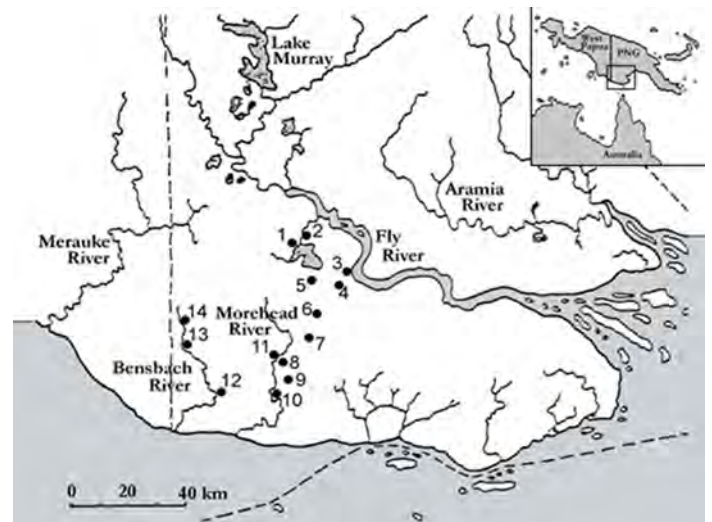
Suki Aramba swamps of the Fly River.

Arthur started his talk by pointing out that PNG is a spectacle of biodiversity; Birds of Paradise, Tree Kangaroos, the Cassowary, large river turtles which can reach 1m in length, echidnas, and spectacularly coloured goannas just to name a few. PNG has an interesting geological history and an incredibly diverse set of habitats which has been important in retaining the biodiversity which has been lost from Australia through progressive aridification.

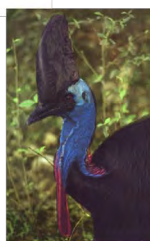
PNG has a special place in the context of Australia, in the sense that Australia has been moving northward at the rate of 10cm per year since striking the Pacific Plate some 30 million years ago. The event created a series of oceanic arcs north of PNG to accrete to the islands northern coastline, and about 10 million year ago as the Australian tectonic plate began to

subduct beneath the Pacific Plate, there was a telescopic uplift of a mountain range which resulted in the isolation of the north and south.

A more recent set of events, some ten thousand years ago, provided a more direct connection between Australia and PNG. The sea level dropped up to 135m below its current level, at which time these two continents became one land mass. Biota moved freely back and forth across this land bridge. The Arafura Sill is 53m deep, and became exposed about 22 thousand years ago, to form Lake Carpentaria, now known as the Gulf of Carpentaria. Periods of connection and separation has driven speciation of various groups of organisms which can still be found in PNG and northern Australia today.



In 2006, Arthur self-funded his initial foray into PNG to conduct surveys of endemic turtle species. The area of Arthur's interest was between the **Fly River** and the Indonesian border, which has a landscape very similar to northern Australia; open savannahs which are dissected by rainforests. It is also an area rich in turtle diversity. Getting there is via a small plane which flies above a vista of rainforest dissected by ephemeral wetlands, before landing on a dirt airstrip.





The people who live in these swamps do so on what appear to be inverted river channels, where clay deposits have become ridges as the surrounding landscape eroded. Generations of village children have been told that the ground beneath their feet has been put in place by the dead, who appear as white skinned beings at night, digging clay from the swamps to bring up in handfuls to form the land. This is a story which reconnects the children to the efforts and work of their ancestors. Some of these stories are quite frightening for these kids. Enter Arthur Georges, white skin and hair, who drops in from the sky and tries to hand out little koala toys to the children to make some friends. In these remote villages many small children have never seen a white person before and to all intents and purposes Arthur is a dead person who has appeared in broad daylight! He initially managed to terrify the local kids, who ran off screaming, but who eventually crept back in curiosity.



The plan was to travel through the **Suki Aramba** swamps by vehicle, visiting villages along a planned route asking for turtle specimens which would be paid for on the return journey. Arthur and his team, with all the western technology at his disposal, managed to trap 17 turtles in 3 weeks. Villagers collectively caught 360!



The team was greeted by an elaborate welcome ceremony at each village, with drum beating and dancing performances which were followed by intimidating men wielding bows and arrows and other deadly implements. In PNG, villagers customarily welcome strangers by demonstrating they could have killed you but that they choose not to. Any visitors were advised to feign fright, because you risk them trying harder.



Working back through the villages, Arthur would ask for specific species on his list in an attempt to gather samples from all known species.



Communication was fraught with difficulties because of so many different tribal languages spoken. In nearly all instances villagers had managed to collect most of the species wanted, including a croc for good measure. Bartering a price for the turtles was usually done between Arthur and a young person on behalf of an adult with limited English. The turtles were returned to the villagers after sampling, which the villagers thought, having been paid for them, quite silly.



A great deal of information about the biology of different turtles was acquired by simply speaking with villagers who had the benefit of generations of knowledge. Several examples are included below.



The **Red-faced Painted Turtle** got its name from the red coloured cedar tree it is associated with.



Australian Emydura make their way onto dry land to dig nests for their eggs whereas in PNG these same turtles nest in **floating mats in swamp areas**, a previously unknown fact about this particular species.



The team were **ceremoniously presented with two long-necked turtles**, commonly found in tea tree swamps across northern Australia. Arthur was keen to know if the biology of this species living on two different

continents was the same, because tea tree swamps are fairly restricted in southern PNG.

Yet another species of interest was found further east: a **snapping turtle** which is normally quite difficult to find in the swamps, but abundant in the flooded rainforests further to the east. 'How are these caught?' villagers were asked. Answer: in tunnels along creek banks in the rainforest once the water level has dropped in the dry season. Found all over PNG, is this species an exceptional disperser? The turtle's genes were examined and genetic divergence occurred some 17 million years ago; this species has a signature of almost the entire orogenesis of PNG written into its genes.



In all probably they are three different species given the length of time, isolated since before the telescopic uplift of the central mountain range.

The Kikori River Basin

The petroleum industry was keen to be part of Arthur's work on turtle populations in the Kikori Drainage area, and the entire cost of Arthur's research equalled the cost of four tyres on just one of the mammoth trucks being used on site. The company has the biggest fleet of Chinooks in the world, outside the military, plus nineteen other helicopters which are used around the site. Arthur went on to say that he was impressed with the way the industry was managing the environment during their operations. Landscape damage appeared fairly localised. Typically, the 'top' is removed from a limestone pinnacle and oil is extracted from cavities beneath the limestone. Barium is pumped into the well which forces the drill mud up, barium is re-extracted and the water is treated through a three or four stage processing plant before being discharged back into the environment.



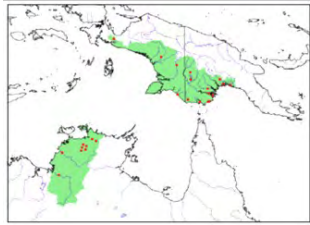
The Kikori River Basin

Often described as an exceptional global treasure, the Kikori River Basin / Great Papuan Plateau covers over two million hectares and contains one of the largest remaining tracts of undisturbed forest in the Southern Hemisphere. The catchment spans across nearly all forest types found in PNG, from alpine and montane forests in the north, to increasingly rare intact lowland forests in the south, and also the largest block of mangrove forest in the Pacific. The region has about half the bird species richness of the entire North American continent, with many species occurring nowhere else in the world. The Basin is also the site of PNG's first major oil development, a partnership between the oil consortium and World Wildlife Fund (WWF) has led to the declaration of over 86,000 ha of protected areas.



The Pig-nosed Turtle

Slide 51 The species of most interest was the Pig-nosed Turtle, *Carettochelys insculpta*, which occupies the Kikori River, most of southern PNG as well as areas of northern Australia. This turtle is of global interest, being the only remaining member of its family. Once widespread



across Europe and Asia, they are now only represented by this species in southern PNG and northern Australia, with biologists keen to capture all available phylogeny not available in other areas of turtle biodiversity.

"From our point of view, this species is a conservation concern. For the people of the Kikori, it is a fishery which would have devastating results should it collapse. An important source of protein, the turtles are caught in large numbers. The eggs are also collected in devastatingly large numbers. Adults and eggs are consumed locally, but are also sold to other villages along the river." Arthur said.

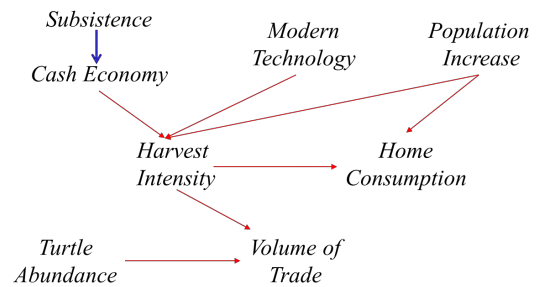


water's edge and recommenced fishing for turtles. The human population has doubled since 1971, moved from subsistence toward a cash economy, new technologies such as outboards have increased fishing success and the turtle trade through new Asian markets has opened up.

Pressures

Social changes in PNG, which occurred with the end of tribal warfare, have caused undue pressures on this species. Prior to 1900, Kewai raiding parties attacked villages throughout the gulf. Villagers moved up into the forest to safety, which effectively reduced the pressure on turtle populations. With the end of clan warfare people returned to the

Are they in decline?

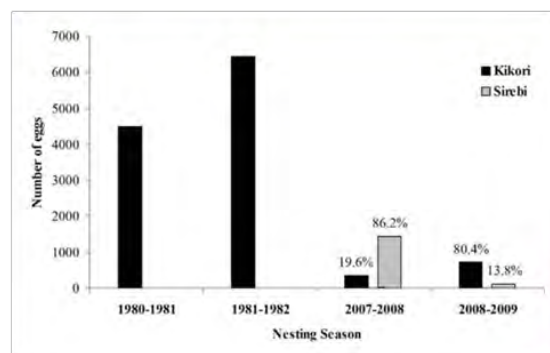


Market Surveys

There is a considerable amount of pressure on these turtles and the question is, to what extent are their numbers in decline?

Many of the Kikori people once firmly believed that the turtles have, and always will be, there. Arthur's and his team's challenge was to firstly demonstrate any decline rate to the people. Records from surveys in 1980-81 and 1981-82 to find the number of eggs which made their way into the markets to be sold at the time were examined. This study was replicated in 2008 - 2009, and researchers found that the number of eggs being sold was dramatically lower than in 1980-1982.

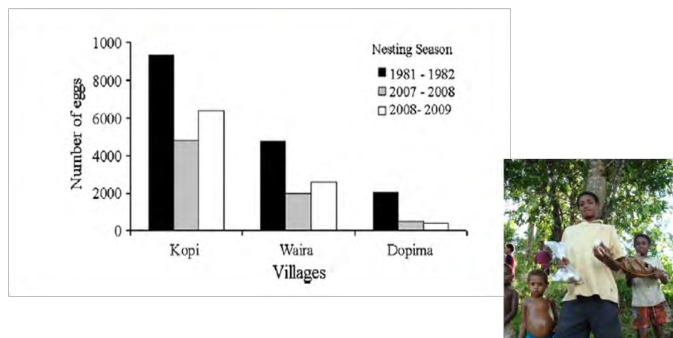
Dramatic decline in trade



"These are good indications that there has been a decline, however turtle abundance and the turtle trade are loosely connected: just showing that egg numbers in the market place have declined doesn't necessarily mean turtle numbers have declined." Arthur explained.

A whole suite of other factors come into play:

- Villages were assessed to see if there was an increase in the consumption of turtles: consumption was found to have dropped in 2008 - 2009.



- Were the Kikori still harvesting at an intense rate: along the coast only 3% of turtle populations survived harvesting. Upstream, where there were less people, 33% of the nests were harvested with only 2% of the population surviving.
- Female turtle size has declined since 1981.

The overall result of the study was a decline of 57.2% of the turtle population since 1981 could be demonstrated. "Obviously, one man taking 21 female nesting turtles at one time is not a sustainable practice." Arthur said.

Building Capacity Program

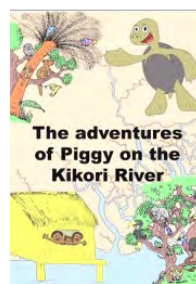
Communities generally lacked an appreciation of the concept of sustainability. Therefore, how could the conservation message be explained to the community to better manage their own affairs to insure the survival of the turtles?

There were two areas where communities had a good sense of sustainability. They knew their grandfathers had planted coconut trees and that the fruit could be used now. If they didn't start planting coconuts then their own grandchildren wouldn't have them to eat. Planting sago crops, which could be harvested in 15 years, was the other example. Communities understood a long-term view in that regard. Conversely, most community views in relation to fisheries was an immediate one. 'We are going to catch it and eat it, and expect that the resource will always be there.'

A book titled '**The adventures of Piggy on the Kikori River**' was produced by Carla in Arthur's team under the Building Capacity Program. The book introduced a conservation ethic to students, with a simple message: if you want the resource to stay you need to manage it. Introducing environmental research into the curriculum was a government directive, however generally lacked any resources to do this.

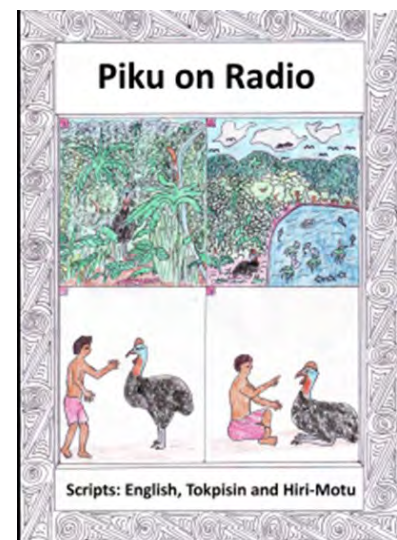
(Adventures in the Wilds of Lowland PNG, cont'd...)

"We printed 5000 copies of this book and our aim was that each child would receive a copy. We conducted a workshop with the teachers to discuss when and how this book could be best utilised." Arthur explained. "The book was distributed last month and the children's response was fantastic. This was the first book many of them had ever owned and they carried it around with pride. As we moved along the river I saw children in canoes holding their book up. How they ever kept them dry and in good condition in a canoe with an average rainfall of 6 m per annum I'll never know!"



Piku on Radio

The Program's second initiative was to produce a series of radio plays, which would be developed by the children themselves. We recorded six scripts in the three most common languages used in PNG: Motu, Tokpisin (Pigeon) and English with the help of Kikori students. The plays were broadcast across the Kikori as well as nationally. The exercise improved most of the children's confidence and sense of self-respect. They were proud of their work and the fact that the whole community was listening to them on the radio. The intention is the role the radio plays out across all regional areas.

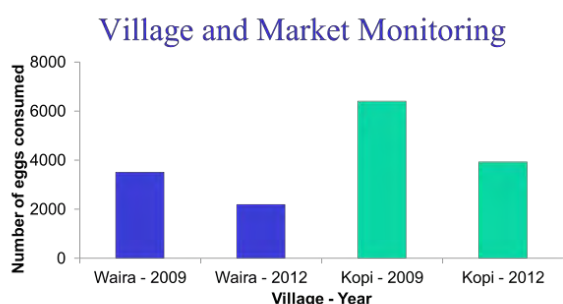


Another children's book has now been produced. It concentrates on the effects of releasing invasive animals into the environment. The book focuses on carp which have been released into Lake Kutubu, and farmed Tilapia have escaped however there is more concern about the predatory Nile Perch being locally farmed. Fourteen endemic species will be at risk from these fish should they enter the waterways.

A third book is planned, which will help explain the consequences of garbage being thrown into the river.

Village and Market Monitoring

The petroleum company has now provided communities across the whole catchment area with access to mobile phones. We can now ask community youngsters to become involved in areal market surveys, by entering data into a Nexus 7 unit to continue the monitoring work.



Data entries showed a small decline in relation to the eggs consumed in Kopi and Waira Villages from 2009 to 2012. Recording was undertaken by Kikori secondary school students and continues to add to data. It is difficult to tell if this decline is due to a decrease in PNT population size or harvest effects.

Landowner Action

"Our strategy was to have one landowner on side, rather than expecting communities to listen to foreigners telling everyone how they should be doing their day to day activities. It doesn't work in Australia, it won't work in PNG. The designated landowner would

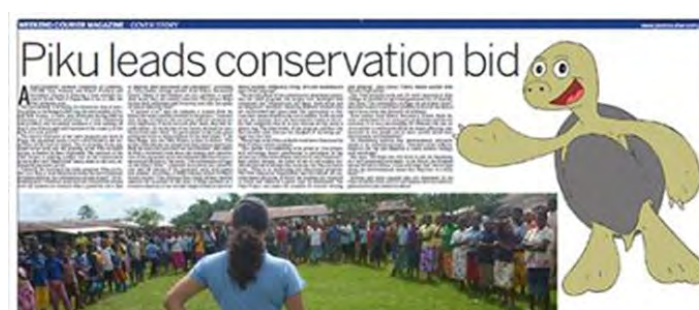
endorse some of the principles and practices one would hope is going to make a difference. When other landowners see the benefits in this and the flow-on effects to other people, they will hopefully want to come on-board. One of the most important actions we observed during this period was that some hunters were leaving nests untouched or bringing them home to incubate. This was seen in both the **Waira** and **Kopi** villages. This shows that the community is ready to commit to a long term



protection plan." The slide above shows the hatchlings been released at **Wau Creek**." Several newspapers in PNG produced front page stories of the release.

To start with, a research station is to be built in the form of a rudimentary hut on the Wau Creek. This is where a Masters student Yolarnie Amepau, amongst others, will be working with rangers and landowners. As part of the project, a ranger will be provided with an income to protect the area for the next 3 years. Another locality on the coast is also to be targeted. It will be a little more difficult to negotiate but will hopefully provide protection for the turtles nesting on these coastal beaches. "This initiative goes above and beyond that of our initial project, which is really exciting." Arthur added.

The project continues for the next three years.



(Adventures in the Wilds of Lowland PNG, cont'd...)

Arthur describes himself as a resources coordinator for the project and is immensely proud of the team's achievements to date. The image at right shows Dr Carla Eisemberg talking to locals about the project and further to the right is a list of members of the team.

Arthur is really looking forward to working with the people in PNG over the next three years and finished his talk by saying "These people have a sheer intelligence, energy and real desire to move forward into a higher standard of living without impacting too much on their environment. Quite an inspiration!"



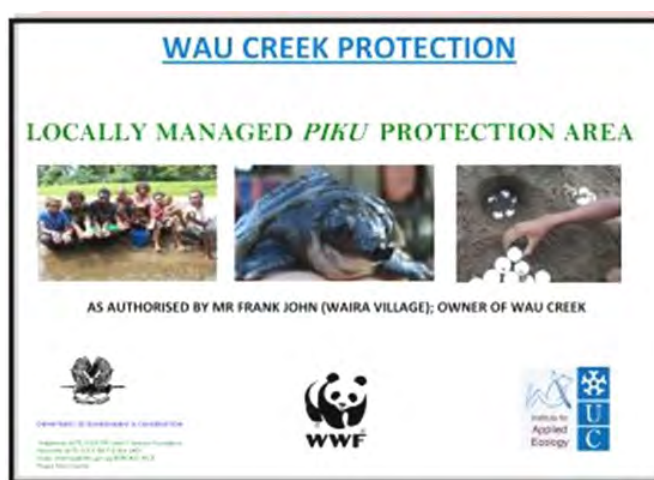
Institute for Applied Ecology
University of Canberra
 Dr Arthur Georges
 Dr Jasmyn Lynch
 Dr Carla Eisemberg
 Dr Benedict Yaru

PNG Institute of Biological Research
 Yolarnie Amepau

WWF
 Saina Jeffrey
 Felix Kinginapu

Flora and Fauna International
 Mark Rose

Kikori Landowner
 Frank John



RESEARCH OF THE MONTH *By Gabrielle Openshaw*

Research Article

Cernansky, A. & Hutchinson, M. (2013). A new large species of *Tiliqua* (Squamata; Scincidae) from the Pliocene of the Wellington Caves (New South Wales, Australia). *Alcheringa* 37: 131-136.

Comments

This short paper describes an isolated frontal bone, referred to the new fossil species *Tiliqua laticephala* (from the Latin *latus* for broad, and the Greek *kephale* for head). The material was discovered in the Pliocene-aged (2.5-5 million years ago) section of the Wellington Caves system in central eastern NSW (Fig. 1). The following key points are made: (1) the skink was large and heavily built, as indicated by the unusually robust and broad frontal bone, (2) it is most closely related to the extant Shingleback on the basis of two head osteoderm (shield) features, and (3) the fossil differs from all extant *Tiliqua* on the basis of eye-bone proportions and a greater fragmentation of the osteoderms.

This fossil finding is interesting because it offers insight into the evolution of the heavily built, charismatic *Tiliqua* skinks. In particular it indicates the presence of a heavily armoured skink, similar to the modern Shingleback, inhabiting SE Australia as the region experienced a substantial drying – cooling trend in the Pliocene. One other skink is known from the same locality around the same period, however this fossil is not referable to any living genus (*Aethesia frangens*). A conclusion drawn from this fossil discovery was that many lizard groups distinct from living taxa have recently gone extinct, suggesting we may have little idea of the diversity of lizards once inhabiting SE Australia. The discovery of *T. laticephala* suggests both familiar and unfamiliar lizards were around at least 2.5 million years ago.

(Research of the Month, cont'd...)

Today, the genus *Tiliqua* comprises six Australian species, and one New Guinean species. Three species can be found around the ACT (Fig. 1):

1. Southern Blue-tongue (*Tiliqua nigrolutea*) (Fig. 2): found in cool temperate forests, woodlands and heathlands.
2. Shingleback (*Tiliqua rugosa*) (Fig. 3): found in many habitats from dry sclerophyll forest to mallee woodlands, shrublands and coastal dunes. Sweetly, pairs mate for life!
3. Common Blue-tongue (*Tiliqua scincoides*) (Fig. 4-5): virtually all habitats excluding the alps and closed rainforests.

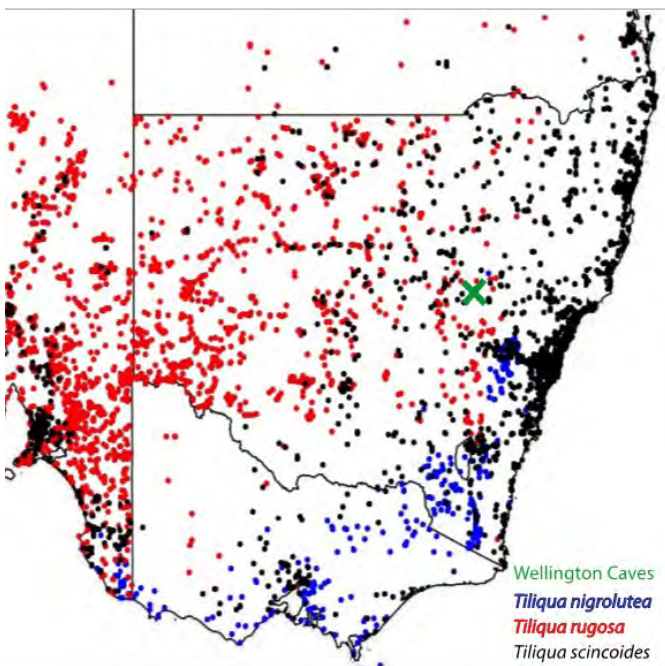


Figure 1. Map of southeast Australia, with the distributions of three extant *Tiliqua* species found around the ACT, and the location of the Wellington Caves system, where the extinct *Tiliqua laticephala* was discovered.

Remember, see ACTHA's website!



Figure 2. *Tiliqua nigrolutea*, the Southern Blue-tongue (image by Henry Cook)



Figure 3. *Tiliqua rugosa*, the Shingleback (image by Stephen Zozaya)



Figure 4. *Tiliqua scincoides*, the Blue-tongue Lizard (image by Stephen Zozaya)



Figure 5. *Tiliqua scincoides*, the Blue-tongue Lizard (image by Stephen Zozaya)

Research Article

Wall, M. & Shine, R. (2013). **Ecology and Behaviour of Burton's Legless Lizard (*Lialis burtonis*, Pygopodidae) in Tropical Australia.** *Asian Herpetological Research* 4(1): 9-21.

Comments

Wall & Shine (2013) provide a comprehensive ecological study of Australia's most widespread lizard, a pygopodid called Burton's Legless Lizard, or sometimes the Lance-headed Lizard (*Lialis burtonis*) (distribution in Fig. 1). Pygopodids, or flap-footed lizards, are close relatives of geckos, and found throughout Australia. They appear snake-like, but retain small hindlimbs in the form of scaly flaps, which contain most limb elements. This snake-like morphology is thought to aid movement through dense vegetation. Like geckos, they frequently clean their eye scale with their broad tongue, and can voluntarily shed their tail when threatened. There are ~40 species, which mostly feed on arthropods. *L. burtonis* is considered a snake 'analogue' because it feeds on large prey, swallowed whole.

Although the study takes place in the Northern Territory, *L. burtonis* is found in the ACT, and this is a pioneering study for the group, so I decided to review it here. The paper argues the importance of studying ecology in limbless squamates, as the 'morphotype' has evolved in multiple lineages, with the most successful obviously being snakes. The specific questions addressed in the study were about diet/foraging, seasonal patterns, daily activity, temperature impacts and microhabitat usage. Morphology was also examined to assess any sexual dimorphism and age variation.

As with many squamates, female *L. burtonis* grow larger than males. Although all pygopodids have a fixed clutch size of two eggs, the larger female body size is thought to enable larger eggs to grow. Like snakes, legless lizards are 'gape-limited predators' (they can only eat what fits in their mouth). Smaller, or younger, individuals are likely to be more affected by this as they already have limited prey options. Accordingly, small *L. burtonis* show patterns of larger relative head size and trunk length. The study found NT *L. burtonis* to be lizard-eating specialists. Skinks were a common item found, and most prey is believed to be surface active. No seasonal changes in diet were identified. Based on behavioural observations and prey items, *L. burtonis* is believed to be visually oriented, and ambush its prey mostly during daylight hours. Like many other NT reptiles, reproduction is seasonal. Leaf litter was identified as a key microhabitat for *L. burtonis*. Leaf litter probably provides individuals with an escape from extreme weather, and also helps to hide the lizard as it ambushes its prey.

What about *L. burtonis* in the ACT? *L. burtonis* has been identified in various locations across the ACT- Mount Majura and Mount Ainslie, Pine Island, Stoney Creek and Birrigai. This species varies greatly in colour across its distribution (see Fig. 2), with ACT forms generally being fawn to light grey, sometimes with scattered darker flecks. *L. burtonis* is a sizable lizard, and adults can grow to over 500mm long. Activity times are believed to vary according to season (diurnal during mild weather, becoming crepuscular and nocturnal during hot conditions). A few other pygopodids are known from the ACT: the Pink-tailed Worm Lizard (*Aprasia parapulchella*), the Olive Legless Lizard (*Delma inornata*), and the Striped Legless Lizard (*Delma impar*).

Figure 1. Distribution of *Lialis burtonis* on mainland Australia.

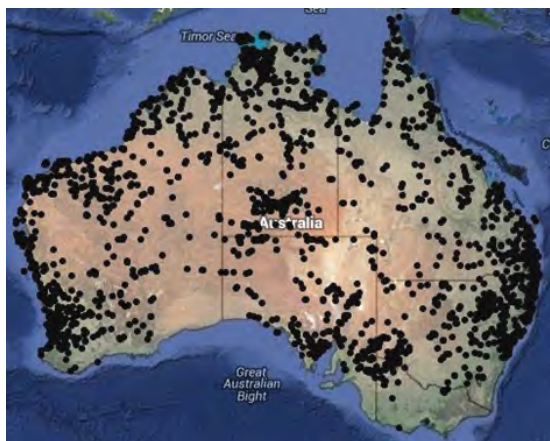


Figure 2. Colour variation in *Lialis burtonis*. Photographs by Stephen Zozaya.



THE AUSTRALIAN & INTERNATIONAL SCENE

Counting the cost: fire and reptiles.

Are prescribed burning targets appropriate for reptile conservation? Author: Annabel Smith, ANU
Source: DECISION POINT Issue #72/ August 2013

Be careful when playing with fire. It's a message politicians know too well and after recent catastrophic wildfires in different parts of Australia they want to be seen as actively responding to the threat. One of the common responses is to raise the level of prescribed burning but what are the benefits and costs of this strategy?

Following the 'Black Saturday' wildfires in 2009 the Victorian Government introduced a 5% annual prescribed burning target to the entire public estate in Victoria. They are currently on track to deliver this target. The South Australian Government has followed suit, also adopting a 5% prescribed burning target for high risk public land.

At the same time that these policies are being implemented there is growing scientific evidence that such policies are unlikely to protect lives, built assets or to conserve biodiversity. Consider the study by Phil Gibbons and colleagues, for example, who found that prescribed burning was not the most effective way to protect houses in severe bushfires.

Let's discuss one group of animals where it has been assumed prescribed burning has advantages. Prescribed burning is often assumed to be beneficial for reptiles because fire opens up the habitat, creating areas where reptiles can bask. However, this is not always true, and our research over the past nine years has started to reveal how reptiles may respond to changes in fire management, including increases in prescribed burning. This research is revealing how complex ecosystems and responses to fires can be; it's also demonstrating the value of long term research in unravelling this complexity.

Fire in the mallee

We conducted a study in the mallee vegetation of South Australia to determine:

- 1) how reptiles respond to fire in their habitat;
- 2) if we can develop a predictive model of their responses based on ecological traits of species; and
- 3) whether commonly used short-term survey data (eg, collected in two year studies) are appropriate for making recommendations for fire management in areas of high reptile diversity.

The field effort involved in our study was enormous. We surveyed reptiles every summer for six years in two reserves on the Eyre Peninsula. Over 100 volunteers were involved in the field work, resulting

in 100 unique experiences of pitfall trapping in the remote mallee wilderness. Our data set for this study included 4,796 individual reptiles collected during 32,246 trap nights.

Most common reptile species that we studied were 'successional specialists', meaning they were most abundant at a particular time after fire. For example, many 'early successional' species were common in the first year or two after fire, while a number of 'late successional species' were most common in habitats that had not been burnt for more than 40 years.

Some species persisted in low numbers in their sub-optimal habitat. For example, the effect of time since fire on the southern shovel-nosed snake *Brachyuropsis semifasciatus*, was small. This species was most common 30 years after fire but it occurred in small numbers in all post-fire stages from one to 50 years after fire. Other species were virtually absent from sub-optimal habitat. For example, the abundance of the early successional knob-tailed gecko *Nephurus stellatus*, declined to almost zero after 30 years since fire. The late successional skink *Ctenotus schomburgkii*, was almost entirely absent from habitats that had been burnt in the last five years. Species with this kind of ecological response to fire will be most at risk of extinction under inappropriate fire regimes (eg, widespread prescribed fire or complete fire suppression).

Some ecological traits of the reptile species we studied were related to their fire response. Species that shelter in leaf litter were generally late successional, while species that use burrows for shelter were generally early successional. Understanding the shelter requirements of different species may therefore provide a way of predicting how a reptile assemblage will be affected by different fire regimes. However, our ability to predict fire responses from ecological traits was limited by the scarcity of biological information (eg, movement, dispersal and reproduction) on most reptile species. We are still a long way from having a mechanistic understanding of how reptile communities will respond to changing fire regimes.

Different surveys, different findings

A key discovery from our study was that many of the ecological responses to fire in reptiles were not found in previous studies that used smaller, although substantial, subsets of the same data. Two previous two-year studies at the same locations concluded that most common reptile species were not affected by post-fire succession. Our six-year data set suggested that this conclusion was

premature and that many reptile responses to fire may not be detected using short-term data sets.

Importantly, a higher rate of late successional responses to fire went undetected in previous studies, while early successional responses appear easier to detect. We noticed a trend for sample size to be related to the point in the succession where a species peaks in abundance. This does not mean that early successional species are more abundant than late successional species, but that it is more difficult to accumulate samples to study late successional species.

The implication of these results is that we are probably unaware of the extent to which many reptile species specialise on old vegetation (eg, over 40 years old). It has previously been suggested that fire is beneficial for reptiles because they rely on basking to regulate their body temperature and fire increases habitat in which they can bask. Our study suggests that there may be a large suite of reptile species that need long unburnt vegetation for habitat. These species may become threatened if the amount of fire in the landscape increases, for example by implementing high prescribed burning targets such as 5% per annum.

Managing fire for reptile diversity

Management that is likely to be of greatest benefit to reptiles in mallee ecosystems would aim to protect long-unburnt habitat (eg, 40–50 years old, and potentially older) from fire because these post-fire habitat stages are

uncommon. Actions to help achieve this include promoting small, patchy fires to prevent widespread wildfire and minimising the application of back-burning in long-unburnt habitat while fire-fighting. Implementing spatially targeted burns to reduce the risk that long-unburnt habitat will be burnt in a single fire is likely to be an important strategy but this needs to be implemented as an experiment because its efficacy is poorly understood.

Our study highlighted a risk that fire management decisions based on insufficient data may not accommodate the complex range of responses by animal communities to fire. Although long-term, intensive studies are not always possible, it is important that results from time- or sample-limited fire studies of reptiles are interpreted with the knowledge that many ecological responses may not have been detected.

While avoiding widespread frequent burning or complete fire suppression, it is important that responses to alternative fire regimes are monitored across a range of taxa, so that management practices can be updated in light of new information.

Reference

Smith AL, Bull CM, Driscoll DA (2013) Successional specialization in a reptile community cautions against widespread planned burning and complete fire suppression. *Journal of Applied Ecology* DOI: 10.1111/1365-2664.12119.



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