A stunning panther chameleon.
Photo courtesy Kurit afshen/ www.shutterstock.com

Pete Hawkins explains the system that he has developed for looking after his chameleons, and highlights key aspects of their care.

Chameleon care

Chameleons rank amongst the most iconic and fascinating of all groups of lizards and their care today has become relatively straightforward. Having been a chameleon keeper now for two decades (and been involved in the reptile hobby for over 30 years), a very great deal has changed in terms of the set-ups that we are now using for them, when I think back. This article is based on my experiences in caring for them over this period, and features what has worked for me.

Housing

When starting out with either the popular veiled (Yemen) chameleon (*Chamaeleo calyptratus*) or the panther chameleon (*Furcifer pardalis*), you need to ask yourself: what is the biggest set-up that you can accommodate, even if you are starting out with a young individual? A chameleon set-up also requires vegetation, preferably incorporating at least some living rather than artificial plants in my view, and these should thrive without too much difficulty, given the lighting systems now available. A spacious planted set-up can end up making a stunning focal point in a room.

Chameleons must always be housed individually as a rule, because they are not social by nature. So which unit would I recommend to house a single individual? Ideally. the XL Zoo Med ReptiBreeze® cage measuring 61x61x122cm in height (24x24x48in). However, if you do not have space for this, then choose the medium Arboreal Viva+ Vivarium in the Vivexotic range which will be ideal for an adult chameleon. This wooden design comes with a choice of four different finishes - oak, walnut, beech or black, and can be supported on a cabinet too. It measures 86cm (34in) wide by 49cm (19in) deep, and stands 91.5cm (36in) tall, or 156cm (61in) including the cabinet base.

Some people like to start their young chameleon in a smaller set-up, which is fine. Housing options in this case would include the small Arboreal Viva+ Vivarium or a small/ medium ReptiBreeze®, although this approach will be more expensive, because ultimately, you will need to purchase a larger set-up.

Chameleons need spacious, tall surroundings with plenty of opportunity to climb around their quarters if they are to thrive.
Photo courtesy Eric Isselee/ www.shutterstock.com

A ReptiBreeze® unit, showing the lights on top of the unit, outside of the enclosure, which is a much safer arrangement for chameleons.
Photo courtesy Zoo Med Laboratories.

Arcadia's Deep Heat Projector provides infrared heating. It is a relatively new entrant to the market.
Photo courtesy Arcadia Reptile.

Provide a variety of different basking options for your chameleon.
Photo courtesy Cathy Keifer/www.shutterstock.com

In addition, a further benefit of starting with a bigger enclosure is that your chameleon will not be affected by the stress of a move to new surroundings in due course. I have found that if you provide lots of cover including foliage in the enclosure, as well as suitable ultraviolet (UV) and heating options, then a young chameleon will thrive in a large set-up from the outset without any worries.

Heating

The basic principles of heating a vivarium apply to chameleons, with the need to create a warmer basking zone, but this must reflect the fact that members of this group are essentially arboreal lizards which live off the ground. In this case therefore, the basking area needs to be structured around aerial dimensions.

Don't simply fix one branch beneath the basking bulb, however, but use several vertical and horizontal branches in this area, allowing the chameleon to thermoregulate by moving position. This then allows the lizard to adjust its basking temperature, much as it would in the wild, by moving from branch to branch. Having foliage in the enclosure also enables a chameleon to vary its heat and UV exposure as well, by retreating under the leaves too, allowing the lizard to display its natural behaviour.

I see the best naturalistic activity in these lizards when a bright white bulb is used. In terms of heat, I am currently using one of the recently introduced Arcadia Deep Heat Projector bulbs above my female veiled chameleon's quarters. This provides no light, but emits infrared A and B wavelengths, and so lighting and ultraviolet (UV) need to be provided separately. I must say that after using the Deep Heat Projector for some time now, I'm very impressed with it.

Bearing in mind that chameleons spend their time largely off the

The temperature that young chameleons require is slightly lower than that of adults. A veiled chameleon is seen here.
Photo courtesy Lipowski Milan/www.shutterstock.com

ground, I always aim to have the heat source on the outside of the enclosure, rather than located within it, in order to safeguard the chameleon, so there is no risk of it sustaining burns. This is a much safer option, but if you can't do this, then do please make sure that you use a bulb cage for protection within the set-up. Even so, you need to be sure that the chameleon cannot get near, let alone climb on the protective cage.

The size (meaning the wattage) of bulb needed will vary, depending on several factors. These include

- Your own geographical location.
- The room temperature where the vivarium is being accommodated.
- Any heating within the room and the time of year.
- The size of the set-up.

This is where a local reptile outlet can be so valuable, advising you on what is required for your individual situation, taking these different factors into account. It is not too critical, however, as the heat output will ultimately be controlled by the thermostat anyway. This is another essential piece of equipment, and if you have chosen a light-emitting heat source, then you will need to opt for a dimming thermostat. The key advantage of this is that it means you can effectively regulate the light and heat outputs separately, adjusting the photoperiod by this means as well as the temperature. I personally use Microclimate EVO thermostats, but there are many options available.

Here are the temperatures that I would recommend, measured using a digital thermometer at the basking point in the enclosure. It is worth noting that chameleons in general prefer relatively cool temperatures, compared with some other types of lizard.

- Young veiled chameleon, less than a year of age – 29-30°C (84-86°F).
- An adult veiled chameleon, over a year old – 30-32°C (86-89.5°F).
- A young panther chameleon, under a year of age – 27-28°C (80-82°F).
- An adult panther chameleon, over a year old – 29-30°C (84-86°F).

I mentioned the risk of thermal burns earlier, in the context of heating. If you are using a combined heat and UV bulb, there is not just the risk of thermal burns, but also photokeratoconjunctivitis (PKC) arising from the light, and an increased risk of dehydration, which is a big threat to chameleons, although this is often not something that newcomers to keeping these lizards may be aware of, in terms of the danger that it poses.

▼ Ensuring chameleons remain adequately hydrated is a vital part of their husbandry. Exo Terra offer a Dripper Plant that blends in well into a planted set-up for this purpose.
Photo courtesy ExoTerra .

Dehydration

The problem arises partly from the way that chameleons drink, as they gather droplets off leaves rather than drinking from a container full of water. The water level here could fall, allowing you to believe that the chameleon is drinking, whereas in reality, the water is simply evaporating. Working on the basis that prevention is better than cure, I have experimented over the years and used a wide range of different possibilities, with the aim of ensuring my chameleons remain adequately hydrated without any problems.

One of the most popular options with chameleons in my experience is the Exo Terra dripper plant, which is a drip watering system recommended for these lizards. I modify the unit to get the best results. I place it inside a tub with a section of the lid cut out, and holes drilled into the lid, in order to allow

me to fit it around the stem. This then allows the pump and water to be protected. And water can drip back in, creating a clean cycle, away from faecal matter and other contamination.

Another good option is Zoo Med's Big Dripper, which I place on top of my set-ups. This comes in the form of a simple tub of water that drips at your set rate via the little tap, down onto leaves within the enclosure.

Misting systems and manual spraying

This is another vital area for chameleon keepers. Obviously if you are home most of the day, you can spray the enclosure using the fine mist produced by a typical plant sprayer, as sold for house plants. But there will inevitably be times where you are away, and an automatic misting system will be essential at this stage. I've used most brands over the years, and for me, MistKing and Exo Terra's Monsoon system represent the best options.

It's basically a case of setting up the spray nozzles in the vivarium, sorting out the timer and making sure the water reservoir is kept filled. Covering all the plants with water is a good idea, providing plenty of droplets here for your chameleon to drink. But try not to direct the nozzles to spray your chameleon, as they generally do not appreciate this, and may find it stressful. Also, on a cautionary note, it is obviously vital to be careful with electrical equipment and water.

I think it is better to use warm water, which be far more comfortable for the chameleon if it does get wet. Warmer water also evaporates faster, causing humidity spikes in the set-up, which is again a good thing. I use aquarium heaters inside my MistKing reservoir, set at a toasty 30°C (86°F), so then as it comes out the nozzles, the water is around 25°C (77°F), which chameleons seem to like when drinking.

Humidity

This is closely linked in of course with the misting necessary to ensure chameleons do not become dehydrated. In order to keep a check on the humidity, I use digital hydrometers in my set-ups, as well as the readings on my Microclimate EVO Pro thermostats.

I aim for a figure of 40-60% with my panther chameleons, letting the set-up dry out completely before misting the enclosure again. What you are aiming to create are spikes in humidity - just as happens after a heavy downpour. This is why fluctuations are important - low humidity is almost as bad as it being constantly high, and so allowing the enclosure to dry out is important before spraying again.

I follow a similar pattern with my veiled (Yemen) chameleons, but there is a significant difference, in that I do not spray them as much. This is because they originate naturally from a much drier part of the world than panthers, which hail from Madagascar. A couple of times a day at most is adequate for them. As long as the hydration options are there, allowing the chameleon to drink, things should be fine.

Feeding

Regardless of the species of reptile, variety is the key to preventing any dietary shortfalls, in terms of their nutritional requirements.

➤ Yemen chameleons are to be found on the Arabian Peninsula, in parts of Yemen and Saudi Arabia.
Photo courtesy DnDavis/www.shutterstock.com

Chameleons of course are totally insectivorous, so unlike bearded dragons (*Pogona* species), they depend on a diet of bugs, with no greens! The choice is nevertheless very large, especially with new additions to commercially available live food lists over recent years.

Here is an idea of what all my reptiles get to eat on a mix rotation routine, although it is not a comprehensive list:

Black crickets, brown crickets, cave crickets, Ethiopian crickets, banded crickets, silkworms, butterworms, calcium worms, dendrobaena, lobworms, waxworms, morios, buffalo worms, meal-worms, locust, stick insects, pachnoda (sun beetle) grubs, bamboo worms, dubia roaches, lobster roaches, discoid roaches, banana roaches, turk roaches, deadhead roaches and domino roaches as well.

If you are having difficulty sourcing adequate variety in terms of invertebrates for your chameleons, ask in my groups, and look on eBay. Remember, even using different types of cricket for example is a good thing, as these will vary in terms of their nutritional values, and this also applies in other cases, as

Chameleons use the sticky tip to their tongue to grab invertebrate prey, as seen here. Their tail acts rather like an additional limb, steadying them as they strike.
Photo courtesy Milan Zygmunt/www.shutterstock.com

➤ Misting the enclosure is a vital part of chameleon care. This can now be achieved automatically, in conjunction with a timer too.
Photo courtesy sruilk/www.shutterstock.com

with roaches.

Gut-loading

Your bugs need to be gut-loaded, although they will of course have a basic nutritional value. This is a case of providing greens, fruit, vegetables and specialist gut-loading diets to increase the nutritional content of the bug, thereby passing on the goodness to your chameleon. After all, you are what you eat, as they say!

Night heat

In all the years that I've kept reptiles, I've never used overnight heating with my lizards, such as bearded dragons, monitors and skinks, and this applies with chameleons too. You could easily go down to 10°C (50°F) within that set-up before even considering the need for additional heat.

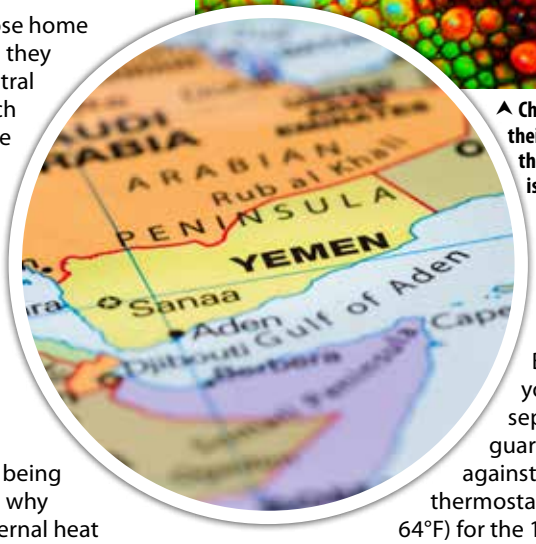
And honestly, whose home gets that cold before they put on their own central heating system, which will then warm up the chameleons as well in any event?

Some people unused to handling reptiles worry because they think their chameleon feels cold if the touch it. But remember, not for nothing are reptiles described as being cold-blooded! This is why they require that external heat source to warm up and energise themselves, whether obtaining warmth from a basking bulb or the sun. Chameleons naturally cool down at night and then will climb up as soon as the basking light and UV source are switched on in the morning. This charges them up, so to speak, for the day ahead, just as happens in the wild.

The temperature fall at night is actually very beneficial to them. Think about it. Yemen chameleons originate from a region of the world that can get very warm during the day, and then the temperature drops back markedly at night. If you have a ceramic bulb running overnight, keeping the temperature up, this will interfere with their natural behavioural and physiological cycles.

If you do require a night heat-source, then the best option is a bulb of this type because it emits only heat and no light, so it will not disturb a chameleon's night-time rest period. But do not forget that you will again need separate protection to guard your chameleon against burns, plus a reliable thermostat set to 16-18°C (60-64°F) for the 12 hours that the lights in the chameleon's quarters are switched off.

Chameleons are well-known for their ability to change colour, and they will look their best when lighting and environmental conditions generally are well-suited to their needs. An example of the colourful Ambilobe locale of the panther chameleon is seen here in close-up. Photo courtesy For Out/www.shutterstock.com



Yemen lies in an arid part of the world, where the daytime temperature is hot, falling back significantly at night. Photo courtesy Wollertz/www.shutterstock.com

UVB systems

Providing the correct UVB level in the chameleon's quarters is vital, as is using a quality UVB product, rather than just picking a cheap generic brand being sold on an online auction site. Inadequate, sub-optimal UVB exposure will result in serious health issues for these lizards. For both my veiled and panther chameleons, I use Arcadia T5 12% UVBs, with a reflector, in the guise of the linear 12% tube, and the Arcadia Flood.

I use these on top of mesh set-ups. They essentially filter the UVB down to the required, more naturalistic UV Index to which these lizards are naturally accustomed. I use a tube size that runs the width of the enclosure or at least three-quarters of the width. UVB lights must be mounted directly overhead, and never half way down a set-up wall or even running downwards.

Natural requirements

The 'average' UV index in Yemen, where veiled chameleons originate from, is between 3 and 7, with peaks of 10+, at certain times of the year. These levels are recorded in the open, however, in direct sunlight, rather than in the shelter of a tree canopy where these chameleons will be encountered. The readings are similar in Madagascar, home of the panther chameleon, peaking at up to 10+ depending on locality and the time of year.

So, with my Solarmeter® 6.5 in hand, in order to measure the UV index, I set up my enclosures first starting with an index at the basking spot of around 5. I found that after a few days, the chameleons were basking far lower in their enclosures. According to the readings that I was taking, this was at indexes around 2.5 to 3, which was about midway down in their enclosures.

I therefore adjusted the arrangement to suit the maximum it would reach at the basking spot. As a result, it is now between 3.5 and 3, for both the veiled and panther chameleons that I have. Interestingly, this is actually pretty much the

recommended distance as set out on the packaging instructions of the Arcadia T5 12% tube. The distance is 33cm (13in) down from the tube to the chameleon's back at the basking spot.

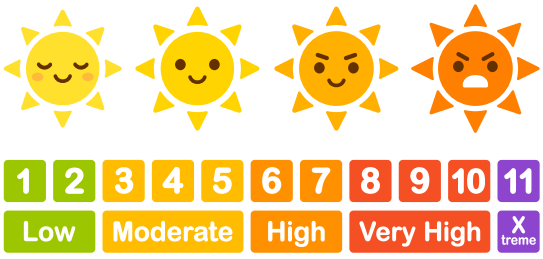
This definitely seems to suit them. I see regular intense basking sessions by the chameleons, taking in maximum heat and UV exposure at the main basking zone. Furthermore, this occurs predominantly first thing in the morning, and also after feeding, with the increased warmth at this stage undoubtedly helping the digestive process. Subsequently, there is a more selective routine of basking at times in less exposed areas within the set-up throughout the day, with the chameleons at a lower point in their enclosures, or under the cover of foliage, not to mention climbing around on occasions too.

I've therefore followed this method and kept to this arrangement, in the case of both species. I've also had blood and facial tests carried out to confirm that all is well, and this is definitely the basking index that I would recommend for these species.

Now I'm fully aware not everyone has a Solarmeter® to test these things, but this isn't an essential piece of kit in this situation. My advice would be to follow the lighting manufacturer's guidelines, having tested this out independently myself and found that it works!

And if you have your set-up with plenty of levels of exposure within, the chameleon can choose its own position where it feels comfortable at any particular moment, assuming that you provide your pet with a good choice of branches, securely positioned at different levels and set in various positions within the enclosure. This is undoubtedly the best way to do things.

There is a significant difference that you need to be aware of, however, depending on where the UVB source is positioned. If it is positioned on mesh, above the chameleon's accommodation, then use the 12% T5, with reflector. Should you have to include it inside the set-up, then opt for a 6% T5 with a reflector instead. This is because the mesh will prevent all of the UVB output reaching the vivarium occupant, and as a consequence, to ensure the correct level is supplied, a more powerful lighting option is required. In both cases, the UVB source needs to be approximately 33cm (13in) from the chameleon's back when it is basking.



▲ The UV index varies on a scale from 1-11. Artwork courtesy woodo/www.shutterstock.com

Plants and decor

As far as I'm concerned, you just can't beat using real plants and branches in a set-up, and I feel this applies particularly with chameleons. I have experimented with many different plants over the years, and have now come to rely on a handful that just seem to thrive dependably in the growing conditions within my chameleon enclosures.

These are:

- Weeping fig (*Ficus benjamina*)
- Devil's ivy (*Pothos*)
- Umbrella plant (*Schefflera / Heptapleurum*)
- Dragon plant (*Dracaena*)
- Yucca

You should also use a light which emits the essential wavelengths to encourage plant growth. For me personally, after many disappointments in this regard, Arcadia's Jungle Dawn® has achieved very clear positive results. It is an LED light that is designed to replicate sunlight, running at 6.5-7 Kelvin. I use the 13w version in many of my set-ups, and these lights are fine located on top of the mesh.

You can of course use fake foliage as well, or use a combination of living and fake plants in the enclosure. But only purchase those sold by reputable reptile brands. I've seen keepers buy from other sources and these will not have been tested for use under vivarium

▼ A variegated form of the weeping fig. Always aim to buy plants for the vivarium from reptile suppliers, as these should be free from pesticides, as will the potting medium. Those sold elsewhere may have harmful chemicals that could otherwise decimate a naturalistic set-up incorporating invertebrates. Photo courtesy Tamara Kulikova/www.shutterstock.com

conditions, which means they could represent a potentially deadly fire risk, or in certain situations, bits may break off and could be inadvertently swallowed.

One artificial plant that I find particularly useful are the vines that can be bent into different positions within the enclosure. These can be especially useful for chameleons, providing more climbing opportunities. They also look very natural in amongst living plants, and are simple to fix securely in position.

Branches

I collect my branches when I go out walking with the dog. As long as you can source them away from roads and in areas free from pesticides (so not around agricultural fields), they should be fine.

I tend to have a choice of oak, birch and willow branches, always picking them up off the ground. Please don't tear branches off trees!

It is possible to use pine, but only if it is an old branch, as the sap can otherwise cause problems. I therefore think it is just safer to avoid pine, especially because there is usually no shortage of other woods. Also on a general note though, avoid branches that are already partially rotted or showing signs of fungus on them.

Basically, if the branches are clean, there should be nothing on them that can harm a chameleon. (There is more about this aspect of chameleon care which you can find in my Facebook Chameleon group, listed as Chameleon Network).

Cleaning

The maintenance routine will have to be based around the substrate that you are using in your enclosure. I use a bioactive substrate, which is a living eco-system comprised of a soil-like substrate to which live bugs such as springtails and woodlice are added. These serve to freshen up the substrate and keep it clean, by utilising waste. It can take awhile to establish fully, but once the system is functioning properly, then very little cleaning will be required.

If you don't choose the bioactive system, however, then I would suggest a bare floor, which simply means that you will need to clean waste from the floor daily, and wipe any obvious contamination off the leaves. You can disinfect the floor area safely with a specific reptile-safe disinfectant such as F10® SC , or use the handy ProRep ProTect wipes, which have the added advantage of being safe to use on plant leaves too.

In conclusion

Start off by thinking big in terms of a set-up, and try to provide a natural interior as far as possible, offering multiple levels for climbing and shelter within the foliage for your chameleon. This will provide it with both mental and physical enrichment, allowing plenty of opportunities for basking and exposure to the heat source and UVB as well.

A varied diet, with careful supplementation, plus regular hydration will be vital in ensuring its ongoing health. Be proactive too, in terms of health monitoring, and organise yearly faecal tests either with your vet or through PALS online, to warn of any parasitic or other health issues. Follow this advice, and your chameleon should enjoy a long, healthy life!

** For more information regarding UVB and the use of supplements with chameleons, please listen to Pete's Chameleon Breeder Podcast'. This can be found at https://www.chameleonbreeder.com/podcast/ep-131-making-uvb-work-for-chameleons/*

The unusual arrangement of a chameleon's toes helps them to hold on to relatively narrow branches very effectively. This is a Nosy Be locale (=local variant) of the panther chameleon.
Photo courtesy Eric Isselee/www.shutterstock.com

You can buy springtails as cultures to add to the substrate. The population may need topping up on occasions.
Photo courtesy Holger Kirk/www.shutterstock.com

➤ Venture into most woods and you should be able to find branches of all sizes without difficulty.
Photo courtesy Milosz_G/www.shutterstock.com