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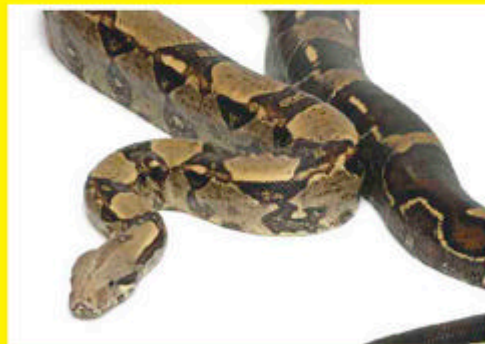
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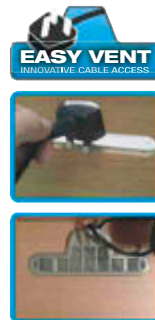
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March 2015

Welcome



Did you watch the BBC 1 adaption of Roald Dahl's story, *Esio Trot*, on New Year's Day, starring Dustin Hoffman and Judy Dench?

It's about a man who falls in love with his neighbour, but she only has eyes for her tortoise, and how he tries to win her round. The title of the story is, of course, 'tortoise' spelt backwards!

What was particularly great about this film was that it showed just how strong the bond can be between a pet reptile and its owner, being every bit as meaningful as that existing between a cat or dog and a person. Better still, this was a central theme that would have resonated with millions of pet-owners who watched the film.

Although things have improved significantly, there is still an "us and them" attitude in the way that the media generally divide up stories about pets. There are those that are cute and others that are treated as, well, frankly bizarre. I'll leave it up to you to guess in which group those involving reptiles are usually featured. . . .

But this is increasingly appearing to be simply ignorance on our part. There is absolutely no doubt now that reptiles can recognise their owners. In fact, it's possible to train snakes to know when they are going to be fed rather than having their quarters cleaned, and encourage crocodilians to assist with their veterinary treatment.

Tortoises have displayed a remarkable ability to distinguish between people, and chose how they respond. In a US zoo some years ago, the zookeepers observed how a giant tortoise in the collection formed a close bond with one of the regular visitors - an elderly lady who always brought an umbrella with her, presumably just in case it rained, so it was thought.

However, unbeknown to the staff, it ultimately became evident that this had another purpose. The keepers were amazed that the tortoise always came over to the front of its quarters as soon as it saw her, allowing the lady to tickle the top of its head gently with the top of the umbrella, revealing that it clearly recognised her.

David Alderton

David Alderton, Editor.  
Email: prk.ed@kelsey.co.uk

David has extensive practical experience with this group of creatures, extending back over 40 years. He has written and broadcast widely about their care and biology, and his website can be found at [www.petinfoclub.com](http://www.petinfoclub.com)

# Contents

## Features

**8 A FROG THAT GIVES BIRTH TO TADPOLES DISCOVERED** – a remarkable finding from an island in South-east Asia, transforming once again our view of amphibian reproduction.

**10 RARE GECKO BRED IN UK COLLECTION** – John Courteney-Smith on a success with a little-known species that could have great potential in the hobby, as he reveals.

**24 HYPOMELANISTIC GRASS SNAKE BRED** – is this a world first? Christian Castille provides the background to this remarkable event, and discusses the lifestyle of one of Europe's best-known snakes.

**36 KEEPING TARANTULAS** – what you need to know. Keeping spiders as a hobby continues to grow in popularity, but it can be difficult to access the latest information about caring for them. Don't miss this in-depth guide.

**60 BORNEO GLIDING LIZARDS** – a remarkable tale of how these unusual lizards have adapted to their environment, and camouflaged their presence while in flight when they are at their most vulnerable.

## Regulars

**4 NEWS AND VIEWS** – featuring news about the discovery of two new species of monitor lizards, a new turtle food, some fascinating findings about venomous snakes from the USA, and a host of exciting new additions to the Exo Terra range.

**14 OUT OF AFRICA** – Living underground. Paul Donovan reveals how various reptiles and amphibians have adapted to survive in this way, concentrating on a number of species with which he is familiar in Africa.

**20 SHOP PROFILE** – focusing on Global Geckos Reptile Shop, which is located in Windlesham, Surrey close to major road and is well-worth a visit, offering between 80-120 species at any time.

**22 VETERINARY CASEBOOK** – specialist veterinary surgeon Sarah Pellett describes a very unusual case in a tortoise, which highlights the ease with which accidental injuries can arise.

**30 Q & A** – addressing the problems that you want answered, concentrating this month on health issues surrounding bearded dragons and the value of veterinary advice.

**32 PUZZLES** – test your knowledge with our range of reptile-related puzzles.

**34 AMPHIBIAN FOCUS** – a bizarre toad is profiled this month.

**46 TALES FROM THE REPTILE HOUSE** – former zoological curator Bill Lowe recalls his experiences involving a boa and a burlesque dancer, and considers just why boas rank amongst the most popular of the larger snakes.

**54 HERPETOLOGICAL MYSTERIES** – Dr Karl Shuker discusses further accounts of pseudo-serpents, which used to be thought to exist, but which, in many cases, have now been shown to be the result of imaginative folktales, monstrous misidentifications or deliberate deceptive hoaxes.

**61 YOU AND YOUR REPTILES** – a stunning selection of the photos that you've sent in over the past year. If you were lucky enough to get a new camera for Christmas, why not try your hand at taking some pictures of your pets, send them to us and hopefully see them in print?

**66 NEXT MONTH** – and also how to contact us.

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Main cover image of a scorpion gecko (Pristinas carteri) by reptiles4all/www.utterback.com

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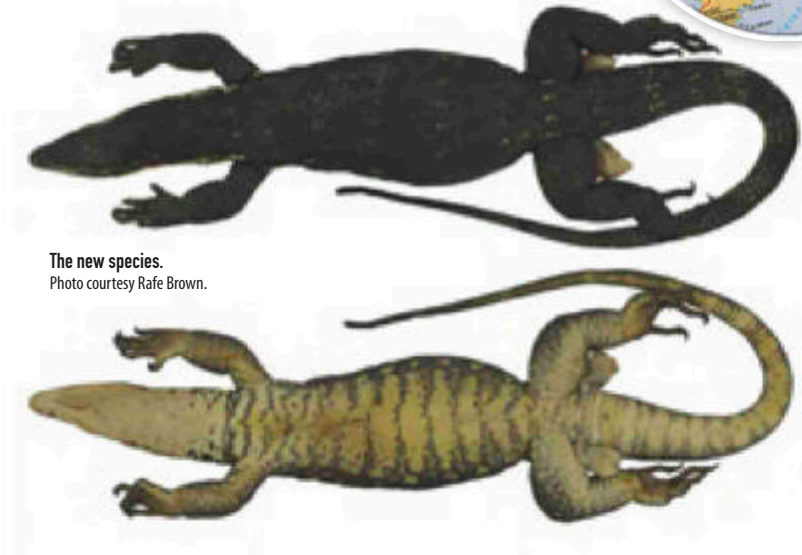
## New monitors discovered in the Philippines



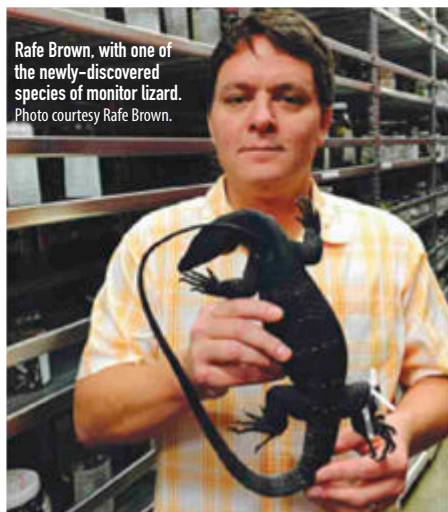
Researchers carrying out DNA sampling on wildlife being offered for sale in markets in the Philippines found genetic varieties of water monitor lizards that varied sharply from those common to the areas surrounding Manila. This was their first clue that additional species diversity might exist, hidden within the northern Philippine water monitor lizard population.

“Both are gorgeous, black-and-white or black-and yellow-coloured animals,” explains Rafe Brown, curator-in-charge of the herpetology division at the University of Kansas’ Biodiversity Institute. “They are dark in general appearance with bright speckling of white or yellow spots arranged in rows and stripes around the body, as if wearing shining necklaces.

“One gets up to a little over three feet (90cm) in length, and the other is somewhat larger at about



The new species.  
Photo courtesy Rafe Brown.



Rafe Brown, with one of the newly-discovered species of monitor lizard.  
Photo courtesy Rafe Brown.

four feet (1.2m). They’re monitor lizards, so they’re alert, with large eyes, continually flicking long tongues, which they ‘smell’ with, and they’re generally very alert and look quite intelligent.”

### Laboratory studies significant

Back in Kansas University, Brown and his colleagues Luke Welton, now with Brigham Young University; Cameron Siler, now at the University of Oklahoma, and Mae Diesmos, with the University of Santo Tomas, Manila, sequenced the mitochondrial and nuclear DNA of the monitor lizard samples. They found the two lizards were “morphologically cryptic,” meaning they looked much like known species of monitor lizard, but their genetic variation indicated they were evolutionarily distinctive, qualifying them as unique species. The researchers

have named these two new species of lizard as *Varanus dalubhasa* and *Varanus bangonorum*.

According to Brown, conservationists had overlooked the lizards because they were considered to be the same as another, widespread species. Now, the two new species are becoming a priority for conservation efforts.

“They were confused with species that were physically very similar in scale numbers, shapes, colour patterns and body size,” he says. “But even though they looked similar, it now makes perfect sense to us in hindsight that they should be distinct, and considered separate species because they come from different areas - a separate island in one case and an isolated peninsula in another. Both have been isolated for a considerable period of geological time.

## New turtle food launched

Hikari is a Japanese company that may already be familiar to fish-keeping readers, being highly respected worldwide for its top quality foods. The company has now added to its range by launching Saki-Hikari Turtle Sticks, which are now available in the UK. They represent a complete and balanced probiotic diet for aquatic turtles, as long as feeding with this particular food is maintained.

Saki-Hikari Turtle Sticks contain Hikari-Germ™, a strain of *Bacillus* bacteria which aids digestion and helps optimise nutrient utilisation, resulting in less waste and helping to ensure water quality in the tank is maintained. The presence of the probiotic

serves to support the beneficial bacterial flora present in the turtles’ intestinal tract. Made from the finest quality ingredients, Saki-Hikari Turtle Sticks include a unique blend of Odor-Stop™ ingredients and herbs that help to reduce odours as well.

According to the manufacturers, Saki-Hikari Turtle Sticks provide complete and balanced nutrition. They contain vitamin D3 to facilitate calcium absorption and metabolism within the body, plus added calcium to support the development of the outer shell and skeleton. On a practical level, the hard pellets also help avoid the mess turtles create in the water when they eat. The full breakdown of the food is as



follows: Recommended prices start at about £3.99 for the 45g size and £14.49 for the 200g pack. Both are re-sealable. Saki-Hikari Turtle Sticks should be available in specialist reptile shops and a number of aquatic outlets now.

Crude Protein	Crude Fat	Crude Fiber	Moisture	Crude Ash	Phosphorus
min. 41%	min. 4.0%	max. 2.0%	max. 10%	max. 14%	min. 1.0%

# All bites are not the same . . . .

If you're one of the unfortunate few to be bitten by a venomous snake, having access to effective antivenom to combat the resulting swelling, pain and tissue damage is critical. But new research by a team of biologists at Florida State University has revealed that creating antivenom is a bit tricky. That's because the type of venom that a snake produces can actually change, according to where it lives.

Mark Marges, a Florida State doctoral student in Professor Darin Rokyta's laboratory, led a research study that examined the venom of 65 eastern diamondback rattlesnakes and 49 eastern coral snakes from all over the state of Florida, in order to determine whether snake venoms varied by geography.

In the rattlesnakes, geography definitely mattered. The venom from an eastern diamondback rattlesnake in the Florida panhandle is very different to the venom from a similar rattlesnake found 800km (500mi) south in the Everglades, and this discovery has huge implications for snakebite treatment.

"So if you use just southern venoms when making the antivenom, it would be ineffective against some of the more common toxins found in northern populations of this species," concludes Florida State University doctoral student Mark Marges.

In the rattlesnakes, significant variation linked to geography was discovered. In contrast though, in the case of coral snakes, their venom was found to be identical, no matter where the snakes were found.

"This can tell us a bit of the history and evolutionary patterns of the snakes," says Kenny Wray, a post-doctoral research associate in Rokyta's lab. "It suggests that the coral snakes may be recent invaders to the region and haven't had time to evolve different venoms in different areas."

This information also will help with the development of coral snake antivenom, because



An eastern diamondback rattlesnake (*Crotalus adamanteus*).

scientists now know there is uniformity in coral snake venom. According to a 2012 estimate by the Center for Disease Control, between 7,000 and 8,000 people are bitten by venomous snakes in the USA every year.

Not only are there medical implications, but this information is also important for the conservation of the snakes themselves. The eastern diamondback rattlesnake is being considered for federal protection under the *Endangered Species Act*. But, if the snakes are removed from one geographic area, they will be irrevocably deleted from the ecosystem altogether. "If we lose some of these populations, we lose a whole venom type," Rokyta explains. "That really changes conservation."

## Dates for your diary

The Evesham and District Reptile and Exotics Club in Worcestershire has published its dates for its meeting through 2015, and they are as follows

Evesham and District Reptile and Exotics Club

A great way to meet exotic reptiles and bring any that you own. Give and gather great advice with other pet owners. Bring along the family, it's a great day out.

**Diary of meets 2015:**

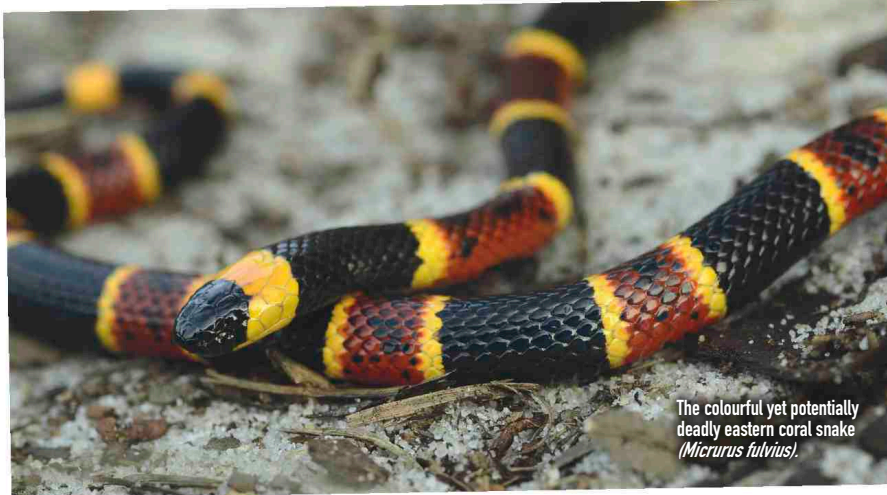
8th Feb	3rd May
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The colourful yet potentially deadly eastern coral snake (*Micrurus fulvius*).

## Can you help?

We've been contacted by a reader in East Sussex, who is desperate to pair up his male Egyptian uromastix. Can you help? If so, please email [prk.ed@kelsey.co.uk](mailto:prk.ed@kelsey.co.uk) and we'll put you in touch.

\* Organising a reptile-related event? Want to let people know about it? Then drop us a line with full details to [prk.ed@kelsey.co.uk](mailto:prk.ed@kelsey.co.uk)

## NEW PRODUCTS FROM HAGEN

A number of additions have been made to the Exo Terra range recently, which you will be able to see and purchase at your local reptile store. Here is just a selection of these products.

### Exo Terra Infrared Thermometer

The Exo Terra Infrared Thermometer is a pocket-sized, lightweight “point-and-click” thermometer that instantly measures the temperature of a surface or object. Point the Exo Terra Infrared Thermometer towards any desired object and with a click on the button, the temperature will be shown on the large, easy-to-read digital display.

The Infrared Thermometer can be used to determine the temperature of basking sites, hiding caves and shelters, hibernation temperatures, incubation media, your reptile’s body temperature, or to measure temperatures “on-the-spot” during field trips.

To determine temperature gradients, the Infrared Thermometer will measure the ambient temperature as long as you press and hold the button; once you release the button, the last measured temperature will be displayed.

A small LED targeting light assists you to measure the correct spot and shows the diameter of the measured surface. It also allows you to scan difficult-to-measure spots with low light conditions, like inside hiding caves, behind branches, underneath leaves and similar localities.

#### Key features:

- Instantly measures the temperatures of a surface or object.
- Ideal to monitor basking sites, incubation medium temperatures and the substrate temperatures.
- Easy to use point and click.
- Temperature display in °F or °C.
- Auto shut-off after 15 seconds.
- 2 AAA Batteries included.
- Great tool for field herping.
- Recommended retail price: £24.99.



### Exo Terra Screen Terrarium

This housing unit provides a perfect habitat for arboreal reptiles and amphibians that are sensitive to stagnant air. The non-restricted airflow provides optimal ventilation while minimising odours and fungus growth in your reptile’s habitat. The screen design provides a broader temperature gradient, which helps your reptiles to regulate their body temperature more effectively, and prevents overheating.

The aluminium screen mesh allows ultraviolet rays from UVB lights or the sun to penetrate deep inside the enclosure. The substrate tray means that you can place a small layer of substrate here, so as to absorb sprayed water and increase humidity levels.

The substrate tray can easily be removed from the enclosure through the swivelling bottom door. The sturdy nickel-plated latches add stability to the enclosure and serve to keep your reptiles safe & secure.

#### Key features:

- High quality, corrosion-resistant black anodized aluminium screen enclosure.
- Maximum ventilation – prevents stagnant air.
- Black aluminium screen finish for greater visibility.
- Includes substrate tray.
- Maximum UVB and heat penetration.
- Recommended retail price £44.11.



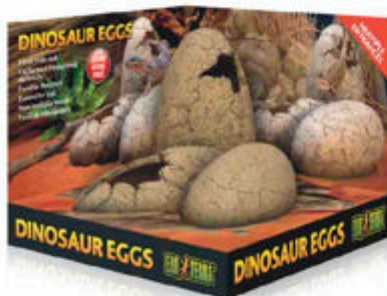
### Exo Terra Dinosaur Eggs Hide Out

Dinosaurs ruled the earth for more than 140 million years and are considered to be the ancestors of today’s reptiles. The Exo Terra Dinosaur Eggs add a prehistoric accent to your vivarium and provide a multilevel hideout.

This product provides a shelter with multiple entrances for easy access and allows you to create a cool, moist microclimate within the enclosure. This fossil hide-out offers a safe spot to hide and sleep, while the moist microclimate will support thermoregulation and hydration, and aid the natural shedding process of reptiles.

#### Key Features:

- Natural fossil look.
- Integrates in any type of vivarium.
- Provides a secure hiding place.
- Helps to prevent stress.
- Ideal to create a humid microclimate.
- Recommended retail price £15.99.



### Exo Terra Terrarium Glass Cleaner

The Exo Terra Terrarium Glass Cleaner is an easy to apply gel that was specifically developed to remove calcium and lime stains from vivarium glass. Tapwater used for misting is a major source of unsightly hard water stains in such enclosures.

Stubborn calcium deposits from misting systems like the Exo Terra Monsoon RS400 can be easily removed using the Exo Terra Terrarium Glass Cleaner. The Exo Terra Glass Cleaner’s non-toxic formula is absolutely free of ammonia, alcohol, dyes, perfumes and petrochemicals.

#### Key Features:

- Quickly and efficiently removes various mineral deposits.
- Effective and effortless application.
- Suitable for glass, plastic and other smooth surfaces.
- Great for removing calcium or lime stains.
- Recommended retail price £8.99 for 250ml.



\* For further information on any of these products, contact Rolf C. Hagen (UK) Ltd on 01977 556622 or visit the company’s website at [www.hagen.com](http://www.hagen.com)

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The newly-described fanged frog *Limnonectes larvaepartus* (male, left, and female) on the Indonesian island of Sulawesi. Photos of the frogs courtesy Jim McGuire.



# A frog that gives birth to tadpoles discovered

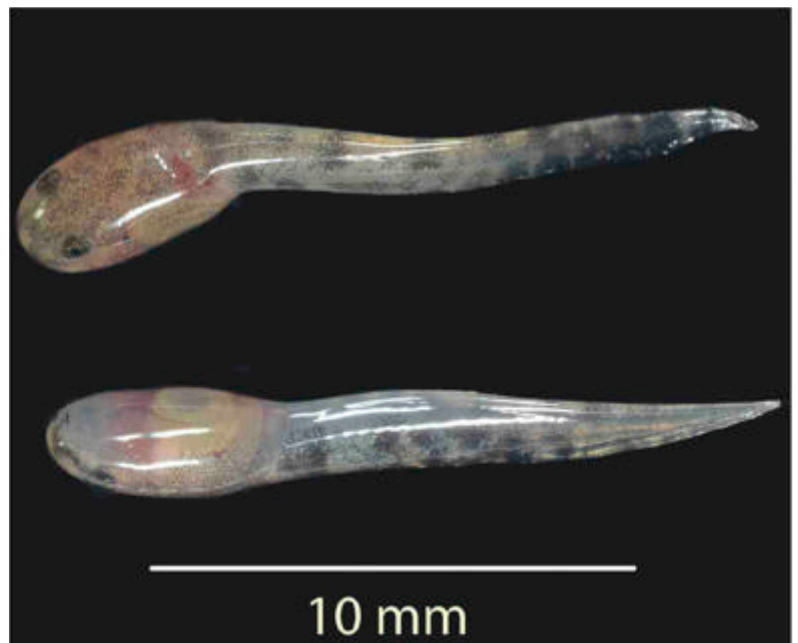
UC Berkeley herpetologist Jim McGuire was slogging through the rain forests of Indonesia's Sulawesi Island one night last summer when he grabbed what he thought was a male frog and found himself juggling not only a frog but also dozens of slippery, newborn tadpoles, reports Robin Sanders.

**T**his provided the proof that the intrepid scientist had been searching for: direct proof that the female of a new species of frog does what no other frog does. It gives birth to live tadpoles instead of laying eggs.

A member of the Asian group of fanged frogs, the new species was discovered a few decades ago by Indonesian researcher Djoko Iskandar, McGuire's colleague, and was thought to give direct birth to tadpoles, though the frog's mating and an actual birth had never been observed before.

"Almost all frogs in the world – more than 6,000 species – rely on external fertilisation, where the male grips the female in amplexus and releases sperm as the eggs are released by the female," McGuire explains. "But there are lots of weird modifications to this standard mode of mating. This new frog is one of only 10 or 12 species that has evolved internal fertilisation, and of those, it is the only one that gives birth to tadpoles, as opposed to froglets or laying fertilised eggs."

➤ A newborn tadpole (top and bottom views) of the newly-described fanged frog.



## External vs. internal fertilisation

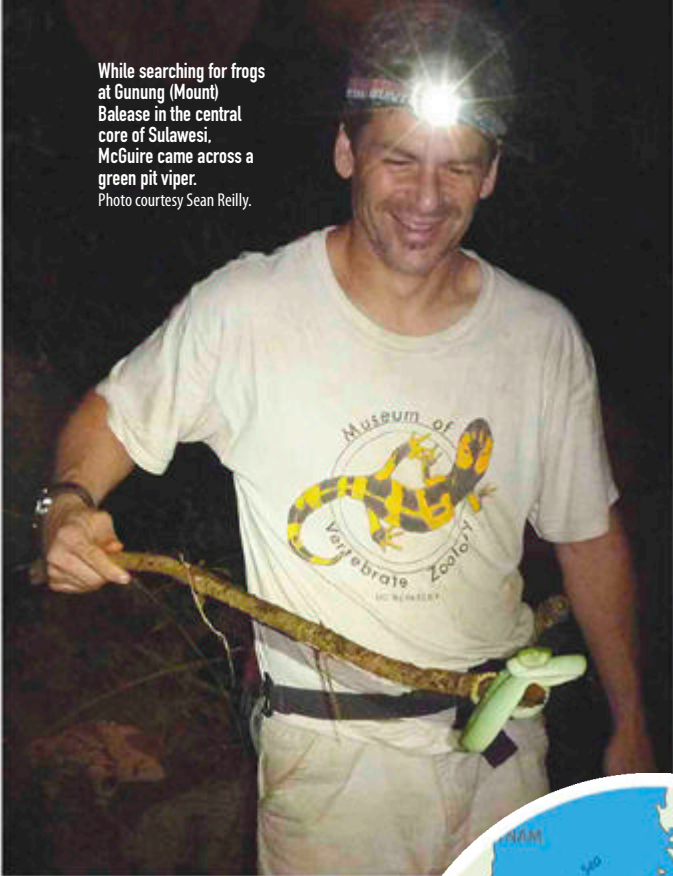
"Frogs have evolved an amazing variety of reproductive methods," says McGuire, an associate professor of integrative biology and curator of herpetology at UC Berkeley's Museum of Vertebrate Zoology. "Most male frogs fertilise eggs after the female lays them.

"About a dozen species, including California's tailed frogs, have evolved ways to fertilise eggs inside the female's body. However, the mechanisms of internal fertilisation are poorly understood in all but California's two species of tailed frogs,

the latter of which have evolved a penis-like organ (the "tail") that facilitates sperm transfer. Whereas the tailed frogs deposit their fertilised eggs under rocks in streams, the other frogs previously known to have internal fertilisation give birth to froglets – miniature replicas of the adults."

Although internal fertilization is therefore extremely rare among frogs, there are many other bizarre reproductive variations. Some frogs carry eggs in pouches on their back, brood tadpoles in their vocal sac or mouth, or transport tadpoles in pits on their back.

While searching for frogs at Gunung (Mount) Balease in the central core of Sulawesi, McGuire came across a green pit viper. Photo courtesy Sean Reilly.



A flying lizard photographed in Sulawesi's Tangkoko National Park. These lizards actually glide from tree to tree using the folds of skin along the sides of their bodies, rather than actively flying.

The two known species of female gastric brooding frogs, both of which are now extinct, were famous for swallowing their fertilised eggs, brooding them in their stomach, and giving birth out of their mouths to froglets. Two genera in Africa are known to engage in internal fertilisation and give birth to froglets without going through a free-living tadpole stage.

**More discoveries await?**

Fanged frogs – so-called because of two fang-like projections from the lower jaw that are used in fighting – may have evolved into as many as 25 species on Sulawesi, though *L. larvaepartus* is only the fourth to be formally described. They range in size from 2-3g – the weight of a couple of paper clips – to 900g (2lb). *L. larvaepartus*



▲ The location of Sulawesi, seen here roughly in the centre of this map.

is in the 5-6g (0.17-0.21oz) range, McGuire says.

The new species seems to prefer to give birth to tadpoles in small pools or seeps located away from streams, possibly to avoid the heftier fanged frogs which are to be found around these areas. There is some evidence the males may also guard the tadpoles. With less of a current in these stretches of water, so the chances of the tadpoles being swept away are lessened too.

**Sulawesi - a biodiversity hotspot**

McGuire first encountered the newly described frog in 1998, the year that he began studying the amazing diversity of reptiles and amphibians on Sulawesi, an Indonesian island east of Borneo and south of the Philippines. The island is a geographical hodgepodge, having formed from the merger of several islands about 8-10 million years ago.

"Sulawesi is an incredible place from the standpoint of species diversity endemic to the island as well as subsequent diversification that has taken place there," he says, noting that most places on the island are home to at least five species of fanged frogs living side-by-side.

Although many vertebrate species have diversified on the island after arriving by overwater "sweepstakes" dispersal, most – such as the flying lizards and black-crested macaque monkeys – have speciated (formed into distinctive species) in such a way that their geographic ranges are non-overlapping, with their distributions now meeting like

pieces in a jigsaw puzzle. The fanged frogs are special, McGuire says, because they appear to represent a virtually unexplored adaptive radiation, with many species occurring at the same sites but adapted to occupy distinct ecological niches, so minimising competition with each other.

"We are really interested in understanding how much of Sulawesi's *in situ* diversification was initiated on the paleo-islands which merged together, or if much or even all of the diversification that we see now was postmerger," he adds.

Much of McGuire's work to date has been with the simpler, non-adaptive radiations of the flying lizards and macaques. Fanged frogs present an even more exciting challenge in his view, because their diversification was influenced not only by the land movements that created Sulawesi, but also by adaptive radiation via ecological diversification.

McGuire and his colleagues and students have collected reptiles and amphibians throughout the island – flying lizards are his particular love – and taken genetic samples to reconstruct the evolution of species over time and perhaps shed light on how and when the islands came together. Plans are also underway to prepare a monograph on the identification, distribution and biology of the fanged frogs on the island. ❖

**Further information**

Djoko T. Iskandar, Ben J. Evans, Jimmy A. McGuire. **A Novel Reproductive Mode in Frogs: A New Species of Fanged Frog with Internal Fertilization and Birth of Tadpoles.** *PLoS ONE*, 2014; 9 (12): e115884 DOI: 10.1371/journal.pone.0115884



A male of the species *L. larvaepartus* sits next to a pool containing tadpoles (yellow circle), and may be guarding them, a typical male behaviour in some frog species.



# Rare gecko bred in UK collection

John Courteney-Smith reports on a success with a little-known species that could have great potential in the hobby.

Nothing delights me more than hearing about rare or rarely kept species being bred successfully in captivity. As technology improves, so do the chances of being able to breed these more unusual species successfully, gaining more insight into their reproductive requirements. This brings the benefit of increasing the number of individuals available to fellow breeders.

It can also go a long way to protect the actual species from possible localised extinction in the wild in some cases. We only have to look at the example of the

▼ These geckos are relatively small, averaging about 9cm (3.5in) including their tail.



crested gecko to understand just how important the effective captive breeding of all species can be, in terms of ensuring their survival in large numbers in collections worldwide.

I was therefore very excited when I recently received an email from Dave and Sarah, who run Contact Pets in Flintshire. Sarah was very keen to show me images of a small group of very rarely kept geckos that they have been working hard with over a period of time, and which has now resulted in successful captive breeding.

The scorpion gecko (*Pristurus carteri*), otherwise known as the semaphore gecko thanks to its apparent ability to communicate with its tail, is not listed as being endangered on the *IUCN Red List* but there are growing threats to its survival in the wild through its range in Oman and the Arabian Peninsula.

These geckos were reported as being widespread at the last update in 2012, but mining, farming and construction through the area where they occur are likely to have an adverse impact on numbers. As with many species of gecko in the wild, even small localised environmental changes can have a huge and detrimental effect upon their food chain.

Chemical run-off from mining also represents a hazard, and this threat remains for many years even after mining ceases. We can see just how the planting of palm nut plantations and open cast mining are factors that have adversely affected the now critically endangered electric blue gecko (*Lygodactylus williamsi*).

It is therefore fantastic news that we now have at least one productive group of the scorpion gecko here in the UK. This is a rarely kept species in the UK. With careful pairing and planning, so these lizards can now form the basis of a bigger breeding group.

I would urge anyone who may have the odd individual or pair of scorpion geckos to get in touch with Dave and Sarah to help with the development of the population here in the UK. This will add to the genetic diversity, and hopefully help their numbers to increase more rapidly than would otherwise be possible, serving to facilitate the long-term availability of these geckos.

I recently spoke with Dave and Sarah to find out more about their success with scorpion geckos. Here is what they said.

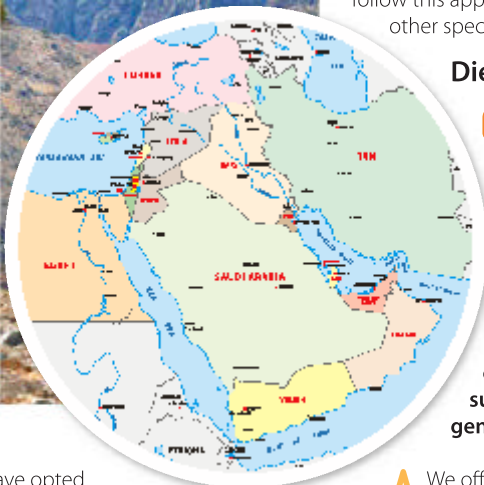
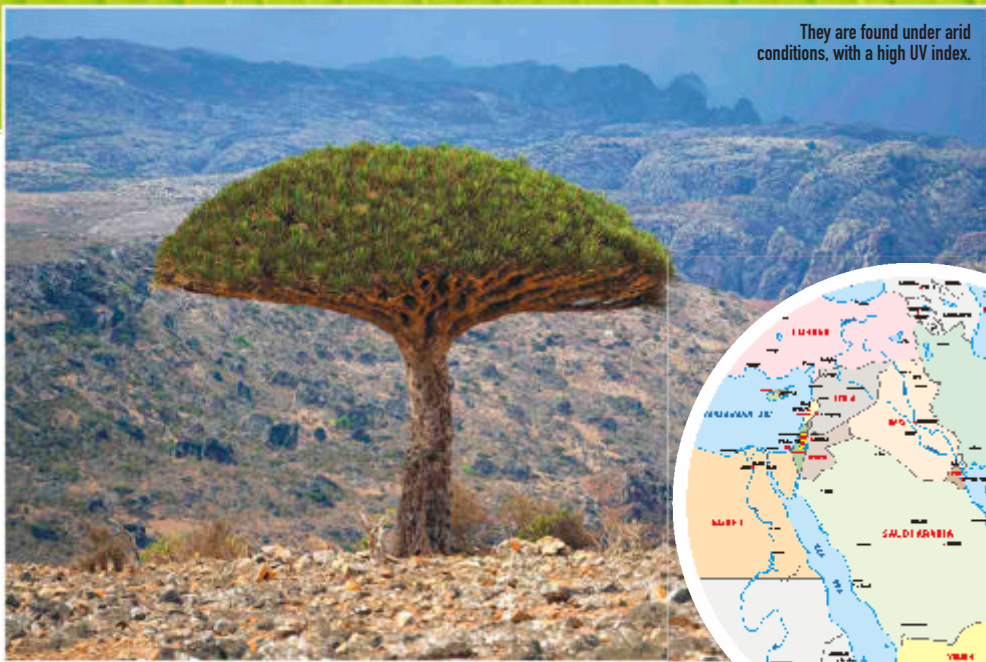
### How it began

**Q** This is such good news. Congratulations from all of us. How long have you had the geckos for, and how did they come into your care?

**A** Thank you - we're obviously delighted with this success, but we see it as just the beginning! The geckos themselves were purchased several months ago from an enthusiast who had had these lizards in his collection for some time. We had never seen anything like them before, and found them very appealing. Initially, we were attracted to them on the basis of their unusual bird-like appearance and their bold nature.



They are found under arid conditions, with a high UV index.



geckos. However, this is again a route we are planning to take with them, and follow this approach with many of the other species that we breed as well.

### Diet

**Q** As with all species, I guess that it is a case of you are what you eat. From my observation, I would always argue that variety is key to success, so what do you feed these geckos? What are your feelings about gut-loading and supplementation in general?

**A** We offer them as wide a range of invertebrates as possible, providing brown and black crickets, small locusts, bean weevils, small cockroaches, calci worms and waxworms. The youngster is only big enough to manage fruit flies and micro crickets at the moment, but is thriving on this diet, with supplements.

All food items are lightly dusted with a multivitamin supplement that includes both calcium and vitamin D3. Gut loading is a particularly useful way of increasing the nutritional value of feeder insects, and so we use it whenever possible.

**▲** Home for these geckos is the Arabian peninsula.

**▼** Bean weevils are a very useful food for small lizards – not to mention amphibians. They are now becoming more widely available from livefood suppliers.



### Lifestyle

**Q** This species is often regarded as being diurnal but may also be classed as being slightly crepuscular, remaining active for a time when darkness falls. Have you seen any behaviour that suggests this is an accurate description of their lifestyle?

Also, occurring in the wild in the scrublands of the Arabian Peninsula suggests that they could be easily kept in a bioactive enclosure, planted in a similar way. How do you keep yours and in what type of enclosure?

**A** We would say they are more diurnal, which may tie in with your description. We have observed a range of activities throughout the day including a strong feeding response, basking, and interactivity between individuals. However, our lights at present do not have a sequential step-down change in lighting levels, as would be required to observe crepuscular behaviour as well. We are intending to adapt the lighting though, to see if it modifies their

behaviour.

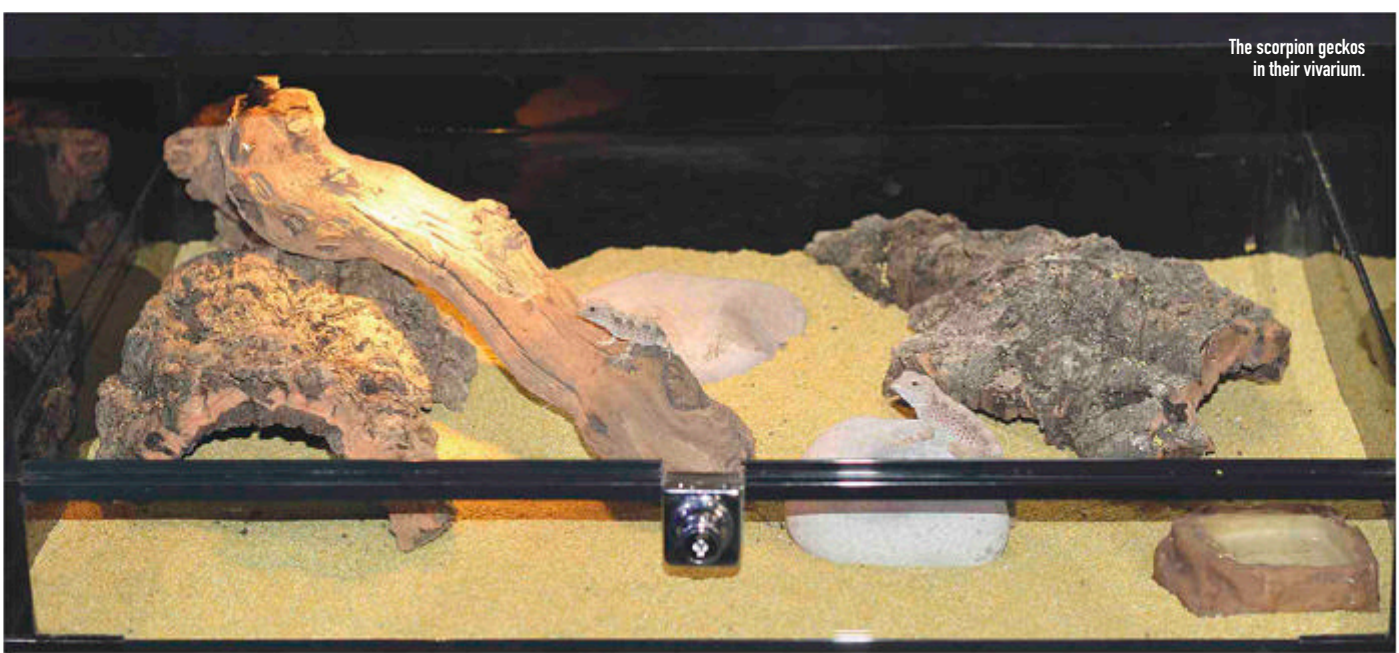
In terms of housing, we have opted for a fairly simple set-up. We are using a glass vivarium, measuring 60x45x45cm (24x18x18in), with a number of natural perches of rock and wood, designed with areas to explore and incorporating a sand substrate.

We are using a halogen light to provide a small high temperature basking area and an Arcadia Compact Desert UV light to provide the essential ultraviolet (UV) light. Our females seem more inclined to roam regularly, leaving the basking area to hunt and explore around the wood and rocks, whilst the male seems more inclined to stay on his perch overlooking the area.

We believe that this may be a hierarchical arrangement, with the male behaving as the more dominant animal. This may also indicate that this species is territorial by nature in the wild.

A planted bioactive enclosure may work very well and is a style of vivarium we would recommend for many species, but we have not yet tried it with these

The scorpion geckos in their vivarium.



All gecko photos but the header courtesy Dave and Sarah/Contact Pets.



Fruit flies are featuring in the diet of the young gecko.

## Communication

**Q** Apart from being known as the scorpion gecko, this species is also sometimes referred to under the alternative name of semaphore gecko. How have you observed any of your geckos use their tail for this purpose, and do you believe that it serves as an example of active communication within the group?

**A** We have seen certain tail movements, flicking and waving, which indicate an interaction between the group, to the same extent a bearded dragon will use head bobbing or waving. But not to the degree of say, steppe runners (*Eremias arguta*), where we have noticed marked signalling behaviour within a group.

Signalling would almost certainly be considerably more extreme in chance encounters or in a less settled group where the hierarchy was less well established. However, we have seen them use their tails as a defence when they feel threatened. They raise and curl their tails over their backs as a deterrent, mimicking the movement of scorpions, and showing why they have gained the common name of scorpion geckos.

## Breeding success

**Q** These geckos have had a reputation for being very hard to keep, and there are very few records of them being bred successfully before. What were the factor or factors that you discovered that allowed you to persuade them to lay, and then incubate their eggs successfully? How long do you see them basking for and do they openly use the high strength UVB system?

▼ The steppe runner is another lizard that uses its tail for communication purposes.



**A** We purchased them as a small group that were already settled, which obviously helped. We then tried to mimic natural conditions under which they live in the wild. They were offered a varied, well-supplemented diet, combined with the ability to bask under Arcadia's high-powered UVB lamp that mimics natural sunlight.

This has certainly encouraged them to lay multiple times, while staying in peak health with no obvious issues that can sometimes be associated with egg production. The females dig a small hole in their sandy substrate, and lay a single egg, which they then cover over again, concealing its presence. You need to watch them, because otherwise you can miss where they lay!

The eggs have hard, calcareous shells and we have incubated them at 28°C (82°F) on a dry sandy substrate in a humid tub.

The first egg hatched out after 45 days and we currently have several other eggs incubating.

We frequently see the females basking on a branch underneath the halogen bulb for heat in the morning, and then as the day progresses and they warm up, so they usually move to a perch under the Arcadia UVB in a cooler area of the vivarium.

We believe that the UV is absolutely essential, as this species seems to bask under the UV almost continuously during the day. This reflects the very arid, sunny landscape in which it occurs in the wild.

Contrary to what has been said before, they certainly appear to be relatively easy to keep successfully in our experience. Other factors are likely to influence breeding success though. These are likely to include the correct environment and a good, healthy varied diet, plus individuals that are compatible with each other.

Keeping them in a trio of a male with two females has worked for us. Males housed together may be aggressive towards each other, and this might impact on breeding performance.

**Contrary to what has been said before, they certainly appear to be relatively easy to keep successfully in our experience.**





The young, like adults, seem quite steady and trusting.



them fully within the hobby. Obviously more stock is needed as well. We believe anybody could breed these geckos at home, provided that they can meet their basic husbandry and reproductive requirements.

### Looking to the future

**Q** In an ideal world, what would you like to see, with regards to this species in the hobby in, say, 2020?

**A** We feel the scorpion gecko would make a really good breeding project. As mentioned before, the only problem is obtaining enough to achieve adequate genetic diversity through the early stages. We're hoping to obtain some more specimens in the future, with a view to setting up a number of unrelated groups. We would hope that they would become firmly established, rivalling crested and leopard geckos as they appear to be an ideal pet species as well, based on our experience with them.



▲ The tiny size of the youngster is evident from this photograph, set against a 1p coin.

### Drinking

**Q** This is a species that lives in arid scrubland, and in the wild, they would obtain water from food sources and from early morning mists. Have you seen them drink from a bowl or do you use the "morning spray" method and allow them to self-regulate?

**A** Our adults seem happy to drink from the bowl in their enclosure although this is very infrequent. They appear to get most of their water requirements from their food. The hatchling is being given a very light mist in the morning to prevent risk of dehydration, until he has learnt what the water bowl is for – and this is obviously shallow for safety's sake.

### Long term potential

**Q** This species seems to be naturally friendly. Dare I say it could be a potentially good pet species? Do you see a time when they can be bred in numbers at home?

**A** In the past 30 years, we have honestly not come across a lizard even close to being as good a pet as these are, and their size is another factor in their favour. They don't appear inclined to hide at all, so they are very visual, easy to keep, and exceedingly relaxed and handleable.

We would hope they could be bred in numbers, although because they only lay one or two eggs at a time, in true gecko fashion, it may take some time to establish

## Further information

Dave and Sarah can be reached at Contact Pets, Unit 68, Welsh Road, Zone 1, Deeside Industrial Estate, Flintshire, CH5 2LR. Tel. 01244 280880.

The young gecko is plainer in colour than its parents.



# Out of Africa

## Meet the burrowers



A Saharan sand viper (*Cerastes vipera*) largely hidden in the desert sand. Its camouflage helps these snakes to hunt successfully, but they are not truly fossorial in their habits.

In the second of his new series of articles, explaining how specific groups of reptiles and amphibians have evolved to live in different and often extreme types of habitat, Paul Donovan considers the lifestyle of subterranean species that spend the majority of their time below ground.

**W**ith the exception of Antarctica, reptiles have successfully colonised every continent, and occupy just about every type of habitat, from living beneath the soil to occupying trees, in habitats ranging from rainforest to desert. Some species have even adapted to life within the Arctic Circle. This versatility has usually been achieved by means of unique anatomical

adaptions, as well as resulting from specific physiological processes in the body.

### What is a burrower?

Living in Africa, I have been able to study the remarkable diversity that exists within the species of reptile and amphibian occurring here, and so I will concentrate

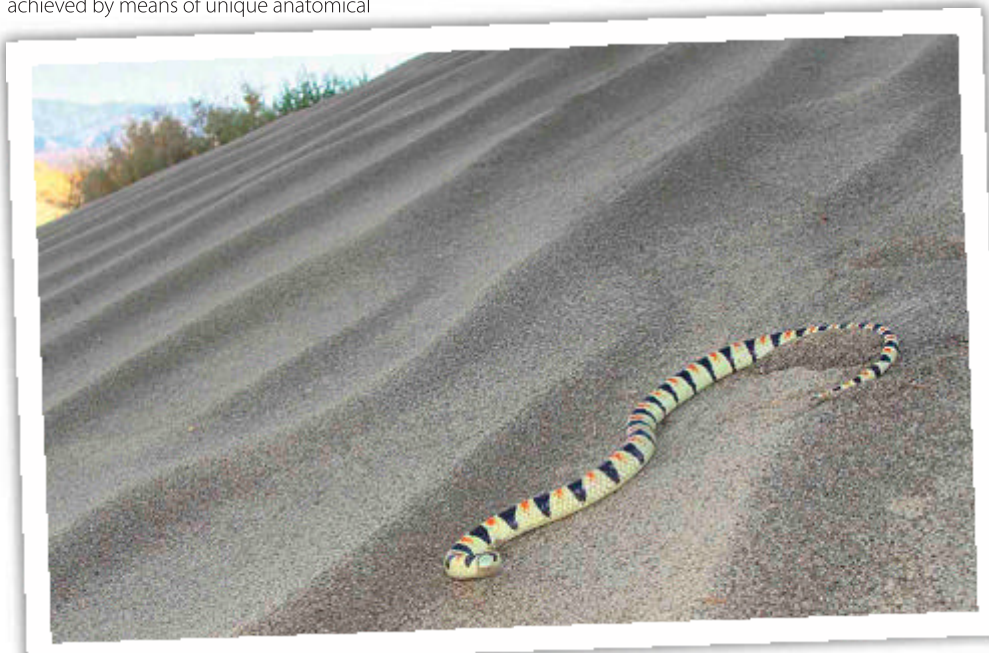
▼ The shovel-nosed snakes (*Chionactis species*) from North America are a typical example of semi-fossorial species.

on those that I am most familiar with at first hand. Nevertheless, it is not always easy to observe burrowing species, wherever you happen to be in the world.

'Burrowing' in this sense is not a scientific description as such, being simply used to refer to any group of snake or lizard that lives permanently beneath the ground, in tunnels that they have excavated. This description is also applied to reptiles that make use of pre-existing burrows dug by other animals or adopt natural features created by geological faults such as caves and crevices, although there is a significant difference between these two lifestyles.

True burrowing reptiles seldom venture out above the surface; they are most likely to find their way there inadvertently following heavy rains when they are forced to the surface as the ground becomes waterlogged, or their presence is revealed unexpectedly during excavation work. They otherwise spend their entire lives beneath the surface, even breeding there, and are termed as being 'fossorial', because they cannot live outside this environment.

Other reptiles that make use of disused rodent burrows or natural features could best be described as 'semi-fossorial'. While they may spend a good proportion of their lives underground, they will come to the surface in order to move from burrow





The Cape cobra is a generalist, even climbing trees in some parts of its range, but is often to be found taking advantage of rodent burrows, and rocky crevices in very arid areas. This particular individual was photographed in the Kalahari Desert.



▲ Fossorial snakes are not designed to live above the surface. Photo courtesy of the author.

to burrow, mate, or to find food. As always seems to be the case, there are also some exceptions to this rule though.

To give you an example, blind snakes of the family Typhlopidae are permanently fossorial. They eat, sleep and breed in this environment. A snouted cobra (*Naja annulifera*) that has found a disused rodent burrow in which to take up residence is not a true burrowing species, but is simply making use of the burrow for security.

However, we then have species that fall somewhere between the two, in terms of their lifestyles. Burrowing snakes (*Atractaspis* species) or mole snakes (*Pseudaspis* species), while they may push through loose soil making their own tunnels, are equally at home in a disused rodent burrow, or will adopt cracks amongst rocks in which to live.

### Recognising fossorial snakes

Members of this group tend to be small, being seldom more than 1m (3ft) in length. Their slender, cylindrical bodies are

limbless. In the case of fossorial lizards, they too may be lacking limbs, or only have very rudimentary limbs.

The same can be said about their eyes. These can even be completely absent in fossorial species. There is little benefit in having eyes in an environment where these organs would serve no purpose and would be easily damaged, but semi-fossorial species will have more developed vision. Their eyes can nevertheless be tiny and semi-functional, being capable of detecting little more than the differences in shadows.

A snake living on the surface may have evolved one of several modes of movement, but fossorial snakes and lizards living permanently underground have adopted a single, universal method of locomotion. As there is no channel



▲ Where there is little cover provided by the environment, so snakes on the surface are vulnerable to predators such as birds of prey.

through which the snake can move, it must therefore create its own, and it does so in a couple of different ways, depending as to how hard the ground is in front of it.

The head of such species is strongly chisel-shaped, which allows the individual to shift loose sand or soil out of the way as it pushes its body forwards. Alternatively, where compacted ground is encountered, the head may be 'hammered' into the soil, like a jackhammer, to force its way through.

In order to facilitate movement, true fossorial snakes and lizards also usually have short squat tails. The tail often has a strong pointed tip which is used to gain a firm purchase point against the soil as the individual pushes its way forwards. More impetus is provided as a consequence when the tail is short than if it was long.

Finally, the scales covering the body of this group of reptiles are smooth and highly polished. The purpose of this arrangement is of some debate, with some scientists arguing they provide little friction against the surface as the snake/lizard burrows, while others hypothesise that these scales may actually repel dirt. What is indisputable, however, is the fact that the combination of these different anatomical features means that a fossorial snake or lizard can move through even the most compact of soils with ease.

Unlike the true burrowing snakes and lizards, many of the semi-burrowing species can be larger in size. Mole snakes (*Pseudaspis cana*), for example, can reach 1.3m (just over 4ft) and have a good girth, while other species of this type can be even larger. Such snakes can have varying degrees of smooth or keeled scales, and their heads are marginally wedge-shape, or may be quite blunt with well-developed eyes. They also typically employ any one of the terrestrial modes of movement, rather than the method used by true fossorial species.



Mongoose are also active hunters of snakes in arid parts of Africa.

Permanent fossorial inhabitants include this thread snake, as shown here. Photo courtesy of the author.



## The architect of burrowers

One of the most successful groups of reptiles, when it comes to underground living, must surely be the primitive worm lizards. Once classified along with the lizards, they now occupy a separate suborder of their own, called Amphisbaenia. What makes these worm lizards so unique is the way that although clearly vertebrates, they have almost transformed themselves into invertebrates, effectively losing their skeleton.

This transition has effectively been achieved through the evolution of what could loosely be described as a hydrostatic skeleton; a fluid-filled cavity surrounded by muscles, as is seen in earthworms. Although the worm lizard has not lost its skeleton, the way that it mirrors the earthworm is shown by how its vertebral column has become detached from its outer skin and muscles.

As the worm lizard moves through the substrate, its skeleton moves independently from that of its outer skin and muscles. This gives it more contact points, and thus enables it to move in a similar way to that of an earthworm. Conversely however, another adaptation that they have evolved is the presence of a short robust skull strengthened with extra bone, and a spade-like scale for penetrating through the earth. They use this scale to scrape and lift soil out of the way, and it also helps to compact this against the walls of the burrow.

## Feeding

For those species that are genuinely fossorial, feeding has evolved into a



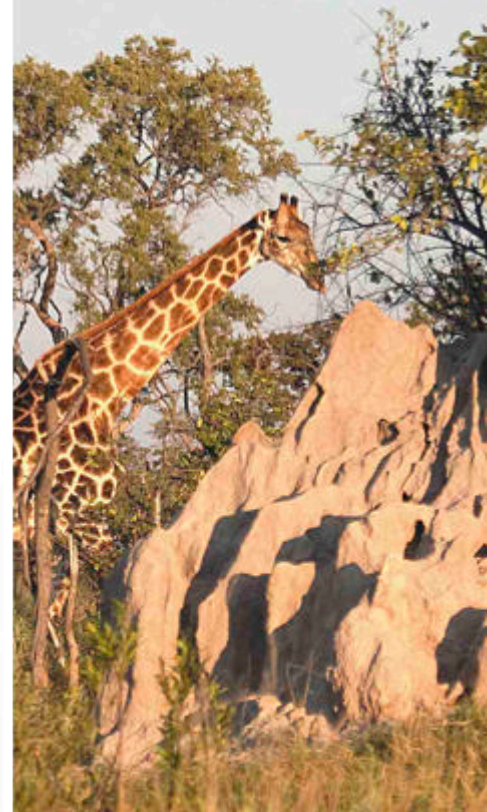
▲ One of the rudimentary eyes of this blind snake is just visible as a black 'spot'. Photo courtesy of the author.

For those species that are genuinely fossorial, feeding has evolved into a highly specialised behaviour.

highly specialised behaviour. In the case of the African blind snakes (*Rhinotyphlops* and *Typhlops* species), as well as the thread snake (*Leptotyphlops*), and the worm lizards forming the genera *Monopeltis*, *Chirindia* and *Zygaspis*, they all feed almost exclusively upon termites or ants and their eggs.

It is thought that these snakes and worm lizards almost certainly find their

Termite mounds are a common sight in the African landscape, and can reach a gigantic size.



As a worm lizard burrows, its skeleton moves independently from that of its outer skin and muscles. Photo courtesy of the author.





▲ A viper would find it hard to open its mouth sufficiently to erect its fangs in a burrow to deliver a bite. Photo courtesy of the author.

way into the nests of their prey by locating these through the use of pheromones released by the insects. In order to protect themselves from attack while in the nest, the snakes and worm lizards themselves secrete a pheromone similar to that of the ants/termites who accept them as one of their own, despite the huge disparity in size. Other foods may also be taken by different species of permanent burrowers, being hunted again by movement and vibrations they give off.

Even for a snake that finds its way into a burrow in search of food, securing it can be difficult. A rat or mouse can put up a concerted fight to defend itself against the snake. It may even be able to flee past the snake and make its escape. For a constricting snake, killing its prey in these surroundings is much easier than for some venomous species.



▲ A cobra can inflict a bite in a burrow more easily than a viper as its fangs are much shorter. Photo courtesy of the author.

▼ The scales covering the body of a fossorial snake are invariably smooth and highly polished. Photo courtesy of the author.

Certainly, if a viper found itself in a burrow with a food source, it would have great difficulty in initiating a bite due to the limitations of the burrow. The snake would find it hard to open its mouth sufficiently to erect its fangs and deliver a bite. For a snake such as a cobra, things are a lot easier. Their fangs are shorter and do not need to be raised to a vertical position in order to inflict a bite. ➤



### Thin necks

I have read some interesting views on the ball (royal) python (*Python regius*). There is some speculation, (and I must point out that there is no scientific evidence to back this up – or at least none that I can find!), that as this particular snake spends a significant proportion of its time underground in burrows, so it has supposedly evolved a thin neck.

The purpose of this feature, supposedly, is to allow a ball python to constrict its prey within the confines of a tight space. The reason that this theory has been proposed comes from the observation that this small python constricts its prey using only the frontal portion of its body.

I suppose if you look at it theoretically then yes, this sounds valid but there are an awful lot of snakes as large as the ball python that live and hunt down in burrows, but do not show the same degree of anatomical specialisation.

### Specialised fangs

This then leads us to a family of African snakes that have evolved a highly specialised way of feeding in a burrow. The burrowing asps, often called stiletto snakes, belong to a family called Atractaspidae. This family is made up of both front and rear-fanged snakes.

One curious adaptation occurs in the genus *Atractaspis*. These snakes have evolved a set of front fangs which can be moved laterally to stick out of the side of the mouth, even when the mouth is closed. This means that if an individual enters a burrow and the mouse tries to flee past the snake, it can then deliver a bite by a sideways jabbing motion.

### Primitive fossorial lizards

Although I have mentioned the primitive worm lizards, there are many other lizards living a fossorial or semi-fossorial way of life. Lizards such as various geckos,

► A web-footed gecko (*Pachydactylus rangei*), photographed in Africa's Namibia desert, which lies on the southwest side of the continent. These geckos are nocturnal, spending the day in an underground burrow which might be 1m (3ft) or so in length.



agamids, gerrhosaurids, and lacertids are typical examples. However, it is perhaps the burrowing skinks (family Scincidae) that show the most diverse adaptations to a fossorial way of life.

These specialised skinks are represented in Africa by the genera *Scelotes*, *Sepsina* and *Typhlacontias*. Some members of the group are entirely limbless, while at the other extreme, there are others that possess rudimentary limbs. In the case of these limbed individuals, some have both front and hind limbs, while others have only hind limbs. They are all characterised by their pointed snouts, cylindrical bodies and small, smooth scales. The tail is as long as,



The legs in some skinks may be entirely absent, or as seen here, just rudimentary. This indicates a subterranean existence.

and sometimes longer than the body. External ear openings may be present or absent, with the eyes being tiny in all cases.

### Reproduction

Although we know much about the anatomy of fossorial reptiles, a lot of their biology is still uncharted, when compared with other species. One of the reasons for this state of affairs is probably due in part to the difficulty of finding them, and then implementing any kind of research programme. Reproduction is



Is it an illusion, or do ball pythons have relatively thin necks to suit their lifestyle?



Some amphibians are semi-fossorial, particularly during the dry season here in Botswana. Photo courtesy of the author.



approaches; head end first, or rear end first. There are a number of reasons why amphibians burrow: most often to avoid desiccation and to increase their chances of surviving extended periods of drought.

An amphibian's skin is extremely porous, and in anything apart from a wet or damp environment, this can quickly result in fluid loss and the risk of dehydration. By burrowing into the substrate, an amphibian can survive in very hot countries, or certain types of environment where its survival could otherwise be difficult.

▲ Even in the case of toads, that are a group of amphibians quite well-adapted to living on land, their skin will dehydrate rapidly, especially in arid surroundings where the humidity will be low. Burrowing helps to minimise the danger.

As a consequence, a surprising number of amphibians here in Botswana can be encountered in habitats where you would not expect amphibians would be able to survive. They can be found in some parts of the Kalahari desert, as well as semi-bush environments and the very dry sandy regions of the south. This is a topic that I will return to in more detail in a forthcoming article.

### Tail end

Whether fossorial or semi-fossorial, reptiles that have made their home beneath the surface of the soil have developed many different anatomical modifications, enabling them to live in what is really quite a hostile environment. Movement can be restrictive in these surroundings, food can be difficult to locate, and possibly reach, while finding a mate can be even more challenging.

Yet this has not stopped many species from making this type of environment their home. It should also be borne in mind, that as primitive as many of these burrowing species are, they probably played a major role in the evolution of land reptiles as we know them today, although the jury is still out on that one! ❖

## ▶▶ Burrowing takes one of two obvious approaches; head end first, or rear end first. ◀◀

one area where our knowledge is scant.

How, as an example, do individuals locate one another? Is it just luck that the sexes come together? Or do they make use of pheromones? And do they mate in enlarged chambers? What we do know is that mating is internal with either eggs being laid, or live young being born. And a recurrent trait amongst fossorial snakes is that clutch sizes are almost always

small, seldom exceeding 2-5 eggs.

### Semi-fossorial amphibians

Although I have focused on burrowing snakes and lizards, there are of course many amphibians that burrow on a regular basis. Few of these lead a permanent fossorial existence, and can therefore be classed as semi-fossorial. Burrowing takes one of two obvious



**GLOBAL  
GECKOS**

OPEN



This month, we profile Global Geckos Reptile Shop, which is located in Windlesham, Surrey.

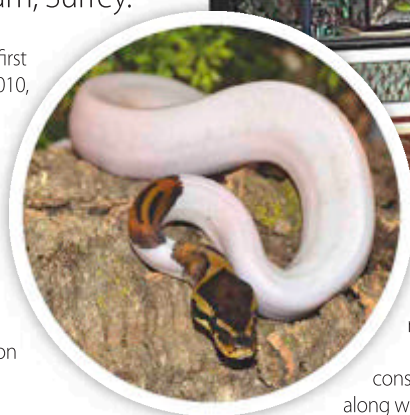
**G**lobal Geckos Reptile Shop first opened its doors back in 2010, and within just five years, it has become a well-known and highly respected name within the reptile-keeping hobby. How has this been achieved? It is simple really, according to its owner - by always putting animal welfare before company profits. Global Geckos has achieved its reputation for three main reasons: staff knowledge and qualifications, tremendous success with captive breeding and an overwhelming commitment to animal welfare.

The shop is owned and run by Will Thomas, who holds both a BSc degree in Zoology and a Research Masters degree in Molecular Ecology. The other members of the team are senior livestock technician Ed Howard, holder of a degree in Animal Behaviour and Welfare, and assistant manager Ally Chapman, who has spent over a decade working in the reptile business.

### A diverse breeding programme

Global Geckos is home to one of the largest and most diverse reptile breeding facilities anywhere in the UK. Every year, the team breeds over 1000 reptiles of more than 40 different species. As the name would suggest, the business is perhaps best known for its huge array of geckos, ranging from the popular leopard gecko and crested gecko right through to rare day geckos and various Australian species.

In addition, Global Geckos also has a well-deserved reputation for its chameleons, including panthers, Yemenis and Jackson's, and this year, the team has a number of breeding projects planned to raise the profile of other African chameleons. The snakes produced include favourites



such as corn snakes and ball (royal) pythons, which are bred in a huge array of morphs.

Various king snakes, boa constrictor localities and morphs, along with Australian Pythons and a few endangered species like the Madagascar tree boa also form part of the breeding collection. Interesting projects to keep an eye out for in 2015 involve the porcus false chameleons (which are actually a species of anole), Bauer's chameleon geckos and, of course, Fijian iguanas.

When it comes to reptiles that have not been bred in-store, Global Geckos still adheres to its 'only captive bred' policy, obtaining such stock from other reputable sources. You can count on Global Geckos to have a huge variety of species available; at any given time, the shop will have between 80-120 different species and a total of over 400 reptiles, amphibians and invertebrates available.

### Welfare matters

Global Geckos takes its responsibility for animal welfare very seriously, to the extent that members of the team actively spread the message out into the community and encourage others to follow their lead. Global Geckos supports a local school reptile club and is the official sponsor of the Surrey Reptile and Amphibian Society (SRAS). Leading by example, staff seek to dispel myths and outdated knowledge, helping to advance the hobby through education, knowledge and compassion. These qualities are what help to maintain Global Geckos at the cutting edge of reptile keeping.

### Exclusive equipment

Alongside an amazing array of animals, Global Geckos also offers all the associated equipment you could ever need. There is a policy of only stocking products that staff themselves are happy using and recommending, so you will not find any gimmicky or inferior items available here. Recent expansion in the area of bioactive ranges and the choice of live plants means that you can find everything needed for a planted vivarium set-up here, all under one roof, no

matter whether you are an enthusiast just starting out or a seasoned herpetoculturist.

Global Geckos also has an exclusive range of 'Terra-vivs', designed by the team and specially manufactured by a leading maker of pet products. These units offer the perfect housing solution for terrestrial reptiles such as leopard geckos and ball (royal) pythons, as the name suggests, and they are only available through Global Geckos. It's this proactive, positive approach to the needs of reptiles that has seen the shop go from strength to strength, providing a unique and unforgettable experience for visitors.

In addition, Global Geckos maintains an active online store for customers further afield, and also offers an incredibly popular reptile holiday boarding service for owners, in addition to supplying its livestock to various other retailers. The shop hosts a number of in-store events and special time-limited offers, so to keep up-to-date with what's going on, why not join Will and the team on Facebook for regular updates? ❖



### Plan a visit

**Global Geckos Reptile Shop**

**Where:** 18 Updown Hill, Windlesham, Surrey GU20 6AF. **Tel** 01276-423137.

**Online store website:** [www.globalgeckos.co.uk](http://www.globalgeckos.co.uk)

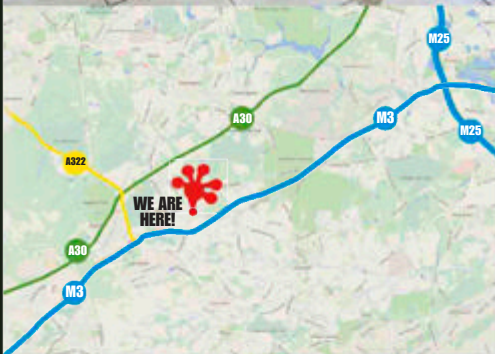




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# VETERINARY CASEBOOK

Accidental injuries by definition tend to occur quite unexpectedly, and of course, hindsight is a wonderful thing. There are some obvious risks when it comes to keeping tortoises outdoors – falling in a pond, being attacked by a dog or fox, seized by a seagull, falling over trying to climb steps . . . . But Ted's problem was pretty unique and far from straightforward, as Sarah Pellett, the veterinary surgeon who treated him, now explains. The moral of this story is always to watch what your pets are doing, and try to anticipate any dangers in advance.



## Hook, line and sweetcorn . . .

**R**eptile cases are often both interesting and challenging, and none more so than that of Ted, the Hermann's tortoise. He was referred on a Friday night, with a long piece of fishing wire hanging out of his mouth.

Ted had been outside in the garden all day and when his owners went to bring him indoors, they were shocked to see the long piece of wire hanging out of his mouth. It soon came to light that their son had been fishing and had left his equipment in the garden to sort out and put away later. The chances that there was a hook at the end of this line in Ted's body appeared to be worryingly high . . .

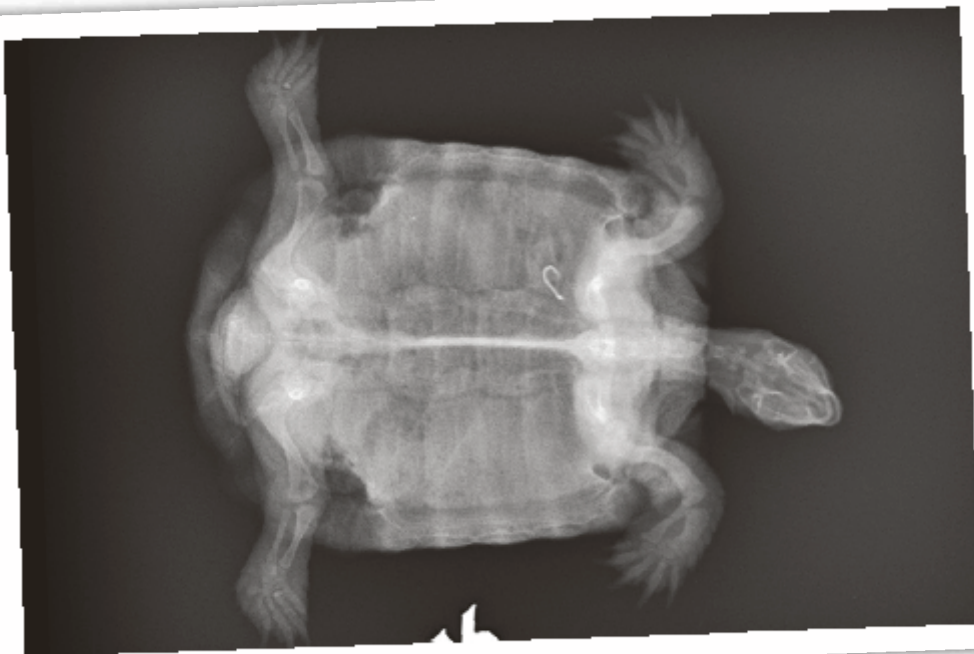
### Examination

This initial concern meant that the wire could not be pulled from his mouth in case the hook – if present – was attached to the stomach lining. Pulling the wire could have caused tearing of the stomach or intestines, with very serious consequences.

Pain relief was therefore administered as a starting point, and a cautious examination of Ted's mouth got underway. Unfortunately, the wire disappeared out of sight down his throat, and the only way to assess what was going on further down in his digestive tract was to X-ray Ted's body.

➤ Ted with the line trailing out of his mouth.

▼ The hook is very clearly apparent in this X-ray.



Most tortoises do not need sedation when they are having a radiographic examination, and Ted himself was very co-operative. He remained perfectly still on the X-ray table and allowed us to take these essential images. They proved our initial fears were correct, as they clearly revealed a fishhook at the end of the wire, located in his stomach.

### Anaesthesia needed

The decision was taken to try and remove the hook by means of endoscopy. This entails putting a tiny camera down into the stomach, with the resulting images being used to guide the removal of the hook. This was a very delicate procedure, as care had to be taken not to tear the stomach wall when removing the hook.

However, the only other alternative would have involved a major operation, cutting a flap into Ted's plastron (the base of his shell), in order to allow access to his stomach, and removing the hook by this route. It was decided to avoid this approach, however, as it would have been much more invasive and traumatic for Ted, and would have made his recovery more problematic as well.

Ted was therefore given a sedative injection and a tube was placed into his airway to enable him to be ventilated with anaesthetic gas and oxygen during the procedure. The endoscope was passed into his mouth, down the oesophagus and into the stomach where we could then see the hook. It now became clear why Ted was so keen to swallow a hook in the first place – a piece of sweet corn that had served as bait was still attached to the end!



The forceps at the tip of the endoscope meant the hook could be removed safely.

Small forceps were passed down the endoscope into his stomach to allow the hook to be carefully removed, and it was a great relief once it emerged from his body. By using the endoscope, it was also possible to check carefully that Ted had not

suffered any obvious tears or lacerations to his oesophagus or stomach wall as a result of swallowing the hook. Amazingly, it even came out with the intact piece of sweetcorn still attached!

Tortoises can be quick to stop eating, especially after surgery and they may take weeks or even months to start eating properly again. We didn't want to take this risk with Ted, so while he was under the anaesthetic, we placed a feeding tube that went from the side of his neck, down his oesophagus and into his stomach. This could then also be used to give medication to Ted, as well as for feeding him.

▲ The endoscope, complete with viewing eyepiece.

### Recovery

Ted stayed with us for a couple of days to recover, and we provided special food through the feeding tube, designed to deliver all the nutrition that he needed. Special so-called 'gastroprotectant' medication was also given to line and soothe his stomach.

Ted then went home and his owners carried on feeding him through the tube. Luckily, it didn't take long for him

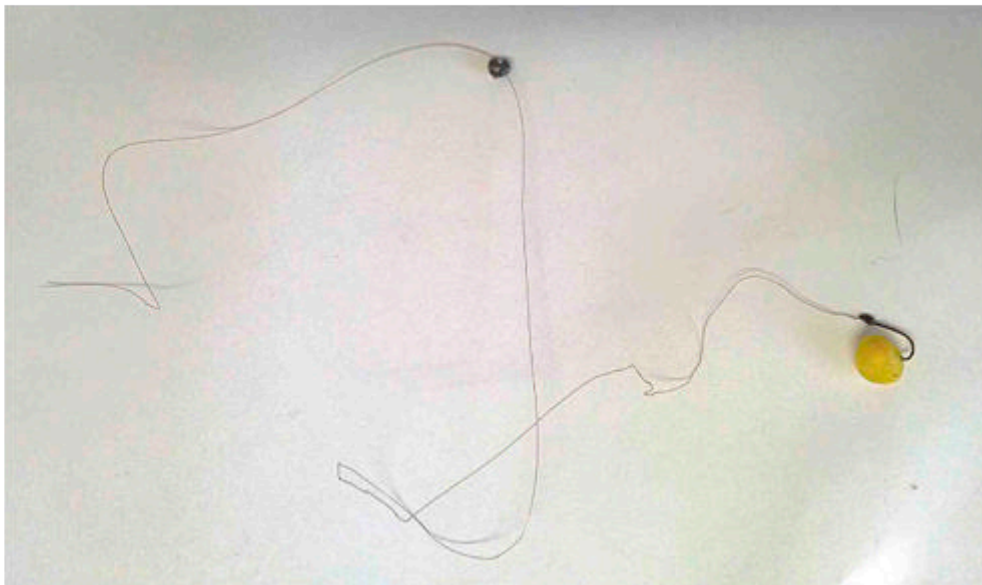
to feel better and he started eating independently again within the week. He was back to consuming normal amounts of food on his own by

**▶▶ Tortoises can be quick to stop eating, especially after surgery and they may take weeks or even months to start eating properly again. ◀◀**

week two, and so he did not require the feeding tube anymore. It was removed and we are delighted to report that Ted is now back to normal, with no on-going problems after his adventure.

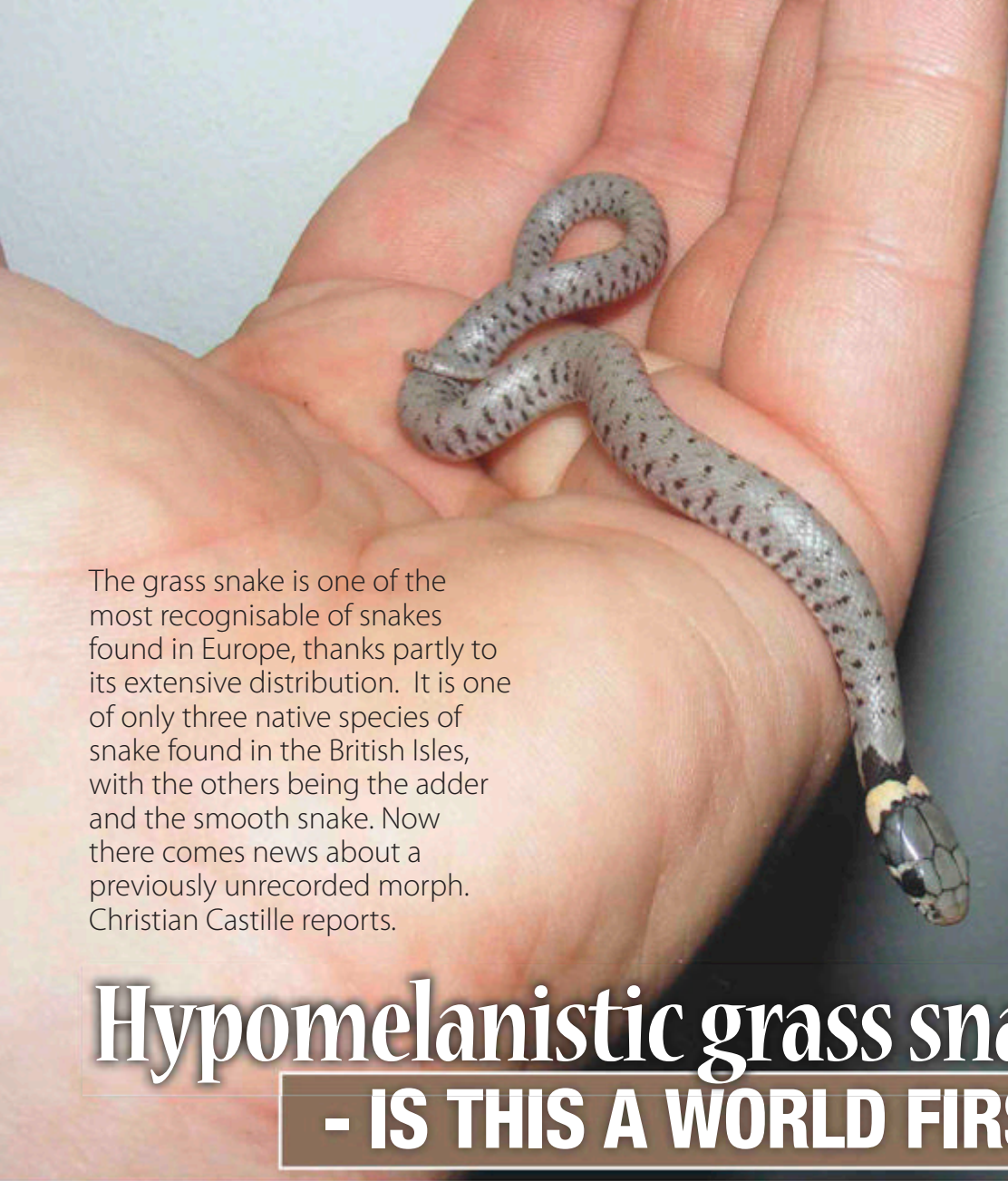
Ted's story is certainly an unusual case, and we are unlikely to see this problem again in a hurry. But it does go to show that tortoises can be very inquisitive, and if something looks like food then they will probably try and eat it, being unaware of the associated risk. Make sure that such dangerous items are therefore not left lying around within reach! ❖

▼ The line with the hook and the piece of attached sweetcorn.



Need to add: All photographs, except the top image, courtesy of the author.

Sarah Pellett BSc(Hons), MA, VetMB, Cert AVP (ZooMed), MRCVS graduated from the University of Cambridge in 2006. While studying for her degree, she spent time in exotic practices and zoos both in the UK and abroad. She then worked for three years at a first opinion and referral exotic animal practice in Manchester where she completed the RCVS Certificate in Advanced Veterinary Practice (Zoological Medicine). Sarah now works at Animates Veterinary Clinic Ltd, in Thurlby, Lincolnshire, seeing a wide range of first opinion and referral exotic animal cases. She is currently studying for the RCVS Diploma in Zoological Medicine.



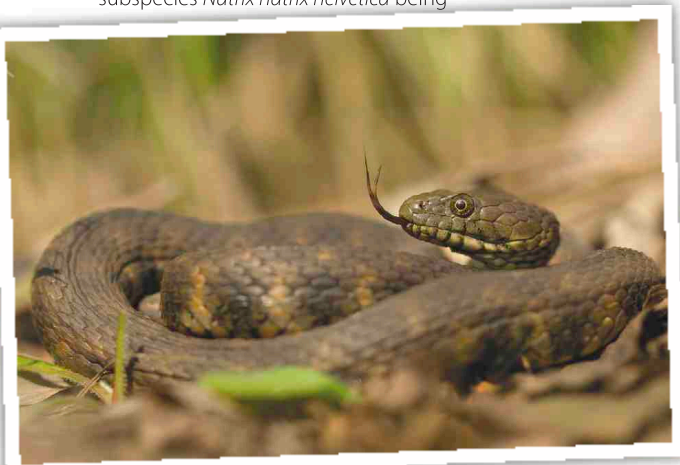
The grass snake is one of the most recognisable of snakes found in Europe, thanks partly to its extensive distribution. It is one of only three native species of snake found in the British Isles, with the others being the adder and the smooth snake. Now there comes news about a previously unrecorded morph. Christian Castille reports.

# Hypomelanistic grass snakes bred - IS THIS A WORLD FIRST?

I am always keen to see grass snakes in the wild, as well as breeding them in captivity. So you can understand my excitement when I hatched out the world's first ever captive bred hypo grass snakes back in August.

I've caught species of *Natrix* in multiple countries, from viperines (*Natrix maura*) in the south of France to dice snakes (*Natrix tessellata*) in eastern Croatia. However, nothing beats herping for grass snakes (*Natrix natrix*) in my view, with the subspecies *Natrix natrix helvetica* being

▼ A dice snake photographed in the wild.



the form found in the Britain.

I love going out walking and looking for these snakes. For some 20 years, finding them in long grass, under logs and in canal systems has been less of a hobby and more of a vocational calling for me, even though I've been fortunate to go on exotic herping trips to many other parts of the world, discovering more unusual and exotic reptiles.

Being an allotment holder and managing multiple wildlife reserves in Staffordshire, so discovering grass snakes in such localities has become a regular sight over the years. From having them basking on the stones alongside my ponds to finding them brumating and even egg-laying in my compost bins, this is a sight that never becomes repetitive, dull or boring in my eyes!

Like many people, my interest in the natural world was sparked as a child. I grew up in France catching anything and everything, keeping the creatures for a few days at a time in plastic storage boxes and such like, watching them closely and then letting them go a few days later. It's a very fond memory, and I was interested to read that Sir David Attenborough recently described how

his experiences as a boy growing up in Leicestershire, catching a myriad of creatures in Charnwood Forest, served to inspire him in a similar way. This is an aspect of natural history that has now largely disappeared, along with the genuine feeling of excitement that accompanied such experiences.

## British species

The smooth snake (*Coronella austriaca*) is the rarest of our native species of snake. It is highly protected, now being confined to south-eastern parts of Dorset, south-western Hampshire and an area of East Hampshire and West Surrey. This means that it is rather uncommon to see one and without the appropriate licence, it is illegal to disturb one, let alone even touch one.

Adders (*Vipera berus*) on the other hand are very widespread over the country, although they are far less numerous than used to be the case. They are the only species recognised as venomous, although it is worth noting that Dr Brian Fry proved in 2013 that in fact, all the world's snakes – even the so-called harmless constrictors – produce venom. However, as far as these species



A smooth snake – Britain's rarest snake species.



## Did you know?

There are four other non-native species of snake that survive and breed in very restricted localities here in the UK. There are two colonies of Aesculapian snake (*Zamenis longissimus*), one existing in London and another in Wales. A group of corn snakes occurs in a remote part of Essex and then a mixture of viperine snakes (*Natrix maura*) and dice snakes (*Natrix tessellata*) are present on Cannock Chase in Staffordshire. All of these should be described as non-native rather than invasive, because they actually pose no risk in terms of a threat to the ecosystem in which they occur.

are concerned, this is redundant, as it has no impact on the way that the snake takes its prey.

In the case of the grass snake, it is worth pointing out that the mild toxins present in its saliva are harmless to us, but these do have some effect on its prey, which is comprised mainly of amphibians. Even so, there have been reports that on the rare occasions, after a person has been bitten by a grass snake, they have then experienced very mild tingling sensations in their skin but that's all.

However, adders are listed on the *Dangerous Wild Animals Act*, just like all front-fanged and some rear-fanged species, and you must have a licence granted by your local authority in order to keep them. Combined with the highly protected status of the smooth snake,

► An Aesculapian snake.

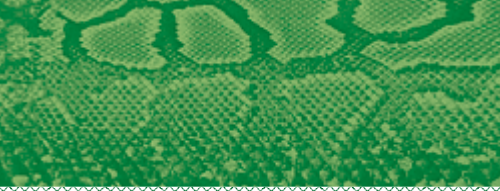
▼ Adders display a distinctive pattern of markings down their back.

this therefore means that realistically, the grass snake is the only option to those who want to keep a native species of snake.

### Keeping grass snakes

For many years, I've been keeping and breeding native species ranging from slow worms to European hares, being fascinated by the creatures that live in the same environment as I do. Obviously, I keep, breed and work with many exotic species too, but I think people should be more aware of native species. Far too often people look much further afield for interesting reptiles for example, and thus





overlook fascinating species that are closer to home.

I've been breeding grass snakes for around 15 years and it's a pure thrill to see the eggs begin to pip. There is often some confusion over the law when it comes to selling grass snakes. It is illegal to sell wild grass snakes, but captive bred ones can be sold, as long as the specimens in question are not derived from the wild.

I am not a huge lover of colour morphs, I have to admit, but I can appreciate them for their beauty in many cases. I can understand that they are the driving force for the herp hobby in many ways, helping it to expand at a massive rate, and bringing a lot of inward investment into large scale breeding set-ups.

I do keep and breed morphs myself, although personally, I prefer the natural colouration of species in virtually all cases. This view, however, has never stopped me from producing my own morphs, perhaps most notably when I produced the first ever non-polymorphic viper boa to be hypo, or the first albino ocellated skink.

### Breeding plans

As far as grass snakes are concerned, I have actually thought that morphs in this case could be good, because it might raise their profile somewhat, and generate more interest in them. So in 2012, I purchased a trio of het albino grass snakes from a Spanish breeder, and then five months later, I brought a pair of het peds from one of his contacts. These snakes are still maturing with me. I was overjoyed with the prospect of being able to set up a breeding programme with them in future.

In May 2014, one of my female grass snakes laid a large clutch, consisting of 27 eggs. This was a good size for her, as in previous years, she had produced less than 20 per clutch. She has laid for me every year and I always used the same



▲ The appearance of this grass snake was unique.

▼ The clutch was comprised of 27 eggs.





▲ Young grass snake.

day, and so there only a few adders out, along with several large female common lizards, attempting to bask when the clouds briefly parted, to let through the sun. Clearly, obtaining warmth was a priority for them, as they would have been giving birth within a few weeks.

We headed over in the direction of a large pool of water, which can attract wildlife. Sarah had paused and was photographing a huge stag browsing on some leaves that were within reach on a low hanging tree, when all of a sudden, Ben uncharacteristically shouted "Snake!"

We all rushed over to see why there was such excitement in his voice, as normally, he would just use the snake hook to pick up his find. Mike reached him first and saw that the snake in question had eluded Ben's grasp, and had slithered successfully into a gap in one of the adder hibernaculums in the area.

Ben said that he had seen some sort of snake but didn't know what it was, as it was uncharacteristically bright! This got us all interested and we began searching the area carefully.

He hooked up a grass snake, which was a large healthy female and heavily gravid, but this was not what he had originally seen.

Moments later though, I spotted the tail end of something that resembled what Ben described, but before I even



▲ The first documented specimen.

Grass snakes were not very common in the area.



male with her with no issues, and they have always had healthy offspring which did well.

### Out herping

On this occasion, she laid the week before I was setting off on a planned herping trip with some good friends of mine. During the following week, the group of us headed off to visit one of my best locations for herping. My friends comprised my fellow reptile breeder Ben Warden, Belgian hare breeder and photographer Sarah Fowler and the conservationist Mike Potts.

Where we visited was a location only about 40km (30ml) from my house. It is a fantastic area for seeing wild deer and pheasants. As far as reptiles are concerned, it has an abundance of common lizards, which is why it is superb for finding adders because the lizards serve as a food source for them. Grass snakes are not very common in the area where we were, but you do come across them now and then.

We must have been out in the field for about two hours. It was a very overcast

The hypomelanistic patterning would appear to be quite individual.



had the chance to announce it, he had become reacquainted with the snake that he had seen previously. He tailed it up off the heather mount with his hook, and it began to musk over and over, squirting its foul smell over all of us, as we simply stared at it.

### An amazing find

We stood there slightly dazed, and we were left scratching our heads at this individual. None of us had ever seen such a snake before, in spite of the fact that between the four of us, we had collectively over 60 years of herping experience.

Sarah simply began to take photographs of this awesome animal. We ended up in agreement that this was a hypo grass snake. I knew for a fact that this was the first documented sighting of such a snake. Only a week before, we had been talking about phases, morphs and geographical differences in these snakes on one of the online *Matrix* discussion groups. This one had not been recorded.

To find an unknown morph of a wild snake that you are a huge fan of is an amazing experience. We then all took turns holding and examining this beautiful reptile, appreciating its beauty, before releasing it back into the wild. Herping for us is about studying and getting up close to these animals.

I announced these findings on Facebook and other internet media that I use, and this generated an overwhelming amount of interest, including people asking the location where I discovered the animal, which, of course, I refused to reveal.

### Hatching gets underway

Some seven weeks later after having found that snake, my previously



Light and dark shade hypomelanistic youngsters with a normal hatchling for comparison.



▲ The clutch starting to hatch.

▼ The hypomelanistic youngsters have continued to thrive.



mentioned batch of grass snake eggs began to pip. There was nothing too unusual about that: I was incubating them on vermiculite and rotten leaf litter at a temperature of 29°C (84°F) and so I expected them to hatch around that time.

In all, it took three days from start to finish for the entire group to leave the eggs. The first three came out without any problems at all, and were clearly lovely normal grass snakes. The fourth one, however, had a very light head. I joked with Ben and said: "Imagine if it's a hypo!" He laughed and replied to the effect that sadly, I wasn't that lucky.

The following morning, however, I was truly stunned. There in front of me were three more normal grass snakes being sat on top of by no less than four hypo grass snakes, like the one we had seen in hatch, and in the end, the tally was 12 hypo grass snakes, 10 normal grass snakes, three still-borns and two infertile eggs.

One of the still-born youngsters was a very deformed hypo, with no eyes and was obviously severely underdeveloped. However, on the plus side, not only had I produced the first ever hypos, but it seemed to be two distinctive strains of them. Seven of the group were very pale, whereas the other five of them were of a darker shade and yet all still lacked any sign of green on them, which is what you would expect as the uniformed standard for this species.

### Future plans

I gave a few of them to my friend Ben to work with, while I kept the rest back myself. Needless to say, I've had one or two people suggest how it was very odd that I stumbled upon a hypo, and then seven weeks later, I hatched out my own, but I do have records to back up all the breeding results with my grass snakes.

As of now, I've had offers of as much as £2,500 each for these hypo grass snakes, yet I have no plans to sell them as I wish to work with these snakes, in order to see if I can define their traits and also, as I mentioned earlier in this article, to raise awareness of how suitable this species is as a pet.

My plan is to breed from these babies with the intention of producing more hypos, and if it then turns out profitable, I'd like some of the money raised to be donated towards helping our own native herpetofauna, which has really suffered over the past 20 years.

The hypo grass snake youngsters have been taking chopped up trout fillets and recently moved onto eating pinkie parts. They are now being conditioned for brumation and will remain in this state until around the beginning of March.

I cannot describe just how amazing it is not only to discover a morph in the wild, but then to see it replicated in this totally unexpected way in your collection. I think this is something that most reptile enthusiasts dream about, and I hope this project works out, as I'd love to write a follow-up article in a few years, showing the second generation of hypomelanistic grass snakes. ❖



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## DO YOU NEED A HELPING HAND OR ADVICE?

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# A problem with a bearded dragon



I have noticed a small pea-sized lump near the tail of my bearded dragon. I posted an image on an online forum but have had so many differing replies

that I simply do not know what to do. What would you advise?

The first step in terms of caring effectively for any species is to ask questions proactively, and learn from/act on the answers – but you need to be sure that you can trust them! As with medical problems, whether animal or human, there is typically no general ‘off the peg’ response, as all cases are different, and this will obviously impact on the solution. The correct diagnosis and treatment of reptile ailments is complex, and requires good observational skills, attention to detail, and, in most cases, experience as well.

This is why the services of a good exotics vet can be very helpful, and when you are starting out in the hobby, always take time to track down the nearest veterinary practice to you that caters specifically for this group of pets. It could be critical for your pet’s survival going forwards.

In this instance, the actual cause of the lump could be one of many things, which is why you doubtless received many different replies! It could simply be an insect bite from live food left inside the enclosure, with crickets being notorious in this respect. Never provide more than your pet is likely to eat at a single sitting, so as to minimise the risk of injuries of this type.

Bites can be easy to treat with a reptile first aid kit, if they have not become infected. This is the risk though, even if your pet’s quarters are very clean. Should you be in doubt, a visit to your vet will be able to put your mind at rest one way or another, and suitable treatment can be obtained for your pet as necessary.

Other possible causes could include a skin parasite picked up from either an infective food source or contaminated vivarium decor, or possibly

a bruise from energetic exercise in the enclosure. Alternatively, it could be a sign of any one of the many metabolic conditions that we currently refer to as MBD (which stands for ‘metabolic bone disease’).

Lumps and bumps, waves in the tail and spine, curling of the toes and a receding jaw line are all very common symptoms of MBD, but this is not always the case. In fact, there is no real way of telling what the exact problem is until formal diagnostic work is carried out.

### Reptiles as patients

It is not possible to diagnose or treat an internal condition accurately, via an online post, no matter how detailed the images are. Reptiles and amphibians are complex creatures, with surprisingly sophisticated biological processes, and as a key part of ‘survival of the fittest’ strategy, they do not tend to display any obvious symptoms until quite late on, after an illness has developed.

The lack of vocalisations and facial emotions, such as wincing with pain, also stops us as keepers from picking up at an early stage that something may be

Reptiles fail to display many of the obvious signs of illness that are associated with mammals.



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**Appetite can be an indicator of health. But what is your bearded dragon eating?**

wrong. For example, a sick dog may stay in its bed all day with its ears back, eyes closed, and whimpering. These are clear indications that all is not well, and that a vet should be contacted without delay.

Reptiles do not behave like this. Over time, experienced enthusiasts can pick up an almost sixth sense about their animals and may feel instinctively that something is wrong, but this skill is difficult for new keepers to acquire at the outset. Keen observation is the key in such cases – being able to recognise how your pet behaves normally, because this in turn then alerts you to a potential problem.

We must also remember that the metabolic conditions affecting captive reptiles are also complex, being driven by an under- or indeed over-provision of one or more dietary components. For example, a deficiency of calcium can manifest in exactly the same way as an overprovision caused by excessive dietary D3. The end result of both of these imbalances is the same – cardiac arrest.

If both of these conditions manifest in the same way therefore, how is it possible to treat the condition correctly? Well, the first thing is to obtain an accurate diagnosis. The animal must be presented to a specialist exotics vet. X-rays will be required to visualise whether the symptoms are indeed the result of an excess or deficiency of calcium.

Blood serum tests will need to be taken to see whether the animal is producing enough vitamin D3 via the natural D3 cycle, or if it has been over dosed with synthetic compounds, as can happen if a supplement is not used in accordance with the stated recommendations. There may even be liver function tests required to see how effectively it is hydrated. It does not matter how good your heating, lighting, enrichment system and nutritional provision all are, in the absence of sufficient fluid. Should a reptile not be getting adequate water in the right way and in sufficient

quantity, the core biological processes will always struggle, affecting the animal's overall health.

After the results from the relevant tests are available, your vet will then be able to review them and reach a definitive diagnosis, based on the facts of the case. This will identify the cause of the problem with your reptile as appropriate, and you can then be advised about any necessary ongoing medication and pain relief. Your vet will, of course, also be able to suggest to you if the enclosure requires any adjustments, in terms of the provision of heating and lighting. Advice on feeding methods and availability of water for your pet may also be very important, as can humidity.

The patient will, in most cases, need to be monitored for some time, especially when suffering from a diagnosed deficiency of calcium. More X-rays and serum tests will need to be taken over a period of time to make sure that the calcium level in the blood is being stabilised and that reserves of calcium are being deposited back into the bones.

### Helping the process

But what can you do to aid your vet in the diagnostic process? After all, the quicker that a formal diagnosis is made, so the more effective the treatment will be.

Firstly, keep good records. This will allow your vet to see at a glance when you last had a parasite

**Looking at a reptile can only tell you so much about its health – specialist veterinary tests are likely to be necessary to reach a definitive diagnosis.**

screen carried out; food sources and supplements that you are using; fluctuations in the reptile's body weight over time, and parameters of the enclosure, in terms of temperature and light exposure, as well as humidity.

Make sure that you note the exact thermal gradient of your vivarium from hot to cold. Take an image of the vivarium, so that the vet can see instantly how your set-up is maintained. Always record the time frame between UV lamp changes and make sure that you change them in accordance to the advice of your chosen brand, which is required annually as an example in the case of Arcadia. Measure the distance between the lamp and the animal's back at the highest basking point.

Keep feeding and supplementation notes. What has your reptile been eating in terms of live food, rodents and vegetable matter, as applicable? Has there been a prolonged period of excessive hunger or disinterest in food? When it comes to supplementation, how much powder and what brand is used per species, and how often? This information will enable your vet to see if insufficient or too much powder is being used, with the impact being most noticeable over a period of time. Check too that the supplement is still likely to be effective, and is not out of date.

What bedding is being used? Is there an impaction risk from the substrate that you have chosen? This will affect the reptile's appetite. Take an image of the lump, wave, curve or change to the animal's appearance as soon as you spot it. This will then help your vet to see if there have been any changes between the time that you first recognised the problem and the appointment, giving an idea of how fast it is progressing.

All of this information will help your vet to build up an accurate case history that will be essential in diagnosing and treating any potential disease or injury in your animal. In reality, assuming your management is good, most of these cases turn out to be bruises and insect bites, both of which are easily and cheaply treated, rather than anything more alarming. But you need to be certain.

Remember also that early intervention is not only better for the health and longevity of your bearded dragon, but it could also greatly reduce the amount that needs to be spent on vet's bills going forward. Seek veterinary advice without delay, and good luck!

*John Courteney-Smith, Reptile Products Manager, Arcadia.*



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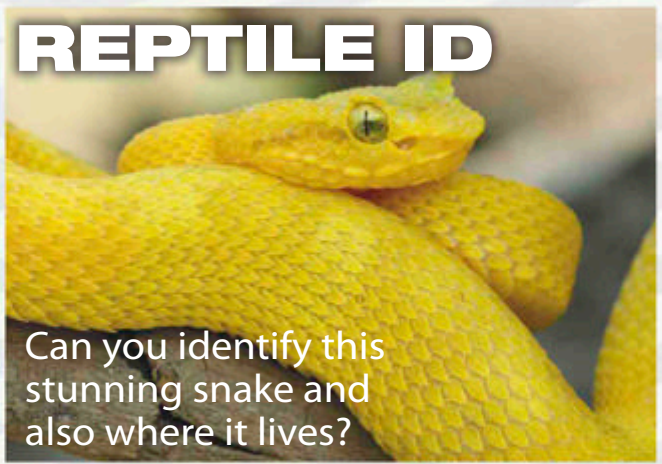
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# Puzzle Corner

Find the solutions to these puzzles by following the clues, to discover which reptiles, amphibians or invertebrates are hidden within them. The answers can be found on p66.

## REPTILE ID



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## MAKE A WORD

Taking just the first letter from the common name of these reptiles, use these to spell out the name of a North American turtle.



## TWOSOMES

Choose two consecutive letters in order from the three circles in each row to form a six-letter word in each corresponding row of boxes. We've given you a start with **REVOKE**, and a correct solution will reveal a lizard species down the ringed columns.

NAVY	ENVY	SAGE		○		○		
ACID	FUND	PIER		○		○		
GASP	RUBY	FACE		○		○		
FIRE	VOLT	SKEW	R	E	V	O	K	E
DROP	SWAG	FONT		○		○		

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Pick out and rearrange those letters printed **ONCE AND ONCE ONLY** in the illustration below to spell out a species of turtle in the water.



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# AMPHIBIAN FOCUS



## Malayan horned frog (*Megophrys nasuta*)

**T**hese rather bizarre-looking frogs are found in the rainforests of southeast Asia, where they live on the forest floor. They are relatively large in size, growing up to about 12.5cm (5in) in length. Their unusual appearance helps them to hide away unnoticed in the leaf litter, while being able to observe their surroundings.

Their horns and eyes protrude above the surface here, allowing them to seize any invertebrates and other potential prey that stray within reach. The horns themselves are simply folds of skin. Malayan horned frogs also have swellings called tubercles on their bodies, and these may have a sensory function.

This species is sometimes available in the hobby, but unfortunately, it has not proved to be easy to breed. This is partly because these frogs are inclined to be cannibalistic, with males being at risk of being consumed by their larger female partners.

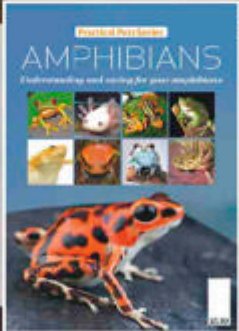
They require a typical warm rainforest enclosure, with high humidity, maintained by regular misting of their quarters. They may also use a shallow water bowl. Good ventilation is vital to prevent the development of any mould, and water used in their quarters must always be treated with a suitable dechlorinator first.





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# Keeping tarantulas

## WHAT YOU NEED TO KNOW



Keeping spiders as a hobby is something that is continuing to grow in popularity, with an increasing number of species now available, along with a growing range of specialist equipment. Yet in spite of this enthusiasm, it can be difficult, especially when you are starting out, to obtain accurate and current information about the care of this group of spiders. Here tarantula enthusiast Phill Robinson BSc (Hons) shares his knowledge and experience with them.

Unfortunately, the information that is generally available extends across a wide range of forums and websites. This in itself can be problematic, as the information isn't always reliable and it can also be daunting for a newcomer to sift through. My aim in writing this article is to help keepers - both old and new - by presenting the latest knowledge about tarantulas, which in turn should hopefully promote a better understanding of their captive needs in general, and in turn encourage more interest and specialisation in particular species.

### Ecology

Tarantulas are found in numerous habitats throughout the world, ranging from deserts and scrubland to tropical rainforests. They are not social and so should be housed individually, with the sexes having to be introduced cautiously for breeding. Within their ecosystems, tarantulas can be separated in to two basic niches:

■ **Arboreal** – spiders that are arboreal are generally found living above ground level. Their retreats often consist of web-lined

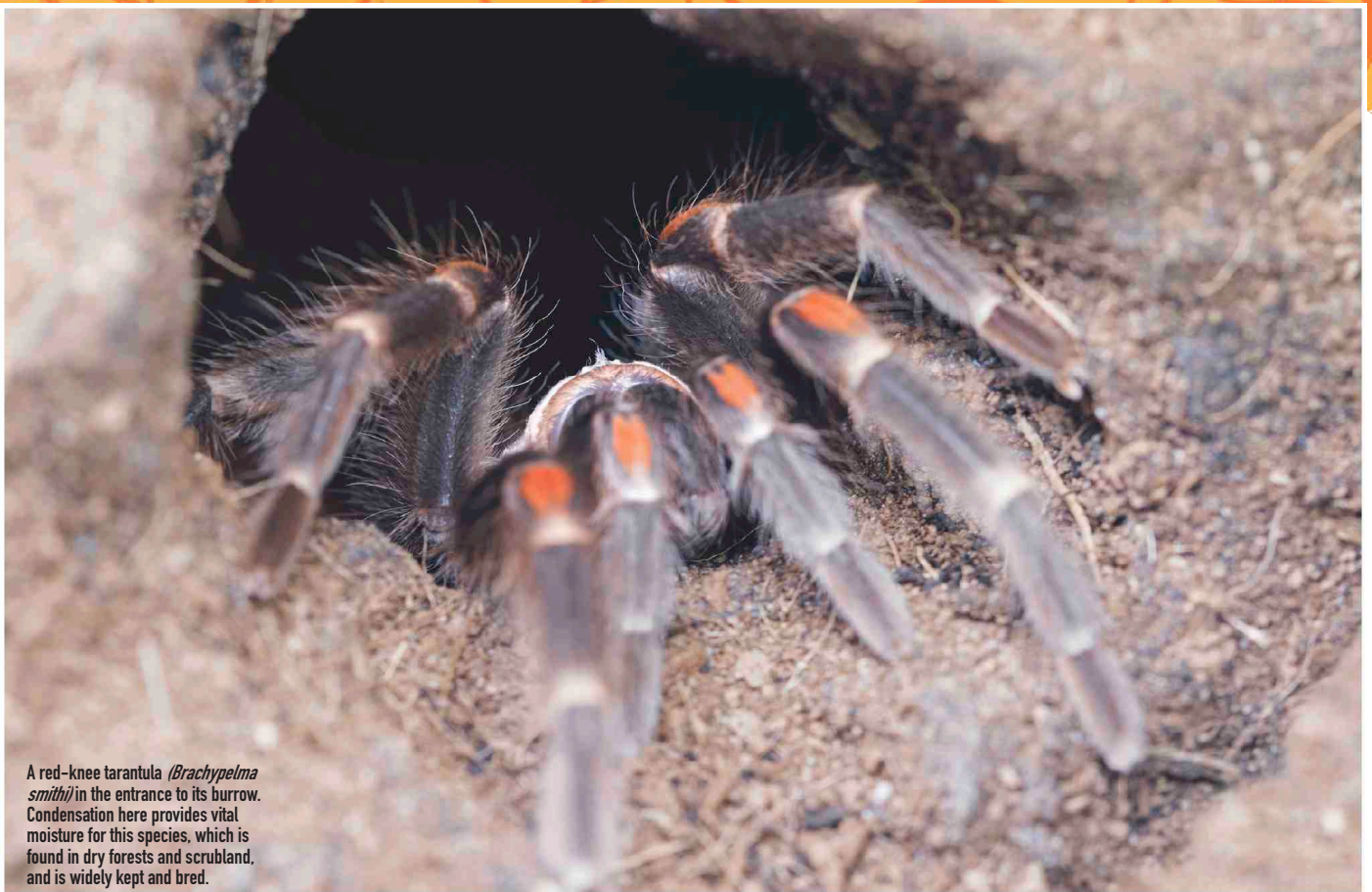
crevices in tree bark, fissures in rocks or dense foliage. These spiders tend to be agile and fast moving, which often makes their husbandry and breeding introductions a little more challenging. The basic starting point for housing an arboreal spider is to choose an enclosure that is taller than it is wide.

■ **Terrestrial** – members of this group live at ground level and are generally stockier and less agile than arboreal spiders. Being stockier doesn't necessarily mean that they are slower, however, with some species being fast and relatively agile (although not usually quite as agile as arboreal spiders). The larger and more aggressive spiders in this group can still pose challenges for husbandry and breeding introductions. Terrestrial tarantulas can be further divided into two sub-groups, depending on their lifestyle:

■ **Opportunistic burrowers** – these are spiders that find and make retreats in a variety of places such as the abandoned burrows of small mammals, cracks underneath large rocks, tree roots and various other crevices that are large



Some tarantulas are arboreal by nature, and surprisingly well-camouflaged in this environment.



A red-knee tarantula (*Brachypelma smithi*) in the entrance to its burrow. Condensation here provides vital moisture for this species, which is found in dry forests and scrubland, and is widely kept and bred.

enough for the spider to enter and line with silk. These spiders are often the ones that require vivariums with the largest floor space, so as to allow for adequate décor. This enables them to find and excavate their chosen hide more easily.

**Obligate burrowers** – tarantulas in this subgroup are fossorial, meaning they live underground. Their retreats are dug out by their own efforts and then lined with silk; these can be as simple as a small hole in the floor (like the burrow of a trapdoor spider) or large intricate tunnel systems (as in the case of a *Hysterocrates* species). Thanks to their need to dig a suitable burrow rather than making use of the surrounding environment, this particular group of spiders should be accommodated in tall and wide enclosures, ensuring that these are deep enough to allow for sufficient substrate to be included for them to create their own burrows.

### Defence

Tarantulas employ various defensive strategies when they feel threatened; some are more severe than others. Those species defined as New World spiders, (representing tarantulas found in the Americas), possess urticating hairs that they are able to 'flick' using their hind legs if they feel threatened. These hairs are covered in microscopic barbs that can become lodged in the skin and are able to cause various levels of irritation.

There are six different types of urticating hair that can be found on New World spiders and although no species has all six on its body, many of these spiders possess two or three types. Old World spiders

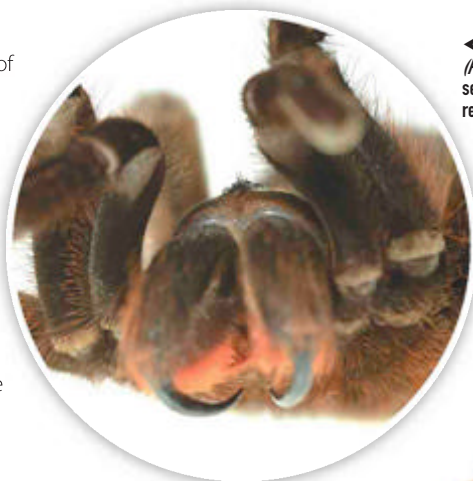
(meaning those that are found in parts of Africa, Asia and Australasia) do not possess urticating hairs as a method of defence and instead, they rely on posture and biting as a means of deterring potential predators.

Although this is their main defensive mechanism, most species will attempt to flee before attempting to bite. Both groups contain spiders that may rear up in a threat display, and rub the modified sets of bristles located on their pedipalps,

chelicerae and forelegs against each other to stridulate (making a hissing noise) in hope of scaring away the perceived threat.

### Ecdysis

This is the process that is often referred to as moulting or shedding. As a spider grows, its exoskeleton remains the same size, so that in order to become larger, it must grow an expanded body casing under its existing one. The new exoskeleton is soft and wrinkled at first, whilst the spider remains in its old 'skin' until it is ready to moult.



◀ A giant tarantula (*Phormictopus platus*) seen in close-up, revealing its sharp fangs.



A Usambara orange baboon tarantula (*Pterinochilus murinus*), originating from Africa, rears up aggressively to reveal its fangs.



Before a moult, a tarantula will usually exhibit a few tell-tale behavioural traits; one of the more commonly seen is to refuse food, sometimes for as long as a couple of weeks before actually moulting. Those species that have silken retreats, whether arboreal or terrestrial, will generally web up the entrance to their den. This allows them some privacy to undertake the process of ecdysis, helping to ensure that they are safer from potential predators during this vulnerable time.

Another sign of ecdysis is when a tarantula makes a 'hammock' or thick mat of web on the floor, often lined with urticating hairs in New World species, which the spider will lay on to moult. A further sign is in New World spiders, especially in specimens that are prone to flicking hairs, when the bald patch on the abdomen will turn from a pinkish colour to a darker shade as a result of the urticating hairs on the new exoskeleton forming underneath.

Once the spider is ready to moult, it will lay upside down on its 'moulting mat' and the anterior (front) edge of the carapace will loosen and open, thereby allowing the spider to begin sliding slowly out of the exuviae (its old skin), which can sometimes take hours. After this process is complete and the spider is free from the exuviae, the spider's condition is described as teneral.

Its body is soft and a much lighter colour than before, and during this phase, the spider is extremely vulnerable to predators. Whilst in this condition, it will slowly expand its new exoskeleton using haemolymph from its abdomen. This is the fluid found in the circulatory system of spiders, being the equivalent of our blood.

▼ A Mexican fire-leg tarantula (*Brachypelma boehmei*) working its way out of its old exoskeleton. It is seen top left, with its white fangs.



The spider (top) is more brightly coloured after the moult is completed.



The abdomen looks thin as a consequence, almost like the spider was undernourished. As the spider fills out again, the exoskeleton hardens and darkens in colour, and it slowly returns to a larger version of how it appeared before the moult. As the oesophagus and pumping stomach of the spider are also moulted during ecdysis, this is why it will not eat for a time during the post-ecdysis period, until these key parts of its digestive system have hardened and are able to deal with prey items again.

### Sexing

The sex of a tarantula is often tricky to distinguish externally, especially in immature specimens, and it almost always requires the examination of the epigastric furrow (genital opening) area of the exuvium to locate the presence of spermathecae (sperm storage organ,

which would indicate a female) or their absence (which would confirm it is a male). There are also a very small number of species, such as *Encyocratella olivacea*, in which females lack spermathecae as well.

However, there are some exceptions to this rule, which would allow the spider to be sexed externally without the need to examine the exuvium. An example would be the presence of palpal emboli (the male reproductive organs that resemble a 'boxing glove') in mature males; these are often accompanied by tibial apophyses (a hook-like extension on the tibial section of the leg) on the first pair of legs in some species.

Other than these variations, there are some less accurate methods of distinguishing the sexes; for instance, the majority of species are sexually dimorphic (meaning that males and females have a different appearance) with males often



This incredible rare Madagascan species of tarantula, known as *Monocentropus lambertoni*, has just moulted on its web.

being slightly different in colour and much smaller in body size, compared with the female. This becomes much more apparent when the spiders are nearing their final maturing moult.

### Housing

The enclosure for a spider can come in a range of styles and will vary in cost, depending on several factors. The initial and most important issue to consider is the captive requirements of the species that you are planning to keep. Do not be tempted to cut corners in this regard - it

will only lead to your spider becoming stressed and, inevitably and ultimately, its death.

To avoid this type of situation, be sure that you know exactly what your target species requires, in the way of temperature and humidity, and also its habitat requirements. Once you have done the research and decided whether you will be keeping a terrestrial or arboreal species, an obligate or opportunistic burrower, a tarantula that is found in arid or rainforest surroundings and so on, you



▲ The extended embolus of a male *Chilobrachys* sp. 'Thailand'. This spider is in the author's collection. Photo courtesy of the author.



▲ Tarantulas tend to be very prolific when breeding. Here are hundreds of baby blue-footed tarantulas that have hatched from this nest in the wild in Brazil.

can begin to make the decision about what type of enclosure will be required. There is some flexibility

though, based on your preferences. For instance, if you are intending to keep a terrestrial obligate burrower, you could opt to keep the spider in a basic plastic tub, providing that the tub is of a size and depth that allows you to provide all the necessities that the spider needs, rather than a glass enclosure.



A pair of mating Asiatic cobalt blue tarantulas (*Haplopetma lividum*). The male is clearly smaller and less brightly coloured in this case.



The pink-toed tarantula (*Avicularia* species) is an arboreal species, requiring a tall enclosure.



Similar guidelines apply in the case of an arboreal spider. These can be kept in tall sweet jars with holes drilled in the sides, providing that there is some form of cover (such as cork bark) and enough substrate within to retain moisture. This should ensure that the humidity can be maintained at the level required by the species being kept, and that there will be enough ventilation within the enclosure to prevent the air from becoming stale and encouraging fungal growth.

Although these cheaper alternatives can make more than adequate enclosures for the majority of spiders, they are not that aesthetically pleasing to the eye. This can obviously detract from the experience of keeping any animal, when taking into account that having such enclosures can be likened to having a bit of nature inside your home. Consequently, there are a range of specially designed vivariums that make perfect habitats in which to keep almost any species of tarantula.

Obviously, these will be more costly than a plastic jar, but an enclosure of this type definitely looks more appealing. They are also designed specially to house these spiders and as such, they take in to account their need for air flow, as well as humidity and temperature requirements.

Other than purchasing commercial enclosures, however, there are other ways to accentuate the enclosure and make it more appealing. For example, you can purchase a large range of naturalistic décor based around real flora, which not only makes the enclosure look a lot more natural, but also provides a much more secure and stress-free environment for your spider. Artificial



▲ Desert species will not thrive under rain forest conditions – and vice-versa, so find out about the requirement of species that interest you, at the outset.

plants are much easier to manage than the real thing, and can look surprisingly natural in vivarium surroundings.

In addition to the appearance of the enclosure and the habits of the spider though, you also have to think about the issue of enclosure size.

This can vary greatly from species to species, and for the most part, it comes down to the spider's adult size. However, the provision of an enclosure that is effectively too large can create just as much stress as one that is too small. This is because it will not provide the spider with a sense of security, particularly if there are

**Did you know?**  
Female tarantulas are potentially very long-lived, with a life expectancy measured in decades.

few hiding places, with tarantulas being instinctively shy by nature.

As a general rule therefore, select a terrarium (or plastic tub) that has a width equal to 1.5x the legspan of the spider and a length that is 1.5x the width of the enclosure. To put this in context, for an adult spider with a 15cm (6in) legspan, you would need an enclosure measuring 23cm (9in) in width by 34cm (13.5in) long.

The height should be around the same size as the width for most species, particularly as a fall can severely injure a tarantula, partly because of their bulk, so it is generally advisable to minimise the height of the enclosure. The exception to this rule would be with arboreal spiders where the length can be switched with height, and the height then should be double the width. In this case, for an arboreal spider with a 15cm (6in) legspan, the enclosure should measure around 23x23x46cm (9x9x18in) in terms of width, length and height.

### Substrate

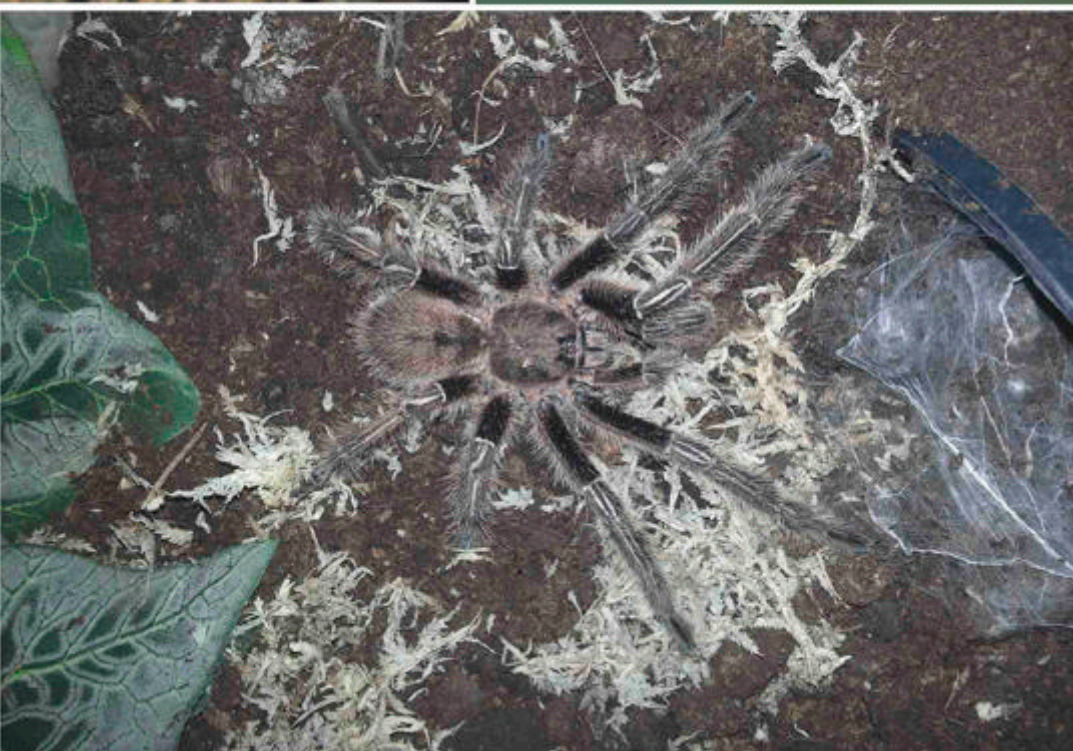
The ground cover used for your enclosure can vary greatly and there are a broad range of substrates that are readily available for this purpose. In fact, within reason, there are no specific substrates for an enclosure, and often the best way to



The spider's size is vital in determining the size of its enclosure. A skeleton tarantula (*Ephebopus murinus*), so-called because of its markings, is shown here.



A greenbottle blue tarantula (*Chromatopelma cyaneopubescens*) on a mossy log.



create a substrate can be to mix and match to make your own, although this often requires a bit of trial and error.

The main things to consider are: the habitat in which your spider is found in the wild, and the suitability of the substrate if you intend to buy it. There are some commercially available spider substrates which are ideal for the keeper who wants the convenience of just emptying a bag into the enclosure and not having to do any preparation work. These are a good option, other than

being a little on the pricey side, compared with the DIY approach, and can hold moisture well.

If you decide that you want to make your own, (which often adds to the experience of being a spider keeper!), there are many more possibilities. Personal experience has led me to the choice of three staple components, which can be mixed in various ratios to create the main substrate. However, it is well-worth experimenting and developing your own. I use a mix of coir, sand and top soil, which

must be free of both any pesticides and fertilisers.

These basic ingredients all have advantages that, when combined, are ideal for creating an array of habitats. Coir is a cheap medium that is highly absorbent and generally does not compress and become anaerobic, although it does tend to dry out fairly quickly as a result. Sand is another inexpensive choice, and a bag can last quite a long time for most species, as it is generally the minor constituent of the three ingredients in most cases.

It has the benefit of providing excellent drainage so that water can penetrate with ease, rather than sitting on the surface. Top soil is slightly more expensive than the previous two constituents, but it will give a mixture greater stability. This is especially beneficial for burrowing species, and also helps to retain moisture, which serves to prevent desiccation.

The ratios vary, depending on the species that you are keeping, and it is worth experimenting until you find a consistency that works

▲ Substrates vary, and should take account of the spider's lifestyle. This is a male Columbian lesserblack tarantula (*Xenesthis immanis*). Photo courtesy of the author.

► Coir is derived from coconut husks.





well. For the majority of enclosures, I have found that a ratio of 40% coir, 40% top soil and 20% sand represents a pretty good mix. I confess that I rarely measure exact ratios, so this is only provided as a rough guide. In the case of fossorial species such as trapdoor spiders though, a higher ratio of sand would be more suitable.

Once a base layer of substrate is in place, there are a number of optional substrates that can be added on top as a 'litter layer' which further aids humidity, as well as creating a natural looking effect. These can be as simple as mosses purchased from a reptile stockist, leaf litter collected from a garden in autumn (although it is advised to select locations where you can be sure that there have been no insecticides used) or for a more authentic look, purchase some ketapang/ Indian almond leaves (*Terminalia catappa*).

### Temperature and humidity

This is a pretty broad topic to cover accurately, and for the most part, as with any aspect of keeping a spider, it requires background knowledge of where the species that you are going to keep originates. As a generalisation, it is safe to say that most species will be completely fine at temperatures of between 24-29°C (75-85°F) but this can also vary at different times of the year.

Your goals as a spider keeper will also be significant here. If you are keen to breed your tarantulas, then you need to carry out additional research to find out about seasonal changes in the climate in the areas where that particular species is to be found. This will inform you about rainy

► Don't leave unwanted prey in your tarantula's quarters – otherwise, your pet could be fatally injured.

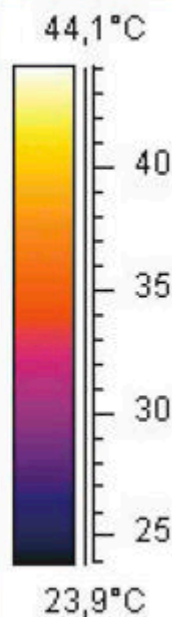
▼ It is easy to keep a check on temperature and humidity, thanks to digital technology.



Do not be tempted to place a heat mat under the enclosure. Burrowing spiders will otherwise encounter increased temperatures as they head downwards, which is the reverse of what they would normally experience, and this also leaves them more vulnerable to dehydration too, which can be potentially fatal.



The differing temperature of a tarantula, resting on a human hand can be seen in this thermal image.



seasons for example, and the extent of the rainfall. Doing this can give a better idea of when the wet seasons are, how much rainfall occurs and over how many days, not to mention the thermal fluctuations that occur throughout the day. This type of information can all be found without great difficulty on the internet these days.

Breeding your spider will be much easier if you can adjust its care accordingly, by mimicking its natural cycle. This is likely to have a conditioning effect. However, for those who are starting out or just keeping tarantulas for interest, you can house your spiders at an average temperature and humidity, based on the areas in the wild where they are to be found.

The main rule when it comes to heating is to avoid sources such as incandescent bulbs, partly as the majority of spiders are photosensitive to some extent, and will shy away even more than usual. They are more likely to stay at the colder end of the



The opisthosoma is the swollen area at the back of the body, as seen here on this black tarantula (*Grammostola pulchra*).



▲ Use a dechlorinator rather than providing water straight from the tap, both for drinking or spraying purposes within your tarantula's enclosure.

enclosure. The best way to heat enclosures would be either to use a heat cable which can be manipulated around the enclosure(s) to provide the optimal temperature or through heat mats attached to the back or sides, set under thermostatic control.

Keeping enclosures within a heated environment would obviously negate the need for heating equipment but there would be a higher risk of thermal fluctuations occurring if the heating were to have any problems. Humidity can be monitored via a hygrometer within the enclosure, and can be increased by simply spraying the habitat, although provision of water bowls will also aid the humidity level in the tarantula's quarters.

It is often recommended to add a sponge to water dishes, so as to prevent spiders drowning, but this is an outdated practice and can even have adverse health impacts, with the sponge being capable of harbouring harmful microbes. Instead, it is recommended to use a shallow water dish that the spider can easily climb over without the risk of falling into the water and being unable to get out.

Spiders that require humid habitats also require enclosures with plenty of ventilation because, as previously mentioned, such set-ups with little airflow are at risk of stagnation. This can lead to fungal growth that then poses a serious

risk to your spider's health.

### Feeding

Feeding is generally a pretty easy part of tarantula care, and providing that a few simple guidelines are adhered to, there should be absolutely no problems. Firstly, the size of the food is important. As a rough guide, it is recommended to choose prey items that are no larger than the spider's opisthosoma, (the rear part of the body, that could be likened to an insect's abdomen).

Nevertheless, there are some species, notably members of the *Poecilotheria* genus that can and will take prey items that seem too large for them. However, it is not recommended to do so often, because of the risk of overfeeding, combined with the possibilities of the prey causing potential injury.

Secondly, the prey that is to be offered is significant: black or brown crickets (*Gryllus bimaculatus* and *Acheta domestica*) and locusts (*Schistocerca gregaria*) tend to be used most widely. These are good staples that, so long as they are gut-loaded, will form an adequate diet for your spider. But do not overfeed your pet, placing too many crickets in its quarters. Otherwise, the tables may be turned, with

the crickets attacking the spider.

In order to provide a more varied diet, you can use other prey items as well, such as cockroaches (with the species most often offered being *Blattica dubia*), all life stages of the fruit beetle (*Pachnoda* species), as well as all life stages of mealworms and morios (*Tenebrio molitor* and *Zoophobas morio* respectively). In the case of some larger species of tarantula, defrosted pinkies (day old mice) are suitable, although these represent a large meal, so care should be taken not to overfeed the spider in the weeks after offering this type of food.

The habits of your spider need to correlate with that of its prey whenever possible, as this can dictate which items will be most suitable. For example, crickets tend to be more terrestrial so they can often be overlooked by arboreal species, whereas locusts tend to be active climbers, and so would be ideal for this group of spiders. This situation is then reversed in the case of terrestrial spiders.

The frequency of feeding is an area that is down to the owner to a certain extent, as it can vary from spider to spider as to how often and how much (or little) they are willing to eat. A general guide is two to six items of prey given between two and four times a month (being adjusted according to spider and size/age), although the best idea will be to observe

your spider to see how much it eats and how often.

It is worth taking in to account that at some times of the year, or simply due to being in a pre/post moult situation, your spider may refuse food for prolonged periods of time. This is a normal occurrence and should rarely be a cause for concern in a healthy adult. Some individuals can go for months without needing to feed, and then all of a sudden, they start eating again.

If your spider does suddenly lose its appetite, then the best thing to do is observe it closely, checking for any signs of ill health or rapid weight loss and noting any difference in behaviour. It may also be beneficial to log the dates of the fast, so you can accurately monitor the period over which the spider is refusing food.

### Handling

Handling is a grey area in spider-keeping circles. For the majority of the time, keepers tend to opt for the 'hands off' approach. As a rule, this is often the best choice, as a large number of species that are kept should not be handled. Nevertheless, there may be instances where handling could be required, such as when rehoming or when carrying out a health check, and appropriate equipment is unavailable. If the situation arises where a spider needs to be handled,

► The goliath birdeaters (*Theraphosa* species) from South America are the largest tarantulas in the world, with a leg-span equivalent to a dinner plate. They are quite able to deal with small vertebrate prey.

▼ The appetite of tarantulas varies through the year. They ambush their prey. This individual has just caught a cicada in the wild.



there are several methods, including:

■ Coaxing the spider on to a platform (such as cork bark or a tub) and then encouraging it to step on to a flat hand. It should be stressed that this is only an option when dealing with spiders that have a docile temperament, because of the risk of being bitten.

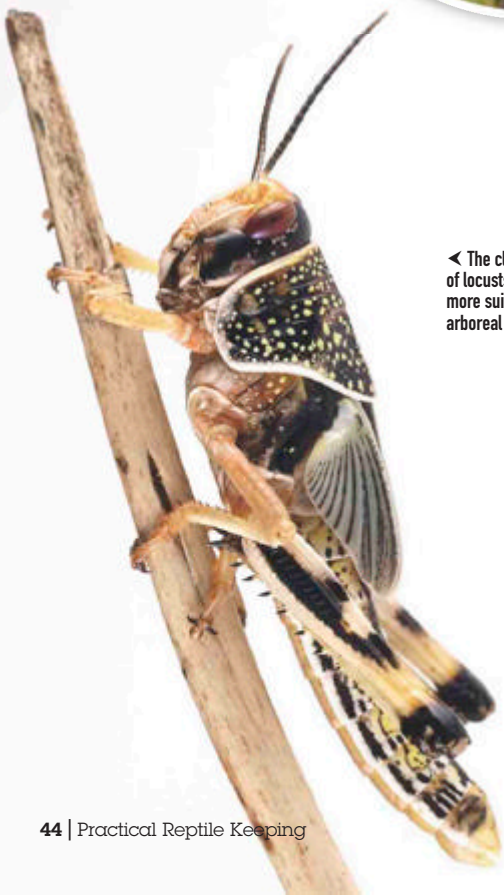
■ For nervous or defensive spiders, it would be more suitable to 'pinch grab' which involves lightly placing the index finger onto the carapace, whilst lightly gripping the sides of the carapace between the second and third legs. This method should never be used on smaller spiders though, as the pressure on the coxa and trochanters can cause injury.

You also need to be aware of the urticating 'hairs' (bristles), aside from the tarantula's ability to bite, and never peer closely at the spider. The bite of some tarantulas is more potent than others. Although there are these safe methods to handle a spider, it is recommended to limit handling to a minimum and always ensure that the spider is not at a great height, especially when free handling, as a fall even from a small distance can prove to be potentially fatal. Always wash your hands immediately afterwards, if you have had direct contact with the spider, to wash off any loose bristles here. Otherwise, you could transfer them to your eye by rubbing it.

### Tools of the trade

There are a number of items that make

◀ The climbing abilities of locusts make them more suitable as prey for arboreal spiders.



The Indian ornamental tarantula (*Poecilotheria regalis*) is a species that has a particularly potent bite.



▲ A 'catch cup' in use.

feeding multiple spiders a few times a week would fill a diary relatively quickly! You could obviously keep a log on-line as well though.

■ **Feeding tongs** – these are pretty important when dealing with large, fast and defensive species as they put a bit of distance between your hand and the sharp, venomous end of the spider. They can be used for feeding and general maintenance so they are an all-round useful bit of kit.

■ **Spoon(s)** – these are something that can be used for general husbandry to spot clean, or to dig up fossorial species if needing to be rehoused.

■ **Paintbrushes of various sizes** – these are extremely beneficial when it comes to convincing a spider to move in certain directions, such as into a catch cup, or from one enclosure to another.

■ **Aquarium net** – this is purely used as a backup if a spider tries to make a run for it. The net can simply be placed over the spider (gently) to prevent it from going further away.

■ **Various 'catch cups'** – when rehousing a spider, these remove the necessity for handling and when it comes to health checking, catch cups are indispensable as they provide a clear chamber that allows the keeper to examine all areas of the spider without direct handling. Choose a plastic container with a lid for this purpose.

■ **Torch** – having a torch in the arsenal gives the keeper the opportunity to see further down burrows or into the web tunnel of species that are elusive.

■ **Magnifying glass or microscope** – this is basically to examine the exuvium of a spider to determine its gender, but it can also be used to examine other areas of the spider's anatomy, and can be a great help in unravelling the taxonomy of spiders.

■ **Ruler** – although not an often seen tool of the spider keeper, I have found that a ruler can be extremely useful to have to hand with spiders, as it can mean life or death for the male. If the female, at any point during copulation, shows even the slightest indication that she may want to eat the male, the ruler can be simply slid in between the pair, and braced against the chelicerae of the female, buying the male some valuable time to escape. ❖

▲ This Mexican fire-knee tarantula (*Brachypelma auratum*) has lost the defensive urticating hairs on its abdomen.



extremely valuable pieces of kit in the toolkit of someone who owns spiders. The majority of these items are not essential by any means, and yet they will go a long way towards making life a lot easier, as well as reducing the risk of escapees and being 'tagged' (bitten). They include:

■ **A spray bottle** – this is pretty essential as it will be your main means of controlling humidity within the spider's environment. The best type of spray bottle to use is the atomiser style, as these have a more gentle spray that creates less of an impact in the enclosure, which is

especially beneficial for spiderlings.

■ **Diary** – this is often underutilised by many keepers and although it isn't essential, it definitely helps a lot, especially when keeping numerous spiders. The use of a 'spider diary' is subjective and can be as intricate or as simple as the keeper requires. Personal experience has led me to using a diary to record when new spiders are acquired, when spiders moult, when mating occurs and eggs are produced etc. These are areas that I believe are important for recording, and I admit to opting out of noting feeding, as

# TALES FROM

# THE REPTILE HOUSE



## THE BOA AND THE BURLESQUE SHOW

Having worked for many years as the curator of a zoological collection in Scotland, Bill Lowe soon came to appreciate just how important it was for all the staff to work as a team and sometimes, it was necessary to participate in out-of-hours activities that the staff were planning – even if he did sometimes unexpectedly get the blame for what was going on!

**S**ometimes you need to let your hair down, you know. You should come out with us. It's only a bit of fun," said Fred, making me feel slightly guilty. I could have replied that for someone as follicly challenged as myself, "letting my hair down" really wasn't an option!

Nevertheless, I agreed to join the rest of the guys who worked alongside me in the park – some of them as gardeners and others who were employed in the greenhouses, as well as my two animal keepers, Fred and Mick. It was really against my better judgment, but after all, it was Mick's stag night, so I felt obliged to go.

I should have known that disaster would follow though! Anything involving

either Fred or Mick – or worse still, both of them – was sure to end in trouble, typically with me getting the blame, and this night out was to turn out to be no exception. ....

There were times when I really could not believe the evidence of my own eyes - such as the occasion when Fred was up a tree armed with a chain saw and I wasn't able to shout out my warning in time before he sawed through the very branch that he was sitting on. What made it worse was that he had forgotten to wear his safety harness and he came down to earth with such a wallop on his backside that he couldn't sit down again for at least a week afterwards.



▲ What was wrong with the garter snakes?

### The case of the missing garters

Then there was the time that I couldn't understand how we were managing to breed so many young garter snakes in the Reptile House and yet, despite their apparent excellent condition typified by their bright eyes, healthy appetites and unblemished skin, they were still succumbing in large numbers.

A female garter snake will produce as many as 80 live youngsters at a time. At birth they appear as fully formed



There was obviously a lot of interest in the young garter snakes.



discovered one novel way of stretching his finances by selling off some of the surplus stock from the Reptile House to the local school kids without my knowledge, let alone approval.

I knew that I had to put a stop to these financial transactions between the unsuspecting school children and the hard-up Welshman, and decided on a plan of action to let him know that I was on to him.

One evening I stayed behind at the Reptile House waiting for all the staff to leave. I carefully caught up all the remaining young garter snakes, transferring them to another vivarium, which I hid away out of sight. I had previously visited one of the toyshops in the town and had purchased a number of rubber snakes. I had explained to the rest of my staff what I had done and threatened them not to breathe a word to Fred.

We all agreed that we would come into work half an hour early the next day. What Fred didn't know was that I had replaced the young garter snakes with their rubber counterparts and I had affixed a price tag to each one - all of which were prominently displayed.

Fred was unaware of our presence, as we were hidden out of



▲ The replacement snakes all came with their own price tags!

### Caught out by a toy

I had to explain that I had done no such thing, but I did not have to give much thought to the matter as I had a pretty good idea who the culprit might be. Fred was as well known for his proclivity for spending most of his weekly pay packet down the betting shop as he was for invariably backing the last horse past the finishing post.

I would often remark that Fred was always extremely kind to sick animals – particularly horses – but he just didn't realise that they were not in prime condition when he placed his bets on them!

It was therefore not unusual for him to be very short of cash long before the end of the week and, with 13 children for himself and his wife to feed, he was forced to hit upon ever more inventive means by which to stretch the household budget. Not content with flogging bunches of flowers he had picked in the park, he had clearly

miniature versions of their parents. Strangely enough, I never discovered a single mortality, but Fred seemed to find dead ones in abundance. According to him, every morning he would discover several dead bodies in the large vivarium situated "behind the scenes" and out of view of the public.

He would explain to me that he had thoughtfully buried the dead bodies, because he knew that I would be upset to discover so many fatalities. As least, that was his story!

I have to admit that I had inadvertently provided Fred with an ideal alibi for what he was doing behind my back. I had previously explained to him that the reason why garter snakes produce such large numbers of offspring was that, in nature, a large proportion of them would not survive. I should add that this was in complete contrast to the number of children that Fred himself had fathered – 13 in all and every one of them had survived!

One day, a couple visiting the Reptile House related to me that they were very pleased that their 10-year-old son had finally managed to find a hobby that absorbed him so much. Apparently, the youngster had taken up keeping reptiles as a hobby after purchasing a couple of young garter snakes from "me" when he had encountered "me" hanging round the school gates one afternoon on my day off, and offering young garter snakes for sale to the pupils at £1 each!



▲ The young garter snakes were all removed.

“ I carefully caught up all the remaining young garter snakes, transferring them to another vivarium, which I hid away out of sight. ”

sight waiting to spring our surprise on him. As soon he reached into the vivarium, he was met with a rousing chorus: "Will you take 50p for that one, Fred? We can't afford any more. We don't get much pocket money."

I felt that embarrassing him in front of his fellow workers would have more effect on him than me simply taking him into my office and reprimanding him for his actions. However, afterwards, I felt that I still had to back up this light-hearted attempt to embarrass him in the eyes of his colleagues with an official verbal warning, stating that if I ever discovered him doing any such thing again, he would be dismissed.

### Heading out together

It has to be said that Fred was a "loveable rogue" and it was difficult to remain very angry with him for too long. So by the time that Mick's stag night was due to take place, all had been forgiven – for the time being anyway!

It was Fred whose self-appointed task it was to arrange the entertainment for the evening. I should have known that somehow, I would become involved to a greater extent than I had bargained for, or would have wanted.

I suppose that the clue was there in the photograph of a scantily dressed young lady that he was bandying around the staff canteen. She was wearing little more than a large boa constrictor draped across her shoulders!

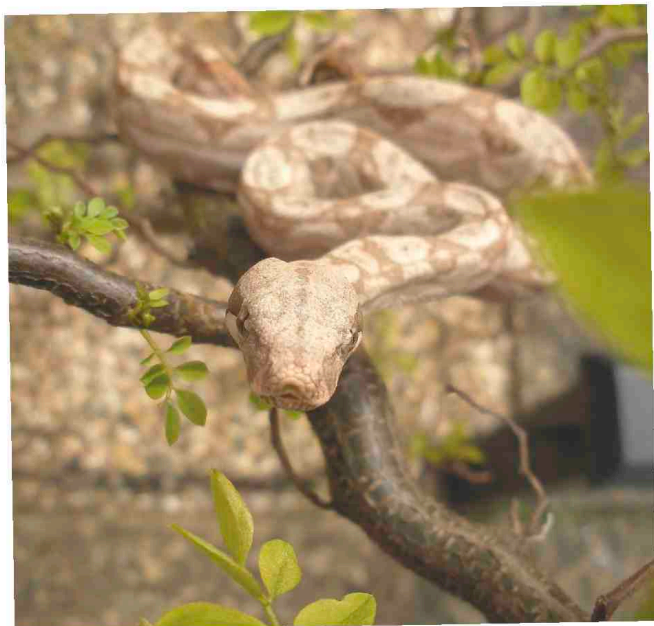
At least, she had had the sense not to allow her pet to coil around her neck, as this can be a dangerous practice. When handling a boa constrictor of any size, it is always important to support the weight of its body.

If handled from an early age, most boa constrictors will become extremely tame,

Supporting the weight of the snake is important.



▼ Pale colouration is a feature of the Hogg Island boa. Photo courtesy Purplegerbil.



although it is important for an owner to appreciate that the larger the snake becomes, the more powerful it is. Whilst the tall tales (usually purveyed in Hollywood horror movies) of boa constrictors swallowing people whole are an exaggeration, they are nevertheless still a force to be reckoned with, when fully grown.

Young boa constrictors may prove to be a little bit nervous of being picked up at first but, if handled correctly and on a frequent basis, they will soon become quite confident and allow their owner to handle them in safety and with relative ease.

These snakes are readily available in pet stores these days, as they are now being bred regularly in quite large numbers. Would-be pet owners are often attracted to purchasing an example of this species, on account of its beautiful

markings and because they may feel that owning a boa constrictor gives them a certain kudos.

### Variations on a theme

My advice is that anyone considering the purchase of a boa constrictor should think long and hard before doing so – as with any reptile – but especially in this case, because that small, beautifully patterned baby boa is going to grow up into a very large and very powerful creature, measuring up to 18ft (5.6m) in length.

There are some regional differences in the case of this species though, which ranges from Central America as far south as Argentina and Paraguay in South America. The species is also represented on some Caribbean islands, including St Lucia, and other islands off the coast of Panama. Some of these populations tend



▲ The stunning colouration of a young emerald tree boa.

▼ The adult form of the same species.

to grow to a smaller size, such as the Hogg Island form.

This attains a size of around 1.8m (6ft) in length, and originates from the Cayos Cochinos, translating as Hogg Islands, which lie just off the northern coast of Honduras. These boas have a very distinctive colouration, being paler than normal, with this population being naturally hypomelanistic, thanks to a lack of the dark pigment melanin. Their tail colouration can vary from an orange shade to salmon pink.

There is still confusion surrounding the

classification of the boa constrictor, to the extent that is unclear as to exactly how many valid subspecies exist. One of the most sought-after, though, is the red-tailed boa (*Boa constrictor imperator*). As its name suggests, the tail colouration of this subspecies serves to distinguish it from *Boa constrictor constrictor*.

Red-tailed boas grow to a smaller size, and as they mature, a key difference in size between the sexes will also start to emerge. If you are seeking a smaller individual, then choose a male, which is likely to average around 6kg (13lb) once

adult, being significantly lighter than a female.

### Other options

When size is an issue, there are also other species to consider, although their care may be more specialised or demanding than in the case of the various forms of the boa constrictor. There is, for example, the emerald tree boa (*Boa caninus*), which is unlikely to exceed 1.8m (6ft) when fully grown, although it does have proportionately larger teeth. The young in this case can vary from orange to brick red in colour, acquiring their adult, emerald green colouration over the course of perhaps a year.

Another smaller option is the rubber boa (*Charina bottae*). These snakes are unusual for a number of reasons, not least because they are the most northerly representatives of the group. They are to be found in western parts of the United States, extending northwards into British Columbia in Canada. There is also a much rarer species called the southern rubber boa (*C. umbratica*), that is restricted to isolated parts of California.

Rubber boas also rank amongst the shortest of all boas, ranging from about 38-84cm (1.25-2.75ft) overall. They are so-called because of the wrinkly skin, which is brownish and paler on the underparts, with a rubbery texture.

Interestingly, research has revealed





that the rubber boas represent a more primitive lineage, compared with their larger relatives found in the tropics, as reflected in part by their club-like tail. This means that their tail and head are rather similar in shape. They are very adaptable snakes, and can be found in a wide range of localities, and at altitudes from sea level up to more than 3000m (10,000ft). They can climb well, and they may burrow, as well as being able to swim when necessary.

Rubber boas also offer an ideal introduction to keeping boas, because they are surprisingly inoffensive, and will not attempt to strike. Instead, if alarmed, they release a very pungent musky fluid from their vent, although with regular, gentle handling, the risk of this happening will soon diminish.

### One to avoid!

Being by far the largest of the boas, with an often irascible temperament, the one member of this group that I would definitely not recommend to the hobbyist, especially if you are starting out, is a green anaconda (*Eunectes murinus*). In my opinion, such a large and powerful creature really should only be maintained in a zoological collection. It ranks as one of the longest and heaviest snakes, capable of attaining a length of more than 5.2m (17ft) and tipping the scales at potentially well over 70kg (154lb). It is not just its length, but its muscular power and weight that make handling this snake so difficult.

► A rubber boa photographed in the wild.



► These snakes tend to curl up in a ball if alarmed.

### Choosing your snake

When choosing a boa as a pet, always look out for signs of a firm, muscular body; there should be no loose folds of skin, or any body lesions. The eyes should be perfectly clear, unless the snake is casting.

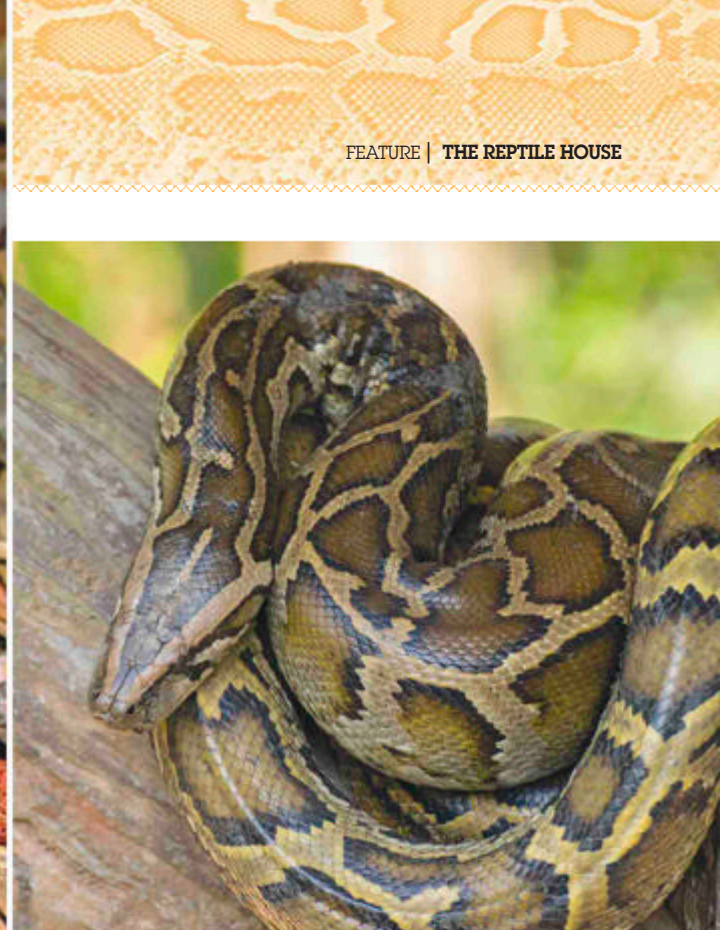
If an individual being offered for sale is in the process of casting its old skin, leave it where it is for the time being and return to view it again once it is fully cast. When a boa is in the process of casting, it is at its most vulnerable and may also behave in a slightly aggressive manner. A change of environment can often serve to aggravate the situation. Only the more experienced reptile enthusiast should ever consider making a new acquisition whilst it is in the process of casting its skin.

If possible, ask to see your intended purchase being fed and carefully observe exactly what it is eating. At the same time, make a thorough inspection of the animal, avoiding any which show signs of external parasites. Always be on the lookout for healthy-looking scales, with no apparent skin wounds.

Starting out with a young, home-bred snake is the best option. This should mean that it settles more readily with you, and should be free from internal parasites. In the longer term, it should also be possible to tame a snake of this type, so it becomes used to being handled without any problems.



Anacondas can be more than a handful!



▲ The reticulated python at the zoo was always looking to escape up to the roof.

Your boa should be alert at all times, with a tongue which is constantly flicking in and out and it should react to being handling by gently coiling itself around the lower part of your arm and hand.

A young boa constrictor can be housed in a vivarium, but you will undoubtedly require a much larger purpose-built enclosure for it once it reaches maturity. A minimum size of floor space for an adult boa constrictor in my view would be a vivarium measuring 1.5x 0.6m (5x2ft) - this is suitable for a single snake, although I would always recommend the provision of as large an enclosure as possible.

### Escapees

Remember too that boa constrictors are particularly adept at making a bid for freedom and will readily escape if given half a chance. Make sure the door closings in particular are adequate.

Some snakes seem to get into the habit of trying to escape regularly. I remember in the Reptile House, we had two regular "Houdinis" – a reticulated python (*Python reticulatus*) called Monty, whose greatest ambition in life was to escape from his enclosure, climb up into the beamed ceiling and wrap himself around one of the beams. He would then refuse to budge and struck out at anyone other than myself who attempted to dislodge him from his favourite perch. His usual target was

one of the nightwatchmen, who would often call me late at night, summoning me to return to the Reptile House in order to "move Monty".

Likewise, one of the boa constrictors in the collection would be all too anxious to make its own bid for freedom – usually when its enclosure was being cleaned out and especially if my attention was momentarily distracted by an enquiry from a member of the public visiting the Reptile House. It seemed to know exactly where the pinkie mice were to be found, tasting the air and sniffing them out with the dogged determination of a bloodhound.

### Environmental needs

On account of the typical weight of a boa constrictor, it is important to ensure that branches

installed in its enclosure for climbing purposes should be sufficiently sturdy to support its weight. This may entail the use of screws and brackets for this purpose. If a branch with a snake attached does fall to the floor, this could be fatal, should the snake suffer internal injuries or even severe bruising.

In terms of substrates, there are various options to consider for an enclosure containing a boa constrictor. These include astroturf, paper towelling, or you can choose a commercial bedding product such as Zoo Med's Eco Earth made from coconut fibre, or Forest Floor Bedding, derived from the bark of red cypress trees. I would not use wood shavings, as the particles may be ingested and this can lead to subsequent bowel impaction. It is also important to remember that certain types of wood should be avoided, as they can cause skin irritations and even respiratory problems.

Your pet boa will need an artificial heat source. This should be maintained at a suitable temperature gradient throughout

▼ Morphs are now adding to the popularity of these snakes. This is an anerythristic Columbian red-tailed boa.



the day and night. Remember that these creatures generally originate from around the Equator. A suitable daytime temperature would be approximately 28-32°C (82-90°F), with the nighttime temperature falling back to or being just above the ambient level in the room.

In addition, your boa constrictor will need a basking spot, which should be maintained at 32-35°C (90-95°F), during the daytime. This can be provided by the use of an incandescent bulb, or a ceramic heating element, but you need to be absolutely certain that the snake will not have any opportunity to gain access to this heat source, as coming into direct contact with it could cause serious if not fatal burns. It needs to be safely and securely shielded from the snake.

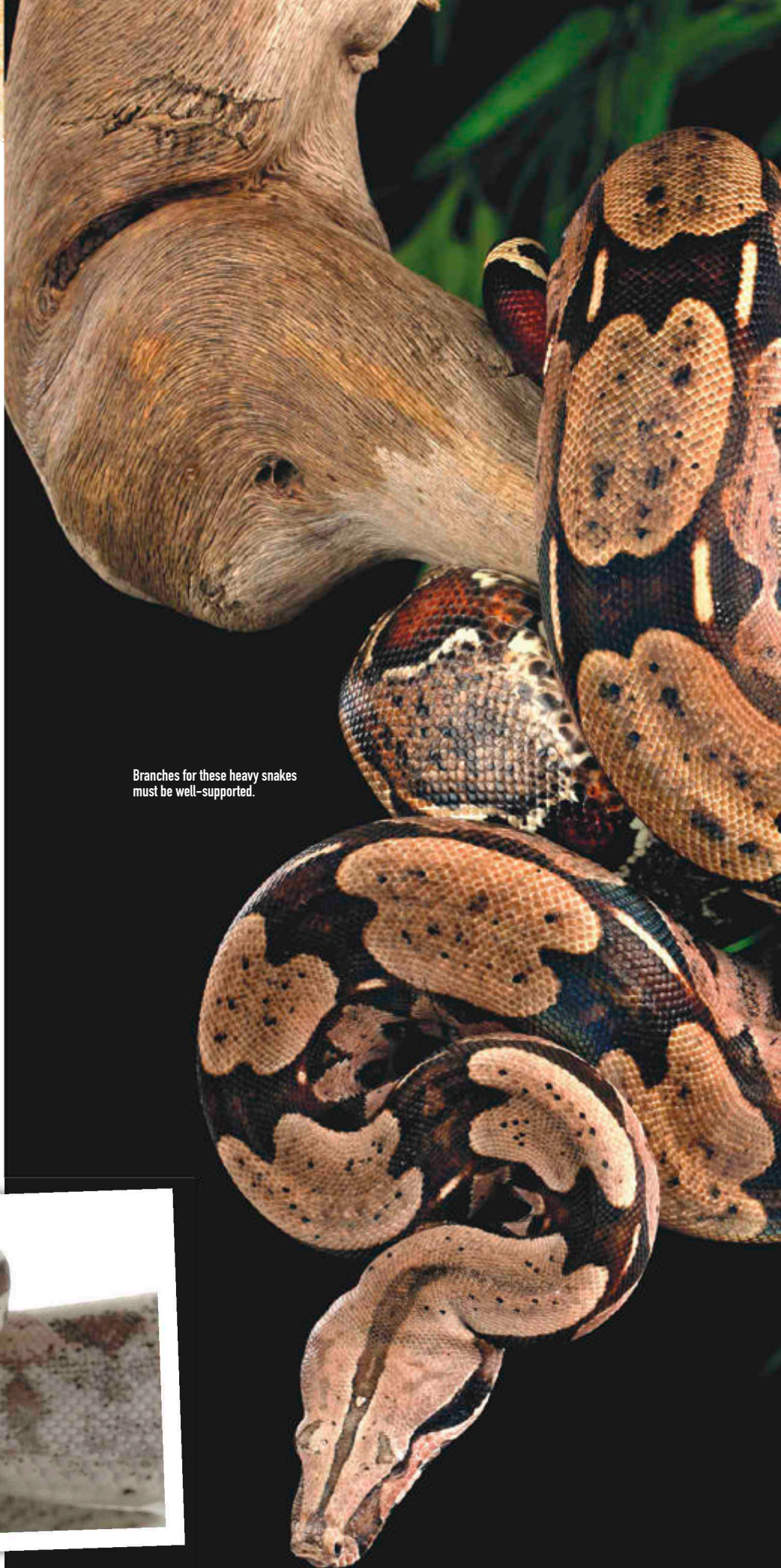
### Feeding

Feeding a boa should be a straightforward matter; most of these snakes will only eat rodents and you should start a youngster off by feeding it pinkie mice, working up to small mice, followed by rats and then rabbits. A fully-grown boa constrictor may only require one meal every three or four weeks, but juveniles should be fed about twice a week.

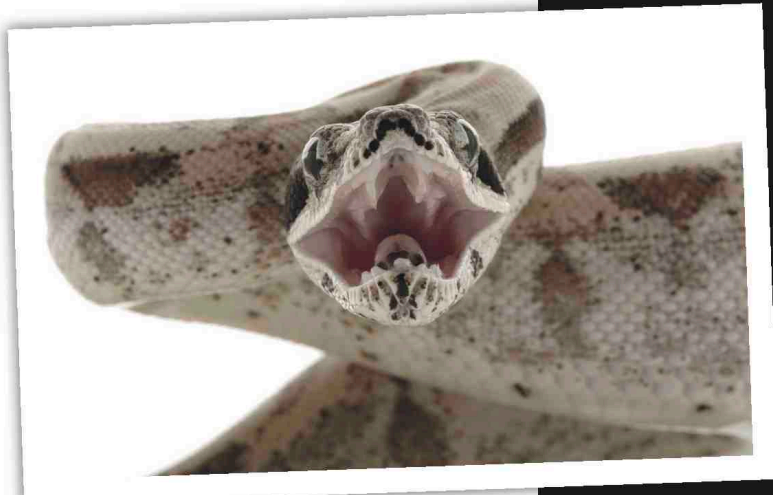
It should always be remembered that most boas tend to prefer to consume their meal in a secluded spot, rather than in the open. Reptile "caves" which are available commercially are suitable for smaller boas, but as your snake gets larger, you may need to provide a bigger retreat, such as a hollow upturned log for this purpose. Screening one area of the enclosure with opaque glass will also add to your pet's feeling of security.

In the Reptile House, I would always try to get the feeding out of the way before the premises were open to the general public. As a result, the occupants had more peace and could remain undisturbed while they were eating. It was also easier to keep a check on their appetite. Besides, I would not suffer so much "disturbance" myself, caused by visitors complaining that they and their children were being upset by observing dead small furry animals disappearing down the throat of a voracious reptile!

You should avoid handling a snake for at



Branches for these heavy snakes must be well-supported.



▲ Rodents of different sizes usually form the basis of the diet of these snakes. This is a ghost Colombian red-tailed boa.



The markings of boa constrictors are individual.



least 24 hours after it has eaten a meal, as handling may otherwise stimulate the regurgitation of its food. I would always advocate wearing a pair of thin latex rubber gloves when feeding prey items, or at the very least wash your hands thoroughly afterwards.

It also helps to train your snake to learn when it is being fed, as distinct from having its quarters serviced. This minimises the risk that it will strike at you instinctively when you place your hand in its quarters. You can tap on the door when offering food, and, in addition, use feeding forceps.

Always remember to include a large bowl of fresh water in the enclosure as well – both for drinking purposes and in order to help to maintain the humidity.

When casting, your boa will often immerse itself in its drinking bowl, as this helps it to shed its old skin more easily. Change the contents frequently, and wash the bowl out as instructed with a reptile-safe disinfectant before rinsing it. It's often overlooked that these containers and their contents can become a major breeding ground for bacteria, potentially endangering the snake's health.

Unlike their close relatives the pythons, which are egg-layers, boas all produce litters of live young, numbering up to 40 offspring. In the case of a newly born boa constrictor, each individual youngster will measure approximately 36cm (14in) in overall length. They are perfectly formed, miniature versions of their parents at this stage, and their patterning is unlikely to alter significantly as they grow larger. This makes it easier to identify individuals accurately.

A baby boa constrictor can make a fascinating and rewarding pet. Provided that it is given the right care and attention, it may well live for up to 20 years in captivity. It's strange, but for some reason, even those people who have no real interest in reptile keeping seem to have a fascination for boa constrictors!

## A final thought

I am guessing (although here, I have to admit that I may have been mistaking his motives) that the real reason why Fred wanted to employ that particular young lady for Mick's stag night, complete with her boa constrictor, had nothing to do with her own undisputed charms. Instead, it was actually to be more likely because she might possibly have wanted a friend who was in the market for a boa of her own, and not the feathered form!

After all, the price of a boa constrictor would be significantly more than a garter snake, and one out of 40 youngsters may not have been missed! Fred was optimistic though, thinking that he had much chance of sneaking a boa constrictor out of the Reptile House now that I was on to him!

As I was soon to discover, it wasn't just me who was on his case! Apparently his wife and the mother of his 13 children had found a flyer for the burlesque performer in the pocket of his overalls. I have to say that Fred was always better at getting himself into hot water than getting himself out of it. Not surprisingly, she was none too happy to learn about her husband's choice of female company for the evening.

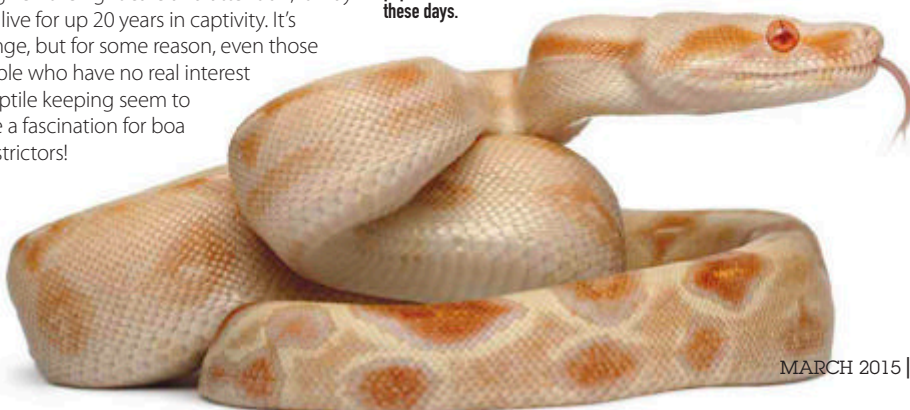
She was waiting outside the pub for us, ready to berate her wayward husband when we all finally emerged after downing more pints than I care to remember, and all feeling more than a little bit the worse for wear.

"Don't worry, my dear. It wasn't anything do with me," Fred slurred his words, when accosted by his long-suffering wife. "It was all Bill's idea. He only wanted to see the snake and how it performed!" ❖



▲ Did Fred see the evening as a commercial opportunity?

▼ An albino boa constrictor – a popular choice these days.



# Herpetological Mysteries

## PSEUDO-SERPENTS OF THE WORLD



Right: The close-up of a two headed eastern kingsnake (*Lampropeltis getula californiae*) and the same snake seen in its entirety (above). This developmental abnormality is not that uncommon.

In his column this month, Dr Karl Shuker returns to the subject of pseudo-serpents, having documented two of North America's most famous examples, in the guise of the hoop and horn snake, in our October 2014 issue. Here he now covers a diverse selection of such snakes, featuring examples drawn from around the globe.



The description of pseudo-serpent is a term used to refer to snakes that were once regarded as genuine species, but have generally been exposed as being the result of imaginative folktales, monstrous misidentifications, or deliberate deceptive hoaxes.

### Fawcett's telescopic snake

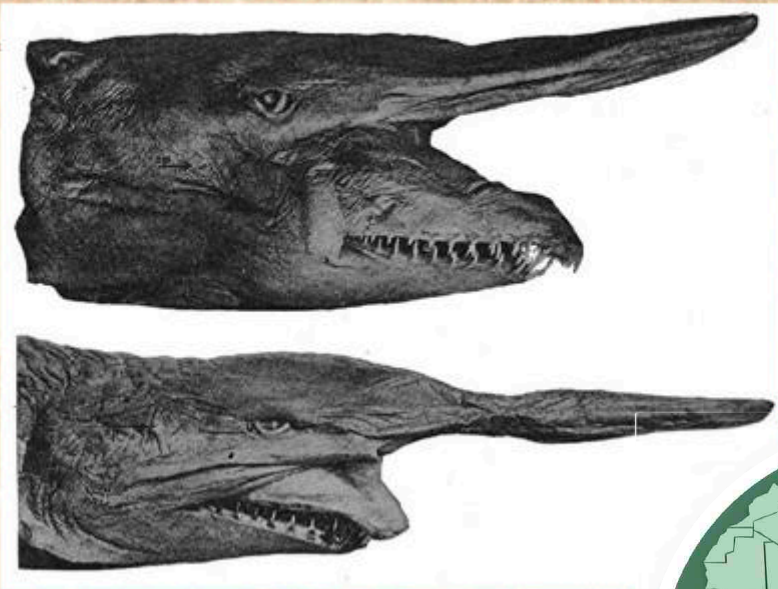
One of the most striking examples of a pseudo-serpent from South America is the Bolivian telescopic snake. During an expedition to Bolivia in 1907 (prior to vanishing in 1925, while exploring neighbouring Brazil, after which he was never to be seen again), the famous adventurer Lieutenant-Colonel Percy Fawcett had reached San Ignacio, capital



Lt-Col Percy Fawcett explored South America extensively during the early 20th century. Source: PD.

of Bolivia's Chiquitos Province. This is an area that he referred to as being possibly the worst region in all of South America for venomous snakes and associated human fatalities arising from snakebites.

Moreover, several of the locals whom Fawcett encountered there also assured



The goblin shark is one of a few species that has retractable jaws. Source PD. Source: PD.

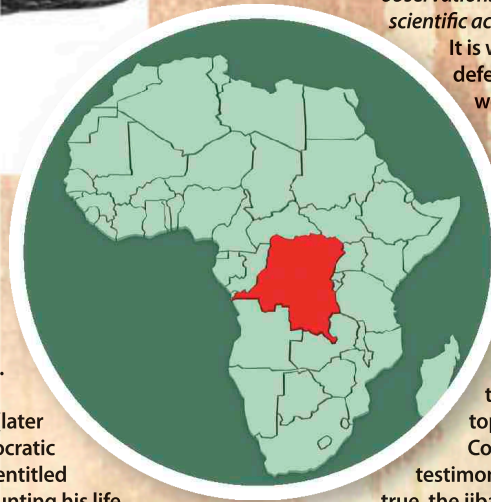
him that this frightening region was home to a most extraordinary serpent that was roughly 1m (3ft) long. It was said to possess the astonishing ability to telescope back into itself before striking. Luckily, however, it was not very venomous. Not surprisingly, Fawcett considered this feat to be an anatomical impossibility. Furthermore, he never saw one of these telescopic snakes himself.

Although certain animals possess retractable jaws – notably the goblin shark (*Mitsukurina owstoni*) – there is no vertebrate that can perform telescopic behaviour. So unless this was merely an exaggerated description of a snake that possibly recoiled its body quite significantly before striking forward, we can definitely file the Bolivian telescope snake within cryptozoology's bulging folder of pseudo-serpent reports.

### The Congolese jibate – a missile-spitting mystery

From 1908 to 1923, American missionary E.R. Moon lived in what was then the Belgian Congo (later Zaire, and now the Democratic Congo), and in his book entitled *I Saw Congo* (1952), recounting his life in that area of Africa, he included details of what would be a truly remarkable snake if these details, supplied to him by the native people there, are true. This is what he wrote:

*"All over the Central Congo Basin the natives told me of a snake they call 'jibate', that 'throws poisonous missiles, hurling them with deadly accuracy fifteen or twenty feet'. One man told me that they would always throw at some bright*



▲ A map showing the location of the Belgian Congo, home to the supposed Congolese jibate.

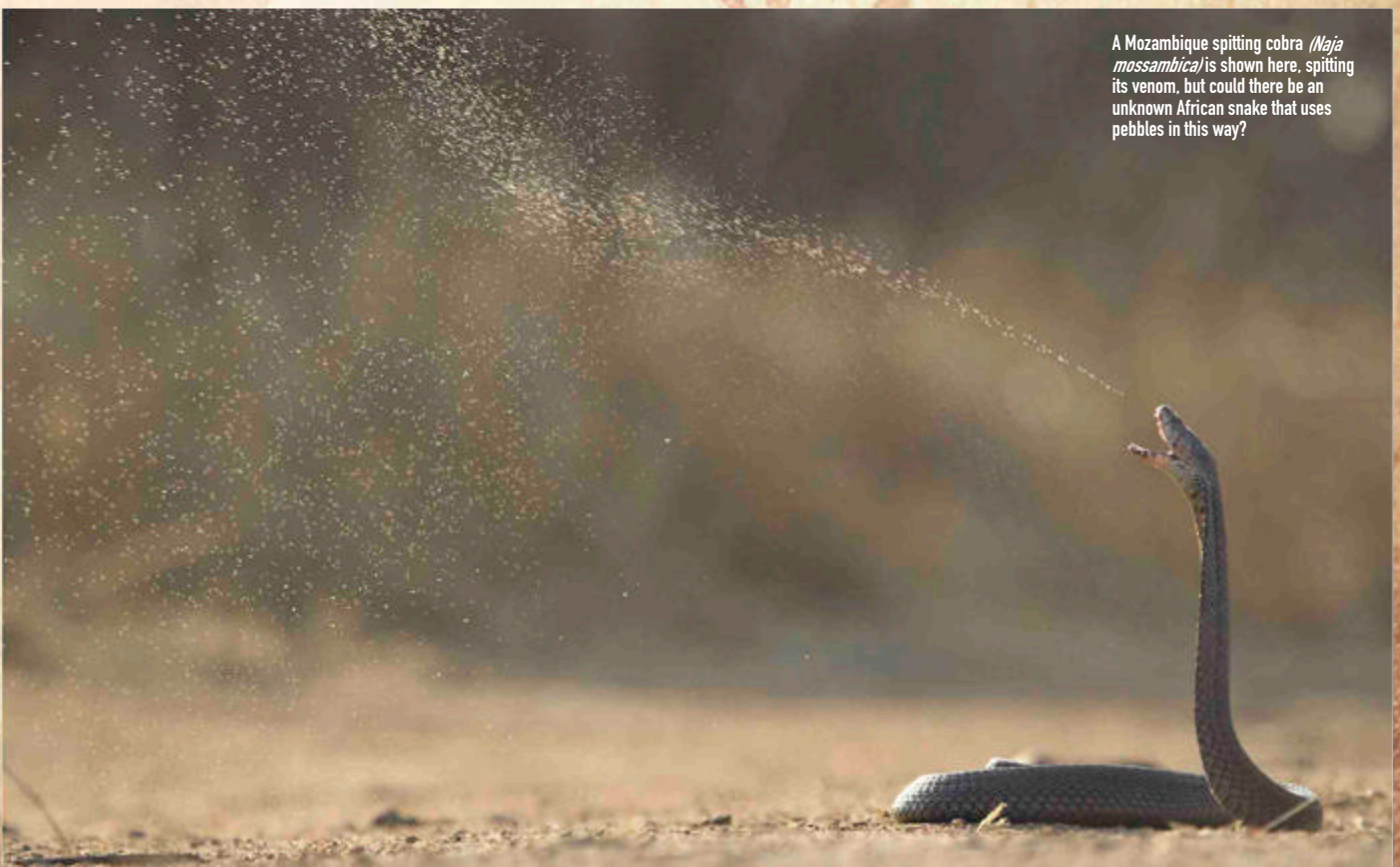
object. He said, 'if you are carrying a gun with bright metal parts, just hold the gun off to one side and you can hear the missiles strike the metal, one at a time. When the snake has hurled all its missiles it is harmless, but if you do not kill it after you are gone it will gather them up to use again.' I never put any stock in the story for I soon found that while the children of the jungle have wonderful general knowledge of animal life, their observations are made with far from scientific accuracy".

It is well known that, as a defence mechanism against a would-be attacker, several species of spitting cobra, such as the ringhals (*Hemachatus haemachatus*), will shoot out streams of venom from their mouth. They use muscular contractions to squeeze their venom glands, which then spray forth the venom through a tiny hole near the top of each fang.

Conversely though, if the testimony given to E. R. Moon was true, the jibate must actually pick up small pebbles or similar objects off the ground with its mouth. These will then be coated with venom from its fangs, before being spat back out both at speed and with not inconsiderable force, being targeted at either potential prey or in response to a potential threat of any kind.

This would undoubtedly be a novel tactic amongst snakes, and although it is not so unlikely as to be impossible, I

A Mozambique spitting cobra (*Naja mossambica*) is shown here, spitting its venom, but could there be an unknown African snake that uses pebbles in this way?



The mysterious snake had originated from Paraguay, in South America.



agree with Moon that it is certainly not very believable. Moreover, no further information about the existence of these snakes has emerged for over 60 years since he wrote those words. It seems likely that the jibate too should therefore be included in the pseudo-serpent category.

### Lost in translation

Some non-existent mystery beasts owe their temporary reality not to tall tales or native folklore but merely to imperfect translations of reports from one language to another. A prime example of this is the *mboi-yagua* or the Paraguayan barking snake, which I documented in my book *From Flying Toads To Snakes With Wings* (1997).

During the early 1970s, America's scientific community and the general public alike were besieged by incredible stories of a large snake known locally as the *mboi-yagua*, that was on display in Paraguay's principal zoo - the Jardín Botánico, Museo y Zoológico, in Asunción. According to these stories, it had hooks on its tail, a notably swollen abdomen, and - most startling of all - the ability to bark like a dog!

As it appeared to be something totally new, everyone was very eager to learn more about this singular serpent. In the USA, its talents were first reported by a Seattle newspaper, which had relied upon a translation from an original Spanish-language story previously published in Paraguay.

The story created such a storm that, eventually, zoo officials in Asunción

▲ The green anaconda has a pattern not dissimilar to the jaguar, adding to the confusion.

► The way that anacondas in general curl around tree trunks helps to explain part of the mystery surrounding its identity. Source PD.

were forced to call a press conference in order to reveal their most famous inmate's true nature. It turned out that their amazing *mboi-yagua* was nothing more than an ordinary green anaconda (*Eunectes murinus*), whose remarkable vocal powers were due not to Nature but simply reflected the inaccurate translation of its name by whoever was responsible for describing it as 'the barking snake'.

The correct translation of '*mboi-yagua*' was not 'dog-snake' or 'snake-dog', as had been claimed, but was

actually 'tiger-snake', because the green anaconda is spotted like South America's famous (if inappropriately named) 'tigre' - the jaguar. Thus the barking snake's bark was no more.

Equally quick to vanish was its swollen abdomen, when it gave birth to 61 live young on 20 May 1972. As for its tail hooks - these were nothing more than a gross exaggeration of the fact that the anaconda tends to anchor itself to a tree or some other solid object by 'hooking' its tail a round it!

So concluded the case of the Paraguayan barking snake - stripped of a series of spectacular features that it had never possessed anyway, except in the words of an article based upon an inaccurately-translated local name.





▲ The state of Oregon lies on the west coast of the USA, north of California.

### Oregon's hammerhead snake

Thanks no doubt to the threat they can pose, combined with the fact they can terrify some people, snakes appear to have inspired a disproportionately large number of journalistic yarns and spoof articles through the years. This particular genre of reportage seemed especially common in American newspapers during the 19th and early 20th centuries.

The following account may well be one such example, although it is remotely possible that this could have been inspired by a genuine specimen. The article appeared on 13th August 1916 in an Oregon newspaper entitled *The Oregonian*, and features a bizarre serpent called the hammerhead snake, which has not been documented before in a mainstream wildlife article.

According to this newspaper account, the snake was originally discovered by a prospector on South Sixes River in Oregon's Curry County, and had since been seen there occasionally by other miners too. Rock-grey in colour and about 60cm (24in) long, it was reputedly known locally as the hammerhead snake, thanks to the peculiar shape and alignment of its head.

This part of the body was much broader than its length, with an eye set at each end, so these were widely separated from one another. The head itself was positioned at right angles to the neck, so that it resembled a tack hammer on a handle.

As noted earlier, although on first sight such a strange appearance seems implausible, it is possible that this snake could have been suffering from a

developmental (or teratological) anomaly. Perhaps it was an incompletely formed two-headed (dicephalic) specimen?

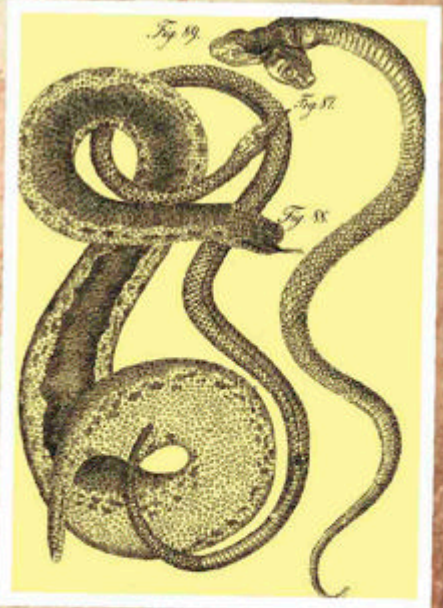
During the snake's embryological development, its head could have widened to an abnormal degree, but it did not actually divide and duplicate into two fully formed heads. However, this possible explanation would not explain why its head was placed at right angles to its neck, unless it had either suffered a vertebral injury at some stage following its birth or at hatching, or it had experienced a separate developmental defect during the formation of its neck.

### The case of the unicorn

Whereas the hammerhead snake, though certainly weird, is not necessarily fraudulent, both the unicorn snake and the American snow snake are unequivocal hoaxes – true pseudo-serpents in every sense of the term.

During the Middle Ages and for several centuries thereafter, explorers

▼ Curry County in the US state of Oregon is said to be the home of the hammerhead snake.



▲ An early portrayal of a double-headed snake – could this phenomenon help to explain Oregon's mystery hammerhead snake? Source PD.



and travellers to exotic far-flung localities around the globe would often return home to Europe with unusual animal specimens as interesting souvenirs. Sadly, however, some of these items were outright fakes.

They include the infamous 'Feejee mermaids', which were composite creations deftly manufactured from preserved monkeys and large fishes.

This category also includes deliberately misidentified objects (such as ibex or antelope horns masquerading as griffin or dragon claws) that have been sold to the unsuspecting travellers at exorbitant prices by unscrupulous vendors.

A false ophidian representative sometimes to be found in the cabinets of curiosities amassed by wealthy travellers was the unicorn snake. This usually took the form of a dried, preserved serpent of fairly sizeable proportions but sporting a long spine protruding from the centre of its brow, like a veritable herpetological unicorn, as its most eye-catching characteristic.

Needless to say, however, an examination of such a specimen by an experienced naturalist invariably



revealed that its 'horn' was merely the quill of a porcupine or a spine from a long-spined species of hedgehog that had been carefully inserted and

glued inside the serpent's head. I have also read of living specimens of supposed unicorn snakes, though I can't imagine that any snake would live very long if they had been subjected to such a barbaric treatment, because the inserted spine or quill would probably pierce their brain. Snakes could acquire quills in their bodies from close

◀ An early engraving of the unicorn snake, with detail of the horn in close-up. Source PD.

▼ There was keen enthusiasm for collecting natural history subjects from the medieval period onwards – but fakes were not unusual. This is the earliest known illustration of a natural history cabinet (with 'cabinet' meaning 'room' at stage, rather than display units within the room). It featured in Ferrante Imperato's *Dell'Historia Naturale*, published during 1599 in Naples. Source PD.



The rhinoceros rat snake, with its pronounced 'horn'. Source PD.

encounters with porcupines though, which may serve to explain accounts of this type.

It is worth noting, however, that there is a real species of snake that is sometimes dubbed the green unicorn. More commonly termed the rhinoceros rat snake (*Rhynchophis boulengeri*), however, this green-scaled, non-venomous colubrid from Vietnam and China earns its rhino and unicorn epithets from the very prominent, pointed, scaly protrusion present on the front of its snout, just like a small horn.

### The snow snake

Much more modern but no less a hoax is the North American snow snake. The lumberjacks, hillbillies, cowboys, and other frontier folk of the early American West created a fascinating, entirely original world of folklore, inhabited by all manner of extraordinary creatures. Many of these were potentially very dangerous, and were known collectively as 'fierce critters'. Happily, however, they were also entirely imaginary.

One of the most ingenious of these 'fierce critters' was the snow snake – an amazing species that, uniquely among snakes, had supposedly evolved to withstand even the coldest of environmental temperatures with ease. According to frontier folklore, it had



Seen in isolation, it is quite easy to see how the horns of ibex could be explained away as dragon's claws.





◀ The modern version of the snow snake.  
Source unattributed.

originated in Siberia, but crossed into Alaska many moons ago when the Bering Strait was frozen over during an exceptionally severe winter.

Since then, this white-scaled serpentine invader, typically measuring between 1-2m (3.3-6.6ft) long, with eyes that are typically transparent like shards of ice but can glow pinkish-red when irritated, has spread south and now exists in a number of other US states too, including Michigan, Pennsylvania, and Ohio, as well as Manitoba in Canada.

During the summer months, the snow snake remains hidden underground in a state of dormancy known as brumation. Once winter begins, however, it emerges onto the surface and remains concealed in low-lying snowdrifts, coiled and waiting for prey victims to walk by – whereupon it lunges at them with jaws open.

A single bite will inflict sufficient venom to kill even sizeable animals as well as humans (such as unsuspecting skiers and snowboarders today), by rapidly freezing their blood and reducing their body temperature until they succumb to hypothermia. However, tanglefoot oil is reputedly effective as a remedy – or at least, it may well be if it actually existed, but of course it doesn't, being just as fictitious as the deadly



▲ The inspiration for the snow snake could have come from an albino snake.

snow snake itself!

During 2014, a short report of unknown origin and authorship circulated widely online, imploring its readers to beware of emerging snow snakes, even claiming that three (unnamed) people had already been bitten by this deadly reptile. Moreover, the report also included a good-quality colour photograph of one such snake – such good quality in fact that close examination of the photo swiftly revealed that the snake depicted in it was not real but rubber – it was in fact a toy snake.

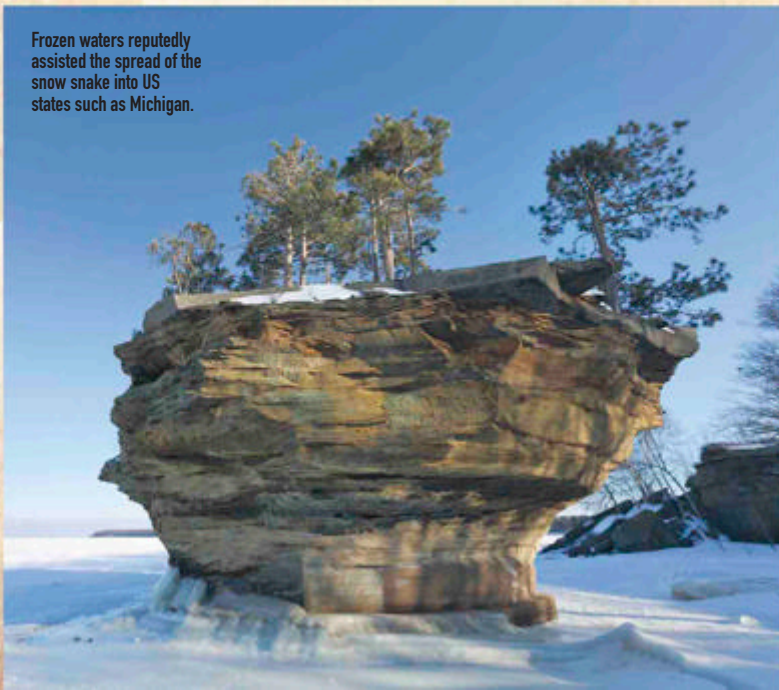
Needless to say, all of the claims made for the snow snake are nonsense. Yes, there are white snakes, and even (among albino specimens) white individuals with pinkish-red eyes. Due to their poikilothermic ('cold-blooded') physiology, however, no species of snake (whether in Siberia, North America, or anywhere else for that matter) could be active in cold, snowy conditions.



Snakes require external heat to maintain their normal body temperature, as they are of course incapable of maintaining it endothermically (from within the body). No species of snake (or any other animal), moreover, possesses venom that freezes its victim's blood and lowers their body temperature to a hypothermic level when bitten.

Although undoubtedly novel, the snow snake is also unquestionably a hoax, representing another pseudo-serpent – yet one whose contemporary presence online clearly indicates that the human imagination is still very much intrigued (if not actually mesmerised) by the concept of bizarre and deadly snakes.

*\* Dr Karl Shuker BSc PhD FRES FZS is a zoologist, author and broadcaster who is pre-eminent in the field of cryptozoology – the study of animals whose existence is not proven.*



Frozen waters reputedly assisted the spread of the snow snake into US states such as Michigan.

Missed out?

You can obtain the October back issue featuring Karl's first article on pseudo-serpents – or indeed any other back issues that you want, subject to availability – by calling 0845 873 9270. Each one costs £5.20 inc. p&p.



Discover more about such mysteries

Karl's book, entitled *Dragons in Zoology, Cryptozoology, and Culture*, is published by Coachwhip Publications (978-1616462154), and extends to 220 pages. It can be purchased from bookshops or online, and is priced at approximately £20.



By mimicking the red and green colours of falling leaves, Bornean gliding lizards are able to avoid falling prey to birds whilst gliding, according to new research.

This new investigation suggests that different populations of the gliding lizard (*Draco cornutus*), have evolved extendable gliding membranes, resembling wings, which closely match the colours of falling leaves to disguise themselves as they glide between trees in the rainforest, when they are at their most conspicuous.

Found throughout South-east Asia, *Draco* is the only living genus of lizard with extendable gliding membranes - called 'patagia' - that allow them to glide between trees in their territories.

The research team travelled to Borneo, where they studied two separate populations of a species of gliding lizard that have different coloured gliding membranes and occupy very different habitats.

One population has red gliding membranes, which match the colour of the red falling leaves of their coastal mangrove forest habitat. The other population has dark brown and green gliding membranes, which correspond to the colours of falling leaves in their lowland rainforest habitat.

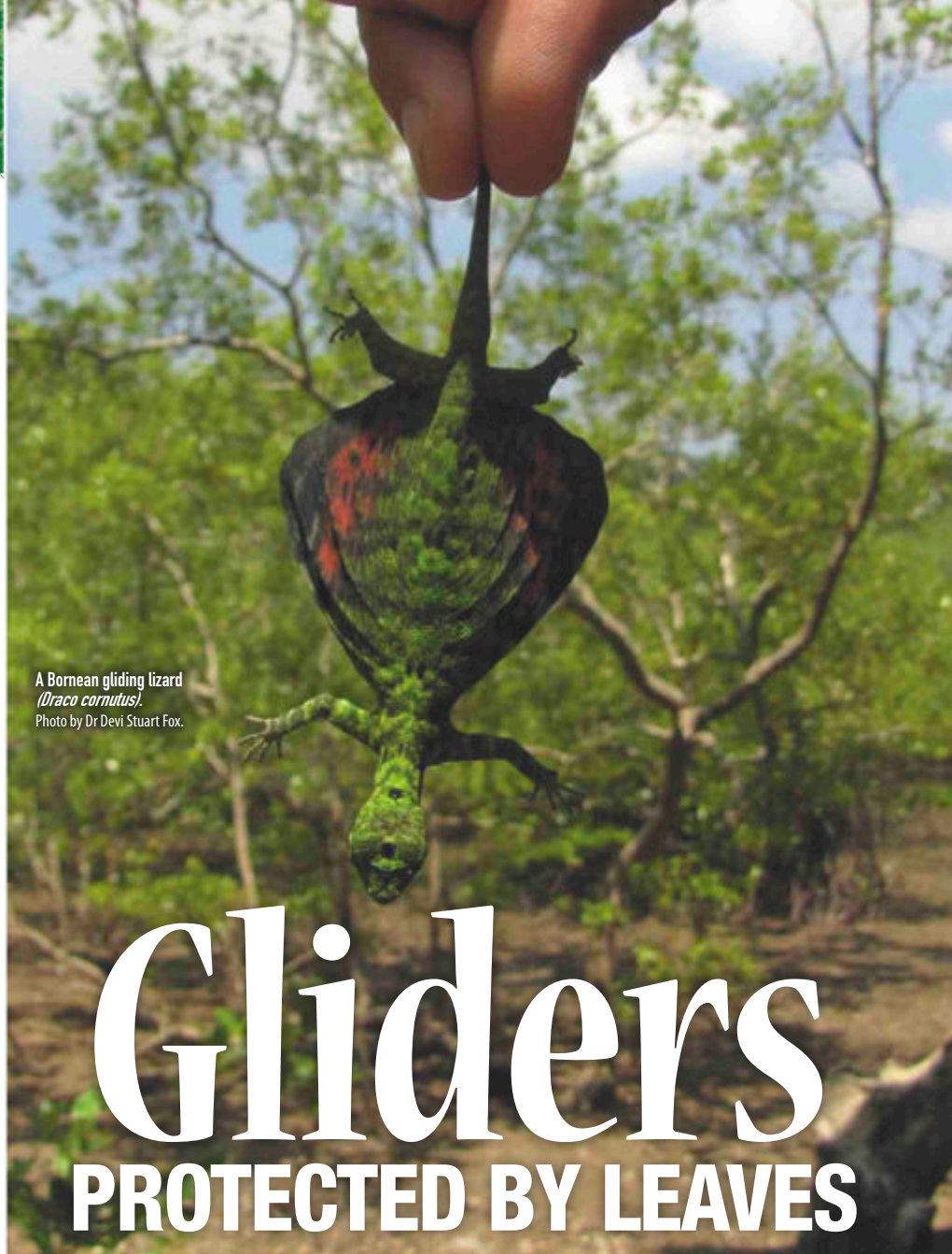
### Matching movements

The scientists determined how these colours would be perceived by a predatory bird, and found that the appearance of the gliding membrane would be indistinguishable from that of a falling leaf in the same forest.

"Like reptiles, birds can also see ultraviolet light, as well as the colours that we can appreciate, so it is important to take into account how closely the colours would actually match to a bird," says team member Danielle Klomp.



The red gliding membranes are very similar in appearance to the falling leaves. Photos by Danielle Klomp.



A Bornean gliding lizard (*Draco cornutus*). Photo by Dr Devi Stuart Fox.

# Gliders PROTECTED BY LEAVES

"It's a really interesting finding, because these gliding lizards are matching the colours of falling leaves and not the leaves that are still attached to the tree. In the mangrove population, the leaves on the trees are bright green, but turn red shortly before falling to the ground, and it is this red colour that the lizards mimic with their gliding membranes. This allows them to match a moving part of the environment - falling leaves - when they are gliding," she adds.

### Not used for communication

"Since some animals have developed colours not only for camouflage, but also as a form of communication, we wanted to watch the lizards interact in the wild and determine whether their gliding membranes were used for communication as well as

gliding," explains Ms Klomp.

The team filmed hours of gliding lizard behaviour to observe how often the colours were displayed to other lizards. "We found that both the red and green/brown gliding membranes seem to have evolved to specifically resemble the falling leaves in each population's particular habitat, and are rarely used for communication," says Ms Klomp.

"Perhaps these populations may have originally had the same gliding membrane colours, but as they have moved into different forest types, so their colours have adapted to closely resemble the colours of falling leaves in the different forests, which is a phenomenon known as divergent evolution," she concludes. ❖

## Further information

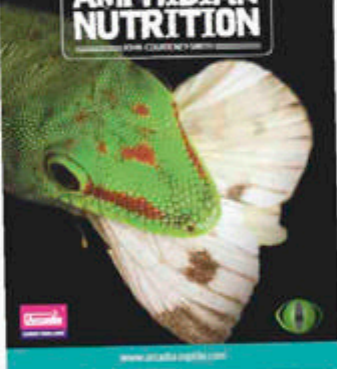
D. A. Klomp, D. Stuart-Fox, I. Das, T. J. Ord. **Marked colour divergence in the gliding membranes of a tropical lizard mirrors population differences in the colour of falling leaves.** *Biology Letters*, 2014; 10 (12): 20140776 DOI: 10.1098/rsbl.2014.0776

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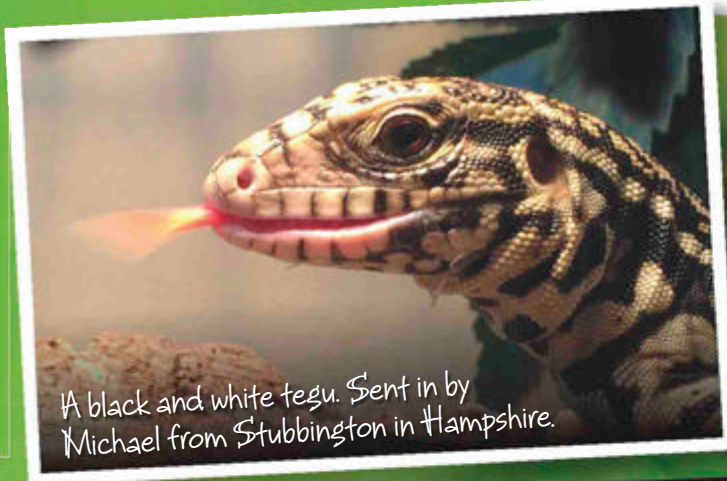


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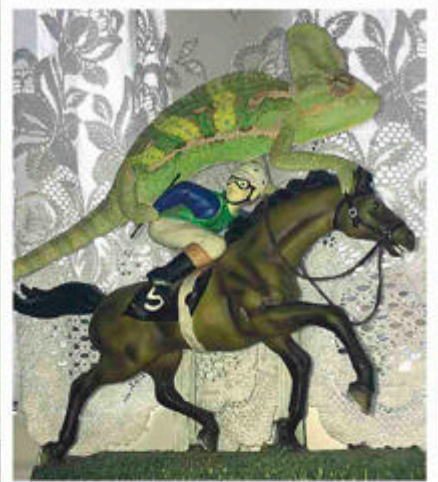


A male blue tree monitor, from Adam.



A black and white tegu. Sent in by Michael from Stubbington in Hampshire.

➤ Rango, the Yemen chameleon, hitches a ride. From Nikki in Peterborough.



Thea from Essex sent in this photo of her two blue phase White's tree frogs.



Yoda the yellow ackie monitor. From Lea and James, who live in Brighton.



Mark in Malta sent this photo of his cute bearded dragon called Lola, who is four months old.



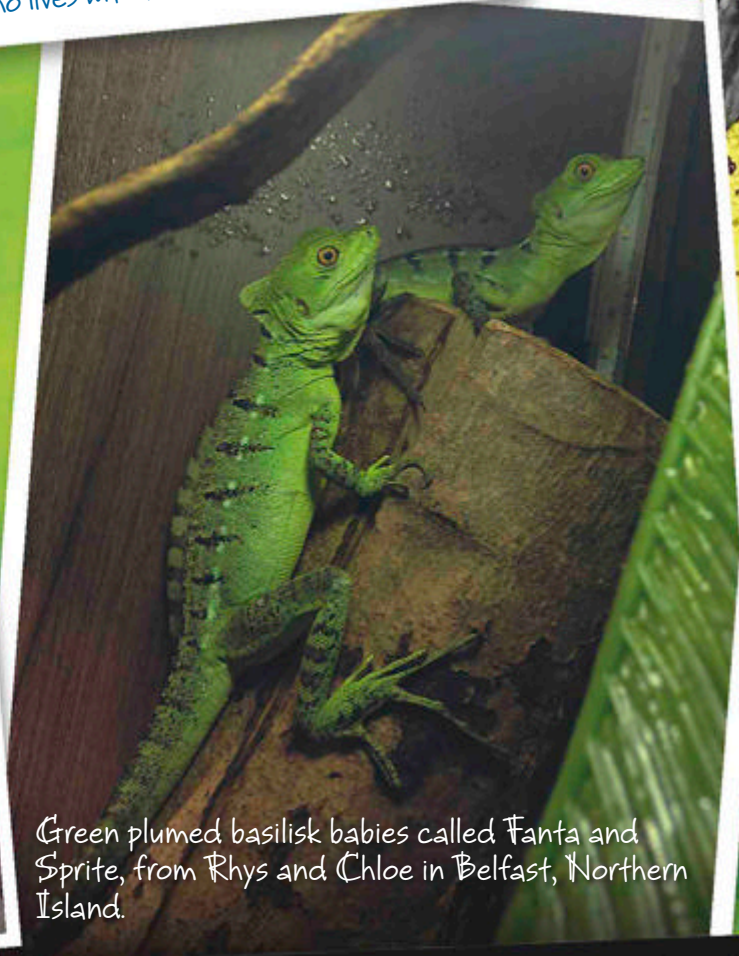
Bog, the western hognose, sent in by Daril from Essex.



A baby bearded dragon called Gizmo, who lives with Siusan in Keith, Scotland.



A Bosc's monitor called Hugo, sent in by Jack from Hastings, East Sussex.



Green plumed basilisk babies called Fanta and Sprite, from Rhys and Chloe in Belfast, Northern Island.



Bearded dragons Fred and Ollie having a chat. From Tegan in Navenby, Lincolnshire.



A carpet chameleon called Draco. From Luke and Alex in Ellesmere Port, Cheshire.

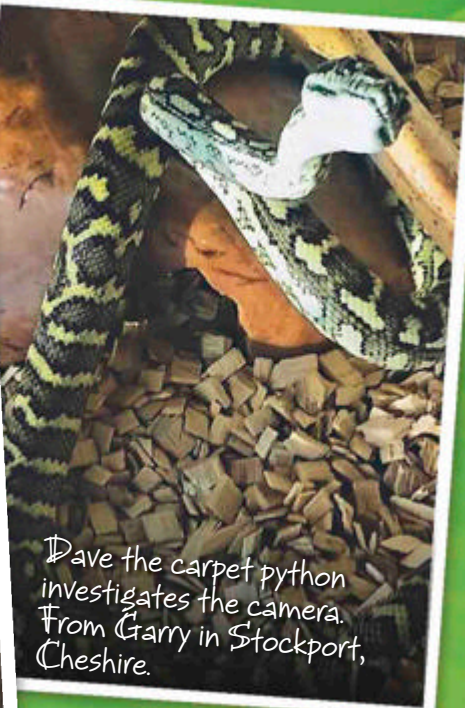


A young Manokwari green tree python, starting to change colour. From Jack.

Toothless, the leopard gecko.  
Sent in by Emily.



Leah sent in this photo of Bandit, her seven month old crested gecko.



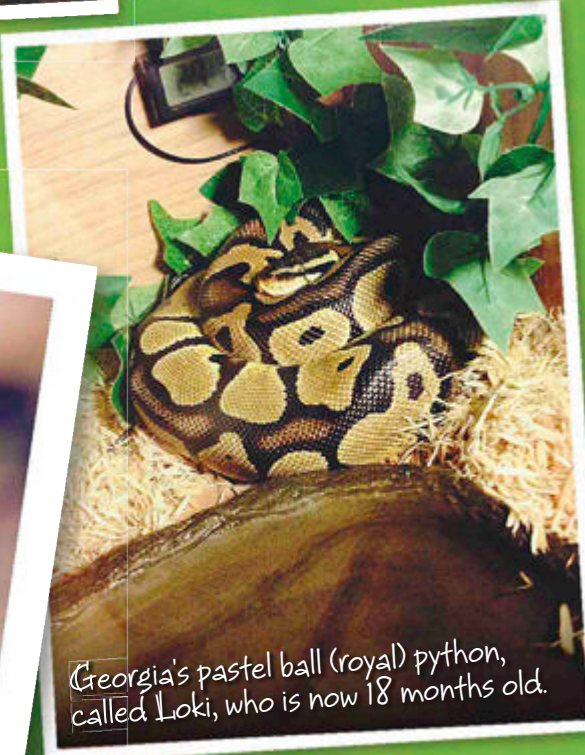
Dave the carpet python investigates the camera.  
From Garry in Stockport, Cheshire.



◀ A Biak green tree python.  
Sent in by Rhys and Chloe from Belfast in Northern Ireland.



One of Molly's five juvenile and very quick blue spiny lizards. This one is Eddie, and they live in Gloucester.

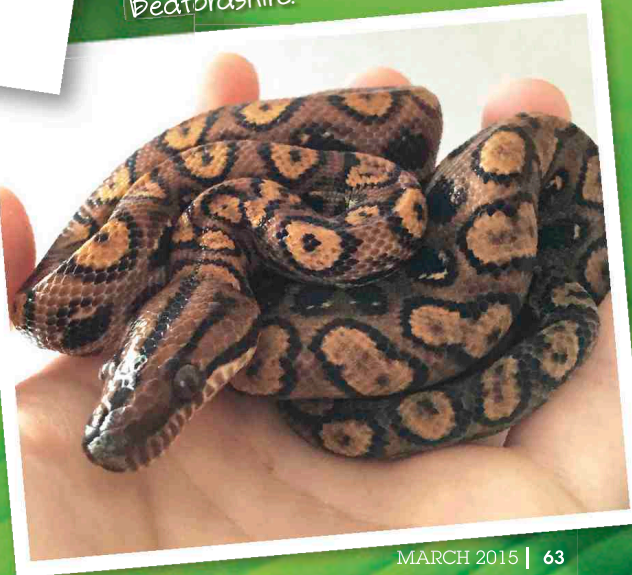


Georgia's pastel ball (royal) python, called Loki, who is now 18 months old.

✔ Skittles, a Brazilian rainbow boa.  
From Shannon, who lives in Bedfordshire.



Laverne, the gargoyle gecko. Sent in by Tom.



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## NEW TECHNIQUES FOR FROGS

A different approach to keeping the *Rhacophorus* or 'cave-dwelling' frogs is revealed by Mikhail Bagaturov in his article about breeding these amphibians successfully.



## REPTILES IN ART

There's a growing interest in art involving reptiles, but what are the themes, and where can you start if you want to begin a collection? We also talk with one of the country's leading sculptors of reptiles.

## STAY SAFE!

Don't miss our exclusive interview with professional snake catcher Simon Keys, who with his wife Nadine stars in the National Geo television series, *Snakes in the City*. Together, they battle to keep Durban's homes free from deadly snakes, moving them to more suitable surroundings.



\*These are just some of the features planned for the next issue but circumstances outside our control may force last-minute changes. If this happens, we will substitute items of equal or greater interest.

**Practical Reptile Keeping** and the Pet Advertising Advisory Group recommend that if you decide to buy a reptile or amphibian, you should:-

- \* **RESEARCH BEFORE YOU BUY.** Be sure you fully understand and appreciate the needs of the reptile or amphibian you are interested in, and that you can provide a suitable environment.
- \* **SEEK ADVICE FROM BOOKS,** the internet and your local veterinary practice who may also be able to recommend a suitable expert for additional advice.
- \* **ENSURE YOU KNOW** what facilities are necessary to provide a suitable environment for the animal – e.g., vivarium, temperature, humidity, light quality etc..
- \* **ENSURE YOU BUY** from someone who specialises in the animal you are interested in.
- \* **VISIT THE ANIMAL** you are intending to buy.
- \* **CHECK THAT THE ANIMAL'S** accommodation is clean, it is supplied with the appropriate food and water, and that special equipment for maintaining the animal's environment (e.g., heat lamps or UV lights, etc) is working properly.
- \* **ENSURE THAT ALL RELEVANT PAPERWORK IS AVAILABLE FOR INSPECTION WHEN YOU VISIT.** This could include any necessary permits such as CITES

registration documents, Dangerous Wild Animals Licence or other documentation.

- \* **IF ANY PAPERWORK IS UNAVAILABLE** and has to be sent on, obtain a written commitment as to when it will be delivered.
- \* **ENSURE THAT THE ANIMAL YOU ARE BUYING** is healthy and free from signs of injury or disease.
- \* **REMEMBER THAT SOME REPTILES CAN GROW VERY LARGE** and some species can live for 50 years or more. Veterinary care can be very expensive.

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