



Newsletter of the British Herpetological Society

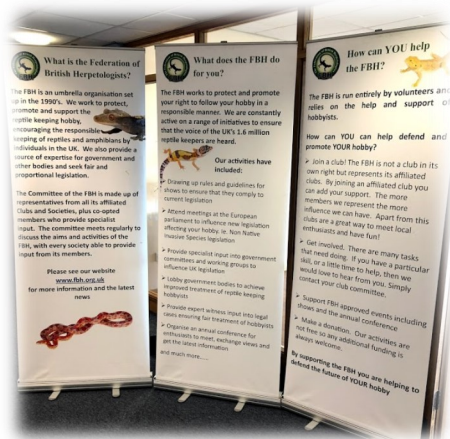
Established 1947

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Doncaster Conference

This amazing event provided a wealth of information from industry



experts in a great setting. The conference was a collaborative effort by the Federation of British Herpetologists (FBH), the International Herpetological Society, the National Centre for Reptile Welfare (NCRW) and others. It was held on the 23rd June 2018 at the Doncaster Racecourse. A fantastic event at a wonderful venue with a great turn out of attendees (as seen in the photo below).



This conference had a variety of industry representatives and guest speakers with informative talks on varying aspects of herpetological husbandry, breeding and regulations. To welcome us warmly was Dave Perry, owner of Peregrine Livefoods, who gave a great talk on bio-active enclosures later in the day. Dave also chaired and took part in the 'Questions from the floor, what's important to you?' panel alongside other experts. The panel of experts also included Paul Eversfield (BHS council member and turtle expert), Chris Newman (Chair



A good attendance from the start

of FBH and REPTA), Tariq Abou-Zahr (Exotics vet) and Sharon



Left to right: Tariq Abou-Zahr, Paul Eversfield, Dave Perry, Chris Newman and Sharon Edwards.

Edwards (Animal Health Inspector for the City of London). Questions had been sent in via Facebook to be asked to the panel in addition to audience participation. This was a great opportunity for hobbyists to ask questions of which many did about colour morph health issues and the legislations currently being put in place.

Frances Baines and Roman Muryn gave detailed talks



regarding heating and lighting, of which, you can find articles in this edition. They continue to update the herpetological community on their latest findings and Roman continues to find new aspects to research. It is evident that there is still a lot of research to be done regarding this field and any students who would like to carry out studies should get in contact with Frances and Roman.

HabiStat were represented with a wonderful range of new packaging that is fully



One of the HabiStat stands showcasing the new packaging.

recyclable. The bags have been tested and the company representatives, Jamie Blackstone and Adam Singleton are very happy with the final products. We hope to hear more about the packaging and details of its success. Many attendees seemed



Siouxie Gillet and Simon Keys

impressed and excited about the consideration of the environment regarding packaging of wholesale products.

Siouxie Gillet and Simon Keys were also in attendance talking

about their tv series, 'Snakes in the City'. They showed clips of the show throughout their talk and discussed the 'ups and downs' to filming whilst trying to catch venomous snakes in cluttered homes. They are passionate about the work they do and it is clear that it is extremely difficult removing snakes whilst being filmed. They talked about how they needed to address the camera and not show their backs all the time but this posed safety issues due to them needing to keep an eye on the snake they were trying to catch. A great insight into filming wild animal encounters.

Animal Activities Licensing

- The Animal Welfare (Licensing of Activities Involving Animals) (England) Regulations 2018

Time line

Date	Event
December, 2015	Consolation animal establishment licensing issued
March, 2016	Joint OATA, PIE, REPTA submission to consultation
September, 2016	Summary of responses published
February, 2017	Next Steps document published
September, 2017	Draft Statutory Instrument (SI) published
October, 2018	Legislation enacted



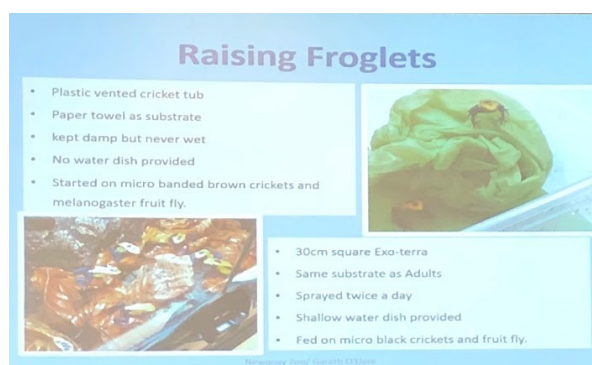
Chris Newman discussed the recent changes in legislation in the UK and EU. The Animal Activities licensing is the latest piece of legislation to be passed and should be part of reading for any hobbyists or keepers regarding buying, selling and housing as a business. You can find out more information on the government website.

Chris Newman giving a talk on the new Animal Activities Licensing regulations.



Gareth O'Dare—Newquay Zoo

Gareth O'Dare represented Newquay Zoo and the amazing work they are doing with their anuran collection. Gareth



discussed the process and care carried out with regards to husbandry and breeding of species such as their dart frogs. Gareth talked through the off show room with the breeding tanks. The zoo cultures their own

Gareth O'Dare discussed the husbandry involved.

livefood to feed their animals ensuring they know what is being provided nutritionally. Some of the processes used to encourage breeding include competition and environment. Playing male calls can encourage breeding, dropping and then increasing humidity and change of tank can stimulate breeding behaviour. Detailed information was given regarding the process and photos complimented and illustrated many of these points. A very helpful talk on breeding husbandry.

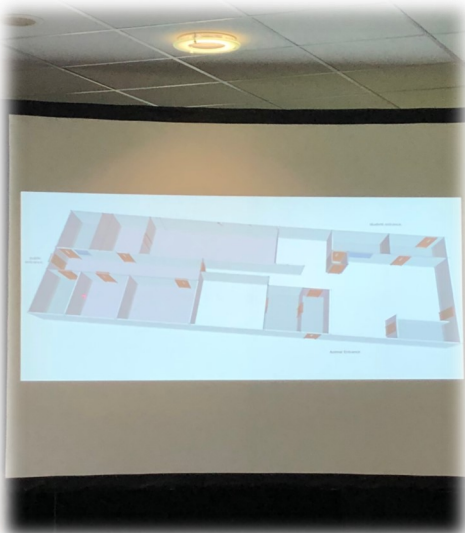
Steven Bol talked about his work with garter snakes which he has been keeping since 1982. Steven travels a lot to North America for his work. He showcased a vast array of photographs from



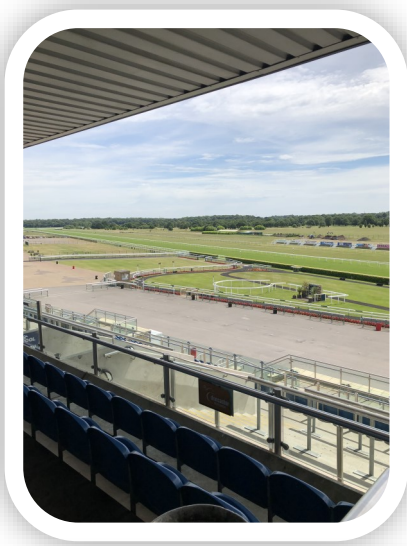
Steven Bol showcasing the various garter species

northern and southern ranges. In many areas, Steven finds multiple garter snake species living side by side. Colour variation amongst populations were explained such as the flame garter snake found in a small pocket and this coloration did not occur in a different population just 5km away. Steven explained how he keeps morphs but they are natural morphs. There were a large number of attendees excited about this talk and joy could be heard in the crowd as the plethora of photos were shown. Check the next Natterjack for an article from Steven.

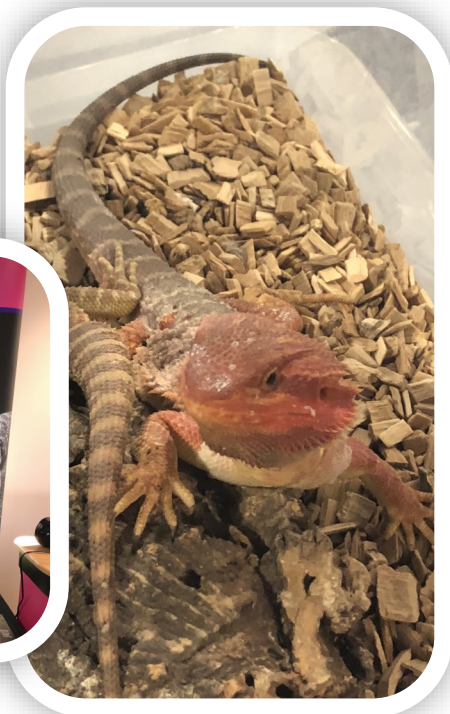
Finally, Chris Newman gave a presentation on the National Centre for Reptile Welfare based at Hadlow College, Tonbridge, Kent. The presentation covered the layout and aim of the centre, the process of admissions and the data collection, in addition to the importance and need for such a facility. It's a collaborative effort including donations such as a large number of vivaria donated by Pets At Home. Workshops and courses are a primary element for the future where herpetological husbandry can be taught. A lot of time and thought has obviously been put into this project and it's set for success in the future.



Chris provided a aerial plan of the centre for attendees to see the layout.



A massive thank you to all involved in this successful event! It was clear that everyone thoroughly enjoyed the talks and were able to meet other hobbyists and share ideas. Additionally, Doncaster Racecourse great hosts.



ZOO BREEDS LIZARD OF MANY NAMES

By Philip Knowling

Paignton Zoo has just bred a rare and unusual lizard for the very first time. The Solomon Islands skink is also known as the prehensile-tailed skink, or the monkey-tailed skink... or the giant skink... or the monkey skink... or even the zebra skink. Whatever you call it, this is one extraordinary creature.

For a start, it's the world's largest skink. A skink is a type of lizard – the word is from the Greek and referred originally to lizards in that part of the world. It's one of the few reptiles known to live in a social group (called a circulus). It gives birth rather than lays eggs – that's also unusual. And females are fiercely protective of their babies, which is a rare trait in reptiles.



Keeper Dr. Katy Upton: "This is a great achievement. They are pretty special in that the mother and the rest of the group will protect and look after the juvenile as it grows. We checked the baby, it's doing really well and is feeding normally."

The Solomon Islands skink reproduces after a gestation period of six to eight months. The new-born is large – in fact, experts have compared it to a human mother giving birth to a six year-old. Almost all births are single babies – which is perhaps just as well for the mother...

Like snakes, the skink smells by flicking out its tongue. They are territorial, herbivorous and live in trees – which is why deforestation is such a concern. Curator of Lower Vertebrates and Invertebrates Luke Harding: "Logging is a serious threat to this species. Skinks are also caught for food and the pet trade. They now have protection under CITES appendix II.

"Other people keep this species but are unable to breed them.

We provided them with a complex environment, the correct diet, the right heating and lighting and good seasonality. All these things – plus our experienced and dedicated keeping team - make a difference and contribute to why we have now been successful with the species and have a healthy youngster.”

The Solomon Islands skink (*Corucia zebrata*) comes from the Solomon Islands archipelago in the South Pacific. Youngsters will stay in their groups for a year or more, protected not only by their parents but by other unrelated adult skinks, too. They can live for twenty-five to thirty years.

Paignton Zoo is home to four adults, all six or seven years old. Mother and baby, along with the other adults, can be seen in Reptile Tropics. Paignton Zoo Environmental Park is a registered charity.

National Centre for Reptile Welfare (NCRW) at Hadlow College

NOW OPEN!

1ST AUGUST 2018



This project has been a long awaited and a well needed operation that has been put together by a great working partnership and the support of The Pet Charity, Hadlow College, REPTA, Support Adoption For Pets, Peregrine Livefoods Vetark, Hagen UK, Monkfield Nutrition, the Federation of British Herpetologists and many more. The centre will facilitate not only rehoming of animals but the education of hobbyists and herpetoculturists.

If you are interested in volunteering with the project, contact the centre via the website: theNCRW.org



PAIGNTON ZOO

Zoo's UK first is a balance of passion and science

Press release: Philip Knowling



Paignton Zoo has become the first zoo in the country to breed a tiny tortoise on the edge of extinction. The secret? A fine blend of driving passion and cool-headed science.

The spider tortoise (*Pyxis arachnoides*) is one of the world's smallest tortoises – and one of the rarest. A burrowing species, it's found around the south western coast of Madagascar. The adults are only around 6 inches long. Their popular name comes from the spider's web patterns on the shell.

Little is known about the life cycle of this tortoise, although it's thought to live for up to 70 years. One thing that is well understood is the threat of extinction. The IUCN Red List classes the species as Critically Endangered – that's just one step away from Extinct in the Wild.

Paignton Zoo is home to four adults – two males, two females - ranging in age from 11 to 22 years. Experienced keeper Andy Meek had to devise a husbandry protocol based on field data and the experiences of other collections. It was a long, complicated process but, put simply, he had to mimic the natural seasonal changes the adult animals would experience in the wild, with all the corresponding fluctuations in weather and diet. This included spraying the tortoises with water to simulate rainfall.

One of the critical elements is a period of brumation – a state of dormancy during a cooler time of the year. Mating tends to occur after this period. One single egg was laid (which is normal for this species) and hatched after roughly 180 days of incubation. An added complication in the process is that the egg needs a cooling period – a delay in development. The egg was incubated by staff in a special custom-made incubator, with progress monitored carefully and daily records kept.

The single egg hatched on Wednesday 25th April. It's the first breeding in a UK zoo of a species that can be notoriously tricky. The team will rear the youngster and then send it on to another zoo in due course.

Zoology is a vocation – zoo keepers are characterised by their passionate devotion to the animals with which they work. But then there's the science, the methodical, clinical, evidence-based analysis which helps achieve results. It's a fascinating combination.

It's hard to see much hope for the spider tortoise in the wild. Deforestation, mining, road building and livestock grazing are all major threats. Then there are the pressures of invasive plant species and locals who hunt them for food. Finally, collection and smuggling for the international pet trade is a significant threat.

“Our success is down to the combination of particular husbandry and precise incubation.”

Curator of Lower Vertebrates and Invertebrates Luke Harding: “This is a great achievement for all the team, but I must congratulate keeper Andrew Meek - this is an excellent example of the hard work, evidence-based husbandry and attention to detail that brings success. Andrew was the lead on this project and did all the hard work and research on how to cycle the animals and incubate the eggs, including the crucial cooling period.”

“Our success is down to the combination of particular husbandry and precise incubation. We also managed to deal with the complicated incubation process and changing the temperatures throughout.

“This species is not doing well in the wild. The more we can breed them and the more we can learn about their captive management and reproductive biology, the more we can contribute towards effective conservation measures in-situ.”
PaigntonZoo Environmental Park is a registered charity.

For more information go to www.paigntonzoo.org.uk or ring 01803 697500..

TUNGSTEN HALOGEN LIGHTING

By Roman Muryn

This note is intended to offer an outline on tungsten halogen lighting with a brief explanation of why it is recommended as a basking source, and why more powerful halogen heaters need special controllers.

A tungsten halogen lamp or heater is just an incandescent lamp; a clever one, but it is just a lamp. Incandescent lamps work by passing an electric current (amps) through a wire filament (a resistor) that gets white hot. How many amps flow through the filament depends on the voltage; Ohm's law says $\text{volts} = \text{amps} \times \text{resistance}$, so, $\text{amps} = \text{volts} / \text{resistance}$ and the lower the resistance the higher the amps and the brighter the light.

The design of a lamp tries to get a thin wire as hot as possible - to emit a bright white light without melting it. Tungsten is a brilliant material for this but at high temperatures it begins to oxidise and leave deposits on the glass, so to overcome this, inert halogen gas is used inside the glass enclosure.

Higher temperatures are also achieved by using quartz instead of glass. So a quartz halogen lamp is still a tungsten lamp.

Tungsten has a positive temperature coefficient so as it warms up, its resistance increases. When first switched on the filament is cold so the resistance is low, thus the initial current (called the inrush current) may be several times greater than the working current. This reduced resistance (almost a short circuit) may only last a thousandth of a second but if this current flow is great enough, it can do damage to some electrical parts. What we can do is allow a safety factor of 3; for the assessment of current flow, this is a common design practice. The power used by equipment is defined in watts (w) and is the voltage multiplied by the current.

Power = Volts x Amps

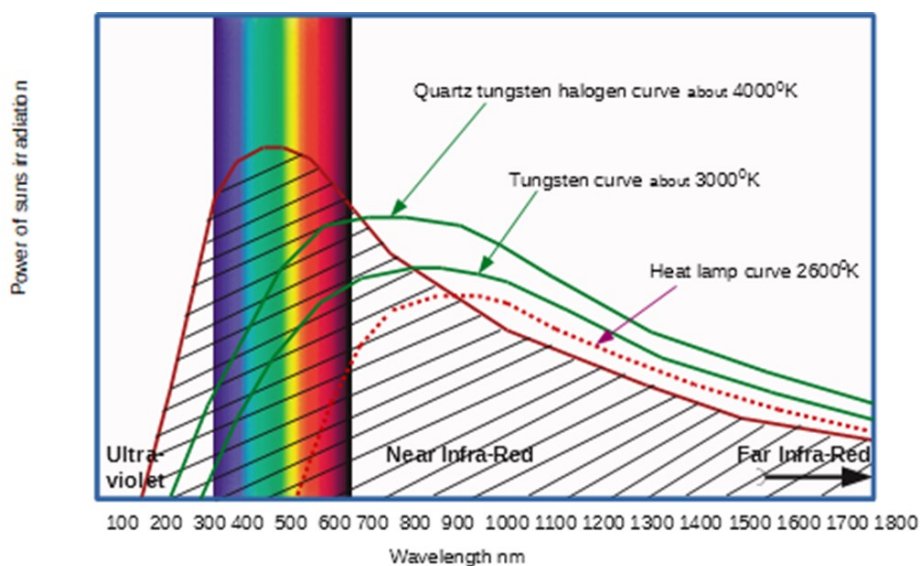
So a 2kw (2000w) heater will draw 2000/240 amps which is about 8 amps. Given the above observation, the inrush current could be 24 amps or even higher. This could damage contactors and switches designed for the standard UK 13 amp rating. The inrush current causes sparking and pitting of the contact with a premature degradation of the contact surface – it reduces the number of design contact cycles.

We can now think about halogen lighting; the standard lamps we use in reptile keeping fall in the 250 watt range or less and so the inrush current is unlikely to exceed 3 – 4 amps, posing no problems with switching, but as we increase the power we have to take the inrush current into consideration if using standard contact switches, including timers and thermostats.

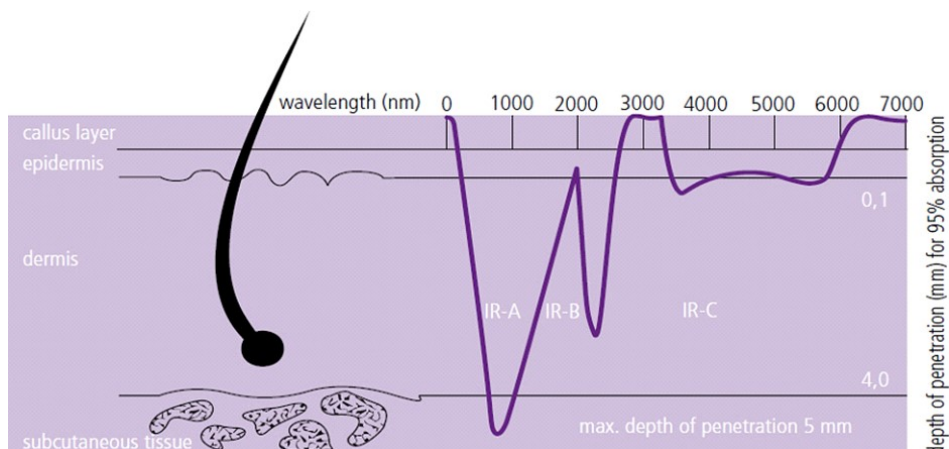
This advice does not universally apply to electronic controllers where switching is solid state.

If our maximum working current in the UK is 13 amps and we wanted to cope with the inrush current our equipment should not take more than 4 amps in a steady state, that's about 1 kW.

Of course each of the lamps will have a different filament characteristic. Some may burn whiter and some redder, which will be determined by the tungsten alloy make up, its diameter and its length. If the item is intended to be a heater and not a lamp its light output profile will be different but the essential description above is the same.



The diagram below shows a typical light spectrum from the sun. I have added the output from a tungsten halogen lamp. You will see that much of the lamp's output is infrared - the hot end of the



spectrum. The filament design will determine just how the curve looks but the one shown is typical. The curve shows that there is a good light content and a great IRa content also. IRa is also known as short wavelength infrared or near infrared. It is the IRa that make us feel warm when we sunbathe, as it has the ability to penetrate deep into our skin and positively helps many of our physical functions. IRa also works in conjunction with UVb allowing more effective generation of vitamin D3 as well as other important biological functions.

The diagram below shows the level of penetration that can be achieved on human skin. The optimal wavelength for IRa penetration is about 800 nm, which ties in with the output of many of the tungsten halogen lamps currently on sale. There are lamps that are designed specifically to produce IRa at the wavelengths of interest to us and having seen them, nay felt them, they are really good. A tingly feeling in our skin I would say – nice. A simple way for us hobbyists to assess a lamp as to its usefulness (as a heater) is to check its efficiency as a light source. What we want from our tungsten source is poor lighting efficiency, which means that more of the power used is radiated as IRa. All lamps now must state how many lumens they produce. I look for less than 10 lumens per watt (lm/W). Heater lamps specially designed for IRa output run at 4 lm/W. Here's what you do: divide the lumens (as stated) by the lamp power in watts, and you get the efficiency. So a 7W LED giving 650 lm gives 92 lm/W, and is a very efficient light source but a

really poor heater! A regular 46W halogen reflector light bulb from Tesco gives 300 lumen, giving 6.5 lm/W.

The diagram above shows most penetrative wavelengths into animal skin are centred around 800 nm or 0.8 microns. That is also the wavelength that has the greatest benefits to the animal's well being.

Our animals bask to gain energy which is mostly through the absorption of the red end of the visible spectrum extending to the invisible near infrared spectrum. We know that the halogen lamp produces some light but mostly heat; its output curve is shown on the diagram above. Our animals absorb most energy right on the cusp of the curve; yellow going through red into IR (sorry about the repeat but it's important).

An efficient lamp will run hotter and its peak will be skewed more to the left and produce more visible bluer light. A less efficient lamp will have a curve skewed to the right and produce less light and more heat. Where heat lamps are produced for medical applications the designer will produce an element that produces the reddish light centred around the 800 nm wavelength. If you use a controller to reduce the heat too much (by providing less power) then you are actually moving the centre of the radiation curve to the right and away from the lamp design intention.

“Unfortunately for us these lovely lamps are being phased out for obvious reasons – get some in now.”

It is for the reasons above, that it is, my view that a basking lamp should provide some of the visible spectrum as well as the non visible infrared. The tungsten based lamps seem to offer the best and most cost effective option.

Unfortunately for us these lovely lamps are being phased out for obvious reasons – get some in now.

Some definitions

I have had to write down the many confusing definitions associated with reptiles and heat management. In doing so it hasn't made me any wiser.

Bask = To lie in or be exposed to pleasant warmth, especially that of the sun

Conformer = use environmental heat (ectotherm) & have variable temperature (heterotherm)

Ectotherm = An organism that regulates its body temperature largely by exchanging heat with its surroundings; (cold blooded)

Endotherms = rely largely, even predominantly, on heat from internal metabolic processes (warm blooded),

Heliothermic = Gaining heat from the sun

Heterothermic = animals that exhibit characteristics of both poikilothermy and homeothermy

Homeothermy = is thermoregulation that maintains a stable internal body temperature regardless of external influence.

Mesotherms = uses an intermediate strategy between an Ectotherm and an Endotherm..

A poikilotherm = an animal whose internal temperature varies considerably.

Regulator = produce heat (endotherm) & have constant body temperature (homeotherm)

Thermoconformer = Any organism whose body temperature changes according to the external temperature, rather than carrying out thermoregulation.

Thigmotherm = An animal that draws heat into its body from contact with a warm object in its environment.



Your First Bearded Dragon

Care Information

by Frances Baines MRCVS

Bearded Dragon owner for 18 years
and author of UV Guide UK

THE BEARDED DRAGON

Pogona vitticeps

Common Name	Bearded Dragon or Inland Bearded Dragon
Scientific Name	<i>Pogona vitticeps</i> . (Order: Squamata, Family: Agamidae)
Origin	Mid to south-eastern Australia
Size	Adults reach their full size of 18-24 inches (45-60cm), with snout to vent length of 8-9 inches (20-25cm), in 1-2 years.
Lifespan	Ten years still seems to be considered a good lifespan for a bearded dragon, but there are a small but steadily increasing number of reports of bearded dragons living up to 20 years or more. As husbandry improves, well-kept beardies are living longer.
Habitat	Bearded dragons may be found over a large area of central and eastern inland parts of Australia. They inhabit a wide range of habitats but typically live in arid scrubland, extending into the dry semi-desert regions, and on the edge of farmland. They are diurnal heliotherms (sun-basking reptiles, active during the day). They are semi-arboreal, often found basking on tree-trunks or fence posts, or on the tops of bushes in their native habitat. They typically bask in full sun in the early part of the day, and then when “up to temperature”, move in and out of light shade and sun throughout the rest of the activity period. In very hot weather in summer, they may retreat up a tree or into temporary burrows they dig in the ground, often between rocks (aestivation) and in the winter they brumate in similar burrows.



Captive Care

The Vivarium

Bearded dragons do need space and an interesting environment if they are to thrive. Pet stores often suggest that a 3ft melamine vivarium or even a 3ft glass tank such as an ExoTerra Terrarium will be adequate. I would strongly disagree. Young bearded dragons grow very rapidly – about 5cm a month! – and need as large an enclosure as possible. It is best to *start* with a 4ft x 2ft x 2ft vivarium. They are active creatures which love to climb; a much bigger vivarium maybe 4ft tall, 4ft wide and 3ft deep fitted with stout branches or shelves for climbing and basking, and hides for shelter on the ground, is even better. Alternatively a vivarium with a larger floor area but less height could be designed with a rock shelter / basking platform made of natural stone or wood, securely fixed for safety (not a “hot rock”-see later).

If natural materials are not available, a simple shelf may be constructed from strips of wood. What is needed is a raised area for basking at a suitable distance (usually about 12 – 14 inches) below the lamp, and some sheltered areas (like “hides” or “caves”) at the cool end and also at the warm end. A wooden or melamine vivarium with front-opening glass panels or doors is much more satisfactory than an all-glass tank or terrarium. Glass tanks allow heat to escape very rapidly through their walls, making it much more difficult to achieve a good temperature gradient. The all-round visibility also may make a dragon feel very vulnerable; they can never really understand glass, and being surrounded on all sides by an outside world, which it cannot hide from, could be very threatening for any animal.

Below are two illustrations of attractive and yet practical vivaria for bearded dragons.

Commercially-available 4ft x 2ft x 2ft melamine vivaria are widely available in the UK, but may need “customisation” to provide the best heating and lighting options, as well as requiring suitable fixtures and furnishing, such as basking branches and hides.



Custom-built 4ft x 2ft x 4ft (WxDxH) vivarium © R. Bullock 2015

It is not too difficult to build your own vivarium, though. There are several good descriptions of “self-build” projects online. Huge vivariums can even be made from old cupboards or wardrobes. One especially useful set of instructions for “The Crossfire Enclosure” can be found [here](http://beardies.dreamwidth.org/2145.html):
<http://beardies.dreamwidth.org/2145.html>

Other useful ideas for DIY vivaria may be found on these links:

<https://sites.google.com/site/thelizardmadness/photogradient>

<https://www.beardeddragon.org/forums/viewtopic.php?f=75&t=224759>

<https://www.beardeddragon.org/forums/viewtopic.php?f=75&t=171697>

<https://www.beardeddragon.org/forums/viewtopic.php?f=75&t=223320>

Substrates

This topic is guaranteed to cause angry debates on any bearded dragon forum! There is no easy way to replicate the natural, hard-packed soil which is so typical of an arid Australian landscape, because we cannot subject our vivarium floor to rain, wind and sun, and shallow layers of sand and soil rapidly dry to dust indoors.



Commercial 4ft x 2ft x 2ft (WxDxH) vivarium customised with ventilation panels in roof and back wall *Photo by the author*

Many warnings are given about the risk of “impaction” – a blockage in the intestines, caused by swallowing loose substrates. It is true that certain types of substrate are risky. Corn cob, bark chips, wood chips, gravel and crushed walnut shell (“Desert Blend”) *should all be avoided* as these are all totally indigestible, some have pieces with very sharp edges, and carry a much greater risk of impaction if swallowed. There are doubts about

so-called “Calci-Sand” as well; it forms solid clay-like lumps when moistened, and could easily do so in an animal’s gut. Builder’s sand and “sharp” sand are also abrasive and inadvisable. However, Children’s Play Sand is widely used by keepers, with few problems reported. However, it can be dusty – some people wash it through, to remove dust – and it offers little resistance to dragon feet, so they slide about on it. Blends of soil and sand, which are even available commercially with brand names such as “Beardie Life”, are somewhat better. They can be moistened before use and if a layer is pressed down hard while damp, it will form a fairly solid surface which can be maintained for a while by occasional light spraying with water.

There is always debate about why a reptile would eat substrate and/or suffer from impaction. In the wild, it is likely that bearded dragons obtain extra calcium in their diet from ingesting small dried bones from carcasses, snail shells and similar items, and possibly even chalky scratchings of rock. In captivity, they certainly recognise and eat calcium provided as powder or cuttle-

fish bone, and even appear attracted to white rocks or pebbles (although they must not be allowed to eat these!) Calcium deficiency, often as a result of vitamin D deficiency, is unfortunately quite common in captivity and it is thought this may lead to a “hunger” for substrate. The risk of obstruction is probably increased in calcium-deficient animals since muscle function (including gut muscle function) is impaired. In addition, if the lizard is unable to reach optimum body temperature, its digestion and gut motility will be poor, once again increasing the risk of a blockage in the gut should the dragon eat a large amount of indigestible substrate. Dragons kept in the right range of temperatures and given adequate supplies of calcium and UVB lighting (for vitamin D synthesis) should not be driven to eating substrate, and if small amounts are swallowed by accident, it should pass through without harm. It is also useful to add some hard surfaces, such as rough tiles, slates or rock slabs to the vivarium floor. These allow a beardie to grip the surface with its claws, thus wearing down their sharp tips naturally. Hard flat surfaces are also easier to clean, when ‘pooped’ on, than loose substrates. Beardies do produce quite a lot of poop and this must be removed completely, as soon as possible. Some keepers cover the entire vivarium floor with tiles, or even non-slip vinyl flooring, making it very easy to clean. However, some beardies do enjoy digging; a tray of sand or soil mixture could then be provided. (Adult females will need a deep soil-filled nest box, too, if they start to produce eggs, which some do even if they have never mated.)

‘There is always debate about why a reptile would eat substrate and/or suffer impaction.’

Temperature

Like all reptiles, bearded dragons require a thermal gradient in their vivarium (one or more basking spots, and cooler areas) to enable them to thermoregulate. **Getting the temperatures right is** absolutely vital for a healthy, happy beardie.

Beardies naturally climb, and seek bright light in which to bask, so most keepers use incandescent bulbs (“basking lamps”) hung over basking zones to provide daytime basking temperatures and “daylight”. *These should always be controlled by dimming thermostats.* Suitable safety guards or mesh screens should also be used if there is any way the beardie could climb up to reach the lamps.

All lamps should be hung directly above the basking zone; they should not shine sideways, directly into the reptile’s eyes.

Because bearded dragons are sun-loving reptiles, the basking lamp should be a good white “daylight” type – avoid red lamps

or so-called “infrared lamps” (dim orange light is un-natural, like permanent sunset, and also renders normal colour vision impossible) and there is no need to buy expensive “reptile basking lamps” – they are just ordinary halogen or tungsten incandescent bulbs with a picture of a lizard on the box! “Spot” lamps should also be avoided. The beam these produce is narrow, and will only heat part of a dragon’s body, risking a thermal burn to the illuminated part while the rest of the body remains cold.

An ordinary household incandescent tungsten or halogen “flood” reflector bulb makes a very acceptable basking lamp. It produces a large amount of heat (infrared wavelengths) plus a small amount of UVA and a moderate amount of visible light, concentrated in the yellow, orange and red wavelengths.

“Neodymium” lamps are often advertised but the spectrum is not noticeably better than a tungsten lamp. The neodymium coating does not increase the amount of blue or UVA – it merely absorbs some of the red, making the resulting light seem to be more blue in colour.



Look for good quality household **flood** reflector type bulbs (with at least a 30-degree flood beam) that

Household “white light” reflector bulbs make suitable basking lamps. PAR38 Flood lamps (on the right) are ideal for larger vivaria.

give you a *wide* bright basking zone of the right temperature when it is about 12” above the dragon’s head.

The basking zone (the circle of warmth and light) should be **at least as big as the whole of the** dragon’s body (or only part of him will be properly warmed) and the target temperature should be around 104°F (40°C). There must be no small “hot spots” which could burn the skin of an animal lying under the lamp. The best way to create large basking zones is to use two, or even three lower wattage bulbs in a group, rather than one high-wattage lamp; e.g. two 50watt flood bulbs rather than one 100watt bulb. Use ceramic, heat-resistant fixtures and heat-resistant electric cables, and always use a dimming thermostat. The other end of the vivarium may approach room temperature – around 77° - 82°F (25° – 28°C).

It is perfectly possible to create good basking zones using only incandescent lamps. The visible light from these, however, is nowhere near as bright as sunlight, and is predominantly yellow in colour. Adventurous keepers wishing to increase the visible light in the vivarium may like to try adding metal halide lamps alongside their basking lamps. These are “arc lamps” which require a ballast controller, and cannot be controlled by a thermostat, or dimmed. However, good quality metal halides can be

found with “daylight” spectra which rival sunlight in both spectrum and intensity. The types used in shop windows and showrooms emit UVA, which is good for reptile vision, as well as visible light and infrared, but do not emit UVB. Typical wattages are 35W, 50W and 70W, and ballasts matching these wattages can be purchased separately. The lamps require heat-resistant fixtures and cables, like any heat lamp, but also use a high-voltage ignition pulse, so it is advisable to use fittings rated for up to 4kV. “Wide Flood” versions should be chosen. Some metal halides are now manufactured for reptiles, and these do emit UVB (see below). These can be used to provide a UVB gradient as well as heat and extremely bright visible light.

Day/night transitions are best achieved using timer switches. In their native habitat, dragons experience dark, cool nights and bright days with hot sunlight. Therefore they need their night-time to be cool and dark (no “night” lamps; they can see red and blue light perfectly well, just as we can). No heat or light is required for juvenile or adult dragons kept indoors, if the room temperature does not drop below 65° - 70° F (18° - 21° C).

Background heat for very young baby dragons, if it is considered necessary, may be provided at night by a low-wattage heat mat affixed to a back wall (not on the floor) or a ceramic heater on a low night-time setting.

“Hot rocks” with built-in heaters, or heat mats on the floor of the vivarium are not recommended for bearded dragons; they sense warmth from above, not below, and can burn their bellies from falling asleep on these.



A combination of T5-HO fluorescent tube (for UVB), incandescent lamp on a dimming thermostat (at the back) and metal halide lamp (at the front) used to create a large basking zone for a bearded dragon. NB. The T5-HO fixture is inside the vivarium. The other lamps are in domes resting on a mesh ventilation panel cut in the roof.

Summary:

Daytime basking zone temperature: 100° - 108° F (38° - 42° C) - target around 104° F (40° C)

Daytime general background temp: 80° - 85° F (27° - 29° C)

Daytime cool retreat: 77° - 82° F (25° - 28° C) - no warmer than 86° F (30° C)

Night-time general background temp: around 65° - 70° F (18° - 21° C) for adults; around 75° -80° F (24° -27° C) for young hatchlings.

It is usually necessary to experiment with the wattage and position of the heat lamps to achieve these temperatures when setting up a new vivarium. Placing maximum/minimum “patio” thermometer probes in key spots or, better, using an infra-red non-contact thermometer (sometimes called a “temperature gun”) are by far the best ways to do this. One of these thermometers may be the best purchase you can make! Check the temperature in the basking zone regularly. On warm summer days when the background room temperature is high, the temperature in the basking zone may be much higher than on winter days when the air is cool. The height of the basking lamp, or its wattage, may need reviewing with the changing seasons.

Dimming thermostats are essential to control incandescent lamps in all but the very largest of enclosures, to prevent accidental overheating of the vivarium. This is far more dangerous than cold. If a lamp fails and the vivarium cools to room temperature, the reptile will become cold and inactive, but will be perfectly fine for as long as 24 – 48 hours or more (just as they are in winter, in the wild). But if the air temperature exceeds the reptile’s critical maximum, and he cannot find somewhere cooler to lose heat, he will die a very unpleasant death very quickly indeed. For beardies, the critical temper-

‘Dimming thermostats are essential to control incandescent lamps in all but the very largest of enclosures, to prevent accidental overheating of the vivarium.’



“Patio thermometer” with probe sensor



Dimming thermostat



Infra-red non-contact thermometer

ature is around 114 - 117°F (46° - 47°C); if the body's internal temperature reaches 46°C death will occur.

A simple way to protect your dragon from accidental overheating is to place the thermostat sensor in the coolest part of the vivarium, set at 86°F (30°C). If the cool end then starts to become too warm to provide a safe retreat, the thermostat will then dim the basking lamp.

At all other times, it will allow the basking lamp to run at full brightness (providing the necessary light and heat in the basking zone.)

UVB Lighting

UVB is ESSENTIAL for bearded dragons. Without UVB light, bearded dragons cannot synthesise vitamin D3 in their skin. Vitamin D3 is needed to enable the absorption of calcium from the gut; calcium is essential for bone health and growth and for normal muscle function, among other things. Adequate vitamin D3 is also vital for the normal functioning of the immune system, and has complex influences on the brain and behaviour, the heart, the pancreas, the skin and many other organ systems. It also plays an important role in the prevention of cancer.

Without adequate vitamin D3 and calcium, metabolic bone disease will occur. This is, sadly, one of the most common afflictions of reptiles in captivity, but it is entirely preventable. Vitamin D3 can be provided by giving it in a vitamin supplement but the daily amount needed is unknown. It is much more natural to allow the dragon to synthesise his own vitamin D3 by supplying a good UVB lamp.

Ordinary household lamps and "reptile basking lamps" sold in pet stores DO NOT emit UVB light; either can be used for providing the heat at the basking spot, but a special UVB-emitting lamp *must* be used *as well*.

UVB-emitting lamps come in four basic types:

- (1) Standard (T8) UVB fluorescent tubes and compact lamps (e.g., coil lamps)
- (2) T5 High-Output (T5-HO) UVB fluorescent tubes
- (3) UVB-emitting mercury vapour lamps
- (4) UVB-emitting metal halide lamps.
- (5) UVB lamps provide UVB in two different ways, the "sunbeam" and "shade" methods.

The "shade" method uses the more familiar standard (T8) fluorescent tube or compact lamp ("coil" bulb) to provide a lower level of UVB. This method is more suitable for shade-dwellers such as geckos and snakes.

The “sunbeam” method is much more suitable for sun-basking species such as bearded dragons. This requires either UVB-emitting T5-HO fluorescent tubes, mercury vapour lamps or metal halide lamps. A suitable level for this species is around UVI 3-5 in the basking zone, with a gradient falling to zero in full shade.

It is vital to buy a good quality lamp; a poor lamp is, seriously, worse than useless. In most cases you get what you pay for; UVB lighting is not cheap to produce.

(A) The “sunbeam” method with T5 High-Output Fluorescent tubes.

These are very reliable sources of UVB with a good spectrum and excellent longevity – a full year or more of use. If you don’t have a UV Index meter (Solarmeter 6.5) to monitor the UV output, though, the tube should be renewed every 12 months, as the UVB output fades with time although the tube still appears bright. T5 UVB tubes with an output suitable for bearded dragons include the Arcadia T5 D3+ 12% UVB tube and the ZooMed T5-HO Reptisun 10.0 UVB tube. T5-HO tubes are much thinner than the familiar 1” diameter T8 tubes. They need matching electronic controllers or a purpose-designed luminaire such as the one illustrated (right). These produce a wide zone of high UVB, like direct morning sunlight, beneath the tube. If used in a luminaire (which has a built-in reflector), or with a clip-on aluminium strip reflector, they can provide about UV Index 3 – 5 at distances of 12 – 14 inches above the dragon’s back. The T5 tube needs to be placed in the warm end of the vivarium, so that it illuminates the same area as the basking lamp. Reptiles will then receive fairly short exposures of high-intensity UV light, at “sunlight” levels, whenever they bask, and when they move out



An attractive T5-HO luminaire which can be affixed inside the roof of a vivarium.

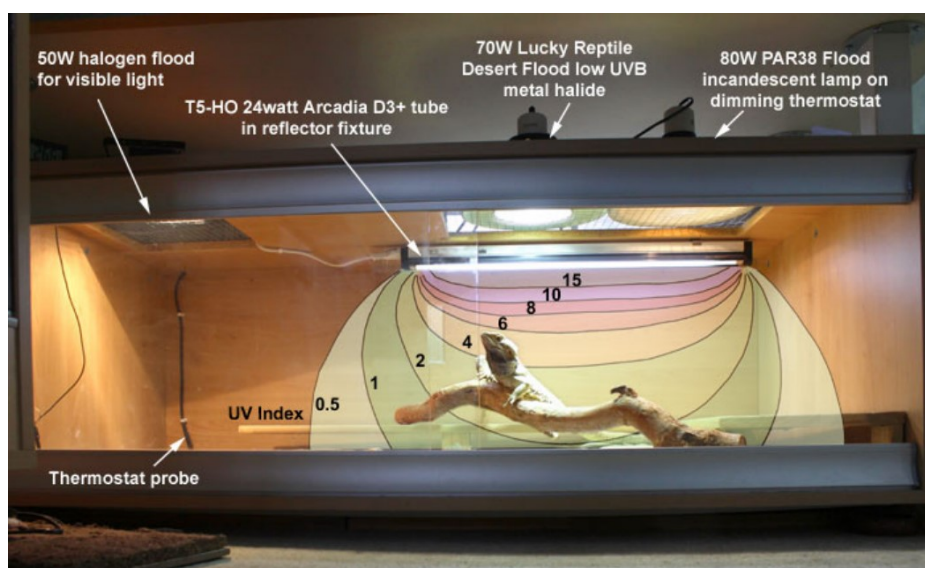
of the basking zone they move out of the UVB zone as well. The length of tube should be chosen to extend no more than half the length of the vivarium, allowing a gradient into shade at the cool end. This would seem to provide a fairly natural situation for species that do this in the wild, like bearded dragons. The T5 tube should not be any closer than 12 inches from the dragon at the closest point, if in a luminaire, or used with a reflector. (If used with no reflector, or if there is wire mesh between the lamp and the dragon, the UVB below the lamp will be much reduced and the tube will need to be hung about 8 inches above the dragon's back.) There must be no glass or plastic sheeting between the lamp and the dragon; these completely block all the UVB.

The diagram below shows an example of one possible set-up.

(B) The “sunbeam” method with a mercury vapour or metal halide lamp.

UVB-emitting mercury vapour lamps and metal halides provide focused beams of fairly intense heat, light and UVB. Although there are several brands available, the quality of their UVB output varies a great deal.

It is important to choose a flood lamp with a wide beam. Individ-



A 4ft x 2ft x 2ft bearded dragon vivarium, customised by the cutting of ventilation panels in the roof to accommodate basking lamps over wide mesh. The UVB is provided by a T5-HO Arcadia D3+ 12%UVB tube in a fixture with an aluminium reflector. The UV Index gradient has been plotted and overlaid onto the photograph to show the wide UVB zone, reaching UVI 3 across most of the beardie's body. In this case a metal halide emitting low-level UVB has been added for extra visible light and warmth. Directly under this lamp, the total UVB will be a little higher (not shown, for clarity).

ual lamps, even from the best quality brands, can vary in their UVB output from batch to batch. If you don't have a UV Index meter, follow the manufacturer's distance recommendations with care. At close range, the UV can be very intense.

Flood mercury vapour lamps usually have a frosted or milky white front face; this spreads and diffuses the beam. Suitable examples include the Arcadia D3 Basking Lamp and the ZooMed Powersun. Lamps with completely clear glass fronts are spot-focus and are not suitable.

Metal halides provide much brighter visible light and UVA, and a much better spectrum than mercury vapour lamps. Unfortunately, they are not as easy to use. As described above, they require ballast controllers and good electrical connections. The ZooMed Powersun HID has a good all-in-one lampholder and ballast; Lucky Reptile and ExoTerra sell ballast and lamp-holder "kits". Suitable brands include the Lucky Reptile Bright Sun UV series, the ExoTerra Sunray and the Mega-Ray UV-Wide-Beam. The ZooMed Powersun HID and the Lucky Reptile Bright Sun Flood bulbs have a lower UVB output, making them more suitable for combining with T5-HO tubes. If metal halides are to be used as the main source of UVB, it is advisable to check UV levels at least monthly, as some lose their UVB quite rapidly and may require 6-monthly replacement.

Mercury vapour and metal halide lamps produce much heat, and because of the way they work, they cannot be used with a dimmer or a thermostat. Because overheating a vivarium endangers a reptile's life, the safest way to use these is to choose a wattage that cannot solely provide enough heat for the basking zone, and pair it with a lower-wattage, ordinary incandescent bulb on a dimming thermostat. This will provide the extra heat needed, but in a controlled way.

Manufacturers' instructions should be carefully noted when these lamps are used, because of the excessive heat and UVB at very close range. A 100watt lamp, for example, must be *at least 12" above* the dragon. Unless the vivarium is at least 3ft tall, they are best hung over a mesh screen top rather than placed inside a vivarium with a solid roof, because of the size of the lamp, which will hang down 6 – 8" into the vivarium. If the lamp is inside a closed vivarium, excellent ventilation is essential to prevent an excessive build-up of hot air. When the lamp is above a mesh screen top, however, the hot air will rise freely into the room, and greatly reduce the risk of overheating.

The diagram on the right shows an example of one possible set-up using a metal halide for UVB. To provide the best light and heat at the basking spot, the ordinary basking light, on a dimming thermostat, should be placed as close as possible to the UVB lamp.

Dawn, Dusk, Day and Night

Bearded dragons are diurnal (awake in the daylight, asleep at night) and timers controlling UV and incandescent light ensure a regular “day” for a beardie. In summer, 14 hours of light (with UV) per day is ideal; this can be reduced over several weeks to 8 hours per day in winter, then back up again in the spring. Some keepers time their daytime lights in keeping with the natural rise and setting of the sun.

A simple “dusk and dawn” effect can be achieved by setting the timers so that the golden light from the incandescent lamp comes on 15 – 30 minutes before the stronger, blue-white UVB lamp, and remains switched on for 15 – 30 minutes after the UVB lamp goes off for the night.

Sophisticated automatic dimming devices are available to achieve an even more realistic “dusk” and “dawn” with incandescent lamps, but it is important to remember that UVB fluorescent lamps, metal halide and mercury vapour lamps cannot be dimmed.

Outdoor Basking

In the UK there are only a few weeks each year when it is warm enough for beardies to be outside to bask in direct sunlight. However, on days when basking temperatures are reached in the sunshine, a suitable secure outside pen can provide almost ideal conditions for a bearded dragon to benefit from the natural light, heat and UV. This must have a cool shaded area and a water bowl. **Never** be tempted to put a glass fronted vivarium out in the sun; temperatures would rise to dangerous levels very quickly inside, and UV does not penetrate glass anyway! The pen should have an open mesh top to keep out predators such as cats, dogs and birds of prey. The dragons should not be left unattended for long periods unless the pen is completely



The author's first outdoor beardie pen, which was in use for a few hours a day in the summer, here in the UK, for several years. The green tray was Sheila's “paddling pool”; the others usually just preferred to bask on the grass or on the logs. Shady corners must always be provided.

secure and escape-proof. Dragons readily climb and they can also squeeze under small gaps and even dig burrows in turf or soil.

A more permanent, secure outdoor run may be made out of an old greenhouse frame if you live in a warm, sheltered area with a sunny aspect. The lower panels can be glazed to prevent the dragons from climbing up the sides, and chicken wire or wide twill weld mesh can be used between the aluminium bars higher up, to prevent escape and/or keep out predators. The author's greenhouse (below) is part-glazed in UV-transmitting acrylic to allow more UVB through, although since it was completed there have been only a few days warm and sunny enough for it to be put to use!



Simple aluminium greenhouse frame part-glazed with UV-transmitting acrylic. The green plastic strip around the base stops is a visual barrier for the dragons; without it, they fail to understand that they cannot walk through the transparent acrylic into the rest of the garden.

Food

Beardies require a mixed diet of insects and vegetation. In their native habitat, food is often scarce. Lush green vegetation only grows in springtime after rain; by midsummer, most of it is reduced to dry stems and coarse leaves. Insects are likewise not abundant all year round. Bearded dragons do not browse in fields of watercress, cabbages and beans in the outback; nor do they ever find bowls full of fat morioworms or crickets! The bearded dragon has evolved to eat whatever it can find; in effect “there may not be any food for weeks, after this lot have been eaten”. One of the greatest risks to long-term health is therefore over-feeding, particularly overfeeding of insects, and an unbalanced diet containing too much livefood and not enough fibre, calcium, vitamins and minerals from what we would call “rough greens” – weeds and dark leafy nutritious greens (the opposite of iceberg lettuce).

Green foods which are suitable staple foods include dandelion, collards (USA) or spring greens (UK), rocket, mustard greens, endive, chicory greens, watercress, nasturtium leaves, mallow leaves, plantain leaves and Chinese cabbage.

Kale, green cabbage and other members of the cabbage family such as Brussels sprouts and broccoli, spinach, bok choy, swiss chard, and beet greens may be fed occasionally, but these all contain either high levels of oxalates (which bind calcium, making it unavailable from the food) and/or goitrogens which can affect thyroid function. So they should not form a high proportion of the diet.

Edible flowers include dandelions and hawkbit, honeysuckle, mallow, rose, nasturtium and hibiscus. Make sure no pesticides have been used – don't feed shop-bought flowers, most have been sprayed.

Suitable vegetables include pumpkin, butternut squash and other squashes, green beans, parsnip, carrot, snap peas, celery, zucchini (courgettes) and red or green bell peppers. These can be cut into small pieces or grated as appropriate. Vegetables are not staple foods but they should be fed occasionally as part of a balanced diet. Grated butternut squash is a favourite of dragons, and its high water content makes it invaluable for keeping a dragon hydrated when recovering from illness or injury.

Fruits such as small pieces of grape, banana, raspberry, strawberry, blackberry or mango can be offered as very special treats, but their high sugar content means they should not be offered regularly.

More information about green foods suitable for herbivorous and omnivorous lizards (including bearded dragons) and a useful chart may be found here: <http://www.greenigsociety.org/foodchart.htm>

All food should be offered in a bowl placed away from loose substrate such as sand, which unfortunately coats damp fresh vegetables all too easily. Leaves may be kept fresh by offering them in a small dish of water (like a bunch of flowers – see picture below).

Live Foods include crickets (brown or black), feeder roaches, locusts, mealworms and moriworms.

These are all raised on commercial insect farms and should be bought in small quantities, either direct from the insect breeder or as soon as they are delivered to the pet store. They are

shipped in tubs containing only dry bran, but they will not live long in these. **They must be properly cared for, and well fed, if they are to be of any nutritional value to the dragon.**

As soon as they arrive, they should be placed in an appropriate, adequately ventilated, clean tank or tub and offered suitable food. For all the insects listed above, dried powdered cereal-based food (such as dry cat or dog food, chick crumbs or fish food pellets, all ground to a powder in a blender) should be offered, along with fresh green leaves (for locusts) or leaves and/or sliced root vegetables (for the other species). The fresh food supplies all the moisture they need, so water is un-necessary. However, the fresh food must be replaced very frequently and never allowed to go mouldy, since this may cause fungal toxins to build up in the insects that eat it, which will then be eaten by the dragons. It should also be kept separate from the dry food, as its moisture will dampen the dry food causing this to develop mould, as well.

Special “gut-loading” foods are on sale; but if the insects are fed a healthy diet, these are not necessary.

Any dead insects must be removed at once, or their bodies will rot and contaminate the tank.

Locusts and roaches, if they are to be kept for any length of time, need a warm environment – either a heat lamp or heat mat is required. Look after your livefood, and your dragons will thrive, too.

Insects should not be released into the dragon vivarium in quantities that the dragon cannot eat at once. Crickets, in particular, can infest a vivarium, hiding in inaccessible corners and biting the sleeping dragons at night. The easiest way to feed dragons is to place the insects in a wide-mouthed jam jar (in which they may be lightly dusted with calcium powder as required) and either feed them direct from the jar, or tip them into a shallow feeding bowl out of which they cannot climb.

This method also avoids substrate such as sand being eaten along with the insects.



Crickets may be lightly calcium-dusted and fed from a large wide-mouthed jam jar



Even baby dragons should learn to eat chopped green leaves and vegetables such as grated squash



Dandelions (both flowers and leaves) are a favourite staple food for dragons



Edible garden leaves and flowers: dandelion, clover, mallow, rose petals, nasturtium, plantain, sowthistle



Shop-bought greens: rocket, lambs lettuce, pea tops, kale, chopped beans, grated squash & carrot



Leaves may be kept fresh for 24 hours by offering them in little dishes of water (like a bunch of flowers)

Hatchlings require feeding twice a day, with greens and very small insects. For healthy growth, it is important that greens make up a fair proportion of the diet. Finely chopped greens eg. dandelion, spring greens, peas, green beans, should be available daily. Young dragons may take little vegetable food at first; to encourage them, try offering the greens half an hour before the first livefood of the day. Live food will mainly consist of small crickets, at first. Larger prey must never be offered as the bulky undigested remains may press on the pelvic spine and cause paralysis. Brown crickets are ideal, they must not be longer than the distance between the hatchling's eyes (2nd instar; "2 weeks old", 6-8mm.) Feed only as many as they will eat in 5 minutes; overfeeding can cause problems. The crickets should be well fed, and very lightly dusted with calcium carbonate powder to ensure adequate calcium in the babies' diet. Twice a week, the crickets should be dusted with a vitamin/mineral supplement such as Nutrobal (UK) or Rep-Cal (USA), instead. Very small feeder roaches, black crickets and locusts may be introduced gradually, to vary the diet. Mealworms, which have tough chitin and more difficult to digest, are best avoided.

Juveniles up to 6 months are growing very fast and will eat prodigious amounts of both insects and vegetables, as above. Feed daily; it is important to encourage them to eat plenty of greens, because they are always hungry at this age, but overfeeding on protein and fat-rich insects, which are also low in calcium but high in phosphorus, can result in too fast a growth rate and metabolic disorders, or obesity and the risk of fatty liver disease.

Increase the size of the insects gradually, to 3rd instar crickets "3 weeks old" (8-10mm) by about 7-8 weeks old, and so on. Very large livefoods such as morioworms are best avoided under 6 months of age.

Adults, as growth slows, should reduce their food intake enormously, unless breeding. It is very important to avoid overfeeding on insects in adulthood, as high fat, high protein diets affect liver and kidneys and can shorten life. Vegetarian foods become a much more important part of the diet, and fresh greens should be offered daily. Insects (eg. large brown crickets, morioworms, locusts, feeder roaches and mealworms; waxworms for a very occasional treat) may be offered every other day or, with older dragons, twice a week. The livefood should always be well fed, and calcium dusted (vit/mineral supplement-dusted once a week). Adults, if not breeding, will often eat well in early spring and then cut back, sometimes refusing food for days at a time, in midsummer or towards autumn. If the beardie is healthy and not losing weight,



Bearded dragons recognise calcium powder and will scratch and lick at it, if they need more calcium.

this is normal and of no concern, as they may be preparing for a winter sleep. (See section on Brumation, below.) Breeding females, on the other hand, need very high quality food and daily feeding if they are not to lose condition whilst producing large clutches of eggs.

All bearded dragons of whatever age may benefit from free access to powdered calcium carbonate – also known as “limestone flour” (sold for horses) and available in small tubs eg. Calypso Cricket Dust. This can be offered in a small dish which beardies will lick and scratch at. NB. this is pure calcium, not a calcium/vitamin mix such as “Nutrobal” as this could lead to vitamin overdose. Alternatively, they can be offered cuttlefish bone, which can be coarsely grated into a small dish.

Water requirements:

Hatchlings are best offered droplets of water, from a dropper or spray, daily. Some will learn to drink from a dish if they are shown water splashing in it. Older dragons vary in their desire to drink, but fresh water should always be available and some will drink from a dish. Some beardies enjoy bathing in tepid water, and will learn to drink whilst being bathed; but never leave a dragon in water, unattended. Some dragons will lap slightly warm water from a dropper and this may be offered once or twice a week. Adult dragons will drink up to 5 –10ml if thirsty.



This bearded dragon drinks readily from a shallow dish of water.



This one laps up droplets trickled onto the end of her snout from a syringe

Bathing

Some, but not all beardies love water. Many owners give their beardies regular “bathing” opportunities, using shallow, very slightly warm water in a washing-up bowl, a bathtub or even a kiddie play pool. The water should not be deeper than the beardie’s shoulders, the temperature should be monitored and the dragon should never be left unattended.

One of the author’s first beardies would climb into any large shallow container of water as soon as she saw it; she appeared to love paddling and even swam like a crocodile in slightly deeper water. Another of the author’s beardies hated water, though, and clambered out of any “bath” at once.

Bathing can be very helpful if a beardie is dehydrated as many will drink during a “bath”. It can soften loose skin during shed-

ding, too, easing the process. Many dragons will also defecate in the water, which is a healthy process especially at the end of brumation. (Obviously this ends the bathing session for reasons of hygiene!)

Although in the wild, few beardies would encounter pools or streams, some really do seem attracted to water for some reason. As long as a dragon is able to remain at its optimum body temperature, and is able to dry itself completely afterwards, offering this behavioural enrichment to a pet dragon seems completely harmless and possibly quite beneficial.



The author's beardie Sheila loved to paddle.

General Information

Temperament:

Bearded dragons are sociable creatures which are very responsive to each other and to their keepers; they seem naturally tame though babies are instinctively skittish. With regular gentle handling however, most beardies will become very tame with people. They appear to recognise people involved in their care, and may be noticeably more shy of strangers. A beardie which is aggressive towards humans is unusual, although a few do exist.

Handling:

When handling a bearded dragon, never grab the body or reach down from above (like a bird of prey). Approach him from the side, so he can see your hands coming towards him slowly. Even very young dragons will perch on your fingers if you slide them under the body and let the dragon place his feet on your hand before you lift him. Older dragons may be lifted by scooping your hands under his feet, one hand to each side of his body, so both front and back feet are supported as you lift him. Make sure you support the hips to avoid damaging his back; you may find it helpful to rest the tail along your arm. Dragons are very trusting and do not cling hard; if he is perching on your arm or shoulder, keep a hand nearby to prevent a sudden fall.

Social Structure:

Bearded dragons have a distinct social structure; they recognise each other and some seem to form attachments to one another. Both sexes form dominance hierarchies.

Two adult males *will* fight and should never be housed together. They can seriously injure one another, severing limbs and tails.

Although the author believes that all beardies are best housed individually, a single male may sometimes be housed successfully with one or more females, or females may be housed together, but it is vital to provide enough space – especially basking space – to prevent bullying. There must be more than one basking zone, separated by a wide gap, so that dominant lizards cannot prevent the others from basking. The dominance may be very subtle; sometimes the only sign may be that the more submissive animal avoids the “top dog”, therefore rarely basks, and does not feed so well, since they cannot digest their food properly if not sufficiently warm.

If two or more beardies are housed together, they should be offered livefood separately. Beardies tend to “browse” green food in a less competitive way, so placing the greens in just one bowl may not cause any problems; but be watchful.

Not all beardies will accept cage mates. If you are planning on keeping more than one beardie, you *will* need more than one vivarium, in case they need to be separated.

It is very important not to put dragons of very different sizes together, even for short periods outside of their vivariums. Disasters have occurred in which the smaller baby has “vanished” ... or been found stuck in the throat of a somewhat bigger one. Growing juveniles, in particular, are voracious feeders... be warned. If overcrowded and hungry, they will bite toes and tails off their littermates, too.

Communication:

Social responses include head-bobbing and beard display, usually combined with a number of distinct poses, bows and body-tilting gestures. Given space to run around, beardies will often greet each other by rapidly circling each other, puffing out their beards, bobbing and stamping their feet, and even flattening the body laterally and tipping it towards the newcomer. Males will then often try to grab the neck of the female and mate.



Baby beardies armwaving as a sign of submission

Dominant females in an all-female group will often adopt male gestures, too, even mounting the rival.

Submissive beardies, or ones not receptive to a male, will usually bow slowly down towards the ground in a slow movement that looks as if they are “doing press-ups”, or perform arm-waving, a submissive gesture shown most often by juveniles and females.

Individuals also greet each other by touching the face of the other with the tongue.

An excited beardie will turn its beard black. This colour change is under voluntary control and can happen in seconds. Males, however, may keep their beards black for long periods during the breeding season. Blackening of the beard is also seen when a beardie is frightened, or in pain.

Colour Changes:

The amount of black pigment in the uppermost layer of skin is controlled both by the emotional state of the beardie, and his/her physiological state.

When cold (or ill, or depressed) a beardie appears dark or greyish in colour. When they first wake up and start to bask, they may be very dark indeed, with grey or black flecks speckling their belly, chest and arms as well. This is a way of speeding up the warming process, since black absorbs heat faster than pale colours.



When they are fully warmed up, the black flecks underneath may vanish completely, and the belly may be almost white; the dragon's back, head and throat may become bright coloured or very pale depending upon the natural red or yellow pigmentation.

"Happy", active beardies, at their optimum temperature and given sufficiently bright light with good UVB, look quite different...

Often, as they settle down to go to sleep, they darken again as they cool down. Oddly enough, when they are fast asleep, the dark coloration may fade and they may become very pale indeed until they wake the following morning.

Brumation:

Adult bearded dragons are responsive to changes in the seasons, even as seen through a window, regardless of the artificial lighting regime being used. Many naturally enter a period of brumation (seeking cooler parts of the vivarium, ceasing to feed and becoming very inactive) at any time from August to September onwards.

Individuals vary widely in their response, however. Some drag-

ons never brumate. Others merely seem to doze all day; others dig into corners of the vivarium and virtually go into hibernation for several weeks or months. As long as the adult dragon is in good bodily condition, this is a natural rest period and it is not necessary to prevent its occurrence. Indeed, brumating dragons should not be overly encouraged to eat, lest the food remain undigested and cause internal problems. In Australia, dragons in the Northern (more tropical) part of their range only brumate for a few weeks; those further South, in more temperate areas where the winter is colder and longer, may disappear underground for months.

The author's adult dragons, over many years, have all brumated from September onwards, as soon as the nights become longer and cooler. They refuse to feed after the end of September and are fast asleep in dark corners by the end of October. At the beginning of November, they are deeply "asleep" with very slow breathing movements, and all their heating and lighting is then turned off. The author then checks them, without disturbing them, every day; very occasionally, one is seen to be awake and is offered a drink of water, but they do not eat, and hardly move. They lose very little body weight – only a few grams.

How they know when Spring is returning is a mystery, but they always wake up around the first week in January. They waddle up towards the basking zone, whereupon the lights are turned back on and they are offered a drink. Within a couple of days they are accepting food, and only days after that, they are very active indeed and prepare themselves for the breeding season with much social interaction and display behaviour.

Kathryn Tosney has written a section on brumation on her informative website: <http://www.bio.miami.edu/tosney/file/BDbrumate.html>

Shedding the skin

Young bearded dragons, growing rapidly, shed frequently – sometimes every few weeks. Adults may only shed once or twice a year. Bearded dragons shed "piecemeal". A patch on the head, or one leg, or the back – anywhere - will seem to darken first, as the new skin underneath grows up. It then slowly develops a semi-transparent look, finally becoming almost white. This can take several weeks. Finally, the upper, old layer crinkles and cracks, and peels off. This last stage is itchy, and the beardie will rub against rocks and logs to get rid of the loose skin. If it is



Fleur is shedding her head and one foot.

around the eyes, he will “puff out” the skin around his eyes (this can look most alarming) and if it is around the beard or belly, he may puff out either of these, too, to stretch the skin and loosen it. Don’t be tempted to pull it off; you can accidentally tear the delicate new skin at the edges where old skin is still attached. Soaking is the best way to soften and loosen any dried retained skin, but beardie skin shed rarely sticks. It almost always comes off in its own good time.

Sexing baby bearded dragons

Sexing:

Before 4-5 months, sexing is unreliable, but males can be identified with increasing certainty as they grow, by lifting the tail of a standing dragon and looking for



two bulges (hemipenes)
with definite groove between
them in midline
probably male



single solid bulge
at base of tail, no groove
in midline
probably female

evidence of post-cloacal bulges, the hemipenes, to either side of the midline at the root of the tail. Males also have a wider cloaca. Secondary sexual characteristics – enlarged pre-anal and femoral pores, wider head shape, dark beard and bobbing display in males – appear with full maturity.

Summary:

Bearded dragons make excellent and engaging companions if cared for properly. It is important to realise that they are social creatures and have both physical and psychological needs. It is the responsibility of anyone keeping a bearded dragon to meet those needs; but the effort is not great when compared to the rewards which this small relationship can offer.

References / Suggested Reading:

This care sheet is an outline at best.

Websites: I would recommend keepers start by exploring the following excellent sites which contain detailed care information. (But please remember – bringing up a bearded dragon is like bringing up a child – there are hundreds of different ways of doing it, and many of them turn out just fine... You will inevitably read conflicting advice. If in doubt...use your common sense!)

1. Jenn Harrell's website: <http://www.blackninja-kitty.com/herps/dragons.php>

2. Kathryn Tosney's website: <http://www.bio.miami.edu/tosney/file/BDcare.html> Bearded Dragon.org: a popular forum and good articles: <http://www.beardeddragon.org>
3. <http://www.reptilesmagazine.com/An-In-Depth-Look-At-UV-Light-And-Its-Proper-Use-With-Reptiles/>
4. UV Guide UK – a website about UV lighting for reptiles: <http://www.uvguide.co.uk>

I would also recommend keepers buy one of these inexpensive books: (order from local bookseller, or online eg. Amazon.co.uk)

1. **Bearded Dragons** by Lance Jepson. Pet Expert Series 2013 Magnet & Steel. ISBN 1-907337-15-6 An ideal introduction, inexpensive but very good basic care guide, written by a reptile vet.
2. **The Bearded Dragon Manual** by Philippe de Vosjoli, Robert Mailloux, Susan Donoghue, Roger Klingenburg and Jerry Cole. Herpetocultural Library. 2001 Advanced Vivarium Systems. ISBN 1-882770-59-5 A detailed and most useful guide.
3. **The Bearded Dragon** by Steve Grenard. Owners Guide to a Happy Healthy Pet Series. 1999 Howell Book House. ISBN 1-58245-012-9

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BHS Captive Breeding Committee (CBC) Update: Summary 2018

Dr Simon Townson, Chairman

This report provides an update on CBC activities, particularly meetings and current/recent applied project work. The programme of project work was established in 1999 and has been supported largely by independently raised funds.

To see reports/updates on some earlier funded project work, please refer to Townson (2014) [includes Golden Mantella; Veterinary workshop in Kenya; Belalanda Chameleon; Cayman Iguana; Agile Frog]; Liddiard (2017) [Agile Frog in Jersey]; Burton (2010) [Cayman Island Iguanas, *Cyclura lewis*].

Amersham Meeting 2017

The annual Amersham meeting, in collaboration with the Thames and Chiltern Herpetological Group, took place on Sunday 24 September, 2017 and was a great success with the feedback all positive. The meeting was well attended, with excellent presentations and lively discussions. The presentation by Iri Gill from London Zoo was particularly well received, linking modern zoo work with overseas conservation projects. The meeting programme was as follows:

Chairman: Simon Townson

Iri Gill (ZSL). 'Gharial Conservation in Nepal; Past, Present and Future'.

Rick Hodges (Kent reptile and Amphibian Group). 'Getting to Know Adders Personally – Case Studies on Adder Behaviour'

Chairman: Colin Melsom

Izabella M. Barata. (DICE, University of Kent). 'Frogs in Plants: the Natural History of a Bromeliad Dwelling Frog in Brazil'

Calvin Allen (Berkshire College of Agriculture). 'Breeding Reptiles and Amphibians at the BCA'

Followed by

Further refreshments and an Open and Informal Session for members – Exhibition of captive bred animals and items/posters of herpetological interest.

Captive Breeding Committee funded project work

Work has continued on a range of projects concerned with applied conservation and captive breeding.

Current Projects:

Headstarting of Agile Frog *Rana dalmatina* tadpoles at the Durrell Wildlife Conservation Trust, Jersey.



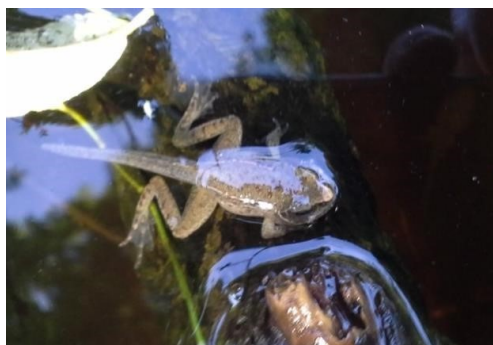
A pair of Agile Frog (courtesy of JARG and Tim Liddiard)

A new project was funded in February 2014 thanks to a 'green' donation to BHS from Peregrine Livefoods.

Partners are BHS, Jersey Amphibian and Reptile Group, Amphibian and Reptile Conservation Trust, and Durrell Wildlife Conservation Trust.

The Agile Frog is distributed widely throughout much of southern and central Europe, but it is found only in a few northern locations including Jersey – the frog is not found anywhere else in the UK. The Jersey population was declining in both range and numbers since the early 1900s until 1996. In the 1970s only 7 localities were listed where the frog could still be found, and by the mid-1980s this had fallen to only 2 sites. Currently, thanks to

successful conservation measures, there are 4 sites.



Agile froglet

While there is an ongoing programme of habitat improvements and protection, this project is specifically about expanding the tadpole head-starting project established at the Durrell Wildlife Conservation Trust. Spawn is collected from the wild, the tadpoles are hatched in captivity at a specially constructed and dedicated facility. When the tadpoles are close to metamorphosis, they are then released back into selected ponds. This system was started in earnest in



Tadpoles being 'bagged up' ready for release

2005 and since then there has been a 5 or 6 fold increase in the number of spawn clumps laid.



Ready to be driven to their new home

The project has made great progress and a paper was presented at the BHS/ARC scientific meeting in December 2014:

Tim Liddiard (Jersey Environment Dept.). 'The Jersey Agile Frog Project'.

The latest data for 2016/2017 shows the continuing success of the project. An article has been published in *The Natterjack* in 2017, demonstrating that a modest intervention can have a significant conservation impact.

Microhabitat Selection and Behaviour of the Harlequin Mantella (*Mantella cowani*) in Madagascar

Madagasikara Voakajy (MV) and DICE (University of Kent)

Towards the end of 2014 a new project was awarded to MV for fieldwork research on the rare Harlequin Mantella.

This beautiful frog has a highly restricted distribution in Madagascar and is listed as critically endangered by IUCN. In January 2014 MV hosted a meeting of the various partners involved with Harlequin Mantella conservation to discuss an action plan



Mantella cowani photographed in Madagascar (courtesy Richard Griffiths)

and priorities for further work. Chester Zoo are interested in supporting both *in-situ* and *ex-situ* work, and DICE can offer advice and support through its existing collaborations with MV. Given the ongoing threats to the remaining wild populations, establishing an *ex-situ* captive population

was discussed as a possible future conservation need. However, if *ex-situ* conservation is to happen, more information is needed to determine the microhabitat, microclimatic and behavioural requirements of this species in the wild.

This project funded by the BHS seeks to extend the mantella monitoring work (on Golden Mantella) to include the Harlequin Mantella. The study aims to collect data on microhabitat selection and microclimate use. This information will be used to identify optimal habitat and inform future captive husbandry protocols. Coupled with wider survey work, the project will also enable the IUCN Red List status of this species to be re-evaluated, and the feasibility of an *ex-situ* programme assessed.

During 2017/18 we hope to continue supporting conservation work on this species with a new project grant for captive breeding, either at Chester Zoo or *in situ*. The situation in June 2018 is that there are some security concerns in the areas where *M. cowani* lives, causing a temporary restriction on progress.

Gharial Conservation in Nepal

Zoological Society of London

The Gharial is a critically endangered species and a highly specialised crocodilian. A BHS grant was awarded for a project to start at the beginning of 2016 but there has been a delay regarding other sources of funding; we hope that this applied conservation project will start in the near future. This ZSL project will involve a collaboration with the Gharial Breeding Centre in Chitwan National Park, with the objective to make improvements to the captive breeding and release programme.



Gharial at the Gharial Breeding Centre in Chitwan National Park
(courtesy Iri Gill)

Following enquiries from Dr Townson towards the end of 2017, we were informed by ZSL that they have now received addi-



Enclosure at the Gharial Breeding Centre in Chitwan National Park
(courtesy Iri Gill)

tional significant funding for Gharial work from the Darwin Initiative, which means that the whole project will now go ahead in 2018.

The overall objectives are:

1. Establish current population status and threats for gharials and prey species in Nepal.
2. To quantify direct anthropogenic threats to the gharial population.
3. To provide science-based recommendations for the revision of conservation action plan for gharials to the Government of Nepal.
4. Strengthen captive management capacity for gharials and fresh water turtles in Chitwan and Bardia National Parks (**BHS funded component**). This should greatly improve the output of the high profile gharial reintroduction programme.



Gharial Breeding Centre in Chitwan National Park (courtesy Iri Gill)



Gharial Breeding Centre in Chitwan National Park (courtesy Iri Gill)

New project proposals under development/consideration

Research on the optimization of tadpole diets. Collaboration between the Waltham Pet Centre for Pet Nutrition, the London Sealife Centre and the University of Derby. The zoo conservation community is trying to establish healthy, viable *ex situ* populations of amphibian species which may become extinct in the next decade or so. However rearing and reproducing these amphibians in captivity can be challenging as little is known about the natural diet of many species of tadpole or their fundamental nutritional requirements. This project will seek to evaluate and optimize diets for a number of species in captivity.

It was intended for this project to go forward in 2017, but has been unexpectedly delayed by the maternity leave of the principal investigator Dr Donna Snelgrove at the Waltham Pet Centre (a MARS company). We hope to go ahead with this project later in 2018 when Dr Snelgrove returns to work.

Conservation of the Indian Python in Gujarat, India. Collaboration between the Jivdaya Charitable Trust (India) and Wheelhouse Vets (UK). This snake is a CITES Appendix 1 endangered species. This project will seek to monitor and protect pythons through a programme of protecting and enhancing breeding sites (including artificial refugia), education and promotion with local peoples (mitigation of road kills and benefits to farmers etc.). **Funding approved June 2018.**

UK Pool Frog Reintroduction Programme. Application from Amphibian and Reptile Conservation (ARC). The Northern Pool Frog (*Pelophylax lessonae*) is the UK's rarest amphibian. It became functionally extinct in the UK in 1995, largely as a result of habitat loss and deterioration. This northern clade of Pool Frog is now recognised in its native countries as a species of conservation concern. It is only found in a few isolated sites in Norway, around 200 sites in Sweden, and a few sites in Finland. For over a decade ARC has been working with partners in Norfolk to reintroduce pool frogs imported from Sweden. This initial phase has gone well, while part of the current work is to produce a dedicated head-starting facility to underpin population reinforcement and to support translocations to further sites. This proposal to BHS is for a grant to enhance tadpole rearing facilities. **Funding approved June 2018.**

References

Burton F.L. (2010). Artificial retreats for restoration of Grand Cayman Blue Iguanas to the wild: s report to the British Herpetological Society (BHS). *Herpetological Bulletin* 114, 19-23.

Liddiard T. (2017). The Agile Frog: a summary of the captive breeding, re-introduction and conservation efforts in Jersey 2014. *The Natterjack* 214, 2-8.

Townson, S. (2014). BHS Captive Breeding Committee (CBC) Report 2013. *The Natterjack* 207, 1-10.

Enquiries regarding applications for CBC Project Grants should be addressed to Dr Simon Townson (s.townson@imperial.ac.uk).

BOOK REVIEW:

SNAKES OF EUROPE, NORTH AFRICA & THE MIDDLE EAST

Author: Philippe Geniez

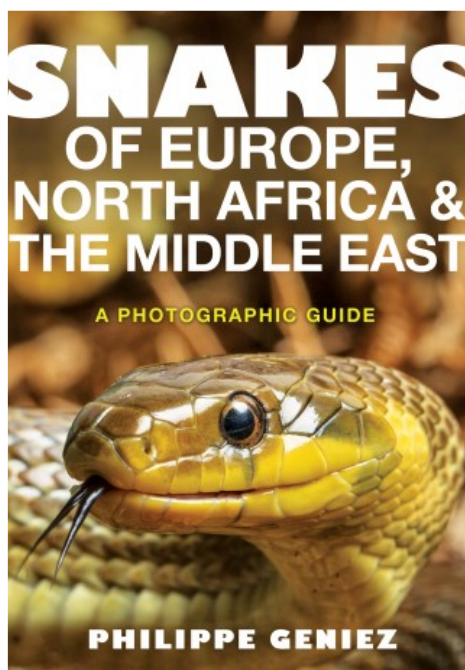
Translated by Tony Williams

Reviewed by Suzanne Simpson

Paperback, 384 pp., size 5 1/4 x 7 1/2, ISBN 978-0-691-17239-2

Copyright 2018 by Princeton University Press

Snakes of Europe, North Africa & The Middle East is a well laid out, hand-sized photographic guide book covering 122 species of snake recorded in the Western Palearctic. The book covers anatomy, taxonomy, habitat, ecological aspects, captive husbandry, diet, reproduction and venom. The contents are methodical in their arrangement where species are in order as to their classification, family by family. The author starts with a brief historical summary then covering morphology, locomotion (wonderful illustrated pictures of movement), sensory organs, ecdysis (visual stages added in photograph format), mating through to birth. The venom section shows illustrations of skulls and dentition then gives a detailed explanation of the different effects following envenomation and how to proceed with care and medical attention.



Included inside are 387 high quality photographs which are clear and accompany detailed information regarding each species. Distribution maps are provided and show home range with additional detail given in text. Varying scalation patterns are explained and there are illustrated drawings at the beginning of the book (repeated at the back) which are a pleasant visual addition. Remarks are added where relevant knowledge may be

of interest, such as, the Blunt-nosed Viper being 'described as a distinct subspecies'. There are two indexes at the back for both scientific and English names and a few section overviews that touch on snakes in captivity, snake enemies and conservation measures.

The book is primarily aimed at field naturalists but would be thoroughly enjoyed by any herptoculturist who can utilise it dependent on the species being researched. Additionally, there is a wonderful table at the back of the book where you can see all the snakes listed and tick off as to when you have spotted them!

As can be seen by the dimensions, this is a handy and easy to carry book that can be carried when in-situ. I would definitely recommend *Snakes of Europe, North Africa & The Middle East* if you are interested in snakes from these areas.

Price: £24.00 (UK) but through the offer below, you can get a £4.00 discount as a BHS member.

Available through all good booksellers and online.

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Offer available until 30 September 2018

Upcoming Events

Find out about the events planned
in the forthcoming year.

Commemorative Symposium: Maxwell Knight, the original “nature detective” and Second World War MI5 agent

Saturday 24th November 2018, 1pm - 6pm

A half-day symposium about Maxwell Knight, OBE, FLS, naturalist and Second World War MI5 agent, will be held at:

**Birkbeck College, University of London,
43 Gordon Square, London WC1H 0PD.**

The meeting will be hosted by the British Herpetological Society (BHS) and supported by the British Chelonia Group (BCG), the Amateur Entomologists Society (AES), the Institute of Animal Technology (IAT), the Frightened Face of Nature (FFON) and others.

The Symposium will commemorate the 50th anniversary of the death of Maxwell Knight, the famous naturalist and renowned MI5 agent.

TICKETS:

£10 per person

**These are only available through the BHS website:
<https://www.thebhs.org/about/events/66-maxwell-knight-commemorative-symposium>**

Registration to enable attendance at the symposium can only be made via the BHS. Registration is strongly preferred directly via the event entry on the BHS website, with payment made via Paypal. However, if this is not possible for some reason, please contact webmaster@thebhs.org to arrange an alternative registration/payment method.





The British Herpetological Society (BHS)

Commemorative Symposium

London, Saturday 24th November 2018

**Maxwell Knight, the original “nature detective” and
Second World War MI5 agent.**

Birkbeck College (Gordon Square annex) 43 Gordon Square London WC1H 0PD

Saturday 24th November 2018, 1.00 pm (13.00) until 6.00 pm (18.00).

Organised by the British Herpetological Society (BHS), with support from the British Chelonia Group (BCG), the Amateur Entomologists Society (AES), the Institute of Animal Technology (IAT), the Frightened Face of Nature (FFON) and others.

The Symposium commemorates the 50th anniversary of the death of Maxwell Knight, the famous naturalist and renowned MI5 agent. It will recount and reassess his life and work in the 21st century, with reference to contemporary environmental issues such as species conservation, captive-breeding of endangered species and public education. Literature and specimens from Maxwell Knight's collection, including long-lost manuscripts from his original filing cabinet, will be on display. During breaks and at the end of the symposium there will be a showing of Maxwell Knight's original television/lecture films.

PROGRAMME

- 13.00 Arrival and Registration. Viewing of literature.
First session, introduced by Mrs Margaret E Cooper (Chairman)
- 13.25 Introductory lecture: "Maxwell Knight the naturalist" – Professor John E Cooper
- 13.45 Introductory lecture: "Maxwell Knight the spy-master" – Mr Simon King
- 14.15 Presentation: "The frightened face of nature: challenges facing the planet" – Mr Paul Pearce-Kelly
- 14.35 "Newts, nadders and neophyte naturalists" – a dramatic interlude (*Provisional title – re-enactment of MK's childhood encounter with youths and newts at a Surrey pond*) - Simon King, John Cooper and others
- 15.05 Tea and coffee break. Viewing of literature and items from Maxwell Knight's collection.
Second session, introduced by Professor John E Cooper (Chairman)
- 16.20 Presentations "Advances in the health and welfare of captive animals" – Mr Alan Graham
- 16.45 Presentation "Educating the next generation: culture, care and conservation" – Ms Victoria Burton/Mr Dafydd Lewis
- 17.15 General Discussion. Short accounts by people who either knew Maxwell Knight or who were influenced by him. Tributes from herpetologists, field naturalists, conservationists, biologists, animal care staff and others (Mark Rose, FFI; John Burton, formerly BBC; June Chatfield, Haslemere; Graham Wellstead, Surrey.....)
- 17.45 Closing Remarks (Professor John E Cooper).
- 18.00 Departure.

Queries on this event should be addressed to:

Professor John E Cooper, FRCPath, FRCVS/Mrs Margaret E Cooper, LLB, FLS, Co-ordinators, Maxwell Knight Commemorative Symposium at:

Wildlife Health Services (UK) ngagi2@gmail.com

Everyone welcome, please come join us at the Amersham Joint meeting



BRITISH HERPETOLOGICAL SOCIETY AND THAMES & CHILTERN HERPETOLOGICAL GROUP

**Joint meeting Sunday 16th September 2018, 2.30 – 7.00 pm at the
Drake Hall, Amersham Community Centre, Chiltern Ave,
Amersham, Bucks, HP6 5AH.**

2.30 – 3.00 Arrival and coffee/refreshments

Chairman: Simon Townson

3.00 – 3.30. **Karen Siu Ting** (University of Aberystwyth, Ecological and Evolutionary Genomics Lab): ‘Don’t Kiss the Frog ! How do Dendrobatid Frogs get their Poison ?’

3.30 – 4.00. **Gilbert Adum** (SAVE THE FROGS ! GHANA): ‘Saving Ghana’s Frogs: the Journey so Far’

4.00 – 4.30. **Janine Robinson** (Durrell Institute for Conservation and Ecology, University of Kent). ‘Supplying the Exotic Pet Trade: Deal or no Deal for Local Communities in Madagascar’

Short break and refreshments/informal session (see below)

Chairman: Colin Melsom

5.00 – 5.30. **Jim Labisko** (Durrell Institute for Conservation and Ecology, University of Kent): ‘Endemic, Endangered, and Evolutionarily Significant: Cryptic Lineages in Seychelles’ Frogs’

5.30 – 6.00. **Rowland Griffin** (Durrell Institute for Conservation and Ecology, University of Kent): ‘The Reptiles of Guatemala’ [provisional]

6.00 -7.00. **Informal Session** . Exhibition of captive bred animals and items/posters of herpetological interest (including science, books, art, photography). There will be limited space for up to 20 exhibits. Members who would like space should contact Simon Townson (0770 775 1900 or s.townson@imperial.ac.uk), or Colin Melsom (07852 949405 or colinmelsom@sky.com)

Amersham is easy to get to via J18 of the M25 or by tube/rail to Amersham station. Parking and entrance to the meeting are free.



THE NATTERJACK



Newsletter of the British Herpetological Society Established 1948

To our BHS members,

We are always interested in hearing from you. Please feel free to contact me if you would like to share anything regarding herps. We would love to about your animals, your experiences, their care and husbandry, ideas, training, research and more.

It is important to us that you have that opportunity to share with the wider community, as we all benefit from sharing knowledge and experience.

Kind regards,

Suzie Simpson

Email: natterjack@thebhs.org

Find out more about The British Herpetological Society on our website at:

<https://thebhs.org/>

Check out our social media pages too:

<https://www.facebook.com/The-British-Herpetological-Society-BHS-295241210567422/>

<https://www.facebook.com/groups/454242811428496/>

Twitter: @britishherpsoc